THE FOREST OF DEAN GLOUCESTERSHIRE

Stage 2: Pilot Field Survey

Project Number 2727

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Summary

The following document is a report on Stage 2 (pilot fieldwork) of the Forest of Dean Archaeological Survey (English Heritage Project No. 2727 MAIN).

The main period of pilot fieldwork was undertaken between December 2004 and February 2005. In addition a number of other pieces of fieldwork were undertaken earlier in the project, concurrent with Stage 1(desk-based documentary research).

The pilot field survey was informed by:

- *The results of Stage 1 of the project, which identified that exploratory field survey within woodland was a requirement of archaeological investigation in the Forest of Dean.*
- *Two specialist seminars held during Stage 1 of the project to discuss suitable methodologies for investigative work within woodland, including:*
    - *Rapid field reconnaissance.*
    - *Geophysical survey.*
    - *Palaeoenvironmental sampling.*
- *Recent developments in LiDAR survey to penetrate canopy cover in areas of woodland and discussion with specialists in that field.*

Pilot field survey consisted of the following main elements:

- *Sample excavation of a charcoal platform to investigate the impact of tree cover, and other forestry operations, on their preservation and potential to produce useful palaeoenvironmental material.*
- *Rapid field reconnaissance to refine the methodology of this technique and also to assess its potential to identify archaeologically significant features within woodland. This process also assessed the value of identifying ecological signature species to locate areas of archaeological potential within woodland.*
- *Rapid field reconnaissance undertaken in conjunction with the results of LiDAR survey, which had been processed to remove woodland canopy cover.*
- *Geophysical survey to test its potential to identify archaeological features, other than highly magnetic residues of past industrial activities, in different woodland conditions.*
- *Desk-based research to identify areas within the Forest of Dean survey area suitable for palaeoenvironmental sampling.*
- *Palaeoenvironmental sampling in one of the identified areas to test the potential of this to identify deposits which could provide information on the environmental history of the Forest of Dean.*

Pilot survey identified that further fieldwork, particularly within woodland, has the potential to identify significant archaeological features and deposits which could radically alter current perceptions about the nature of that landscape in earlier times. LiDAR and rapid field survey have identified patterns of linear and rectilinear earthworks which appear to represent the remains of a unified and large-scale system of landscape organisation, unrelated to current enclosure patterns or woodland.

Palaeoenvironmental evidence questioning current perceptions of the environmental history of the area has been recovered in one of the areas identified as suitable for this type of research, and potential applications of excavation and geophysical survey within a woodland environment were refined.

Suitable methodological approaches to further archaeological investigation within the woodland of the Forest of Dean have been identified. These include all the elements tested as part of the pilot fieldwork, although not all techniques will be appropriate all areas or in all situations.

Further field survey within the woodland of the Forest of Dean should consist of:

- *LiDAR survey of all areas of woodland as a single operation. The results of this will be processed to remove woodland canopy cover.*
- *The results of the LiDAR survey will be used to prioritise areas for further survey.*
- *Rapid field reconnaissance will be undertaken in areas identified through LiDAR survey to both validate and characterise any features revealed through LiDAR and identify other significant features in those areas.*
- *The results of the rapid field reconnaissance will be used to prioritise areas in which further, more intensive investigative techniques, such as excavation, topographical survey, geophysical survey or palaeoenvironmental sampling would be appropriate.*

With the exception of the LiDAR survey, it is proposed that all subsequent field survey should be undertaken in a staged way, to allow:

- *Field surveys in woodland to be undertaken when ground conditions are most suitable.*
- *The success of field survey methodologies and strategies to be reviewed on a regular basis and revised, as appropriate.*
- *Blocks of field survey to be self-contained projects of inherent value in their own right.*

1 Introduction

The following document is a report on Stage 2 (pilot field survey) of the Forest of Dean Archaeological Survey (English Heritage Project No. 2727 MAIN).

The project design for the Forest of Dean Archaeological Survey (Hoyle 2001) set out a four-stage process for the project, consisting of:
Stage 1: Desk-based documentary research
Stage 2: Pilot field survey
Stage 3: Targeted field survey
Stage 4: Reporting and dissemination of results

The results of Stage 1 of the project indicated that the known distribution of archaeological sites from all periods, pre-dating post-medieval industry in the area, is heavily influenced by modern woodland, and is the product of a lack of systematic field survey in this environment rather than an indication of the location of past activities (Hoyle 2008).

The priority for Stage 2 of the project was to explore suitable methodological approaches to systematic field survey within a woodland environment, and the following document reviews the successes of the methodologies employed and makes recommendations for future field survey within the Forest of Dean.

1.1 Specialist seminars and meetings

Two professional seminars were organised by the project as part of Stage 1 of the project, to discuss approaches to pilot field survey within woodland. At a third meeting discussion focussed on the development of LiDAR for this purpose. These events were designed to assist in the development of a field survey strategy for Stage 2 of the Forest of Dean survey.

1.1.1 Rapid field reconnaissance in woodland seminar

The first seminar was held at the Park Campus of the University of Gloucestershire on 24th June 2003, and a number of invited speakers from around the country gave short presentations on their experience of undertaking rapid field survey in a woodland environment (Appendix A, A.i).

The papers from this seminar have been collated and are available on the Gloucestershire County Council Archaeology Service website by following the links from the Forest of Dean Archaeological Survey page at www.gloucestershire.gov.uk/archaeology/fod.

1.1.2 Specialist survey techniques seminar

A second seminar was held at English Heritage's National Monuments Record Centre, Swindon on 14th October 2004.

This seminar discussed a variety of other techniques applicable to the identification of archaeological features in woodland and focused on discussion of their value, and potential. A number of speakers gave short presentations on their experience and the potential applications of the following to further survey within the Forest of Dean (Appendix A, A.ii):

- LiDAR (Light Detection and Ranging) aerial survey.
- Palaeoenvironmental sampling.
- Geophysical survey.

1.1.3 LiDAR meeting

The discussion of the value of LiDAR survey at the above seminar (see 1.1.2 above) focussed on the results of a survey of Welshbury, Flaxley and Chestnuts Woods. The University of Cambridge Unit for Landscape Modelling undertook the survey, in conjunction with the Forestry Commission.

In order to further assess the value of LiDAR the project team also met with Bernard Devereux and Gabriel Amable of the University of Cambridge Unit for Landscape Modelling, Peter Crow and Tim Yarnell of the Forestry Commission and Simon Crutchley of English Heritage.

As a result of this discussion, general specifications for LiDAR survey of woodland were formulated (Appendix M below).

1.2 Pilot field survey

The Stage 2 pilot fieldwork consisted of three field survey projects undertaken concurrently with Stage 1 of the survey:

- Rapid field reconnaissance in Chestnuts Wood, Littledean.
- Rapid field reconnaissance in Welshbury Wood, Blaisdon.
- Sample excavation of a charcoal platform in Welshbury Wood, Blaisdon.

Although the impetus for these pieces of work was primarily to inform management operations within the woods and their timing was dependent on the needs of that objective, they also provided excellent opportunities to test field survey methodologies.

As a result of the discussion undertaken in the two seminars (see 1.1 above), a programme of pilot field survey was undertaken in January and February 2005 and consisted of:

- Rapid field reconnaissance in Great Berry Wood, Drybrook.
- Rapid field reconnaissance to validate LiDAR results in Flaxley Woods, Blaisdon
- Geophysical survey at Welshbury hillfort, Blaisdon, and an undated enclosure near Fairplay, Cinderford.
- Palaeoenvironmental sampling in the Flaxley Valley, Blaisdon.

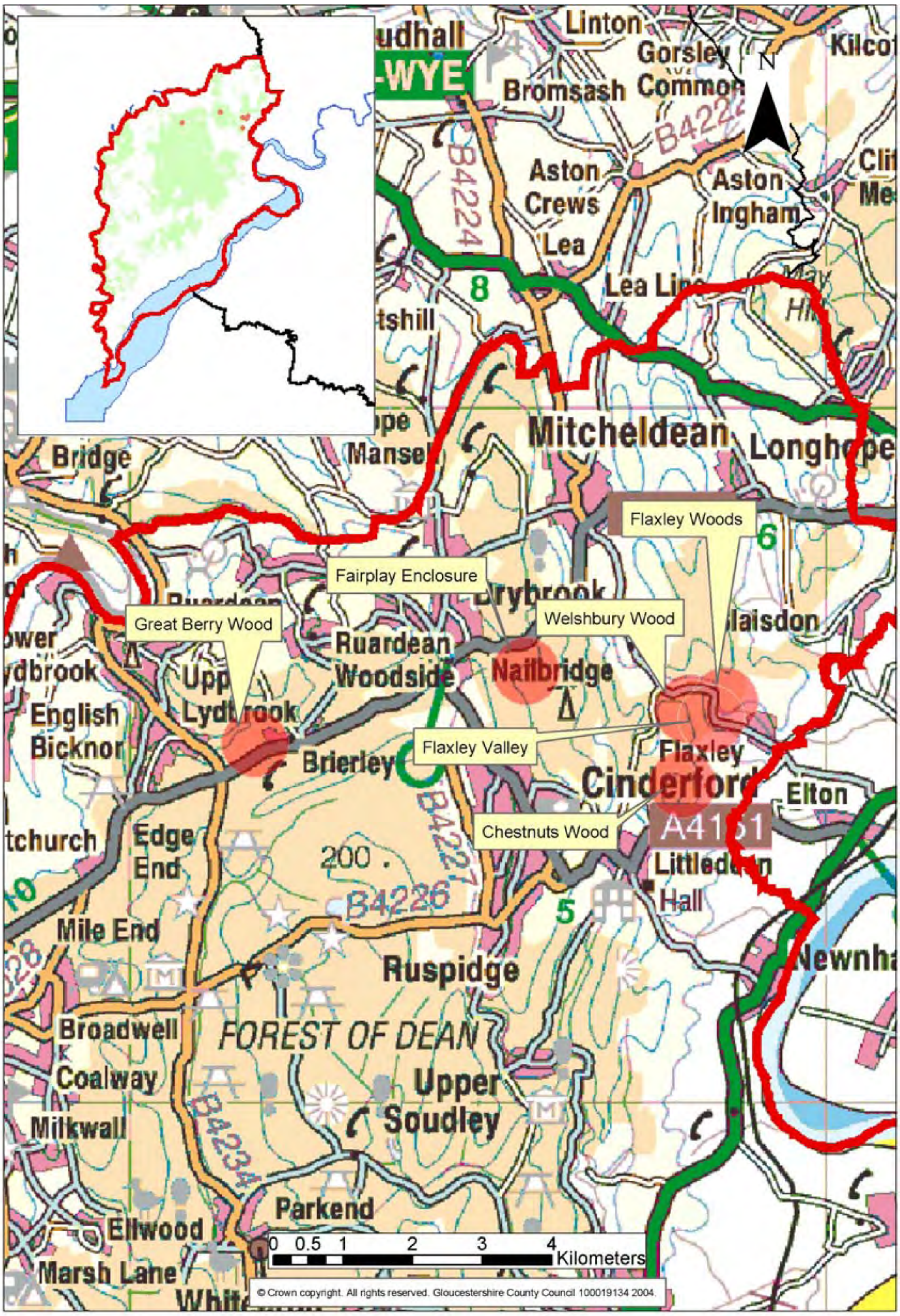

Figure 1: Location of pilot field surveys

2 Sample excavation

2.1 Introduction

Sample excavation of a charcoal platform (Glos SMR 28154; Hoyle 2003b feature A144) on the eastern slopes of Welshbury Hill (SO 67981551) was undertaken in March 2003 (Figure 2).

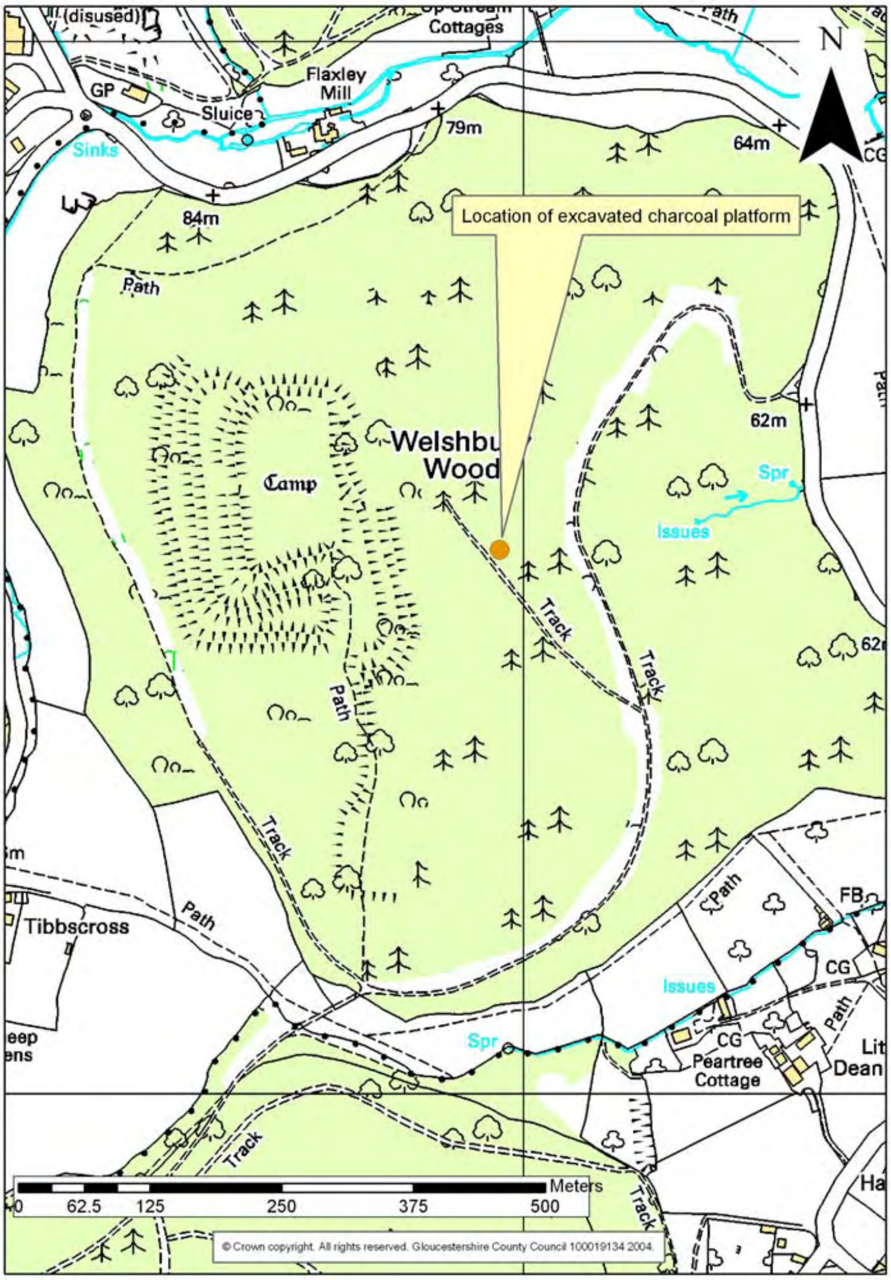

Figure 2: Welshbury Wood 2003: Location of excavated charcoal platform

2.1.1 Background to charcoal production and charcoal platforms

Charcoal platforms are the surviving remains of a process of charcoal production in which wood was converted to charcoal by roasting in earth-covered stacks or clamps (Kelley 1996). This method of production was used throughout the Romano-British, medieval and post-medieval periods and provided industrial grade fuel, primarily for the smelting of iron, and it is likely that charcoal production was a significant industry in this area from the Romano-British period until the introduction of the coke fired blast furnace in the early 19th century (Hoyle 2003b, 3.3.2.1).

Charcoal platforms in the Forest of Dean could date from any of these periods, and although their full distribution is not currently known, it is possible that they are the most common archaeological feature within the woodland of the Forest of Dean.

Smelting sites were probably sited close to sources of charcoal as it has been estimated that, due to its friable nature, charcoal could not be transported for distances in excess of *c.* 5-6km without considerable, and uneconomic, wastage (Cleere & Crossley 1985, 135). Consequently the charcoal platforms identified in Welshbury Wood (see 3.2 below) have a very wide possible date range as they are in the vicinity of probable Romano-British smelting sites (Scott-Garret 1956), and eight charcoal hearths were recorded in Chestnuts Wood (c. 500m to the south) between 1271 and 1282 (Hart 1966). Welshbury Wood is also within *c.* 1km of post-medieval furnaces and forges along the Flaxley Valley, which consumed so much charcoal that they could only be kept in blast for nine months of the year for fear of exhausting the resources (Rudge 1803). Although Welshbury Wood was within the bounds of the Crown woodland (the statutory boundary of the Forest of Dean) on some earlier perambulations, it fell outside the Statutory Forest on later surveys (McOmish & Smith 1985). Its location outside the Forest would have freed it from the restrictions on charcoal production imposed within the Crown woodland (see above), and consequently it would have been a particularly attractive area for the production of charcoal.

2.2 Objectives of the excavation

The excavation was undertaken to determine the following:

- The impact of tree cover and other forestry operations on the archaeological survival and future potential not only of these features, but also of buried archaeological deposits in the area in general.
- The degree of preservation and archaeological potential of charcoal platforms, particularly those within woodland. This focussed on their potential to produce evidence for date and useful palaeoenvironmental material.
- The potential of charcoal platforms in this area to display evidence of construction or to have re-used the sites of former archaeological features such as hut platforms.

2.3 Selection criteria

A single charcoal platform was selected in accordance with the following criteria:

- It was in an area of recent clearfelling of part of a conifer plantation.
- It was outside the area scheduled as an Ancient Monument (SAM 31186).
- The stump of at least one recently felled conifer was within (and roughly central to) the platform, allowing root systems to be recorded in section

2.4 Excavation and sampling strategy

The surface of approximately one half of the platform was cleaned by the removal of debris and loose overburden, which consisted of a thin deposit of incompact conifer litter that had constituted the surface of the woodland floor prior to excavation (Context +). The exposed surface consisted of charcoal impregnated soil (Context 2), which defined the area of the charcoal platform, within an area of “cleaner” forest soil (Context 1).

Subsequent to this a trench 2m wide (narrowing to 1m wide at the extreme downslope part of the excavation) was excavated across the central part of the platform in line with the natural slope of the hill. This trench included all landscape elements deemed to be part of the structure of the platform, including the steps on both its upslope and downslope sides and the spread of charcoal enriched soil visible on the downslope side of the platform. The trench also included a number of stumps of felled conifer trees.

Following on-site consultation with both Vanessa Straker and Rowena Gale (see 2.6 below), a number of bulk samples of charcoal-rich deposits, and charcoal fragments, particularly round wood, were collected and individually bagged for future analysis.

2.5 Summary of excavation results

2.5.1 Platform form

The platform was roughly circular, measuring *c.* 7-8m in diameter and had been created by simply leveling into the slope of the hill. There was no evidence that the level area of the platform had been extended by dumping subsoil from the original excavation to create a terrace on the downslope side.

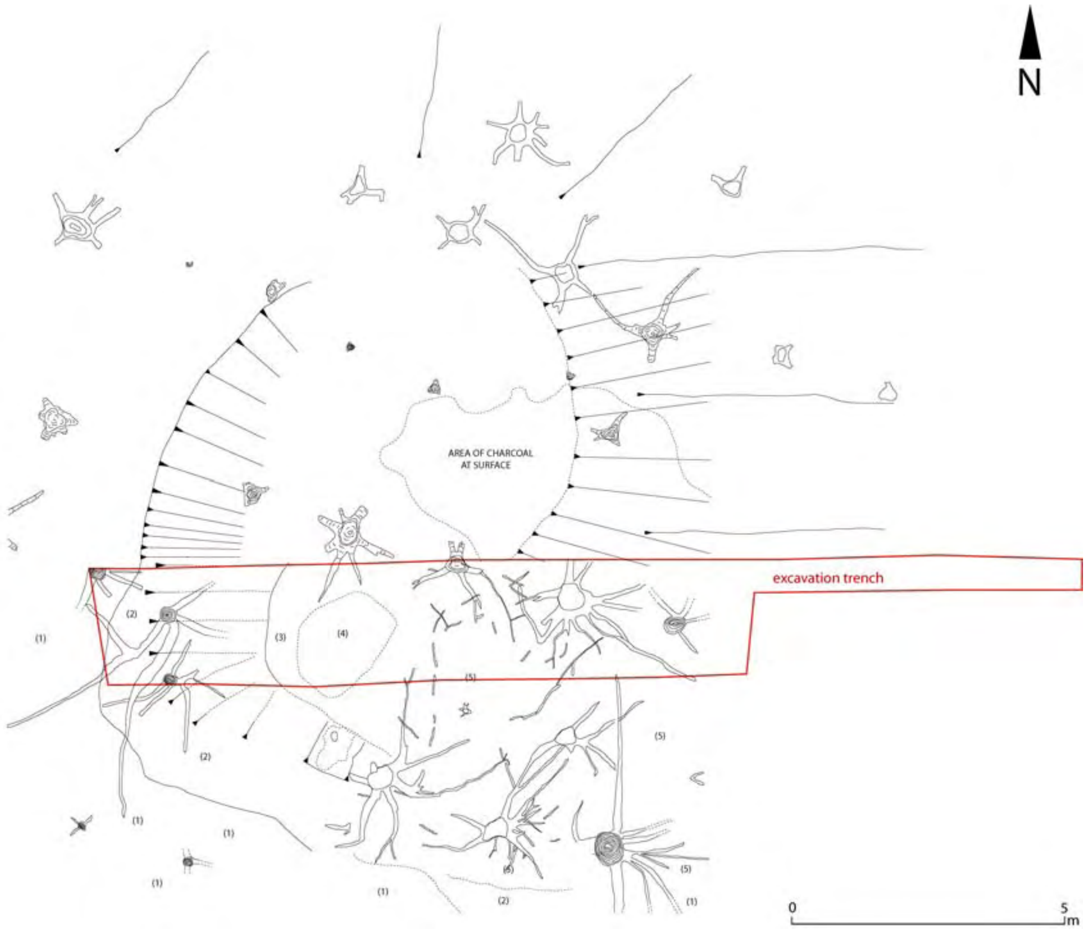

Figure 3: Welshbury Wood 2003: Pre-excavation plan of charcoal platform showing stumps, roots and excavation trench

2.5.2 Charcoal survival

No topsoil or turf was found in the area of the charcoal platform, and the upper deposit consisted simply of a layer (c. 0.03-0.05m thick) of loose leaf litter, which had made up the forest floor prior to clearfelling of the conifers in the area.

This material directly overlay a deposit (c. 0.20-0.25m thick) of fine charcoal and larger fragments in a soil matrix (Context 2/3). No significant variation was visible within this deposit, which was interpreted as the remains of charcoal and charcoal dust left after each burn.

On the downslope side of the platform these deposits merged with a thick (up to 0.50m) deposit of charcoal-rich soil (Context 5) which was interpreted as the detritus of repeated cleaning of the platform, although it was not possible to determine whether this occurred after each burn or (more likely) prior to the construction of each new stack.

Although Contexts 2/3 and 5 were obviously different (Context 5 had a visibly higher soil admixture) there was no clearly definable division between them. In order to ensure that material derived from these two contexts was kept separate, the area in which the two contexts merged was designated Context 4. The boundaries of this context were arbitrarily demarcated by tree stumps in this area.

Although horizontal divisions could not be determined within these contexts, finds and samples were differentiated by arbitrary spit depth within the context in the following way:
Spit 1 0-0.15m
Spit 2 0.15-0.30m
Spit 3 0.30+m

The charcoal rich layers (Context 2/3, 4 and 5) directly overlay the undisturbed subsoil, which displayed no signs of *in situ* burning.

Figure 4: Welshbury Wood 2003; Section of excavated charcoal platform, view – north, scale 1m and 0.5m

2.5.3 Identified features

A small gully (Context 12) was cut into the undisturbed subsoil, and ran along the western edge of the platform where it had been cut into the natural slope of the hill. This gully measured *c.* 0.25m deep by *c.* 0.20m wide, and had a V-shaped profile. This feature displayed no evidence of a structural function and its fill (Context 11) was identical to, and indistinguishable from, the charcoal-rich material, which formed the main deposit at the base of the platform in that area (Context 3). The projected arc of the gully would have extended beyond the edge of the downslope side of the platform, and no evidence of its continuation was identified there. Where this feature coincided with the main trench section the gully was clearly undercut and either changed direction or became much wider and contained a large flat fragment of sandstone (c. 0.40m x *c.* 0.05m thick) stone. The decision was made to not continue the excavation at this stage, although the site grid markers were retained to allow for further extension of the trench at a later stage if this is felt to be desirable.

Figure 5: Welshbury Wood 2003: Gully (Context 12) partially excavated, view – north, scale – 1m

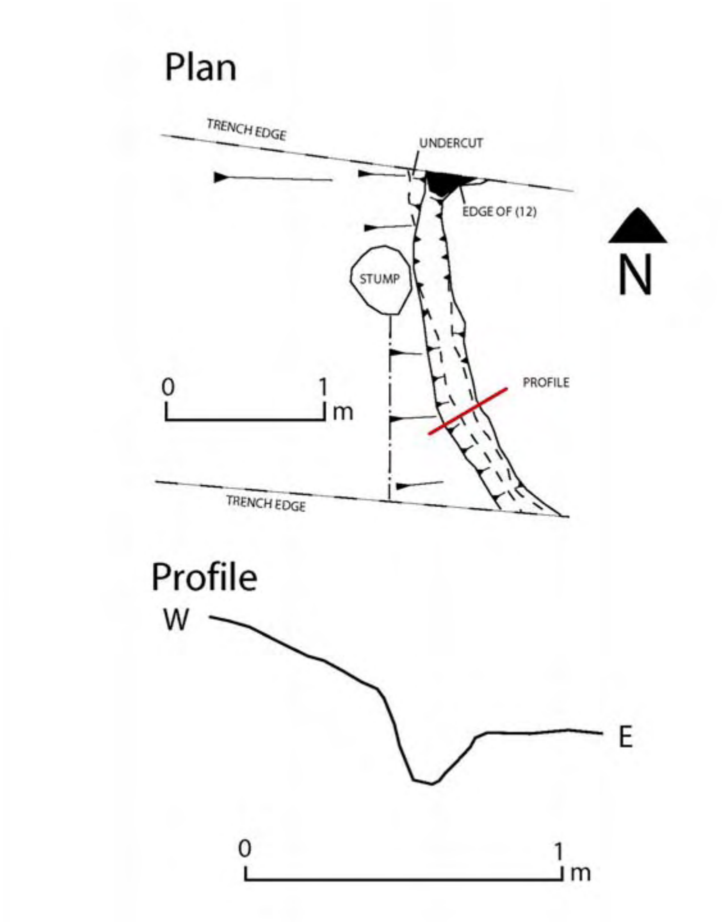

Figure 6: Welshbury Wood 2003: Plan and profile of gully (context 12)

The presence of the gully raises a number of interesting interpretative possibilities, particularly given the suggestion that some charcoal platforms in Scotland are reported to have been constructed on the site of earlier round-house platforms (Judith Cannel, Exmore Iron Project, pers. comm.), combined with the proximity of the Iron Age hillfort at Welshbury, and its associated field system only *c.* 100m to the west.

The evidence from Welshbury, however, would, not appear to represent evidence for an earlier structure on the site as the gully did not form a complete circle, and its fill was identical to the charcoal deposit which overlay it, suggesting that it had been an open feature during the earlier use of the platform as a charcoal-burning site.

Evidence from other charcoal platforms suggests that similar features may be a characteristic of these features:

- A feature, which might be similar to the Welshbury gully, has been identified at a charcoal platform within Horner Wood as part of the Exmore Iron Project (Judith Cannell, Exmore Iron Project pers. comm.).
- Core samples taken of other charcoal platforms in Dean have suggested charcoal-filled undulations on the sub-soil surface below the site of the stack, which may be indicative of similar features (Johns 1989).
- Evidence from illustrations of post-medieval charcoal production suggest that the excavation of a small enclosing ditch (either for drainage purposes, or possibly to contain the areas of combustion) was considered an essential part of the construction of a charcoal stack (Armstrong 1978, Figs 14, 18) although it is not clear from these illustrations whether this feature was primarily a ditch or a low bank (see Armstrong 1978, Fig 12).

No evidence was found for a central supporting pole fixed in the ground to support the stack during construction. It may be notable that constructional features, which penetrate the subsoil and would therefore leave archaeological evidence, do not appear to have been a feature of charcoal stack construction in the Forest of Dean.

2.6 Charcoal and soil samples

In advance of the excavation Vanessa Straker (English Heritage Southwest Region Science Advisor) and Rowena Gale (Royal Botanic Gardens Kew/University of Reading) were consulted on suitable sampling strategies for charcoal or charcoal rich-deposits. Both of these specialists visited the site during the excavation.

Following this consultation the following samples were taken (Appendix B):

- Samples of charcoal fragments (see Figure 7) were recovered from seven contexts. These were made up of fragments in excess of *c.* 0.02m and Fiona Roe had advised that fragments of round wood, particularly those in which the full radius survived, were most desirable. In the event, all suitable fragments of charcoal encountered during the excavation were retained as samples.
- In addition to the collection of charcoal fragments (see above) 12 bulk samples (each of 10 litres) were also taken of particularly charcoal rich deposits.

Figure 7: Welshbury Wood 2005: Charcoal samples

Charcoal samples were submitted to Rowena Gale in order to:

- Identify the species and age of the wood used. This was to determine the potential of similar features to produce evidence relating to the process of charcoal manufacture and the exploitation and nature of the woodland resource at different periods.
- Determine the potential of the charcoal samples for radiocarbon dating, to enable the Palaeoenvironmental evidence (see above) to be dated.

The full report on the potential of these charcoal samples is found in Appendix B, although the results can be summarised as follows:

- The analysed samples provided evidence of:
    - The species of the wood used to make charcoal. This included a wide range of species including alder, birch, hazel, ash, cherry/ blackthorn, oak, and guelder rose. Only one example of lime was recovered, which was surprising as this species is the predominant species of the woodland at the top of the hill (Hoyle 1996) and is generally assumed to have been more widespread in the area in earlier times.
    - Some samples also provided information on the growth rates of the timber used, the age at which it was felled and also the season at which felling took place.
- A number of the recovered charcoal fragments were suitable for radiocarbon dating.

Subsequent to the initial assessment of the charcoal samples, the bulk samples were manually sieved (0.01m grid) to provide further charcoal fragments for identification. This proved disappointing as these samples contained relatively few additional fragments of charcoal and these have not been submitted for further analysis.

2.6.1 Radiocarbon date

A 7gramme sample of Hazel (*Corylus avellana*) was submitted to the Scottish Universities Environmental Research Centre for radio carbon dating.

The sample (SUERC-16310 (GU-15879) was recovered from Context 11, the fill of gully Context 12, which was sealed by later charcoal deposits, and was, therefore, the earliest secure context within the excavated sequence.

The sample was identified as having a 95.4% probability of a date range between AD 1660 and 1950, and was assigned a probable age of 140 +/- 35 years BP, i.e. AD 1774-1884 (Appendix C).

Given the location of the charcoal platform it would seem likely that this platform was used to create charcoal to feed the charcoal-fired blast furnace at Flaxley (Glos SMR 6459), only *c.* 1.2km to the east, which was in operation between 1674 and 1802.

2.7 Tree roots

The roots of two mature conifers were within the excavated area and two others were immediately adjacent to this. They were recorded in the he main section of the excavated trench.

The main root bowls of these penetrated up to *c.* 0.20-0.30m below the ground surface, although individual roots branching from these did penetrate below this level, and the area which could be considered to be entirely taken up with the root bowl was *c.* 0.50-0.80m in diameter. Although the area of the actual root bowls (see above) themselves could be considered to have obliterated all archaeological deposits, charcoal deposits survived intact below these, affected only by occasional individual roots.

Figure 8: Welshbury Wood 2003: Root in section, view – north, scale 1m and 0.5m

The presence of tree roots did, however, have a significant effect on the ease with which these deposits could be accessed. Excavation was generally difficult requiring the time-consuming removal of root systems, and the removal of these added significantly to the time required for excavation and also to the physical difficulty of this process.

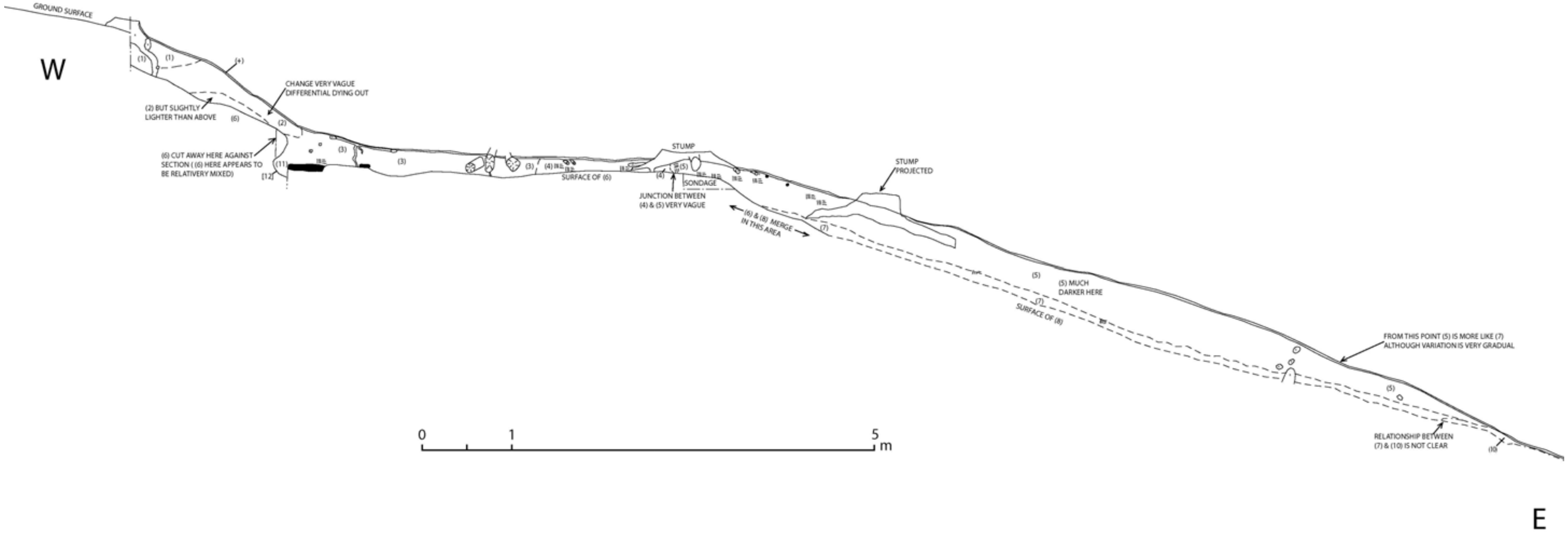

Figure 9: Welshbury Wood 2003: Section through excavated charcoal platform

3 Rapid field reconnaissance in woodland

From the outset of the project it was recognised that rapid field reconnaissance would be an essential tool for the identification and quantification of archaeological sites within unexplored areas of woodland. Accordingly, a number of techniques for this were compared as part of Stage 2 of the survey.

Rapid field reconnaissance was undertaken in four areas of woodland, all in the ownership of the Forestry Commission (see 1.2 above).

3.1 Chestnuts Wood Survey, 2003

Chestnuts Wood (SO67771448) covers a rounded hill at Littledean on the eastern side of the Forest of Dean. The sides of the hill rise from *c.* 120m OD to a rounded summit at *c.* 196m OD. The survey covered an area of *c.* 70ha, almost all of which was under woodland (mainly deciduous, but with some stands of conifer) when the survey was undertaken in January 2003.

The survey was undertaken before the first specialist seminar to discuss rapid woodland survey methodologies (see 1.1 above). It took place in response to the interest shown by the Friends of Chestnuts Woods, a local community group, in the archaeological landscape features of Chestnuts Wood, and also the imminence of forestry operations in this area. The Forestry Commission agreed to delay scheduled thinning and felling operations to allow time for the archaeological survey and to enable the subsequent process of timber extraction to avoid damage to potentially significant features.

The survey not only explored the archaeological potential of the woodland, but also allowed the viability of woodland survey with an inexperienced community group to be tested.

The following is a summary of the methodology and results of this survey. For the full report see Hoyle 2003b.

3.1.1 Objective of the survey

The objective of the field survey was to identify and map visible landscape features within Chestnuts Wood.

3.1.2 Stages of the survey

The survey was undertaken in two stages.

In the latter part of 2002, a desk-based survey of published and unpublished documentary and map sources was undertaken by the local community, who were advised by Gloucestershire County Council Archaeology Service staff.

Following this, the field survey was undertaken over three weekends in January and February 2003. Supervision was given by staff of Gloucestershire County Council Archaeology Service with the assistance of members of Dean Archaeological Group. Several employees of the Forestry Commission also assisted and took responsibility for health and safety.

3.1.3 Methodology

Details of the methodology adopted during the Chestnuts Wood survey are set out in Appendix D, but can be summarised as follows:

3.1.3.1 Desk-based data collection

The Friends of Chestnuts Wood, and community volunteers collected relevant data from a list of potentially useful sources prepared by the project team (Hoyle 2003b, Appendix 1).

3.1.3.2 Field survey

The survey area was divided into eight zones (Zones A-H), generally defined by forestry tracks or other visible features.

Each zone was surveyed by variable sized teams (depending on attendance) under the supervision of a member of the archaeological project team. The zone was walked in as even and systematic fashion as possible based on notional transects *c.* 15-20m apart.

Details of identified features were recorded on a dedicated pro-forma (A4 paper sheet), and mapped at scale 1:1000 in accordance with specifications set out in advance of the work (Appendix D).

Where possible features were located using hand-held GPS (Global Positioning System), although other recording and measurement systems (compass bearing or pacing) were used where the GPS did not function properly in the woodland.

Photography was not used to record features, and ground conditions and visibility of features were not recorded.

3.1.4 Results

The survey identified 403 features ranging from small hollows interpreted as tree throw to a slag scatter, which may be indicative of Romano-British smelting. The results of this survey are set out in the report on the project (Hoyle 2003b) and are briefly summarised below.

3.1.4.1 Charcoal and other platforms (Figure 10)

Ninety-two features were identified as probable or possible charcoal burning platforms. An additional 18 were identified as uncertain charcoal platforms. In addition, 11 other platform features were identified.

It has already been stated that charcoal platforms may be the most abundant archaeological feature within the wooded areas of the Forest of Dean (see 2.1.1 above), and these features could date from the Romano-British to the post-medieval periods.

Like the excavated platform at Welshbury (see 2.1.1 above) Chestnuts Wood is close to probable Romano-British smelting sites (Scott-Garret 1956), and post-medieval charcoal fired blast furnaces in the Flaxley Valley which would have consumed vast quantities of charcoal. Chestnuts Wood has also been identified as a site of medieval charcoal burning with eight hearths recorded between 1271 and 1282, and underwood from Chestnuts Wood was sold for making charcoal in 1325 (Hart 1966).

3.1.4.2 Slag (Figure 10)

Bloomery slag was found in two areas. A sample of this material was retained and was identified as tap slag indicative of bloomery smelting (Dr Chris Salter, Oxford University, pers. comm.). This process of iron smelting predated the introduction of the charcoal blast furnace to the area in the mid-17th century and was used in the Forest of Dean throughout the Romano-British, medieval and earlier post-medieval periods.

Both these finds would suggest that smelting has been taking place in the vicinity of these sites, although the precise location or date of this activity was not clear.

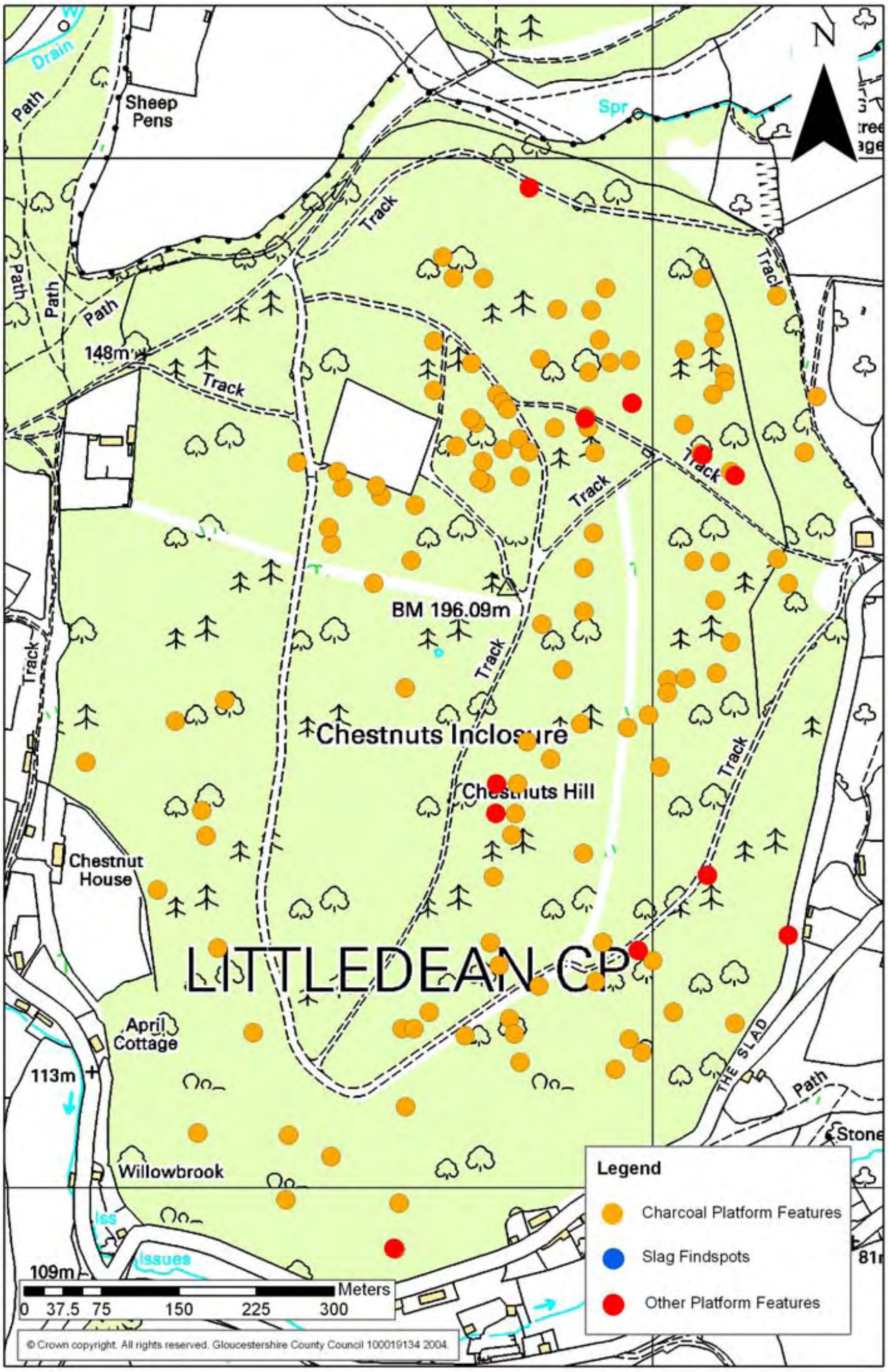

Figure 10: Chestnuts Wood 2003: Charcoal platform features, other platform features and slag finds

3.1.4.3 Quarries (Figure 11)

One hundred and forty-two features recorded in the survey were interpreted as quarries. Within this category there was a considerable degree of variation ranging from large quarries *c.* 350m^2 to smaller discrete features less than 25m^2, with a depth range of *c.* 0.35m to *c.* 2m. Many of these features included areas of dumped waste, which were not separately recorded, and, in many places, relatively small, discrete features, which were individually, recorded as quarries formed components of larger areas of quarrying. The precise interpretation of many of these features remains unclear and it is likely that some of the features recorded as quarries represent the remains of other features, such as saw pits.

Quarrying for both limestone and sandstone, has been an important industry in the Forest of Dean “since earliest times” (Cross 1982, 26), and the sandstones on Chestnuts Hill would have been most suitable for building stone. These quarries are probably post-medieval in date as the greatest need for building stone in this area is likely to have been during the later post-medieval period, to meet the housing needs of a rising population particularly on Pope’s Hill to the east (Jurica 1996a), and also to provide stone for other structures, such as industrial buildings in the Flaxley valley, or for the construction of Chestnuts Lodge and its ancillary buildings.

3.1.4.4 Features associated with the 19th Century Lodge (Figure 11)

A number of features were interpreted as surviving structural remains associated with the 19th century Chestnuts Lodge (Glos SMR 22464). Forest Lodges were originally established in the later 17th century under the terms of the Dean Forest Reafforestation Act of 1668, in which 11000 acres of Dean were to be enclosed to ensure timber supplies for the Royal Navy (Jurica 1996a). The lodges were built to house Crown appointed keepers, each with responsibility for patrolling a section of the Forest of Dean. Chestnuts Lodge, which was constructed between 1806 and 1815, falls within a later phase of Forest enclosure following an Act of Parliament of 1808 which confirmed the 1668 Act (Jurica 1996a, 325)

Although the existing ruins of the Lodge are relatively recent, these features do represent the surviving remains of an administrative system of great significance not only to the history of the Forest of Dean, but also to the history of government organisation of Britain’s woodland resource.

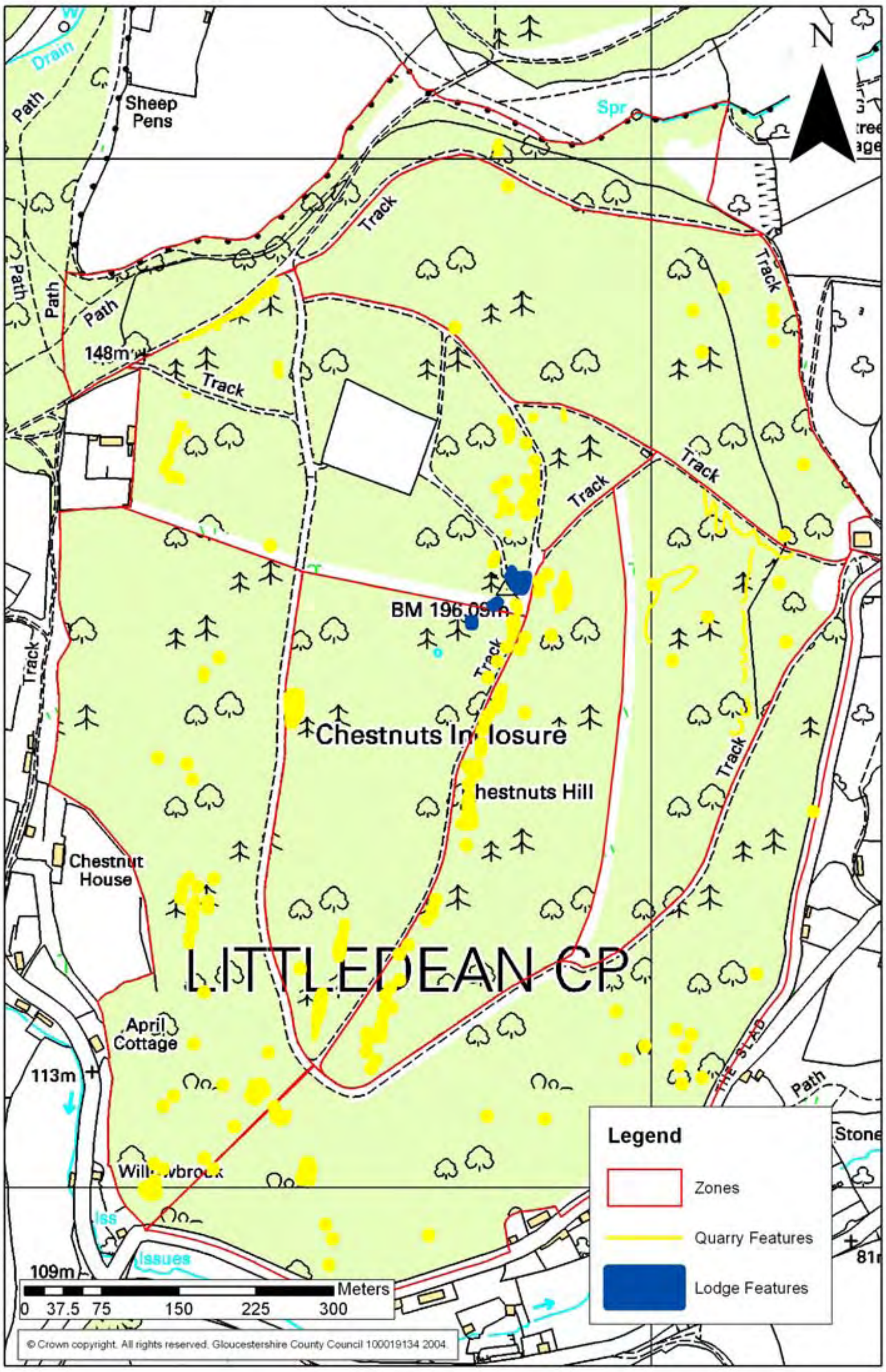

Figure 11: Chestnuts Wood 2003: Quarry and 19th century lodge features

3.1.4.5 Terraces (Figure 12)

A number of terraces of variable dimensions were recorded within the survey area. All of these followed the general line of the contours of the Chestnuts Hill.

These terraces varied in height from 0.5m to in excess of 4m, the higher terraces being those on the eastern slopes of the hill, which appeared to increase in height towards the south, and formed significant landscape features dividing the western slopes of the hill into four distinct zones.

The date and significance of these features remains unclear, and not all of the recorded terraces need be contemporary features or have fulfilled the same function.

One possibility is that some of these features are natural in origin. The natural geology of the area consists Lower Devonian Brownstones, made up of alternating hard and soft bands of sandstone and mudstone inclined at an angle of between 50^{o} and 60^{o} (Mitchell undated). A geology of this sort would encourage natural terracing, caused by differential erosion of the harder and softer strata, and the larger terraces, which run north/south along the line of these bedding planes, may represent weathered outcrops of harder sandstone exposed by the erosion of the softer mudstone. A geological origin of these features may be supported by the fact that quarries, which would have targeted the harder sandstone, are sited along the face of the easternmost terrace (G6/G27). The smaller terraces, however, particularly those in the northern part of the survey area (Zone C-C609, Zone G-G4), appear less likely to be natural as they are less clearly aligned with the geological strata which would allow natural terraces to form.

Similar features sited on slopes are often interpreted as cultivation terraces, suggesting that parts of the hill, currently under woodland, were used for agricultural purposes at some point in the past. In general the most likely date for this class of feature is considered to be the mid-14th century when population growth, combined with poor harvests, resulted in the expansion of cultivation into marginal areas. This phenomenon is a feature of the foot of the Cotswolds Edge to the east of the survey area (Hoyle 1999). Assarts into Crown woodland are recorded in the Littledean area in the 13th century, although these are thought likely to be in the area to the southeast of Chestnuts Wood (Jurica 1996c, 299).

Another possibility is that these are the remains of features associated with arboricultural regimes to produce coppiced woodland. Enclosed areas are a feature of coppiced woodland as young shoots need to be protected from browsing animals, and the remains of coppice enclosures, which generally consisted of a bank surmounted by a hedge, can survive as earthworks in areas of woodland (Peterken 1995, 405). Chestnuts Wood was one of eight new coppices at the edges of the Crown woodland set up at the beginning of Elizabeth I's reign (Herbert 1996b, 362), and an interpretation of these features as coppice boundaries would seem reasonable here. Some of the earthworks, however, particularly on the eastern slopes of the hill, where some terraces were over 4m high (see above), appear excessive for this purpose.

Similar features are, however, known from earlier periods. The Chestnuts terraces are similar to terrace features identified on the eastern slopes of Welshbury Hill which have been interpreted as associated with the probable late Bronze Age enclosure boundaries found to the south of Welshbury Hillfort (see 3.2.4.4 below), and undated earthwork features, sometimes pre-dating later coppice boundaries, have been identified in other areas of woodland, such as Salcey Forest, Northamptonshire (Simco 2003, 3) or at Great Church Wood, Marden, Surrey (Bannister 2003, 8) .

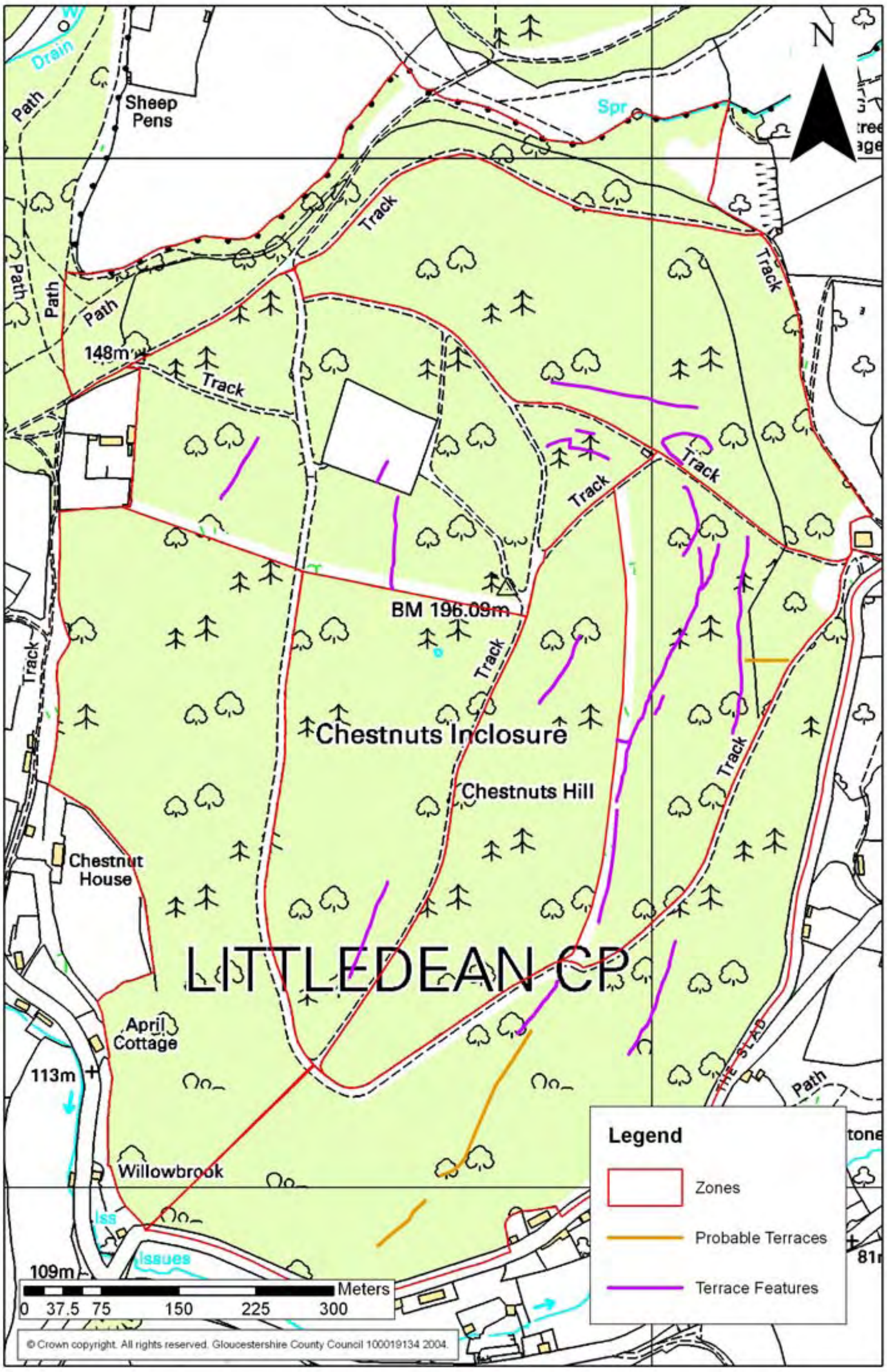

Figure 12: Chestnuts Wood 2003: Terrace features

3.1.4.6 Holloways, tracks and paths

A number of holloways, tracks and paths were recorded, many of which were probably the result of post-medieval forestry operations, or recent access routes through the woods.

The majority of these could be identified as part of the relatively recent system of forestry tracks constructed to serve post-medieval timber management operations within Chestnuts Wood, or shortcuts between more established routes. Others in the northern part of the survey area are the remains of the main access route linking Littledean (to the south of Chestnuts Wood) with the common land, Forest waste and the later 18th century houses at Popes Hill to the east (Hoyle 2003b).

One feature originally interpreted as a pathway (H14/H201) ran along the face of the south-eastern slope of the hill and was revetted on its down slope side by a rough dry stone wall which, in places, appeared to be little more than a rough line of stones. This feature, however, appears to be a southern continuation of terraces to the north. A further terrace (G53) was interpreted as the remains of a trackway leading towards quarrying on the eastern side of the Hill. Examination of the LiDAR images of Chestnuts Hills (Figure 12), however, demonstrate that this feature can also be re-interpreted as part of the network of linear terraces on the site.

3.1.4.7 Stone spreads

Four stone scatters were identified by the survey, although none of these were interpreted as masonry remains. The status of these was not clear although two (G15 & F23) were in the vicinity of quarries and may simply represent scattered quarry waste, whilst another (H23) can be interpreted as spread from the decaying revetment of the path/possible terrace (H14) whose downslope side had been supported by a rough dry stone wall which was in a variable state of collapse in 2003. The fourth scatter (B12) may be associated with one of the finds of slag in the area (see below).

3.1.4.8 Banks

Thirteen features identified in the course of the field survey were recorded as banks. These tended to be relatively low features (0.5 – 1m high), often associated with a ditch.

Four of these (A3, A17, D1, and D9) demarcated parts of the northern and western boundaries of Chestnuts Enclosure and are interpreted as woodland enclosure banks dating to the post-medieval enclosure of the woods. They may be broadly contemporary with the same, early 19th century phase of enclosure in which the Lodge was constructed at the summit of the hill.

3.1.4.9 Other features

Numerous other features, including ponds, drainage ditches, natural watercourses, possible tree throw hollows, wheel ruts and a clearly recent wooden structure were recorded in the survey. These were not considered to be of significant archaeological or historical value.

3.1.5 Use of the results

Recommendations made as a results of the rapid field reconnaissance directly informed a phase of woodland management operations, involving thinning and removal of conifers, which was undertaken between the summer of 2004 and the late winter of 2005.

3.1.6 Discussion of the results

The survey of Chestnuts Wood identified a number of features which related to post-medieval administration of the Forest of Dean, and also a range of features such as charcoal platforms and quarries which, although of potential archaeological significance in their own right, are likely to be common features within the woodland of the Forest of Dean.

The evidence of early smelting in the form of bloomery slag fragments (see 3.1.4.2 above) is also of potential significance in an understanding the early iron industry in the Forest of Dean, although the date and precise location of this activity remains obscure.

Perhaps the most significant features identified during the survey, however, were the terrace features (see 3.1.4.5 above). Although the precise status, date and function of these remains obscure, and further archaeological investigation would be required to shed further light on this, these features may be the remains of systems of land partition which do not relate (and may therefore pre-date) the woodland cover on the site.

Subsequent to the 2003 survey additional terraces were identified at Chestnuts Wood as the result of LiDAR survey (see 4.4 below). These features appeared to form part of an extensive system of earthworks identified in both Welshbury Wood and Flaxley Woods to the north (see 4.3 below, 4.5.3.4 below) and the LiDAR hillshaded images show similar features in areas between these woods which are currently under pasture or arable. The overall impression from these features is one of a unified and large-scale system of landscape organisation, unrelated to current enclosure patterns or woodland distribution, and similar to large-scale prehistoric field systems identified in other parts of the British Isles (Fowler 1983, 119-128, Figures 45-47).

3.2 Welshbury Wood survey, 2003

A further rapid field survey of the eastern slopes of Welshbury Wood, Blaisdon, (SO67791557) was undertaken in March 2003.

In contrast with the survey of Chestnuts Wood (see 3.1 above), the Welshbury Wood survey was undertaken entirely by professional archaeologists who were members of the Forest of Dean Archaeological Survey team. The survey was completed by a team of two in two working days

The following is a summary of the methodology and results of this survey. For the full report see Hoyle 2003a.

3.2.1 The survey area

The survey area could be divided into two zones (Figure 13)

Zone A covered an area of *c.* 9ha to the north and east of the scheduled area of Welshbury hillfort (Glos SMR 5161; SAM 31186). This area was clearfelled in summer 2002 and at the time of the survey was open ground transected by numerous brash mats used by the contractor to protect the ground surface during felling operations.

Zone B covered an area of *c.* 9ha to the south of Zone A, and was under conifer plantation at the time of the survey.

3.2.2 Objectives of the survey

The objectives of the survey were:

- To provide information on the distribution and character of recognised archaeological features or areas of archaeological potential. This was to inform the Forestry Commission’s proposed restocking operations in Zone A.
- To provide information on the distribution and character of recognised archaeological features or areas of archaeological potential. This was to inform the Forestry Commission’s proposed thinning operations in Zone B.
- To allow for comparison of rapid survey techniques in both clearfelled areas and standing woodland.

3.2.3 Methodology

Details of the methodology adopted during the Welshbury Wood survey are set out in Appendix D, but can be summarised as follows:

3.2.3.1 Desk-based data collection

This was limited to consultation with the County Sites and Monuments Record and a very rapid assessment of 1st to 3rd Series Ordnance Survey maps of the area.

3.2.3.2 Field survey

Where possible both survey zones were systematically walked in approximately parallel transects. The distance between these varied depending on factors such as topography and groundcover, although the surveyors maintained “sight of” 100% of the ground surface.

Details of identified features were recorded on paper pro-formas, which were a refinement of those, used at Chestnuts Wood, and mapped at scale 1:2000 in accordance with the pre-agreed specification (Appendix D).

Where possible features were located using hand held GPS (global positioning system).

Features were not recorded photographically.

3.2.4 Results (Figure 13)

A total of 70 individual features were identified during the field survey.

3.2.4.1 Charcoal platforms

Forty-two features were identified as probable or possible charcoal burning platforms, whilst five other platform features, which may relate to charcoal burning were identified during the field survey.

This type of feature was typically a roughly circular levelled area on a slope measuring *c.* 5-6m in diameter, although examples of up to 10.5m in diameter were recorded. Charcoal-rich soil was associated with many of these features although this was recorded in only 23 (55%) of examples. These features tended to be recorded on the steeper slopes of the hill and there was a significant concentration in the northwestern part of Zone A, the steepest part of the survey area. Conversely there were few examples in the central part of Zone A, where the ground was relatively level.

The significance, frequency and possible date of these features has already been discussed in relation to similar features identified as part of the rapid field reconnaissance in Chestnuts Wood (see 3.1.4.1 above) and the report of the sample excavation of one of these features (see 2.1.1 above).

3.2.4.2 Holloways

A single holloway (164) was recorded during the field survey. This feature was *c.* 5.5m wide and varied in depth from *c.* 2–3m, and diverged into two separate forks before petering out towards the southwestern part of Zone B.

This feature can be interpreted as a routeway along the low ground between Welshbury and Chestnuts Woods, and similar features, representing the main 19th century access route to houses at Popes Hill, have been recorded running along the northern edge of Chestnuts Inclosure immediately to the south (see 3.1.4.6 above).

3.2.4.3 Quarries

Eleven quarries were recorded in the survey. These features varied from large features (20m x 10m x 6m deep – 127; 128) which were clearly stone quarries to relatively small hollows (4.5m x 4.5m x 0.3m deep – 134) the interpretation of which is less clear. With three exceptions (123, 136, 160) all of these features were clustered in the eastern part of the northwestern section of Zone A.

It is unlikely that any of these quarries were excavated to provide stone for the ramparts of Welshbury hillfort itself (Glos SMR 5161), as probable Iron Age quarries were recorded immediately inside and parallel to the ramparts, during the 1995 survey of the hillfort (McOmish & Smith 1995, 1996). Like similar features identified during the Chestnuts Wood survey (see 3.1.4.3 above) these are likely to be post-medieval in date and excavated to provide building stone for nearby houses.

3.2.4.4 Terraces

Four terraces of variable dimensions were recorded within the survey area. One of these (138), in the eastern part of Zone A, was up to 2m high and was made up of one east-facing arm with an almost rectilinear south-facing return leading from its southern end. The three remaining terraces were identified in Zone B. All of these features were also *c.* 2m high, but unlike Terrace 138 they displayed no evidence of a return and closely followed the contours of the eastern and southeastern slopes of Welshbury Hill.

The earthworks of the Iron Age hillfort at Welshbury and its associated field system, which may owe its origins to the later Bronze Age period (McOmish & Smith 1995; 1996), are sited immediately to the west of the survey area. Given this proximity, it would seem likely that although there is no direct evidence either for its date or the function of the rectilinear terrace 138, it can be interpreted as part of that system of earthworks and therefore of probable prehistoric date.

The status of the remaining terraces (155, 158 and 169) is unclear. The natural geology of the area consists of Lower Devonian Brownstones, made up of alternating hard and soft bands of sandstone and mudstone inclined at an angle of 50-60^{o} (Mitchell undated). A geology of this sort would encourage natural terracing, caused by differential erosion of the harder and softer strata, and these terraces, which run north/south along the line of these bedding planes, may represent weathered outcrops of harder sandstone exposed by the erosion of the softer mudstone.

It remains possible, however, that these terraces are partly or entirely artificial and, form part of the system of earthworks relating to the Iron Age hillfort or earlier field system to the west (Glos SMR 5161).

3.2.4.5 Slag

Prior to the 2003 survey some fragments of slag had been observed and collected from within the survey area. Although no slag was recorded during the course of the 2003 survey, the location in which slag deposits had previously been identified (137) was recorded.

This slag has been identified as both tap slag and furnace slag (Chris Salter Oxford Materials Laboratory pers. comm.) indicative of bloomery smelting, a process of iron smelting predating the introduction of the charcoal blast furnace to the area in the mid-17th century and used in the Forest of Dean throughout the Romano-British, medieval and earlier post-medieval periods.

The incidence of slag would suggest that smelting has been taking place in the vicinity of these sites, although the precise location or date of this activity is not clear.

3.2.4.6 Banks

Two features identified in the course of the field survey were recorded as banks. The northernmost of these (120) was *c.* 1m high (with a basal width of *c.* 5-10m) and demarcated the westernmost edge of the northern part of Zone A. To the south this bank terminated at the modern forestry track along the northern slopes of the hill. To the south of this track a bank of similar dimensions (119) may have continued although the status of this earthwork was far less clear.

Neither the date nor function of these features is known, and the status of the southernmost bank (119) as an artificial feature is far from clear.

These banks are not contiguous with visible earthworks associated with either the Iron Age hillfort or its associated late Bronze Age field system, although this does not preclude the possibility that they relate to this system of earthworks in some way. Another possibility is that the northernmost bank (120) represents the remains of a wood bank, a class of monument generally interpreted as earthworks constructed to define the edge of areas of woodland during the medieval period, although 120 lacks the outer ditch generally associated with these features (Rackham 1986, 98-100), and does not appear to demarcate the edge of Welshbury Wood.

3.2.4.7 Well

One feature recorded during the survey was interpreted as a possible well. This feature consisted of a roughly circular, apparently stone lined pit, *c.* 1.5m in diameter, surrounded by scattered rubble spread over a diameter of *c.* 4.5m. Further investigation would be required to determine whether this feature does represent the collapsed remains of a well, and its status and date must currently be considered to be in question.

3.2.4.8 Other features

Numerous small features (generally terraces and hollows) were concentrated in a single part of the survey area (Area 1, Figure 13). It was felt that more detailed survey was required before the complexity of this area could be fully understood, and recording consisted of simply demarcating the area in which these features were found.

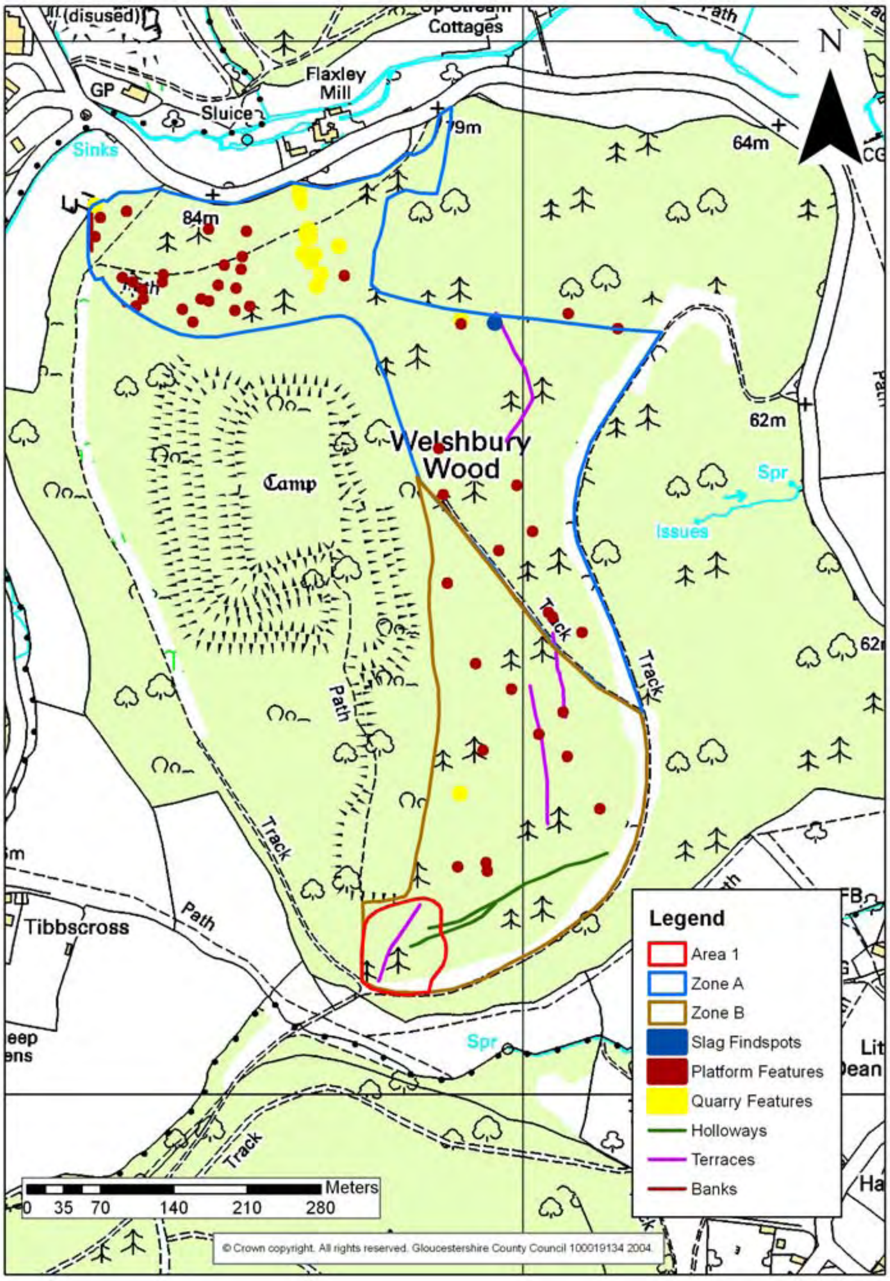

Figure 13:Welshbury Wood 2003: All identified features and survey zones

3.2.5 Use of the results

Recommendations made as a results of the rapid field reconnaissance directly informed re-planting operations in Zone A. This planting was undertaken in January and February 2005.

3.2.6 Discussion of the results

As with the survey of Chestnuts Wood (see 3.1.4 above), the rapid field reconnaissance in Welshbury Wood identified a number of features such as charcoal platforms and quarries which, although of potential archaeological significance in their own right, are likely to be common features within the woodland of the Forest of Dean.

The slag fragments (see 3.2.4.5 above) indicate smelting on the site although the precise date and exact location of this remains unclear.

As was the case in the Chestnuts Wood survey, perhaps the most significant features identified during the survey were the terrace features. Although the precise status, date and function of these remains obscure, their proximity to earthworks interpreted as a late prehistoric field system (McOmish & Smith 1995; 1996) would support an interpretation that these are part of the same system of pre-woodland enclosure.

Subsequent to the 2003 survey additional terraces were identified by LiDAR survey at Chestnuts Wood to the south (see 4.4 below), and Flaxley Woods to the north (see, 4.5.3.4 below). These features appeared to form part of an extensive system of earthworks in this part of the Forest of Dean and the LiDAR hillshaded images also show similar features in areas between these woods which are currently under pasture or arable. The overall impression is one of a unified and large-scale system of landscape organisation, unrelated to current enclosure patterns or woodland distribution, and similar to large-scale prehistoric field systems identified in other parts of the British Isles (Fowler 1983, 119-128, figures 45-47).

3.3 The Great Berry Wood survey 2005 (Figure 15 and Figure 18)

Rapid field reconnaissance was undertaken at Great Berry Wood, Drybrook, in January 2005.

This survey covered an area of *c.* 0.35km^2 centred at SO61901525 and consisted of a relatively flat-topped, but steep sided hill (between 110 and 165m OD) overlying a geology of Pennant Sandstone. The whole of the area was in the ownership of the Forestry Commission in January 2005 and was largely under broadleaved woodland.

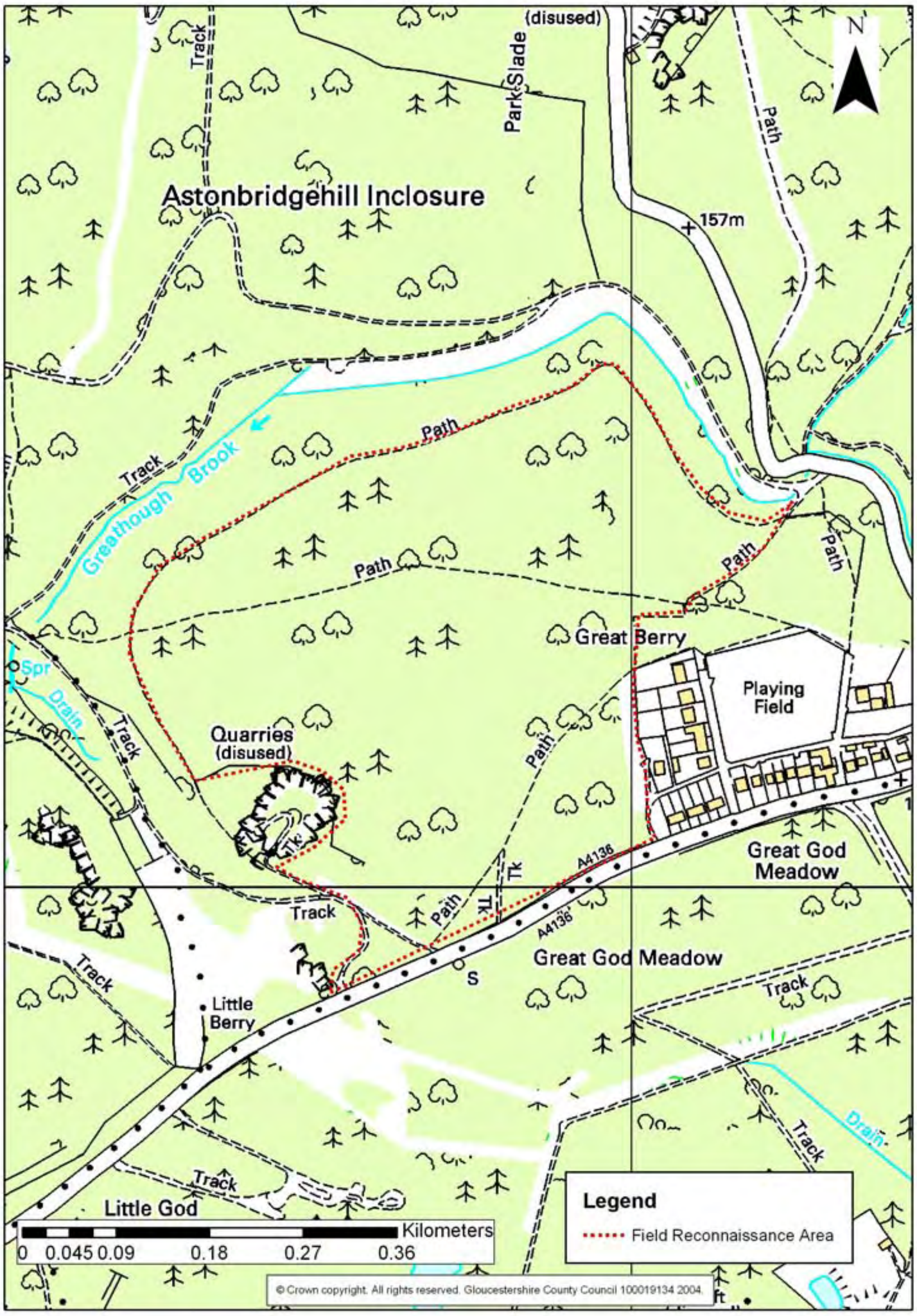

Figure 14: Great Berry Wood 2005: Area of rapid field reconnaissance

3.3.1 Objectives of the survey

The objectives of the survey were:

1. To identify visible features, which related to the placenames Aconbury (Glos SMR 25382) and Great Berry (Glos SMR 25426). Both of these names had been recorded in the area of Great Berry Wood, and suggest the possibility that earthwork features may be present in the area.
2. To trial improved data recording systems, which had been developed as a result of consideration of the two earlier walkover surveys at Chestnuts Wood and Welshbury Wood, and refined as a result of rapid field reconnaissance in Flaxley Woods (see 4.5 below).
3. To undertake rapid field reconnaissance in an the central part of the woodland of the Forest of Dean rather than at its eastern edge where the Welshbury, Chestnuts, and Flaxley Woods surveys had been undertaken (see 4.5 below).

3.3.2 Methodology

3.3.2.1 Desk-based data collection

Desk-based research consisted of checking the Gloucestershire County SMR.

3.3.2.2 Field survey

The field survey methodology was consistent with that undertaken during the rapid reconnaissance in Flaxley Woods (see 4.5.2 below), and Appendix D below with the following differences:

- Survey zones tended to be demarcated by visible features such as paths or tracks.
- No ecological features were recorded in this survey, although this reflects the fact that none were recognised rather than indicating a change in recording policy.
- In one zone (Zone A) no mapping was undertaken and all locational recording was undertaken by recording GPS readings on the feature record sheets

Two teams, one consisting of two people and the other an individual working alone, undertook the field survey over a two day period.

3.3.3 Results of the survey

The Great Berry Wood survey identified a total of 103 features of potential archaeological significance. These are summarised as follows.

3.3.3.1 Charcoal platforms (Figure 15)

Nineteen charcoal platforms were found, along with five other platform features, which may also have been charcoal platforms. These were typically a roughly circular levelled areas measuring *c.* 5 - 10m in diameter and often associated with dark charcoal-rich soil. These tended to be identified on the steeper slopes at the edge of the survey area, particularly at the junction between these slopes and the relatively flat plateau of the hilltop. In addition to the visible platform features, a large area of dark charcoal-rich soil (A12), probably spread from adjacent platform features A11 and A13, was recorded in the eastern part of the survey area where vegetation had been removed from one of the paths which transacted the survey area.

3.3.3.2 Quarries (Figure 15)

Thirty-five features were interpreted as the result of quarrying activity in the area. These varied in size from shallow discrete hollows 2.5m x 2.5m and only 0.5m deep (B225) to extensive areas of post-medieval quarrying up to 80m x 30m and 2m deep

(B220). In addition a number of linear hollows, generally running parallel to the natural contours of the hill, were interpreted as linear quarries.

3.3.3.3 Slag (Figure 15)

Five areas containing fragments of slag were identified where ground cover was absent along the line of the path in the southeastern part of the survey area. Four of these (B200, B229, B230 and B231) were finds of bloomery slag, the waste from smelting activity pre-dating the introduction of the blast furnace to the area in the mid-16th century. The presence of this type of slag is generally taken to indicate that smelting had been undertaken in the vicinity, and it may be significant that one of these scatters (B200) was found in close proximity to a small mound of indeterminate function (B203).

The remaining area (B232) appeared to consist of a dump of later blast furnace slag, the origin of which is not clear.

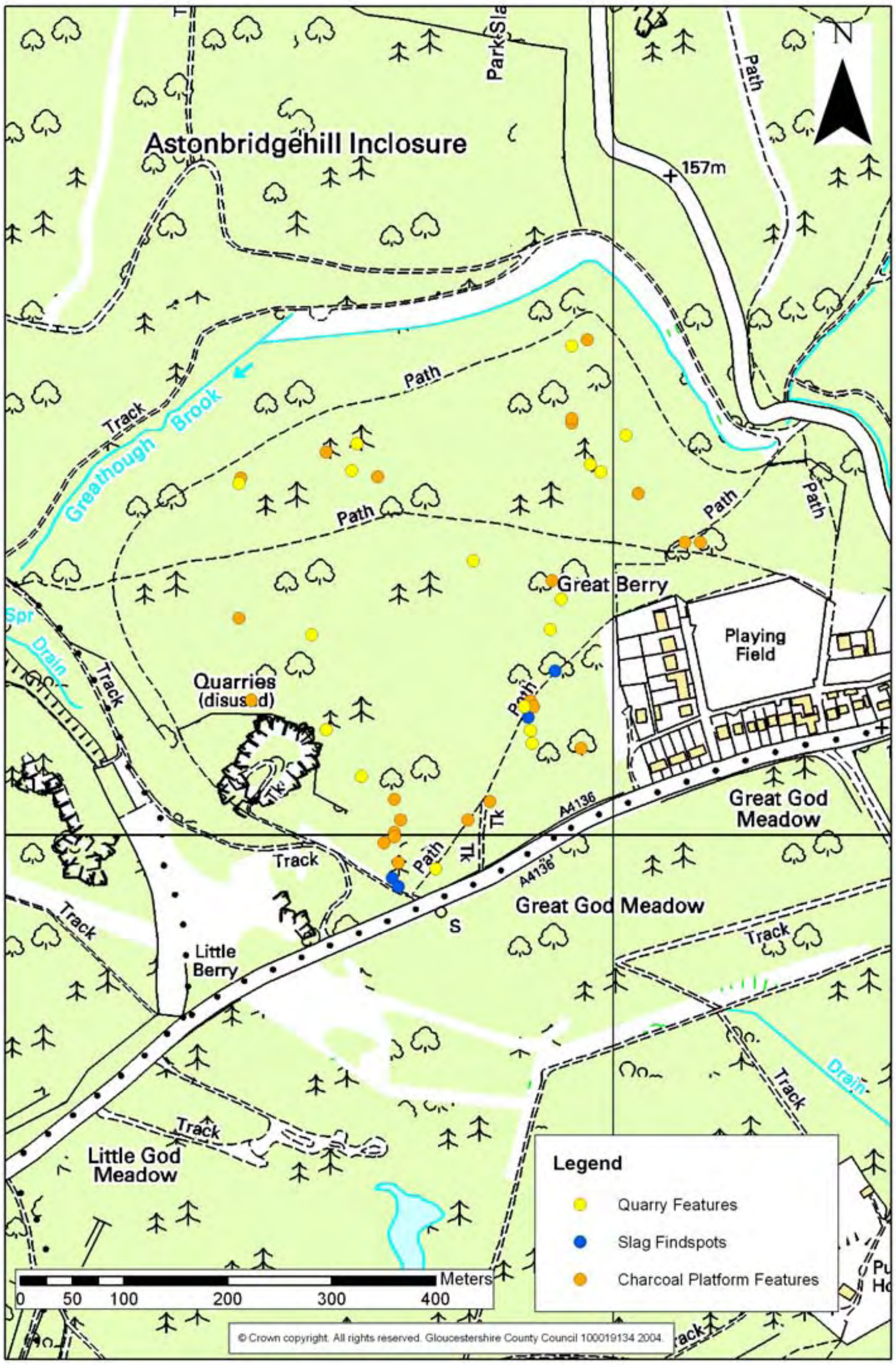

Figure 15: Great Berry Wood, 2005: Quarry features, charcoal platforms and slag finds

3.3.3.4 Terraces and banks (Figure 16, Figure 17, Figure 18)

Eighteen low banks or terraces were recorded within the survey area. These features tended to be *c.* 1-2m in height and, although some (e.g. A5, A6) were short stretches of low bank of indeterminate interpretation, others were considerably longer and appeared to form part of a coherent system of banks and terraces running parallel to the natural slope on the western and southern parts of the area.

In two areas in the southeastern part of the area, these features (B224, B213) appeared to form a rightangled return, whilst a similar relationship was evidence between two features (Z21, Z22) in the northwestern part of the area. In addition to these, two platforms (B210, B233) each defined by rectilinear terraces of *c.* 10-15m in length and *c.* 1m high may also be interpreted as short stretches of terrace with clear returns.

Figure 16: Great Berry Wood 2005: Terrace A5, view - east

Figure 17: Great Berry Wood 2005: Terrace B213, view - east, Scale 1m

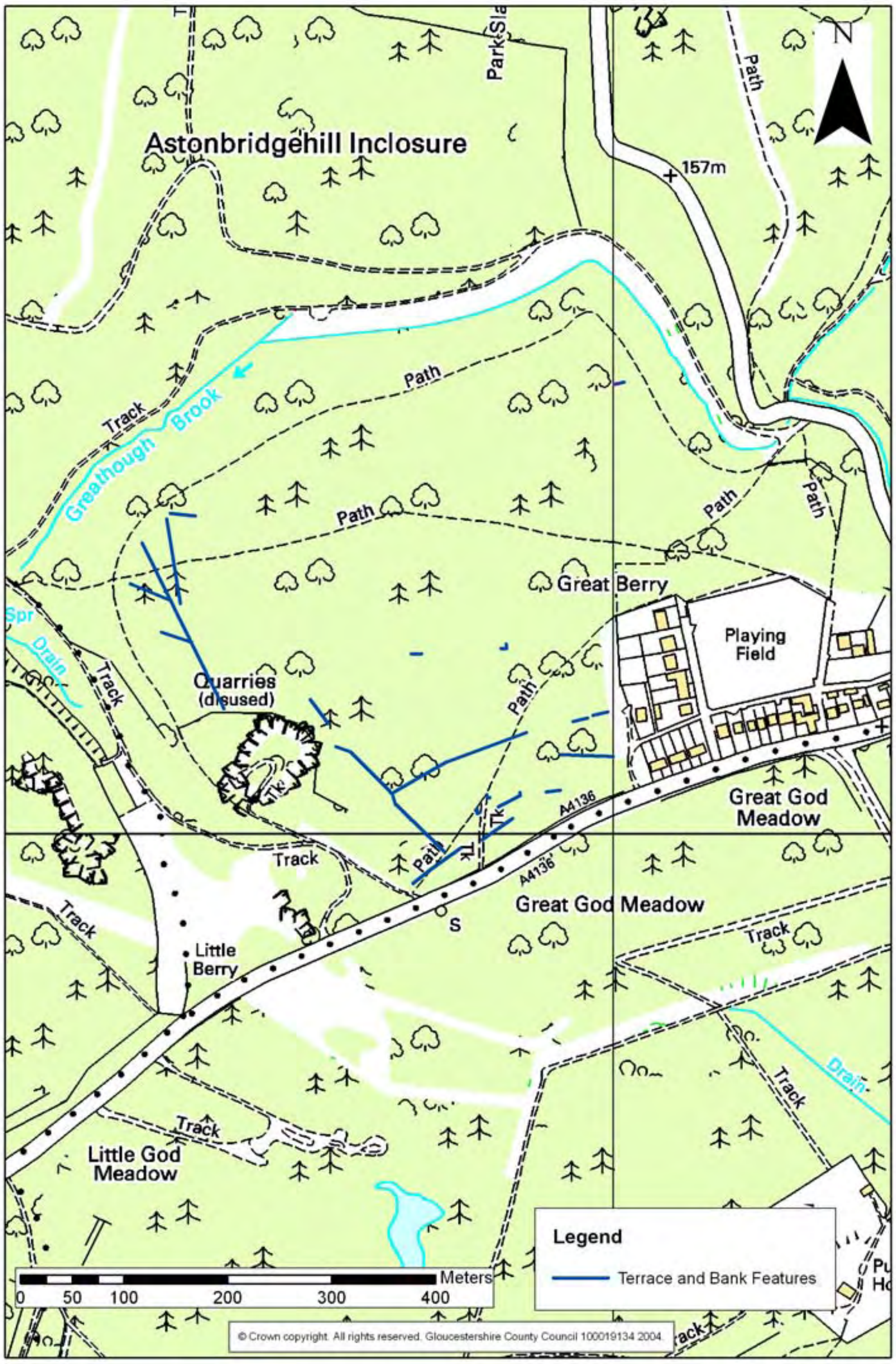

Figure 18: Great Berry Wood, 2005: Terrace and bank features

3.3.3.5 Holloways

A linear holloway (B209) was interpreted as an access route to the quarrying in the area, whilst a further four linear features were interpreted as recent rutting caused by vehicles used during forestry operations.

3.3.3.6 Mounds

Five small mounds (A106, B203, B204, Y41, and Z23,) between 5 x 3 and 10 x 10m in area and up to 1m high were identified during the survey. The interpretation of these features is not clear, but at least one B203) was found in association with finds of bloomery slag (C200, see above).

3.3.3.7 Other archaeological features

A rubble spread (D2) and linear hollow (D3) in the southwestern part of the survey area may relate to the site of a sawmill on the site operated by Italian prisoners of war during the Second World War (local resident pers. comm.).

3.3.3.8 Ecological features

No relict ecological features were identified during the Great Berry Wood survey.

Visible ecological differences were recorded on only six (less than 6%) of identified archaeological features.

Three of these (B216, C4, C6) were charcoal platforms, two (B220, Y40) were recorded as quarries whilst the remaining (D2) was an area of rubble.

The ecological differences identified tended to be a relative lack of either brambles or bracken, although the rubble mound (D2) was reported to be more “mossy” than the surrounding area. In most cases the ecological difference was described as “unclear”.

3.3.3.9 Discussion of the results of the survey

Although a number of the features identified during the Great Berry Wood survey are the types of feature (quarries, charcoal platforms) which would be expected within areas of woodland, two types of recorded feature may be of particular significance.

The finds of bloomery slag can be interpreted as evidence of early smelting on the site, and although the precise location of this activity could not be determined as a result of the survey, the relationship of these with other identified features, particularly mounds or platforms, may be significant

The linear banks and terraces are also likely to be of archaeological significance and are similar to features identified in Welshbury, Chestnuts and Flaxley Woods to the east (see 3.1 above, 3.2 above, 4.5 below), although the date and function of these features is not clear.

There is no record of assarting in this area, and although in 1634 a Mr Gibbons was charged with “spoiling coppices at Morestocke” (Hart 1995b, 68), the modern Myreystock is over 500m to the west of Great Berry Wood, and a connection between these features and recorded coppice enclosures would seem tenuous.

The southern most of these features, which run parallel to the modern road (B206, B211) may correspond with a post-medieval Forest enclosure boundary recorded here in 1856 (Gwatkin 1997), although this is far from clear.

It is also possible that, like the features identified in Chestnuts and Welshbury Woods (see 3.1.4.5 and 3.2.4.4 above), these earthworks may be the physical remains of a system of landscape organisation which may not relate to (and might therefore be earlier than) the woodland cover on the site.

4 Validation of LiDAR survey

4.1 LiDAR information

LiDAR is a form of aerial survey in which short pulses of laser energy are fired from an aircraft towards the ground, and the time taken for these to reflect back to the aircraft is measured. Measurement of this time can be converted to distance by halving the return time and multiplying by the speed of light, and so long as the height and position of the aircraft are known, this information can be used to create accurate maps of the topography of the ground surface (Deverux et al. forthcoming).

The LiDAR information utilised by the project was the result of a survey of Chestnuts, Welshbury and Flaxley Woods undertaken by the University of Cambridge Unit for Landscape Modelling on behalf of the Forestry Commission (Figure 19). The work was commissioned to assess the potential of LiDAR to identify archaeological features in a woodland environment by processing the data to remove the woodland canopy cover, and this area was chosen as there was a mixture of conifer, broadleaved and open areas, and the results could be tested against the results of the rapid field surveys which had been undertaken in Chestnuts and Welshbury Woods (see 3 above).

The survey was undertaken in February 2004 to ensure maximum laser penetration where deciduous canopy was devoid of leaf cover and the understorey vegetation was at a minimum.

In fact, two separate surveys were undertaken to generate approximate point densities of 4 per m^2 and 1 per m^2. The size of the laser footprint was set to a nominal 0.8m and 1.25m for each survey respectively. The data was converted to a 0.25m and 1m grid by assigning cells with the point value of their nearest laser observation. Where more than one laser observation was found in a cell the last one encountered was used, and empty cells were filled by smoothing their neighbours. The vegetation removal algorithm was applied to these data to create a digital elevation model of the topography under the forest canopy, which was then illuminated from the north west at an elevation of 25^o using a standard GIS hillshading procedure (Devereux, Amable, Crow & Cliff forthcoming).

Although this process remains experimental, preliminary results made available to the Archaeology Service in late 2004 were considered adequate for ground truthing in the field.

4.2 Hillshaded LiDAR images

The Archaeology Service received hillshaded LiDAR images from the Forestry Commission and transferred them into the Gloucestershire County Council GIS, georeferencing them in relation to the national grid. The images covering the whole of the survey area were produced by processing the survey data through a $1m^2$ grid, although the area of Flaxley Woods was also produced using a higher resolution $0.5m^2$ grid. As the Archaeology Service were in receipt of processed images, they had no control over either the processing which had produced the images nor was there the capacity, or expertise, for further processing.

A range of topographical features was clearly visible on the hillshaded LiDAR images, including recent forestry tracks and features such as quarries, holloways and earthworks, which had already been recorded in earlier surveys at Welshbury and Chestnuts Woods. In addition to these, however, the hillshaded LiDAR images also revealed extensive patterns of unrecorded features, not only in Welshbury and

Chestnuts Woods but also in Flaxley Woods to the north. These took the form both of rectilinear enclosures (Figure 20) similar to those identified to the south of Welshbury hillfort (McOmish & Smith 1996); and also long parallel linear banks or terraces connected by occasional linear features running at approximate right angles to them (Figure 22, Figure 24). Although the status and date of these features was not fully understood (see 3.1.4.5 above, 3.2.4.4 above, 3.3.3.4 above, 4.5.3.4 below) they appeared similar to prehistoric field systems identified in Cornwall, west Wales and Cumbria (Fowler 1983, 119-128, figures 45-47).

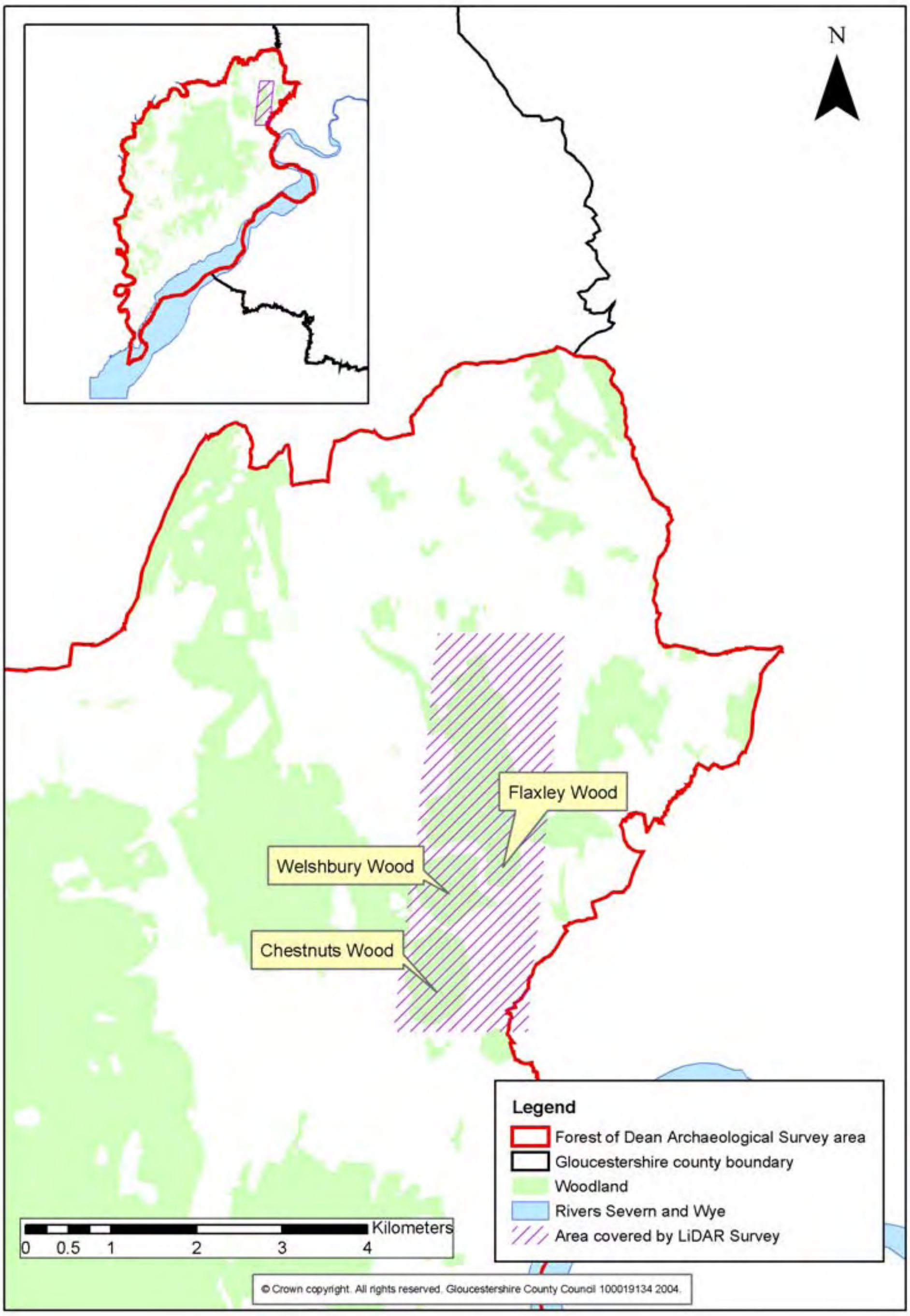

Figure 19: Area covered by LiDAR survey

4.3 Welshbury Wood 2004

The earliest available images of the LiDAR survey were of Welshbury Hill. Hillshaded LiDAR images from this survey were made available (in draft form) to the

Archaeology Service in April 2004 (Figure 20). When compared with the results of the 2003 rapid field reconnaissance undertaken by the Archaeology Service of the eastern side of Welshbury Hill (see 3.2 above; Hoyle 2003a) it was immediately apparent that:

- The LiDAR survey appeared to show a number of linear features which had not been recorded during the 2003 rapid field reconnaissance.
- The LiDAR survey appeared to show that a number of the linear features, which had been recorded in 2003, were more extensive than the results of the 2003 survey would suggest.

As a result of this observation a rapid field visit (half a day) was made to Welshbury Wood in April 2004 to compare selected parts of the draft results of the LiDAR survey with those of the 2003 rapid field reconnaissance. This operation was undertaken by a single field surveyor who simply made observations about selected features visible on an A3 paper print out of the LiDAR information (provided by Peter Crow of the Forestry Commission).

The following observations were made. These should be considered in conjunction with Figure 21.

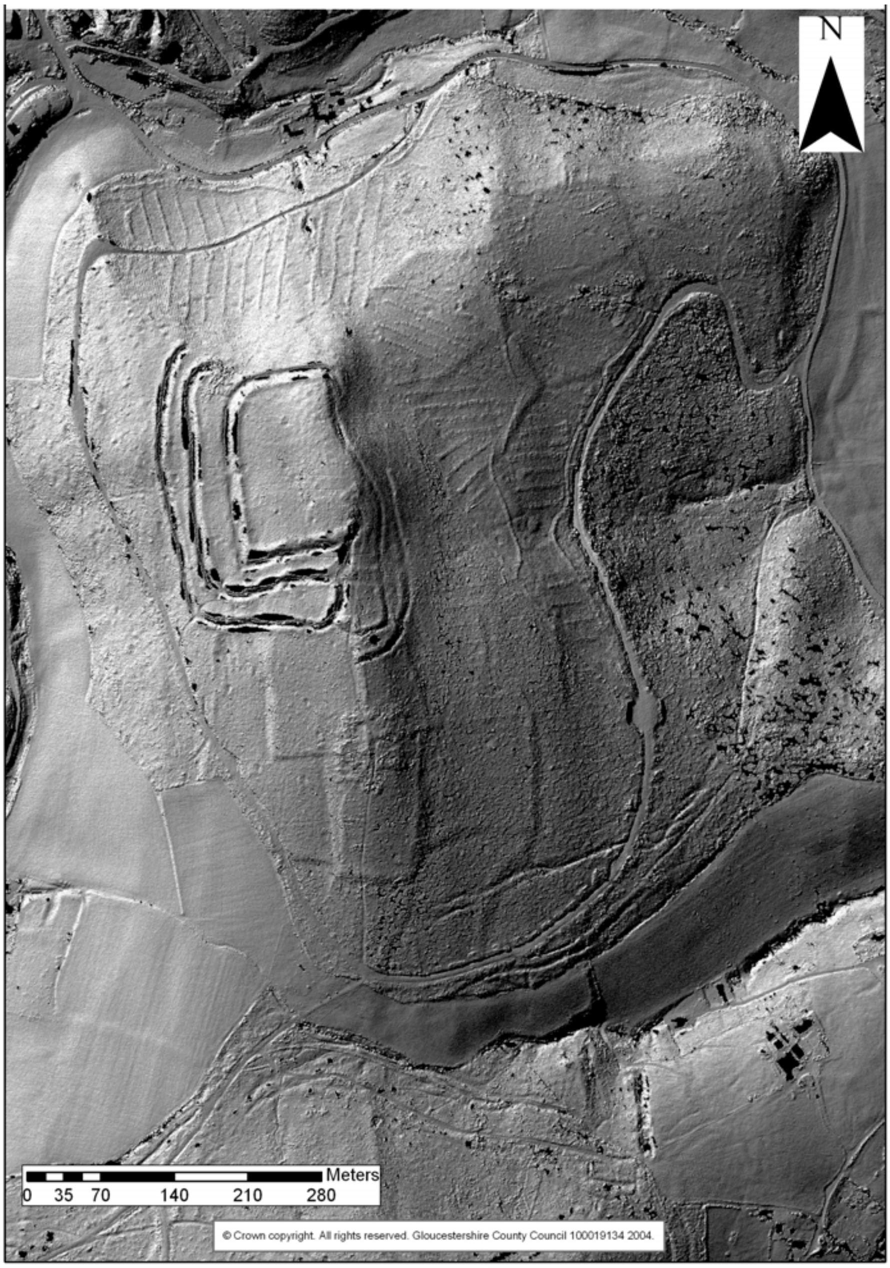

Figure 20: Welshbury Wood: LiDAR survey hillshaded LiDAR image © Forest Research

4.3.1 Results of the 2004 field visit

4.3.1.1 LiDAR Feature A

LiDAR Feature A appeared on the hillshaded LiDAR image to be a southern continuation of Terrace 158 (recorded during the 2003 rapid field reconnaissance of Welshbury Wood) to the south of Holloway 164. A visible terrace *c.* 2-3m high with a face at *c.* 40^{o} corresponded to the position of LiDAR Feature A. In the light of the LiDAR survey this feature was clearly a continuation of 158, although it was less distinct than the sections of 158, which had been recorded in the survey, perhaps due to the natural slope of the hillside here.

4.3.1.2 LiDAR Feature B

LiDAR Feature B appeared on the hillshaded LiDAR image to be a southern continuation of Terrace 158 to the north of Holloway 164. Like LiDAR Feature A (see above) this was a clearly visible terrace (c. 2-3m high with a face at *c.* 40^{o}) although it was considerably more amorphous and irregular than the sections of 158, which had been mapped in 2003, and the point at which the field survey team had terminated their record of 158 was clearly visible.

4.3.1.3 LiDAR Feature C

LiDAR Feature C appeared on the hillshaded LiDAR image to be a northern continuation of terrace 158. This was visible as a terrace *c.* 1.5m high with a face at *c.* 40^{o}. This feature was much less distinct than the sections of terrace which had been mapped as 158 in 2003.

All the above features were visible on the ground in 2004 and could reasonably be interpreted as a continuation of Terrace 158, although in all cases they were not as clearly distinct as the elements of that feature which were recorded in 2003.

4.3.1.4 LiDAR Feature D

LiDAR Feature D appeared on the LiDAR survey to be a linear feature, which may have represented the western boundary of an enclosure of which the eastern boundary was represented by Terrace 155.

An intermittent and irregular terrace (c. 1.5m high with a face at *c.* 35^{o}) corresponded to the northern part of this feature, although no clearly defined feature corresponding to the southern part of the linear mark on the Hillshaded LiDAR image was discernable.

Although, in the light of the LiDAR survey (i.e. the way in which a feature along this line would fit in with the overall patterning of terraces in this area) this feature should be given some credence as an earthwork along this alignment, it was not sufficiently distinct from the general lie of the slope here to have been normally recorded during field survey.

4.3.1.5 LiDAR Feature E

Although there was a very general trending of the landscape to form a slight ridge along the alignment of LiDAR Feature E, there was no clearly distinct earthwork in this location in April 2004, and certainly nothing which would have warranted recording as a linear feature as part of any field survey.

4.3.1.6 LiDAR Feature F

Although this line corresponded to the break in slope along the northern edge of Welshbury Hill, no clearly distinct earthwork was visible in this location in April 2004, and certainly nothing which would have warranted recording as a linear feature as part of any field survey. A clear break in slope/terrace (c. 1.5-2m high) was discernable in the standing woodland to the east (outside the rapid field reconnaissance study area), which appeared to correspond to the eastern continuation of LiDAR Feature F, although this feature was not followed.

Neither LiDAR Feature E, nor LiDAR Feature F could be discerned on the ground in 2004, although both of them fit neatly into a possible pattern of rectilinear enclosures visible on the LiDAR plot in the northeastern part of Welshbury Hill. It remains possible that these do represent low features, which are obscured by a combination of brash matting and undergrowth, and further, more detailed archaeological investigation would be required to check the validity of this. The possible continuation of LiDAR Feature F into the unexplored woodland to the east may also support this view.

4.3.1.7 LiDAR Feature G

LiDAR Feature G was visible as a linear hollow on the LiDAR survey, although no feature had been recorded in this location as part of the 2003 field survey. In April 2004 this feature was visible as an amorphous linear hollow (c. 0.75m deep x 3-4m wide). This feature was fairly overgrown and did not have clearly defined edges.

Although this feature was visible on the ground in 2004, it had not been recorded as part of the 2003 rapid field reconnaissance as it was interpreted as a natural water run-off channel. The results of the LiDAR survey, however, suggest that this feature may conform to, and be part of the general rectilinear patterning on the north-eastern side of Welshbury Hill, and may, therefore be the remains of an archaeologically significant feature, perhaps one whose form has been compromised by later water run-off, although further, more detailed archaeological investigation would be required to check the validity of this.

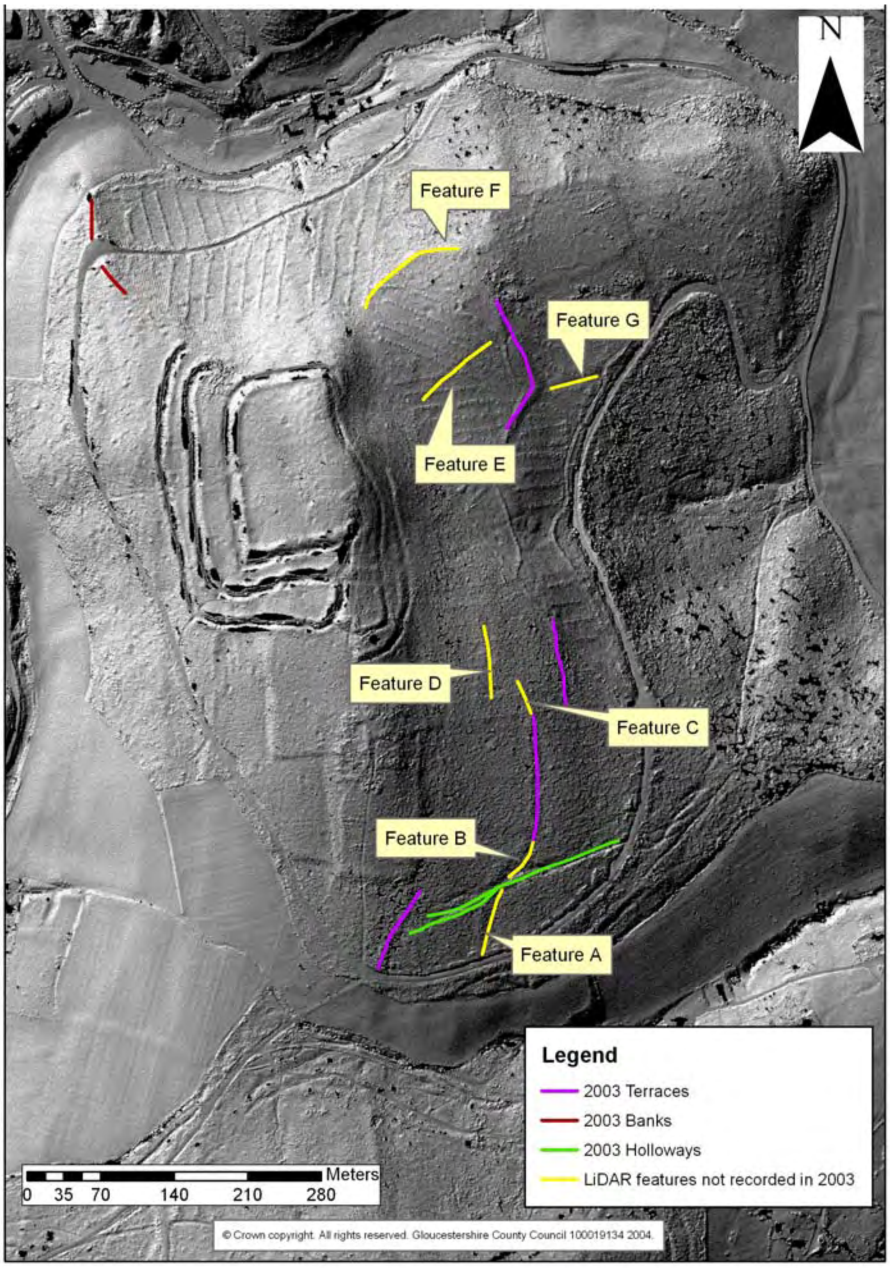

Figure 21: Welshbury Wood: Comparison of LiDAR survey with selected features recorded in 2003. © Forest Research

4.4 Chestnuts Wood 2005

Comparison between the results of rapid field reconnaissance at Chestnuts Wood undertaken in 2003 (see 3.1 above), and the hillshaded LiDAR image (Figure 22) indicated the following:

1. A number of linear features recorded by the LiDAR survey, particularly on the western slopes of Chestnuts Hill in Zones C, D and E, had not been recorded by the 2003 rapid field reconnaissance.
2. Where the 2003 survey had identified linear features in these areas, only small sections of what appeared to be extensive features had been recorded. This phenomenon had been noted with the results of the 2003 rapid field reconnaissance at Welshbury Wood (see 4.3 above).
3. A number of features recorded by the 2003 survey (e.g. G53, a terrace interpreted as a terraced trackway leading to quarries to the west, and H14 originally interpreted as a revetted trackway) had been interpreted as relatively recent features, although when viewed in the light of the LiDAR survey results, these could be re-interpreted as features relating to the general pattern of linear features visible on the hill.
4. Where features which could be equated to features visible on the LiDAR survey, had been recorded in the 2003 survey, there was often a discrepancy of up to 20m between their locations.

In order to investigate points 1 and 2 a two person team visited Chestnuts Wood for half a day as part of the 2005 pilot work, specifically to validate the linear features visible on the Hillshaded LiDAR images in Zones C, D and E

Figure 22: Chestnuts Wood: Hillshaded LiDAR image. © Forest Research

4.4.1 Results of the 2005 field visit (Figure 23)

All features identified during this process were recorded on the revised version of the 2005 archaeological feature recording form (Appendix K) and were cross-referenced with unique LiDAR features numbers allocated in accordance with the methodology used to validate the LiDAR results in Flaxley Woods (see 4.5.2 below).

With the following exceptions, all of the features validated as part of this process were considered to be genuine earthwork features (terraces), which are likely to be archaeologically significant and probably contemporary with the terracing recorded on the eastern side of the hill.

4.4.1.1 LiDAR Feature 4

The status of this feature was not clear. Whilst a terrace was visible in this area it was not clear on the ground to what extent this feature had been created by the conflation of a large charcoal platform (not recorded during the 2003 survey), quarrying and terracing caused by levelling for the forestry track separating Zones D and E.

4.4.1.2 LiDAR Feature 7

This feature, which appears as a wide bank/terrace on the hillshaded LiDAR image (similar in size to the features which were interpreted as partly geological in origin during the Flaxley Woods survey) could not be discerned on the ground, although the area was very overgrown and obscured by detritus from forestry operation when visited in 2005.

4.4.1.3 LiDAR Feature 8

This feature appeared to be a continuation of a short stretch of terrace (C300) recorded during the 2003 survey. It was clear that the LiDAR was picking up a large shallow terrace, although the status of this feature was far from clear. It had not been recorded during the 2003 survey as the field surveyor was not certain that it was not just the natural slope of the hill. Feature 8 appeared to be a continuation of a recognised linear features to the north (Feature 4), and should, therefore, be cautiously regarded as potentially archaeologically significant.

4.4.1.4 LiDAR Feature 9

This feature also consisted of a large shallow terrace which had been interpreted as a variation in the natural slope of the hill in 2003. It did, however, appear to be a continuation of linear terrace C412, and, for the same reasons as L8 (above) should now be regarded as potentially archaeologically significant.

The reasons why the remaining features were not recorded in 2003 are similar to those already discussed with relation to the 2003 Welshbury survey. Some of the features (e.g. L1, L2 and L10) were not distinct in all places, and, combined with the levels of undergrowth, may not have been recognised, particularly where these were either crossed, or completely missed by survey transect lines. Other features (e.g. L3, which is visible as a relatively indistinct linear feature on the hillshaded LiDAR image, and like L9 was a continuation of linear terrace C412) were not clearly distinguishable from variations in the slope of the hillside. Other features (such as L6 or L5 on the western slopes of the hill) were not only overgrown, but were also relatively inaccessible due to the steepness of the slope.

Although it could be argued that changes in the rapid field reconnaissance methodology, or subjective decisions about whether a feature is believable or not, as outlined in 7.7.2.2 below) would improve the recording of these features in future rapid surveys, there can be no doubt that the overview afforded by the hillshaded results of the LiDAR survey not only prompted field surveyors to look for features in locations which may have been missed during normal field survey, but also facilitated the process of making the decision to record the features as of potential archaeological significance.

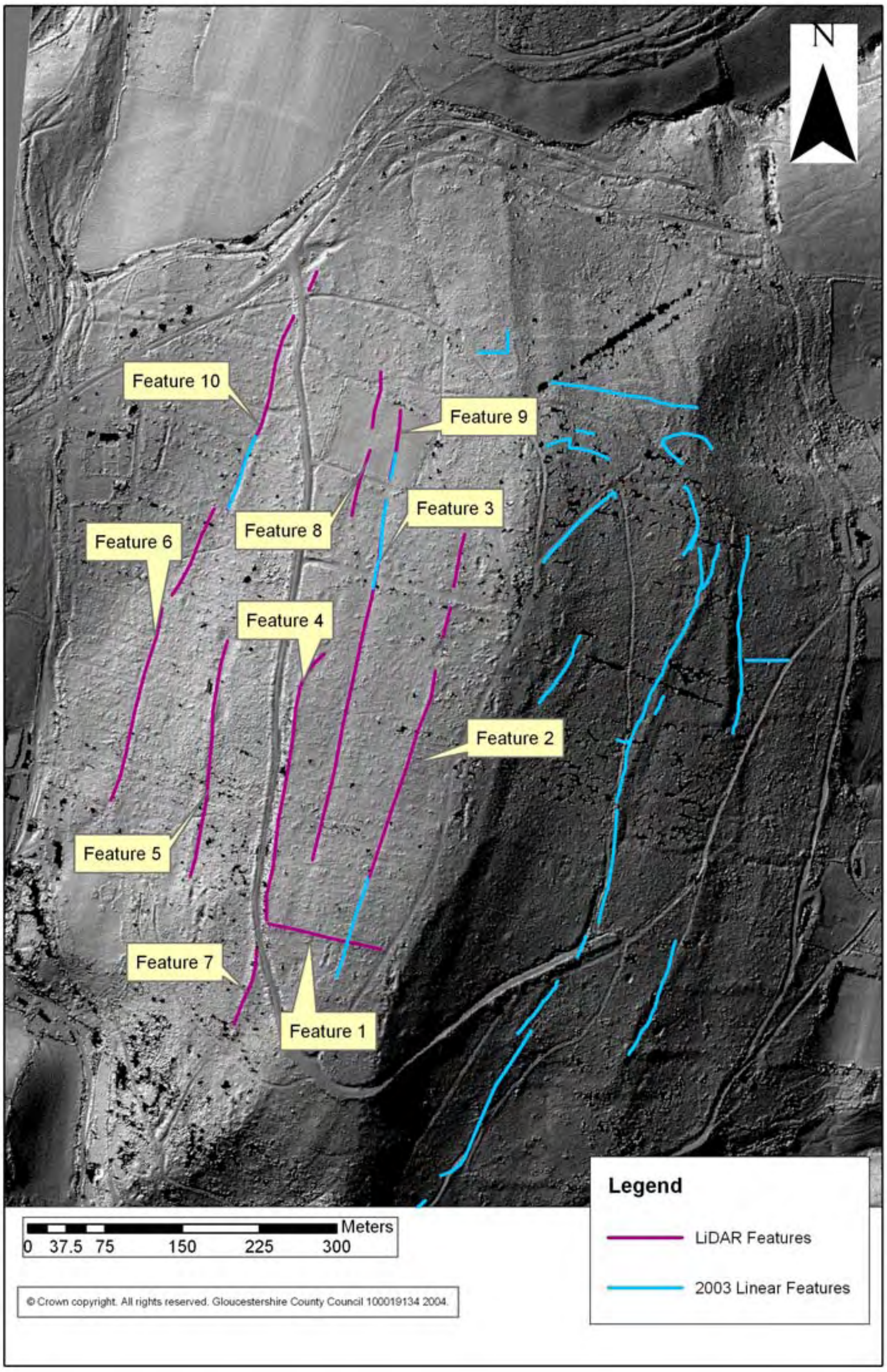

Figure 23: Chestnuts Wood: Comparison of LiDAR survey with selected features recorded in 2003. © Forest Research

4.5 Flaxley Woods Survey, 2005

Validation of the results of LiDAR survey was combined with rapid field reconnaissance in Flaxley Woods (Figure 25) in January 2005.

A specification for the field survey was prepared in advance of the field survey (Appendix D, E.iv.i), although some modifications to this were made as the survey progressed.

4.5.1 Objectives of the survey

The objectives of the survey were two-fold:

1. To validate the results of the LiDAR survey of Flaxley Wood.
2. To trial improved data recording systems which had been developed as a result of reviewing earlier field surveys at Chestnuts Wood and Welshbury Wood.

The Flaxley Woods survey covered two areas within the southern part of Flaxley Woods (Figure 25), a linear bluff ranging in height from *c.* 100 to *c.* 150m OD. The whole of the survey area was wooded with a mixture of broadleaved and coniferous plantation.

Full rapid field reconnaissance was only undertaken in part of the southern of these two areas (Figure 25) within both broadleaved and coniferous woodland.

4.5.2 Methodology

4.5.2.1 Desk-based data collection

Desk-based data collection consisted of consulting the Gloucestershire County Sites and Monuments Record and the hillshaded images of the LiDAR survey of the area (see 4.14.1 above).

LiDAR image resolution

Hillshaded images of Flaxley Woods were available at two resolutions (0.5m and 1m see 4.1 above) and these were compared to determine which appeared to be of most value to inform rapid field reconnaissance.

Both images were rapidly compared on screen (rather than as paper print-outs) with the following results:

Table 1: Flaxley Woods: Comparison of LiDAR hillshading images at both 0.5 and 1m grids

Image scale	0.5m grid	1m grid
1:10000	Linear features show up well, as do large cut feature such as quarries. Occasional discrete features (large charcoal platforms?) are also visible. Image relatively grainy, presumably due to increased number of visible points, although these do not seem to represent additional information about potentially significant archaeological features	Linear features show up well, as do large cut feature such as quarries. Occasional discrete features (large charcoal platforms?) are also visible. Image less grainy than at 1:5000 and therefore appears to be clearer at this scale.
1:5000	Image appears better defined than at a 1m grid, and more detail available. Not clear that more potentially significant archaeological features are visible, however, although those that are, are more clearly defined.	Linear features, large cut features and occasional discrete features are still visible at this scale, but definition of these is beginning to become more vague, although no real definition is lost at this scale. No additional information about potentially significant archaeological features is visible.

Image scale	0.5m grid	1m grid
1:2500	Image still usable and some additional detail, not really discernable at larger scales, is visible particularly on linear features. Occasional discrete features, which had not been identified at larger scales, are also visible. The archaeological significance of these, however, is not clear.	Very poor definition at this scale, and the image is barely usable
1:1250	Images could be used at this scale, but there is a significant loss of definition.	Not usable at this scale

Although not a scientific analysis of the relative merits of both resolutions the following broad conclusions can be drawn:

- At scales of 1:10000 (or above) the lower resolution image (1m) was in fact clearer, due to a lack of "background noise". Although it is recognised that some of this "background noise" may represent archaeologically significant features, these were not discernable as such at this scale.
- Although the 0.5m resolution displayed slightly better definition at scale 1:5000, there was no discernable difference in the relative value of the two images at this scale.
- At scale 1:2500 the 1m image was barely usable, whilst some additional detail was visible on the 0.5m hillshaded image. The archaeological significance of much of this detail, however, was not clear, and no additional linear features were visible. In practice it is hard to envisage how LiDAR information would be used at this scale with the exception of checking details of features which had already been identified.

Given the above assessment, it was decided to take 1:10000 scale paper printouts of the 1m resolution into the field for validation. At a later stage of the survey it was found that larger scale images were more useful, and 1:4000 scale paper printouts were produced. The 1m resolution image was used for this as the assessment (see above) suggested that the higher resolution image would contain no significant additional information.

LiDAR data used in the field

In advance of the field survey, a gridded drawing film overlay to the hillshaded LiDAR image was annotated with a number of possible linear features visible on the hillshaded image, and these assigned a unique number (prefixed L). All such features were investigated and recorded on the field survey record forms (Appendix K). This process made a record of all features identified on the hillshaded LiDAR images, regardless of whether they were considered to be of archaeological significance, or were even visible on the ground.

When features were identified on the ground they were assigned an archaeological feature number in accordance with the specifications for rapid field reconnaissance Appendix D) and cross-referenced to the number of the LiDAR feature annotated on the overlay to the hillshaded LiDAR image.

Figure 24: Flaxley Woods: LiDAR survey hillshaded image. © Forest Research

4.5.2.2 Field survey

Field survey was undertaken by two teams, one consisting of two people and the other an individual working alone. The full survey of Zones A, B, and C was undertaken over a two day period, whilst a further three days (eight-person days) was taken to validate the LiDAR features in the remaining areas.

Survey zones were demarcated by changes in ground cover, visibility and access (Appendix D).

Where possible each zone was systematically walked, along transect lines spaced at between *c.* 30m - 50m, although in practice this often proved problematic due to topography and groundcover, and zones were effectively surveyed in a way which allowed surveyors “sight of” 100% of the area.

In addition to the validation of the results of the LiDAR survey, the following was also recorded:

- Ground cover, visibility and access in each zone.
- Visible features of potential archaeological significance.
- Ecological features indicative of past woodland management.
- Any potentially significant changes in the ecology between identified features and the surrounding woodland.

It was the original intention to undertake all recording digitally, but for reasons set out in Appendix D, identified features were recorded on paper pro-formas and mapped at scale 1:2000 in accordance with the pre-agreed specification (Appendix D).

Wherever possible features were located using hand-held GPS (global positioning system), although these often proved ineffective and other “low tech” surveying systems had to be employed.

Digital photography was routinely used to record identified features, although not all features were photographed and decisions whether to do this or not were left to the discretion of the surveyor.

Extent of survey (Figure 25)

Field survey was undertaken in two areas of Flaxley Woods where LiDAR features of potential archaeological significance were concentrated. The northernmost of these covered an area of *c.* 15.3ha whilst the southernmost covered an area of *c.* 17.3ha. Ground truthing of the results of the LiDAR survey was undertaken throughout both of these areas in the following way:

- In Zones A, B and C (an area of *c.* 6.57ha) the validation of the LiDAR images was incorporated into the rapid field reconnaissance with LiDAR features checked as they were encountered as part of this process.
- In the remainder of the survey area (Zones D and E, an area of *c.* 26.03ha) potential features identified from the hillshaded LiDAR images were specifically targeted for validation. No further rapid field reconnaissance was undertaken in this area.

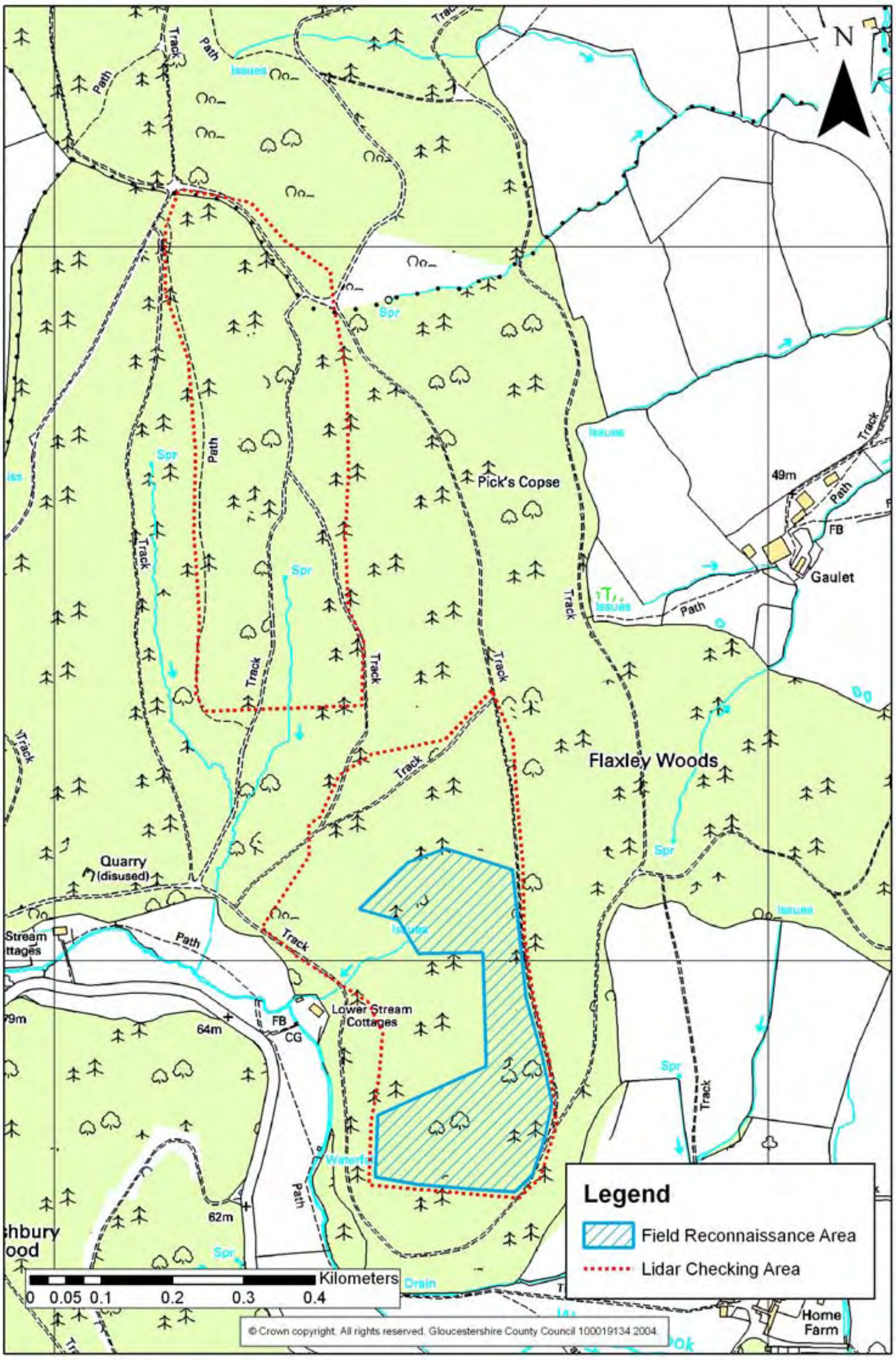

Figure 25: Flaxley Woods 2005: Rapid field reconnaissance areas

4.5.3 Results of the survey

A total of 128 archaeological features was identified during the Flaxley Woods survey. Forty-eight of these were identified on the hillshaded image of the LiDAR survey in advance of the field survey (although some of these were subdivisions of features which had originally been classed as a single feature, and were later subdivided as a result of the field survey), and of these 23 were within the area in which full rapid field reconnaissance was undertaken. These included charcoal platforms, terraces and a large bank which may be geological in origin but appeared to have been modified by human activity.

In addition to these, nine ecological features, which may have been indicative of earlier woodland management regimes, were identified (see 4.5.3.8 below).

The identified features can be broken down as follows:

4.5.3.1 Charcoal platforms and other platform features (Figure 26)

Twenty-five features were identified as probable, or possible charcoal burning platforms, whilst a further eight platform features which were less clearly the result of charcoal burning were identified.

None of these discrete features had been recognised on the hillshaded LiDAR images in advance of the survey, and although a number of these (e.g. A19, A20, A33; B106) could be equated with irregularities visible on these, it is not clear that these anomalies could confidently have been identified as discrete features on the basis of the LiDAR images alone.

This type of feature was typically a roughly circular levelled area on a slope. These tended to measure *c.* 5-6m in diameter, although examples of up to 12m in diameter were recorded. The majority of these were identified in Zones A and C which were predominantly conifer plantation, with relatively few identified in the mixed woodland of Zone B, where undergrowth was more dense.

The significance, frequency and possible date of these features has already been discussed in relation to similar features identified as part of the rapid field reconnaissance in Chestnuts Wood (see 3.1.4.1 above) and the report of the sample excavation of one of these features (see 2.1.1 above).

4.5.3.2 Quarries (Figure 26, Figure 32)

Thirty-four features were interpreted as quarries. The majority of these were discrete sub-circular features between *c.* 15 and $25m^2$ and *c.* 0.5 to 1.5m deep. Twelve of these were visible on the LiDAR images, and the majority of these were relatively large, or linear quarries, generally between 10 and 50m in length, although a single small discrete quarry (E34) was also visible on these images. Although only the larger quarries were identified on the LiDAR images in advance of the field survey, it was possible to suggest that a number of these (e.g. A10, A11, A12) could be equated with irregularities visible on the LiDAR image. As with the charcoal platforms (see above), these could not have confidently been identified as archaeologically significant features on the basis of the LiDAR images alone.

As with the quarries identified in Chestnuts and Welshbury Woods (see 3.1.4.3 above, 3.2.4.3 above) these are likely to represent post-medieval quarrying for building stone.

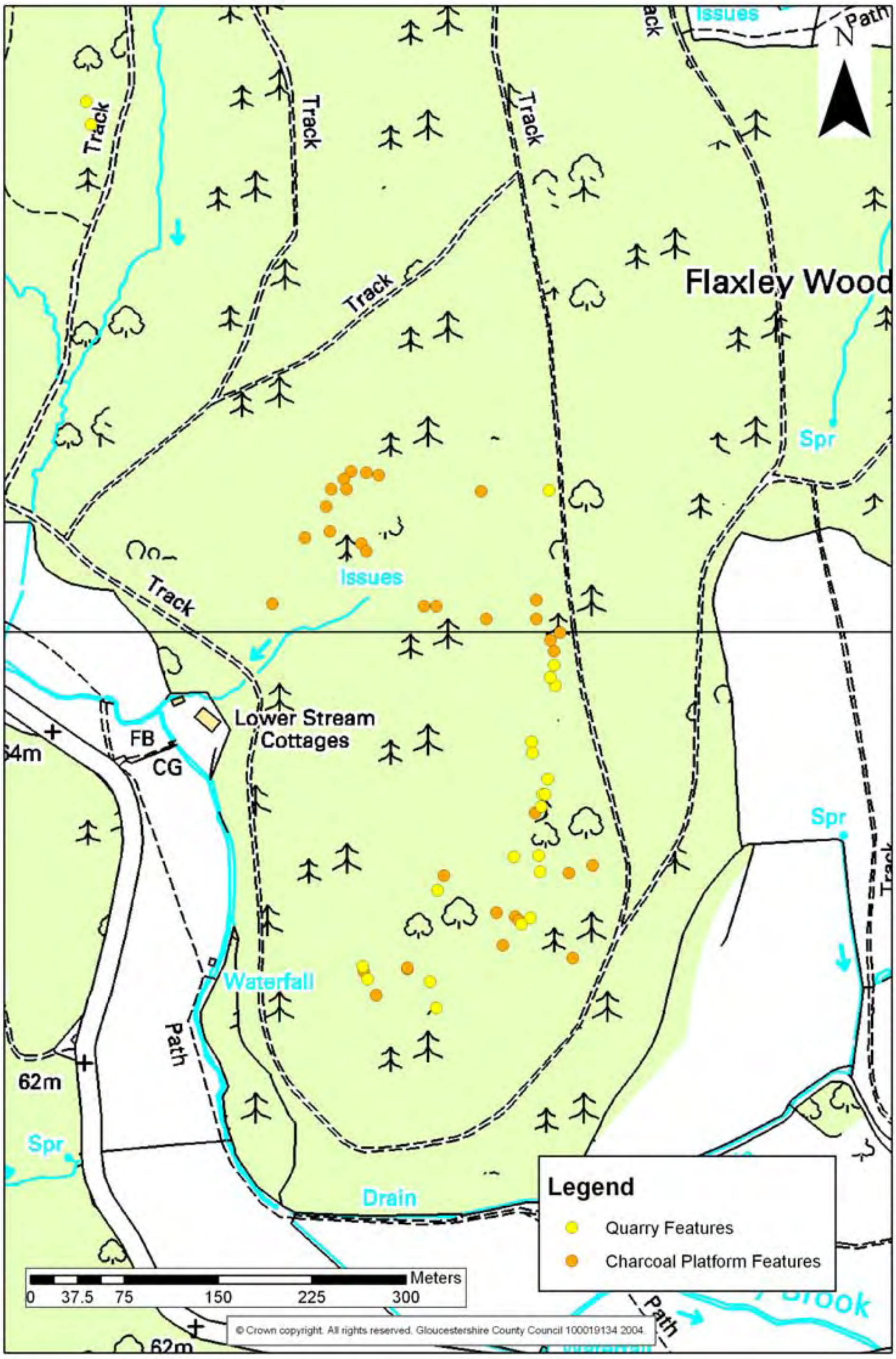

Figure 26: Flaxley Woods 2005: Quarries and charcoal platform features

4.5.3.3 Banks (Figure 29)

A single bank (C48) was identified. This low bank (c. 0.5-0.75m) ran parallel to, and at the foot of Terrace C47. This features had been identified by the LiDAR survey (although C48 was not visible on this), and is discussed below.

4.5.3.4 Terraces (Figure 27, Figure 28, Figure 29)

Perhaps the most significant features identified as a result of the LiDAR survey were the linear and rectilinear terrace features.

Eleven terraces of variable dimensions were recorded within Zones A, B and C, and a further 19 were recorded in the remainder of the survey area. All of these had been identified in advance of field survey on the hillshaded LiDAR images, although Terrace E24/27 was only clearly visible on the images produced with a grid of 0.5m and was not recognised on the 1m grid images taken into the field.

These terraces could broadly be divided into two categories.

The majority were orientated east-west, and were generally *c.* 0.5 – 2.5m in height. Most were clearly artificial, although the status of a some (e.g. B112; C207-209, C211) was less clear, either due to their form or because of dense undergrowth, and these may not have been recognised without the prompting from the LiDAR survey.

The second category consisted of features which formed parallel lines following the general north-south line of the contours of Flaxley Wood, at a spacing of *c.* 40-60m. These were massive in scale and consisted of high terraces, some in excess of 4m in height (e.g. C47. C201), or large banks (between 10 and 25m wide and 2-5m high) which appear to have been enhanced by artificial terracing of one face (e.g. A25, E16, E17, E19, E21, E32). Similar features were visible on the hillshaded LiDAR image both to the west and east of the areas covered by the field survey.

The geology of this area consists of interbedded bands of siltstone and mudstone within the St Maughan's Group of the Lower Devonian Sandstones (BGS 2004). Along with the other geological formations on the eastern side of the Forest of Dean, these deposits are inclined at an angle of 50-60^{o} with the bedding planes trending along a north-south alignment (BGS 1974). This group of very large features could, therefore, be geological in origin, and the result of differential erosion of outcrops of alternating bands of harder and softer strata. The possibility that these are geological in origin is supported by the fact that a number of the quarries identified by the survey, clearly follow the line of these features (see for example quarry features C46, and E5), suggesting that these represent outcrops of particularly desirable stone that is different from the material in between.

Many of these features, however, appear to be integrally connected with the first group of east-west terraces, and a number of these east-west terraces are clearly contiguous with them (e.g. E13, C47). This would suggest that, despite the geological origin of the north-south features, they have been incorporated into an apparently coherent system of linear and rectilinear features, and have to a greater or lesser degree been modified to make them more suitable to this function.

The date and significance of these features remains unclear, and not all of the recorded terraces, need be contemporary features, or have fulfilled the same function. A number of possible interpretations have been rehearsed with reference to the terracing identified during rapid field reconnaissance in Chestnuts Wood (Hoyle 2003b) and Welshbury Wood (Hoyle 2003a) to the south. Further archaeological investigation, outside the scope of Stage 2 of this project, would be required to shed further light on this.

They may be the result of episodes of assarting into the fringes of the Crown woodland associated with early 13th century grants of land to Flaxley Abbey (Herbert 1996c, 298-299) or they may be the remains of enclosures associated with coppicing in Flaxley Wood recorded in 1656 (Hart 1995, 109). They appear to form part of the same coherent pattern as the features identified at Welshbury and Chestnuts Woods, and it is not unreasonable to suggest that they are the remains of a contemporary landscape which may not relate to (and therefore be earlier than) the existing woodland cover in this area.

Figure 27: Flaxley Woods 2005: Terrace E11, view - west

Figure 28: Flaxley Woods 2005: Terrace E19, view - north

4.5.3.5 Holloway (Figure 29)

A single holloway (E11) was identified in advance of field survey on the hillshaded LiDAR images. This appeared to cut through terrace E10, and may have represented an access route to quarries E4, and is likely therefore to be post-medieval in date

4.5.3.6 Enclosure (Figure 29)

A sub-circular enclosure (E3) was identified from the hillshaded LiDAR images in the western part of the survey area. This feature, which was *c.* 50m in diameter was defined by a clear ditch (c. 2m wide and 0.50-1.5m deep) on its northern side. A low bank was visible on both the inner and outer sides of the ditch in this area. This feature was much less clear to the south, although the enclosure could be traced as a complete circuit.

Neither the interpretation, nor the date of this feature is clear. It is smaller (with a diameter of 50m rather than 75m) than the similar enclosure identified in Dry Wood, Soudley by the National Mapping Programme (Glos SMR 21982) although E3 is, however, similar in scale to the undated (but possibly late prehistoric) ring work at Cleeve Common in the western Cotswolds (Glos SMR 435), and there are a number of interpretative possibilities for this feature. Stratigraphically, it can only be said to pre-date the probably post-medieval quarrying (E2) in the area, and it appeared to post-date the possibly enhanced geological outcrop E32.

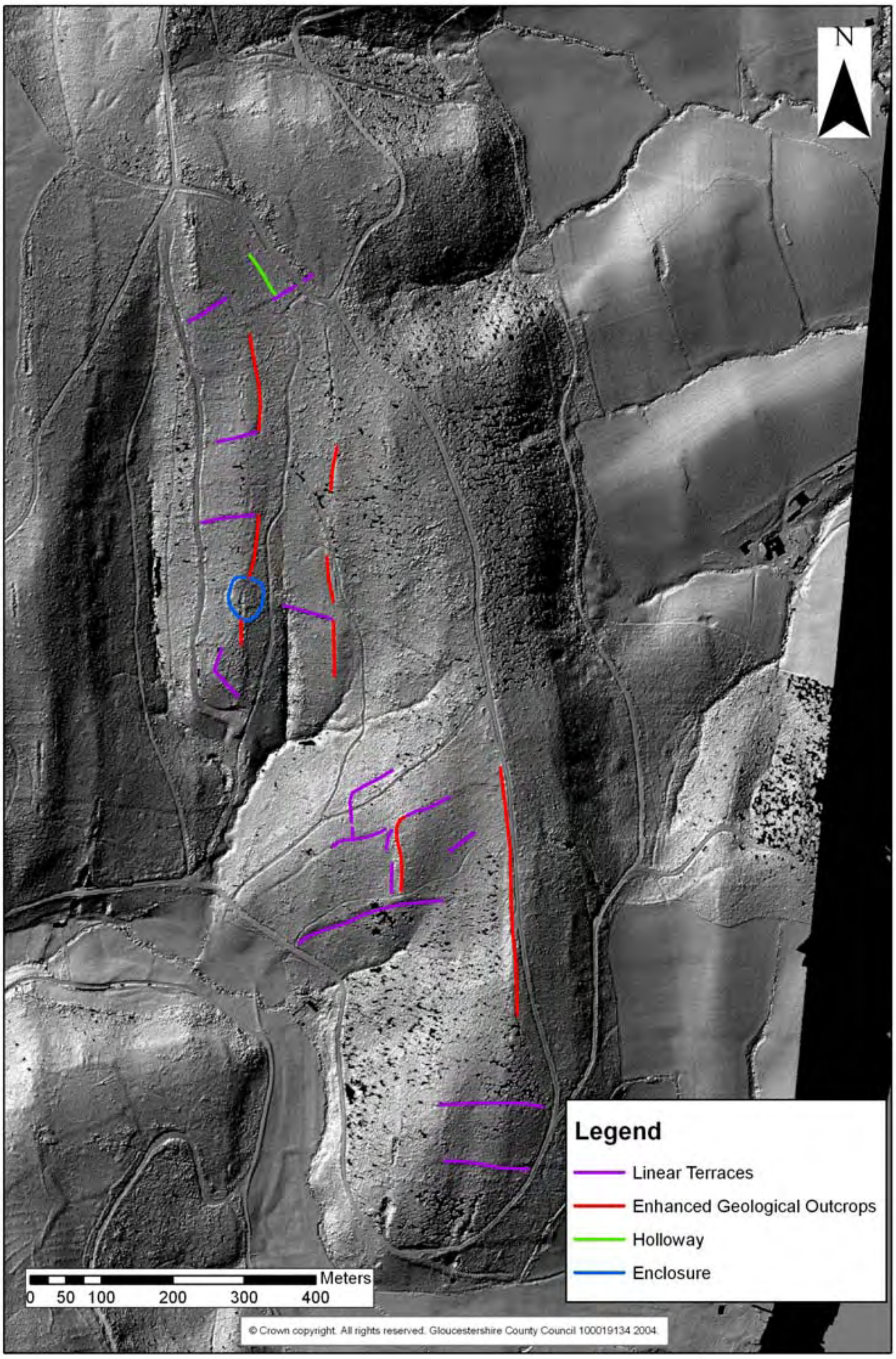

Figure 29: Flaxley Woods 2005: Banks, terraces and enclosure visible on LiDAR. © Gloucestershire County Council and Forest Research

4.5.3.7 Other features

A number of other features ranging from vague linear hollows (B103) to a complex system of shallow gullies, probably relating to forestry drainage activities (A27) were also identified in Zones A, B and C and were not visible on the hillshaded LiDAR images (Appendix I). These features are not considered to be of enough significant archaeological or historical value to warrant separate discussion.

4.5.3.8 Ecological features

Nine ecological features were identified during the Flaxley Woods survey.

With the exception of a single mature yew tree (EF:B103), all of these ecological features were either coppice stools or clumps of coppice.

Although one of these (EF:A3) was clearly an ancient coppice stool indicative of earlier woodland management regimes, the status of the remainder was more equivocal and it was often not clear whether what was being recorded was the result of deliberate coppice or just natural coppice-like regeneration from cut stumps.

Visible ecological differences were recorded on 12 (almost 8%) of identified archaeological features.

Three of these (A20, A29, S39) were charcoal platforms whilst a further two (A19, B121) were platform features which were not clearly charcoal platforms. Five (A10, A11, A12, E2, E22) were recorded as quarries, whilst one terrace (E10) and a single Holloway (E11) also fell into this category.

As with the ecological differences identified during the Great Berry Wood survey these tended to be indicated by a relative lack of brambles, or bracken or ivy.

Figure 30: Flaxley Woods 2005: Relict coppice stool EF:A3, view - south

Figure 31: Flaxley Woods 2005: Possible coppicing/natural regeneration EF:B104, view - east

4.5.4 Features interpreted as non-archaeological (Figure 32)

A number of other features of limited archaeological significance, such as streams or recent forestry tracks were identified from the LiDAR survey. In general these features could be clearly distinguished without the need for field validation.

In addition to these, a number of areas were investigated where the LiDAR survey showed vague linear marks, which appeared to form part of the rectilinear pattern of features discussed above. In all instances these features were much less clearly defined on the LiDAR images than those features which have been interpreted as archaeologically significant as a result of field validation. All of these (A28, A/B129, C205, C206) consisted of wide areas of slight levelling or steepening of the break in slope, and have been interpreted as part of the natural hillside rather than archaeologically significant features. These features are likely to be geological outcrops of harder stone which had not been modified by humans and incorporated into the rectilinear pattern of features discussed above.

4.5.5 Features which could not be identified (Figure 32)

Only one LiDAR feature could not be identified with any degree of certainty. This feature (E35) appeared on the hillshaded LiDAR image to be a link (with a very distinct dog-leg) between two of the linear terraces interpreted as archaeologically significant (E12 and E10). Despite that fact that this feature appeared to link two recognised features, it could not be discerned with any certainty on the ground, although recent felling/thinning activity in this area, which had left a residue of brash and logs may have either obscured the feature, or created anomalous LiDAR results here.

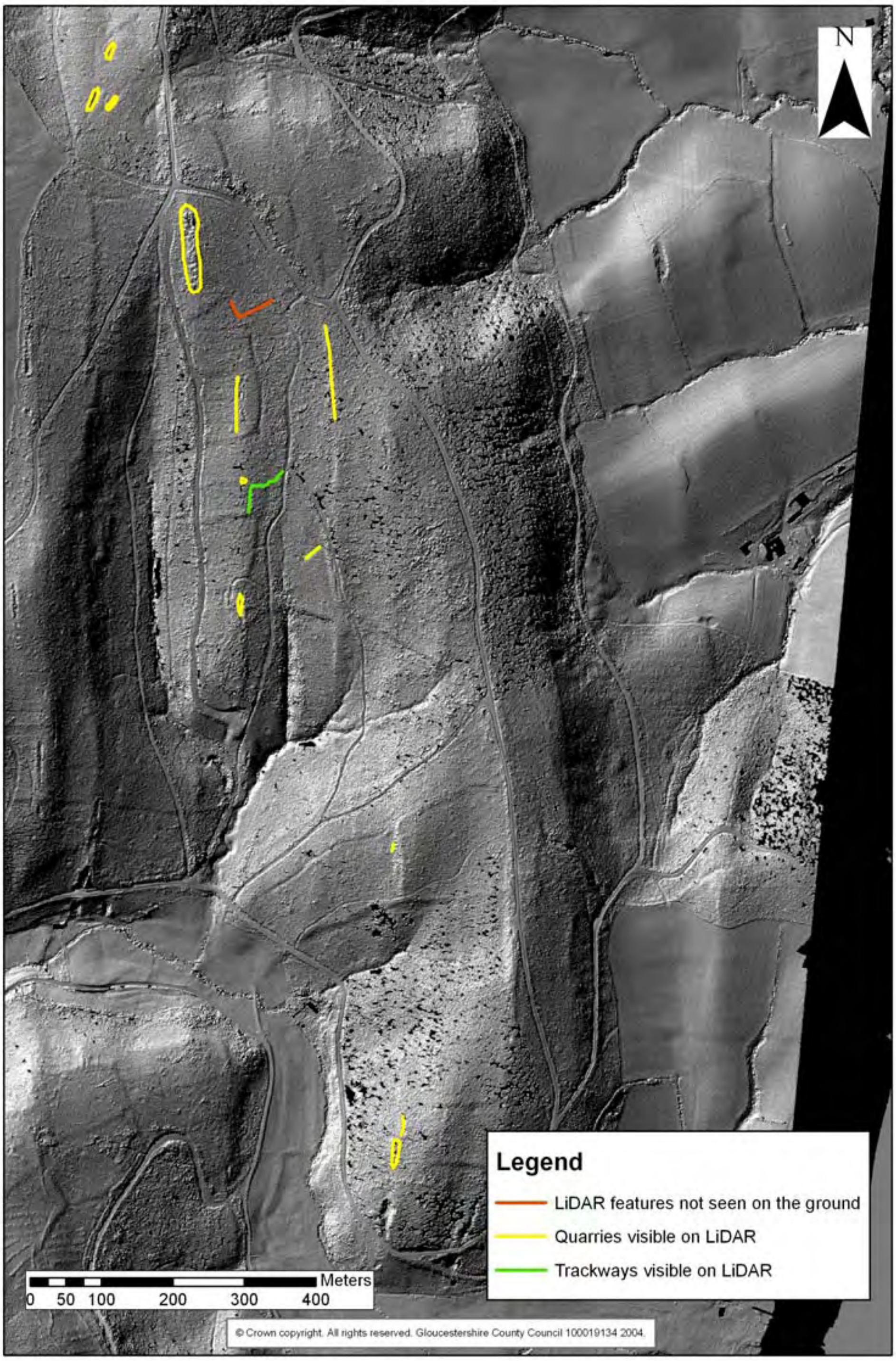

Figure 32: Flaxley Woods 2005: Other features visible on LiDAR. © Forest Research

4.5.6 Discussion of the results

Although, as with the similar surveys at Chestnuts, Welshbury and Great Berry Woods, a range of features was identified (e.g. quarries and charcoal platforms) which would be expected within areas of woodland, the Flaxley Woods survey had been undertaken with the specific intention of validating the linear and rectilinear features identified on the hillshaded images of the LiDAR survey.

Although the date and function of the linear terraces is not clear, they are similar to features identified in Welshbury, Chestnuts and Great Berry Woods (see 3.1.4.5 above, 3.2.4.4 above, 3.3.3.4 above), and can be interpreted as the physical remains of a system of landscape organisation which may be associated with woodland management, but could equally relate to woodland clearance or pre-date the woodland cover on the site. The limitations on any interpretation of these features has already been discussed, but similar features have been identified in all areas of the Forest of Dean that have been investigated in this way, and the correct identification and interpretation of them is an essential part of future understanding of the landscape history of the Forest of Dean and of the nature and origins of the woodland in the area.

5 Palaeoenvironmental sampling

5.1 Desk-based assessment

5.1.1 Introduction

Following the second seminar on suitable field survey strategies (see 1.1.2 above), it was decided that exploration of the potential for palaeoenvironmental sampling should commence with desk-based research to identify suitable areas.

5.1.2 Methodology

5.1.2.1 Desk-based data collection

Several data sources were used to identify suitable areas. These included:

- Drift geological data held on the County Council's GIS which enabled areas of alluvium to be identified.
- Ordnance survey contour data, which enabled flat-bottomed or wide valleys to be identified.
- The British Geological Survey website (Welcome to the British Geological Survey (BGS) website) which identified areas in which borehole data had been complied.
- The Gloucestershire SMR, 1st, 2nd and 3rd series OS maps, and other early maps (Appendix N) which enabled placename or other information to be identified, which suggested the site of boggy or waterlogged areas.
- Historic Landscape Characterisation data and information on areas at risk from flooding held on the Gloucestershire County Council GIS.

Identification of alluvium

A number of areas of alluvium were identified within the Forest of Dean survey area. (see Figure 33 below). These included five alluvial valleys, and eight other areas within the Statutory Forest.

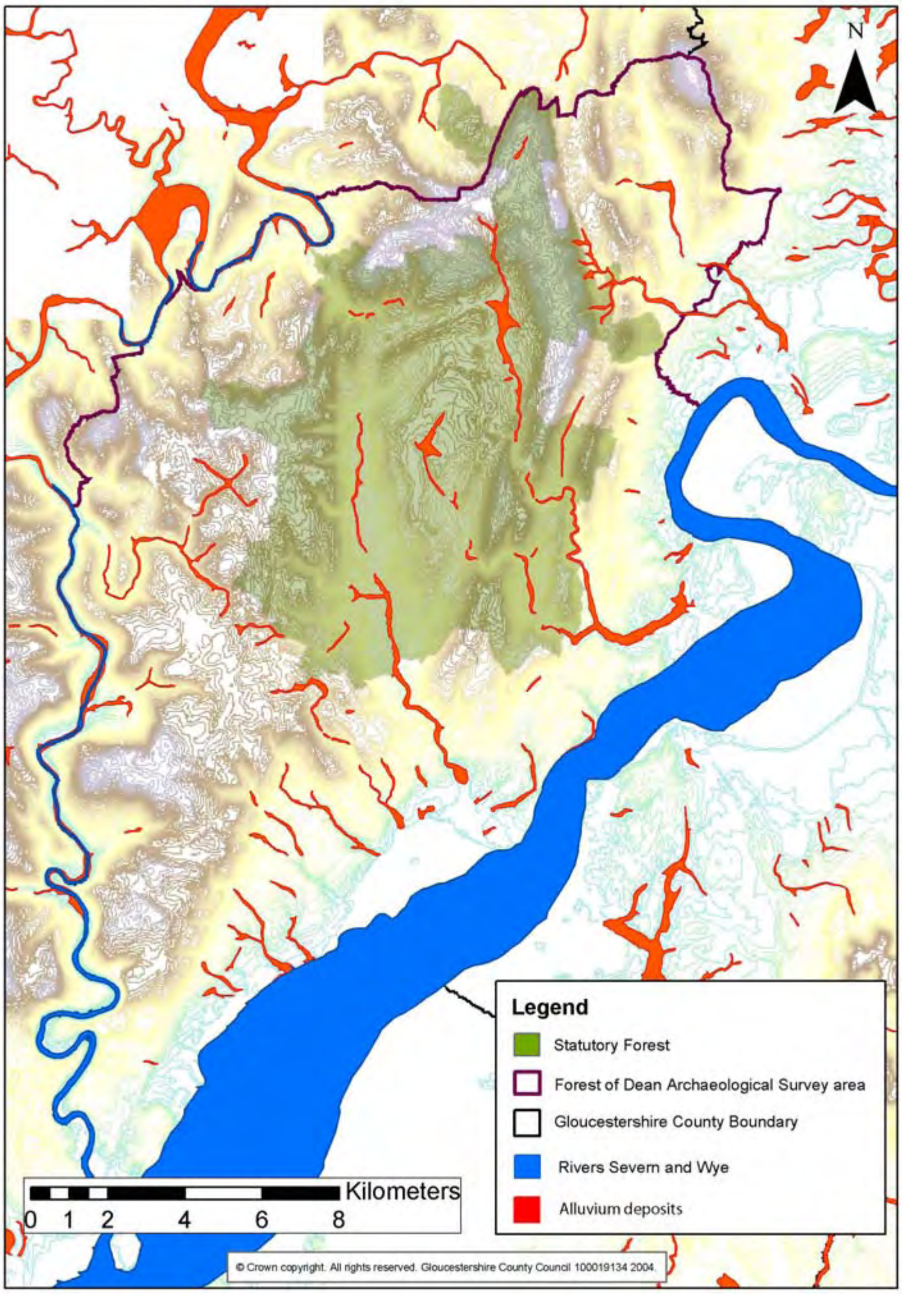

Figure 33: Alluvium in the Forest of Dean

Borehole logs

Existing borehole data held by the British Geological Survey was compared with identified areas of alluvium with the Statutory Forest. Twenty of these were sited on alluvial deposits (Figure 34).

Two of these borehole sites were selected for further assessment of the value and level of detail of data:

- Bore hole SO60 NE1 (Blackpool). This borehole was situated at Blackpool Bridge south of Soudley. The records dated to 1949 and the log contained no information relating to soils.
- Borehole SO61 SE32 (Littledean). This borehole was situated along the Littledean to Soudley sewer. Although the log held some soil information, it was insufficient to be used to determine possible locations for palaeoenvironmental sampling.

The information within the logs for both of these boreholes was disappointing and it was decided that borehole data was unlikely to provide the necessary information required to identify suitable sites for palaeoenvironmental sampling.

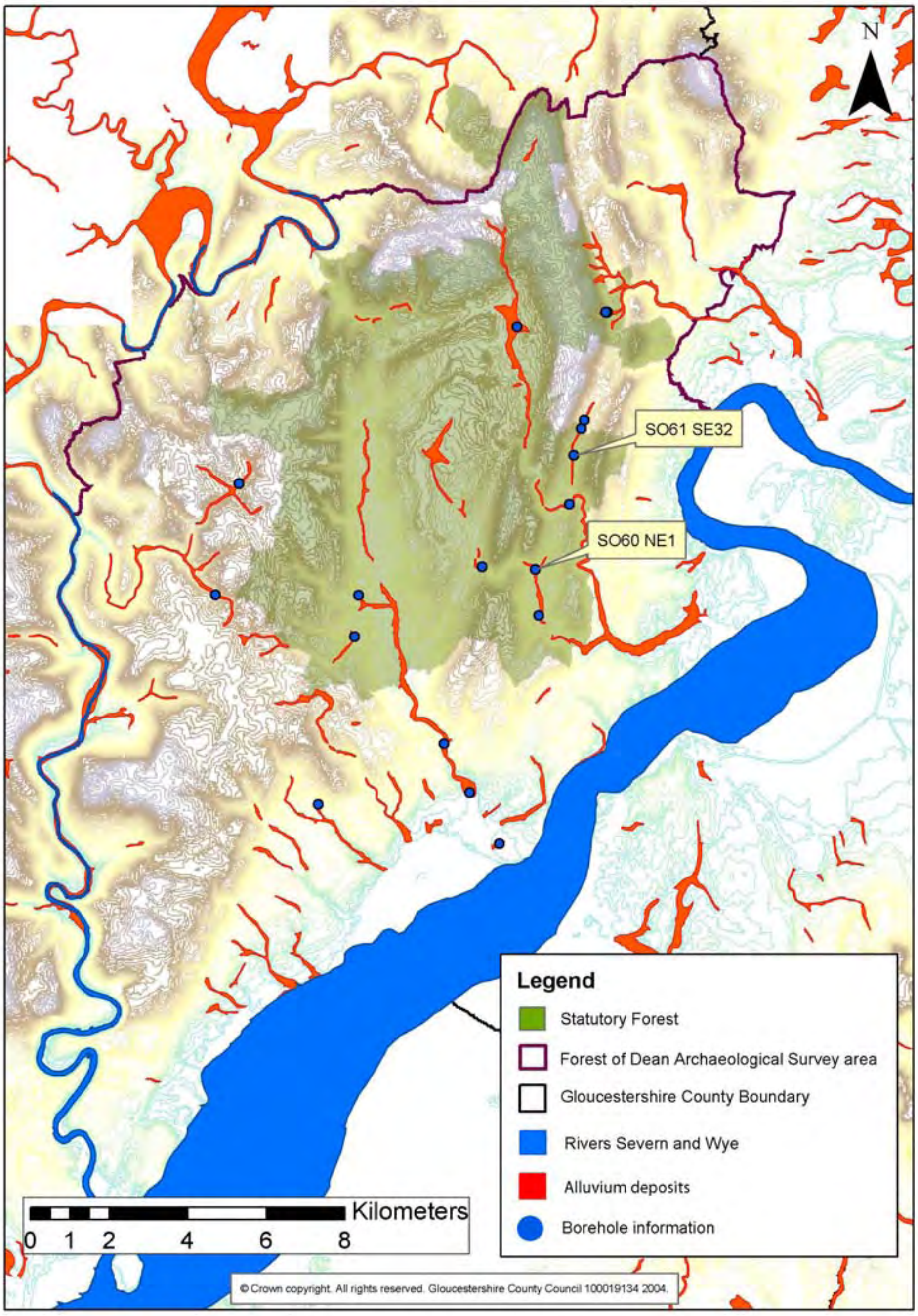

Figure 34: Boreholes on alluvium in the Forest of Dean

Wide flat-bottomed valleys

Wide, flat-bottomed valleys had been identified as areas in which alluvial deposits with palaeoenvironmental potential were likely to be found (Vanessa Straker, English Heritage pers. comm.). These were recognized using OS contour data held within the Gloucestershire County Council GIS. A number of these valleys were identified both within and outside the Statutory Forest, including extensive areas adjacent to the Rivers Severn and Wye (see Figure 35). Within the Statutory Forest, the most significant of these features is the valley of the River Lyd, a tributary of the River

Severn. This valley is orientated north/south and is up to 3.5km wide, and in places, almost 100m deep. It effectively splits the survey area into two parts, as its northern end conjoins with the narrower valley of a tributary (also known as the Lyd) of the River Wye.

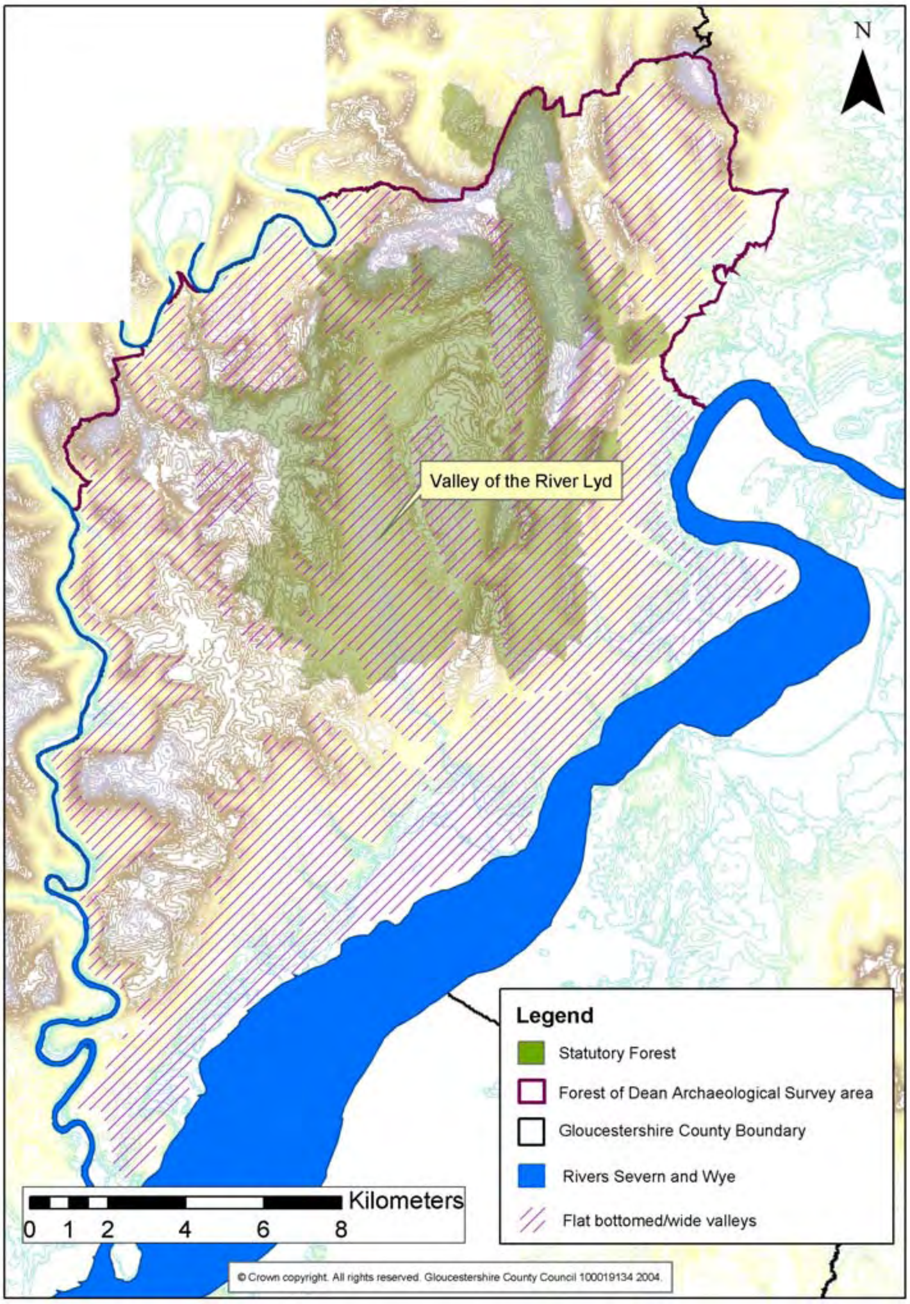

Figure 35: Flat-bottomed wide valleys in the Forest of Dean

Placenames

Selected map sources were also searched to identify placenames which could indicate waterlogged or boggy areas within the Statutory Forest (Appendix N).

Over 80 of these were identified within the Statutory Forest and could be broken down into the following four categories:

- Meer/Mire/Moor/Moss name suggestive of boggy waste ground
- Ham placenames suggestive of meadowland

- Meend placenames suggestive of areas of wasteland within a wooded environment.
- Green/Lawn placenames suggestive of areas of established open space within the woodland.

The distribution of these placenames (see Figure 36 below) indicates that Meer/Mire/Moor/Moss and Green/Lawn placenames were generally associated with alluvial deposits, and could be suggested as an indicator of palaeoenvironmental potential.

This did not seem to be the case with Meend placenames which tended to be on higher ground, often at the edges of steep slopes, and appear more likely to indicate areas which were unwooded waste due to topographical conditions.

None of the Ham placenames was associated with alluvial deposits, although four of these sites were at the very edge of the Statutory Forest and the names may refer to meadowland outside the woodland. Two, however, were found within the north-eastern part of the Statutory Forest and both of these (Crooked Ham SO62801391, and Renham How SO63411542) were associated with watercourses visible on the most recent OS maps (GCC 2004).

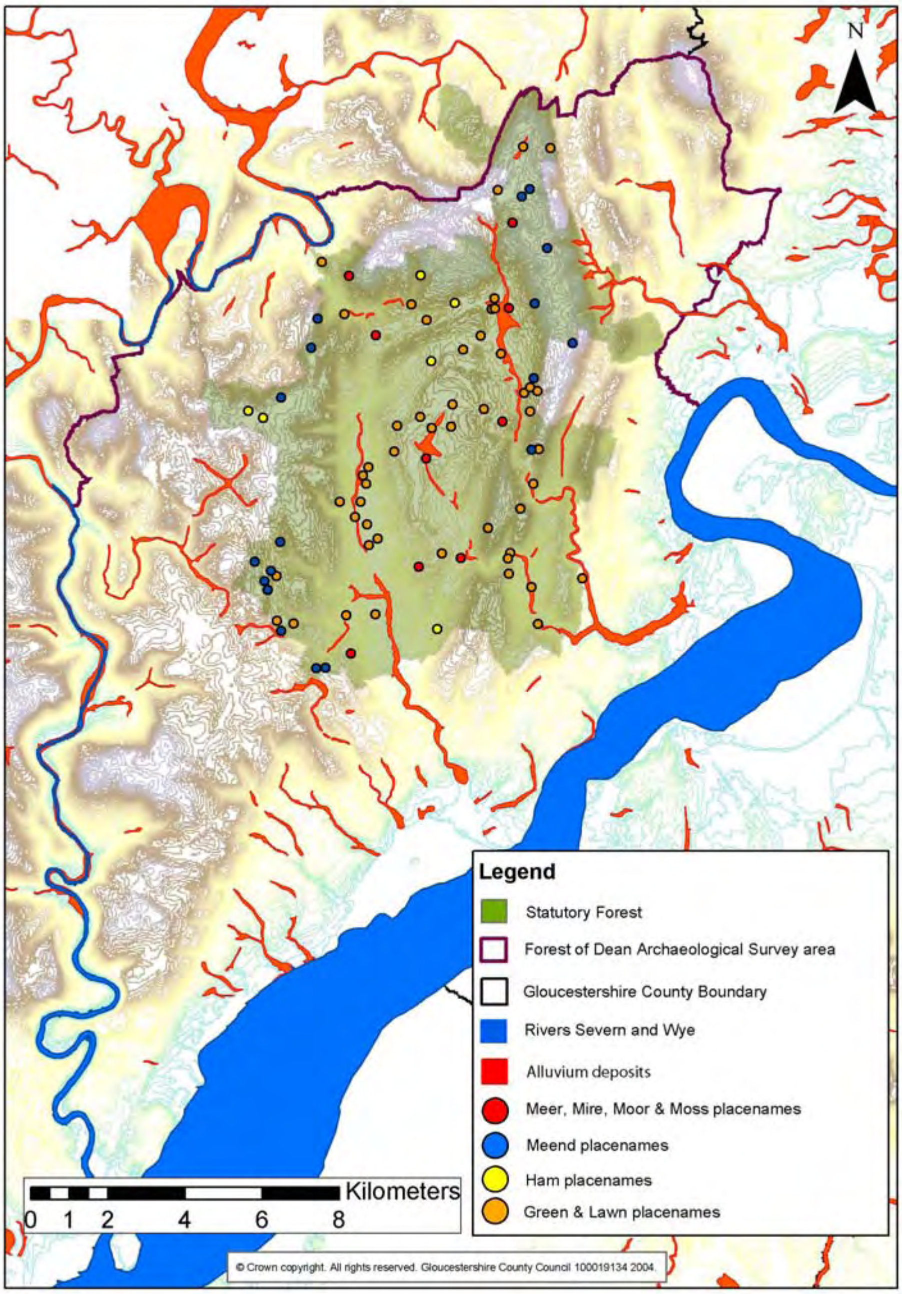

Figure 36: Placenames suggesting palaeoenvironmental potential in the Forest of Dean

Historic Landscape Characterisation data

Outside the Statutory Forest, the results of the Gloucestershire and Wye Valley Historic Landscape Characterisation (stored as a layer on the Gloucestershire County Council GIS) was used to identify areas which had been used as meadowland in the historical period (Hoyle 2006, Primary Type D) and areas which historical map information and other indicators suggested were well watered and would have been suitable as rich pasture land (Hoyle 2006; suffix m).

The sites of identified meadowland tended to correspond with alluvial valleys; particularly the Longhope Brook, which runs south of Blaisdon, the Westbury Brook that runs through the Flaxley Valley and the Soudley Brook which runs through the Soudley Valley and Blakeney (see Figure 37).

Although some of the areas identified as “rich grassland” by the Historic Landscape Characterisation did seem to relate to areas of alluvium, this was not universally the case. Many were on slopes, however, and it is likely that these represent well-watered areas fed by springs.

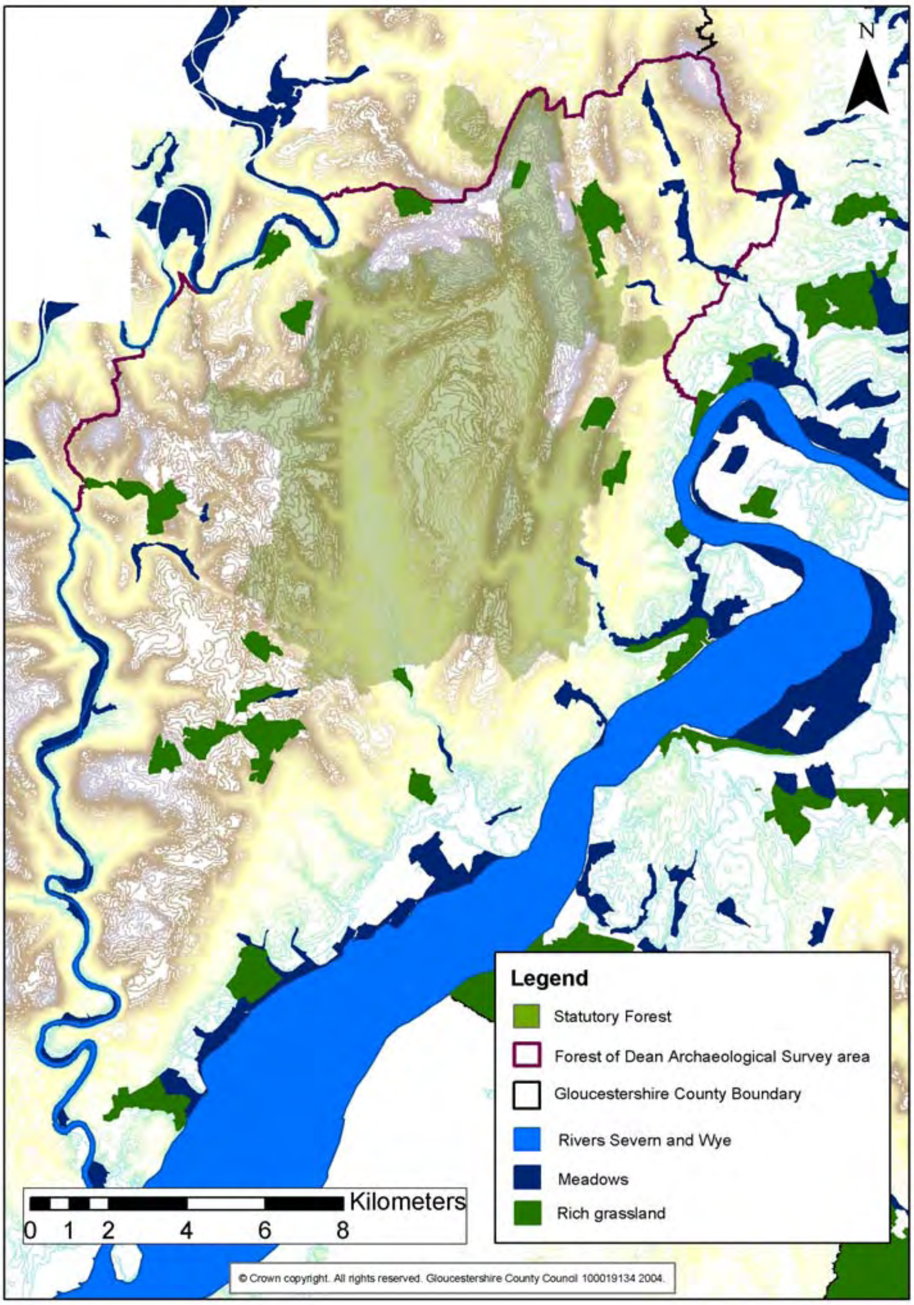

Figure 37: Gloucestershire Historic Landscape Characterisation data indicating areas of palaeoenvironmental potential in the Forest of Dean

Areas “at risk” from flooding

Information on areas “at risk” from flooding was also used to identify areas where waterlogged deposits could be expected (see Figure 38 below).

With the exception of large areas of low ground at the edge of the Rive Severn, all of these areas corresponded to valleys in which alluvial deposits had been identified.

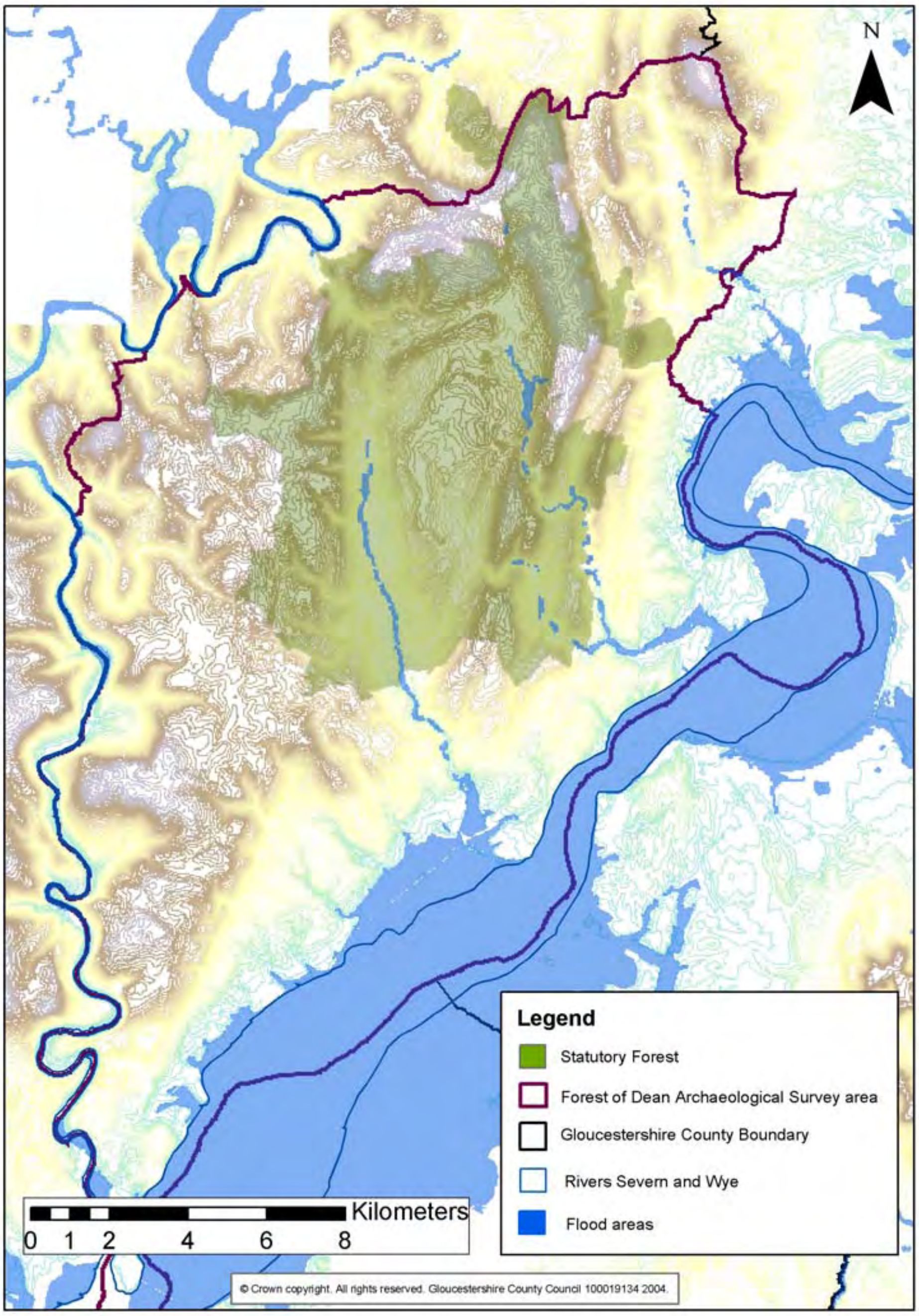

Figure 38: Areas "at risk" from flooding in the Forest of Dean

5.1.3 Conclusion

With the exception of the borehole log data (which proved disappointing) all of the data sets used provided complementary information likely to be of value in the identification of areas of palaeoenvironmental potential.

The principal identifier of areas where sampling has the potential to identify palaeoenvironmentally significant deposits is the distribution of alluvial deposits identified from drift geology maps, although this data was reinforced by the other data sets such as topography, placenames, or areas liable to flood.

From the areas of palaeoenvironmental potential identified, it was decided that trial sampling should be undertaken in the Flaxley Valley, Blaisdon (SO 68361554) immediately to the northeast of the statutory Forest (Figure 1: Location of pilot , Figure 1).

This area was chosen for the following reasons:

- As an area of alluvium within a wide, flat-bottomed valley, it had clear potential for good survival of palaeoenvironmental deposits.
- The valley lies at the foot of the eastern slopes of Welshbury Hill where archaeological evidence suggests that at least parts of the woodland were enclosed cultivated land in the later prehistoric period, and, consequently, plough wash deposits from this period could be anticipated.
- Other types of pilot field survey were being undertaken in the area, and, consequently there was the opportunity to integrate any results of the palaeoenvironmental work with those of other types of exploration.
- The valley was known to have contained a number of early post-medieval blast furnaces, and may also have been the site of earlier smelting activity. As this situation was not atypical of the Forest of Dean, the impact of this on the survival of palaeoenvironmental deposits was thought to be of interest.
- This valley runs between two areas of woodland which historical evidence suggests have been woodland since at least the later medieval period, and were utilized for the production of charcoal.

5.2 Pilot palaeoenvironmental field survey

In January 2005, Worcestershire Archaeology Service took nine borehole samples from two transects in the Flaxley Valley running at approximate right angles to the Westbury Brook (Appendix P, Figures 1 and 2). Three of these samples were further analysed by Worcestershire Archaeology Service and by Terra Nova Ltd. who undertook geoarchaeological sampling (which included testing for magnetic susceptibility) as part of the same process.

5.2.1 Objectives

The objectives of this pilot work were primarily to test the feasibility of palaeoenvironmental sampling in the Forest of Dean and particularly the potential of the areas identified in the desk-based work (see 5.1 above) to provide information of value in understanding the nature of past landscapes.

Samples were assessed on their potential to contain:

- Palaeoenvironmental evidence in the form of preserved organic material such as plant remains or pollen.
- Palaeoenvironmental evidence in the form of animal remains, such as snail or insects.
- Information on the history of soil formation, such as evidence of colluvium derived from cultivation of adjacent land or similar processes.
- Deposits with the potential to provide dating evidence, such as C14 dating.
- Evidence of former industrial activity (particularly iron smelting) in the area.

5.2.2 Summary of results

The following summarises the main results of the palaeoenvironmental sampling, and discusses the value of these techniques. Full reports are included as Appendix P.

5.2.2.1 Palaeoenvironmental sampling

The palaeoenvironmental sampling identified an intact organic deposit, the base of which was dated (through radiocarbon dating) to the late Saxon period (cal. AD 880 to 1030).

Three samples from this deposit were selected for pollen and macrofossil analysis with the following results:

- The pollen results indicated that in the Late Saxon period the environment was characterized by an open, cleared landscape of dry grassland. Subsequent to this the landscape became increasingly wet, as was indicated by increased wetland herbs and an expanding, regenerating alder and hazel woodland adjacent to the stream. It was suggested that the landscape changes which may have brought about this change related to the establishment of both the Royal Forest (sometime between 1066 and 1084) and the founding of Flaxley Abbey (c. 1131). It is also tempting to associate this open landscape with the linear and rectilinear terraces identified in both Welshbury and Flaxley Woods which have been interpreted as enclosures which could pre-date the woodland in these areas (see 3.2.4.4 above, 4.5.3.4 above), and would, therefore, be consistent with the more open conditions suggested by the pollen analysis.
- Few plant macrofossil remains were recovered (perhaps due to the small size of the samples) and, unlike the pollen analysis, provided little indication of landscape change over time.

5.2.2.2 Geoarchaeological sampling

The deposits observed within the cores represented up to 4m of alluvial river terrace deposits of sands and gravels overlain by silty and sandy clays. Thin colluvial deposits (of unclear origin) were noted close to the edge of the floodplain, and a palaeochannel, probably a former course of the Westbury Brook, ran along the western part of the site.

Magnetic susceptibility readings were low and uniform throughout the sample column which did not suggest that significant amounts of metal smelting or working debris were present.

6 Geophysical survey

6.1 Introduction

Archaeological geophysical survey in woodland has traditionally been avoided due to the requirement to collect regularly spaced readings at a high density on a survey grid (Payne 2004). The geophysical guidelines produced by the Institute of Field Archaeologists state that “trees bushes and shrubs are tolerable as long as the operator can walk in straight lines between them – dense vegetation will reduce survey work to a detail no greater than scanning” (Gaffney et al. 2002), and the prospect of undertaking survey within woodland is not specifically mentioned in current English Heritage guidelines on geophysical survey techniques (Payne 2004).

Papers given at the specialist seminar to discuss archaeological techniques in woodland and subsequent discussion (Appendix A, A.ii) indicated that:

- Magnetometer survey is likely to be the best general purpose prospecting technique for use in woodland (Payne 2004).
- Gradiometer survey had proved effective for the identification of iron working sites within woodland as the residues of this process are highly magnetic. Gradiometer survey had been successfully used as part of the Exmoor Iron Project (Ross Dean, Substrata Ltd. pers. comm.).
- The cost of geophysical survey in a woodland environment is approximately four times greater than that in an open environment, principally on account of the additional time needed to physically undertake survey in these conditions (Ross Dean Substrata Ltd. pers. comm.). Consequently geophysics should only be used to clarify details of sites, which had already been identified, and should not be used as a tool to scan large areas of woodland to identify “new” sites.
- Geophysical survey had not proved productive in areas with a Limestone solid geology in the Forest of Dean (Payne 2004).

As a result of this it was decided that any pilot geophysical survey should concentrate on assessing the value of geophysical techniques to identify features not associated with iron working within woodland, and two sites were selected which were within woodland, and where archaeologically significant features, not necessarily relating to iron production, could reasonably be expected.

6.2 Site 1, Glos SMR 4353: Fairplay enclosure, Cinderford

6.2.1 Description of site and reasons for selection

Glos SMR 4353 (SO 65691619, Appendix Q, R.i Figure 3) consists of an undated rectilinear enclosure *c.* 0.4ha in area. It is defined by low banks and with evidence of a ditch on its southern and part of its western side.

The enclosure overlies a solid geology of Pennant Sandstone, and in January 2005 was within an area of reasonably mature mixed woodland with trees fairly widely spaced and little undergrowth. The feature was selected for geophysical survey because:

- Nothing was known about the date or function of the enclosure. The Gloucestershire SMR records a trial excavation in 1958, but does not indicate any significant results, perhaps suggesting there were none.
- As an earthwork enclosure there was a reasonable possibility that it would contain features of archaeological significance.
- As a site about which nothing was known, any indication of its date or function would be archaeologically significant.
- This area is within the normal cycle of forestry operations, and the woodland on the site is the result of deliberate planting in 1949. Although the site is unlikely to have been cultivated as part of this process, machinery may have been used to

clear the site of detritus prior to planting (Peter Kelsall, Forestry Commission, pers. comm.), and forestry machinery is reported to have crossed the enclosure during more recent operations (Glos SMR 4353). This allowed for comparison with the conditions within Welshbury Hillfort (see below), which has not been subjected to recent large-scale forestry operations.

The Forestry Commission owned the site in 2005.

6.2.2 Work undertaken

Gradiometer survey was undertaken in with readings at 1m intervals in accordance with Level 1 of the specifications for geophysical survey submitted by Ross Dean of Substrata Ltd in advance of the survey (Appendix P).

6.2.3 Results

Magnetic response was low, and an area of linear anomalies, interpreted as “cultivation” Appendix Q, R.i, 4) probably associated with recent tree planting, had disrupted much of the upper soil levels across the whole of the site, impeding analysis of the magnetic anomalies that were recorded. In addition to this, a disused iron water pipe ran diagonally across the southwestern part of the site, rendering the collected data unusable for 5 metres either side of its line, a significant loss in such a small area.

Given this, it was decided not to undertake Level 2 survey in this area (Appendix P) and concentrate on extending the survey to look for evidence of a ditch on the western, northern and eastern sides of the enclosure. This was undertaken using a 1x1m sampling interval consistent with Level 1 survey.

Inconclusive evidence was found for either a ditch, or additional bank on the northern and eastern sides of the enclosure and also a possible bank to the south of the visible ditch on the enclosure’s southern side (Appendix Q, R.i, Figure 1, section 2).

There was also evidence for one, and possibly three sub-circular structures with magnetic anomalies some 10 metres in diameter within the enclosure on the northern and eastern sides. These anomalies, however, are similar to those associated with known charcoal production areas at Welshbury Hillfort (Appendix Q). A group of geophysical anomalies in the southwestern corner of the enclosure may be archaeologically significant, but could equally indicate the site of a tree bole (Appendix Q, R.i, Figure 1, section 2).

Discussion of the results

Although the survey of the Fairplay enclosure did produce some useful results, data analysis was made more difficult, not only by the massive anomaly created by the iron pipe running across the site, but also by the effects of recent mechanized forestry operations, and it was not felt that further geophysical survey in these conditions would be worthwhile (Ross Dean, Substrata Ltd, pers. comm.).

6.3 Site 2, Glos SMR 5161: Welshbury hillfort, Blaisdon

6.3.1 Description of site and reasons for selection

Welshbury hillfort (SO67881554, Appendix Q, R.ii Figure 3) is one of the four Iron Age hillforts within the survey area.

The interior (defined as the area enclosed by the inner rampart) covers an area of *c.* 1.31ha, and has an underlying geology of Lower Old Red Sandstone. In January 2005 the site was under fairly widely spaced mature broadleaved woodland (mainly small-leaved lime but also some oak and beech). The site was chosen for the following reasons:

- As a known hillfort site, there was a strong possibility that it would contain features of archaeological significance, which did not necessarily relate to iron working.
- Although the site was extremely open in 2005, as the woodland consisted of mature standards, the current management regime of the site (Hoyle 1996), may lead to the mature woodland being converted to coppice some time in the next ten years, rendering geophysical survey impossible.
- With the exception of a topographical survey undertaken by the Royal Commission (McOmish & Smith 1995), no investigative work had ever been undertaken within the hillfort, and any information on the status or function of the hillfort would be of value, particularly to aid interpretation of associated features, which had been identified through both field survey and LiDAR survey.
- This woodland is established “ancient woodland” and the area had not been subject to recorded large scale replanting or other forestry operations. This allowed for comparison with the conditions of the Fairplay enclosure (see above).

The Forestry Commission owned the site in 2005.

6.3.2 Work undertaken

Gradiometer survey was undertaken in accordance with levels 1 and 2 of the specifications for geophysical survey submitted by Ross Dean of Substrata Ltd in advance of the survey (Appendix P). This consisted of two surveys, a Level 1 survey across the whole of the interior of the hillfort using 1x1m sampling density and a Level 2 survey across selected areas using a 0.5x0.5m sampling density.

6.3.3 Results

6.3.3.1 Level 1 survey

The Level 1 survey gained a general understanding of potential archaeological features across the site. A number of structures identified on known earthworks recorded as part of the Royal Commission survey of the site (McOmish & Smith 1996) were recorded along with some potential archaeological features not associated with known earthworks, including a possible platform feature and associated structure.

Patterns of magnetically detectable material were also noted around five known charcoal platforms. Three of these (Appendix Q, R.ii, L1-13, L1-14 and L2-10) may have been earlier structures which were re-used for charcoal production.

A series of anomalies suggesting pits or hollows (Appendix Q, R.ii L1-3) were identified on the inner side of the western bank, supporting the interpretation that this area had been quarried for material to construct the ramparts (McOmish & Smith 1996), and some anomalies in the western part of the hillfort interior (Appendix Q, R.ii, L1-7) may be evidence for early ploughing of the site.

The Level 1 survey also defined areas in which more detailed survey (level two) was likely to produce further results.

6.3.3.2 Level 2 survey

Level 2 survey was undertaken in two areas in the northern and northeastern parts of the hillfort interior (Appendix Q, R.ii, Figure 2) as these areas had been shown by the Level 1 survey to have a number of magnetic anomalies of potential archaeological significance, and which appeared to associated with earthworks recorded as part of the Royal Commission survey of the sites (McOmish & Smith 1996).

Possible structures around a large charcoal platform (Appendix Q, R.ii, L2-10) and platform features in the northeastern part of the interior (McOmish & Smith 1996) were defined in greater detail and some have provisionally been identified as sub-rectangular in shape (Appendix Q, R.ii, L2-3, L2-4, L2-6). Possible evidence for *in situ* burning, perhaps indicative of some industrial process, was also identified in this area (Appendix Q, R.ii, L2-2) although further archaeological investigation would be required to confirm this.

There was also some evidence to suggest that earthworks in the northeastern corner of the hillfort had originally extended further down-slope, beyond their current visible extent (Appendix Q, R.ii, L2-1), and additional evidence, suggesting early ploughing of the site was found in the northwestern part of the interior (Appendix Q, R.ii, L2-12).

Evidence for a stone mound, originally recorded in the Royal Commission survey (McOmish & Smith 1996; Appendix Q, R.ii, L2-16) and other archaeological structures (Appendix Q, R.ii, L2-14, L2-15) was found in the southeastern part of the hillfort interior.

6.3.3.3 Discussion of the results

Both levels of survey within Welshbury Hillfort produced a number of interesting and potentially valuable results, supporting both the evidence from earlier field survey, and identifying anomalies warranting further investigation.

Some of these anomalies, such as the possible rectilinear structures in the northeastern part of the site may relate to either buildings or structures associated with industrial activity. The suggestion that identified charcoal platforms may have re-used the sites of earlier structures, is of interest as the re-use of prehistoric hut platforms has been suggested for some charcoal platforms identified in Scotland (Judith Cannel, Exmoor Iron Project pers. comm.). The evidence of possible cultivation is also of particular significance, given the suggestion that the late prehistoric field system to the south may have pre-dated the construction of the hillfort (McOmish & Smith 1996).

At this stage, however, any further investigation would need to take the form of exploratory excavation as no additional information on these anomalies could be gained from further geophysical survey (Ross Dean, Substrata Ltd, pers. comm.).

7 Discussion of field survey methodologies

7.1 Introduction

The following section of the report discusses the value of the methodologies employed as part of Stage 2 of the Forest of Dean Archaeological Survey, and the potential of these to form part of future field surveys within the woodland in this area.

7.2 Sample excavation

Although the sample excavation only investigated a single feature type (a charcoal platform, see 1 above), the results of this operation do have implications for the potential survival of other buried archaeological deposits within areas of woodland in the Forest of Dean.

7.2.1 Archaeological potential of charcoal platforms

7.2.1.1 Palaeoenvironmental evidence

Although the excavation of the platform at Welshbury was limited (see 2.4 above) the thick layer of charcoal-enriched soil within the platform contained adequate quantities of charcoal for species identification and radiocarbon dating, and it is clear that examination of a larger quantity of charcoal would provide further information which could provide:

- Evidence of cycles of rotation of woodland management relating to charcoal production.
- Evidence of the selection of species for charcoal production.
- A better understanding of the nature of the earlier woodland in the area.

This would not only enhance knowledge of charcoal production and woodland management in the Welshbury area but in the Forest of Dean generally, and would also inform understanding of industrial processes such as iron ore smelting, which used charcoal as the principal fuel.

The relatively poor quantities of additional charcoal recovered through dry sieving of bagged samples would suggest that manual retrieval of suitable fragments during excavation is the most efficient means of collection of this material. This, however, may be dependant on variables relating to the conditions of individual excavations, and strategies for bulk sampling would need to be determined in advance of future field survey and tailored to suit specific conditions. In particular, it should be noted that lime charcoal breaks up readily over time, and the 10mm mesh size used to process the bulk samples may have been too large to ensure that all usable samples were recovered. In future, bulk samples should be processed using a mesh size of between 2mm and 4mm.

7.2.1.2 Radiocarbon dating

A considerable amount of time would have been invested in the creation of charcoal platforms, particularly where they survive as levelled areas on relatively steep slopes. It is likely that they were re-used on numerous occasions, perhaps over considerable periods of time, interspersed with extensive periods during which charcoal production was not the principal use of the woodland in which they were sited.

Despite suggestions that charcoal would have progressively accumulated in a measurable and predictable way in the base of these features (Johns 1991), the evidence of spreads of charcoal-rich soil fanning down slope from this platform (Context 5) and other platforms within Dean, would suggest that platforms were cleared of charcoal residues, perhaps as a preliminary to the construction of a new stack. Given this, the essentially undifferentiated nature of the deposits at the base of the platform (Context 3) and the material which had been cleared downslope (Context 4 and 5), could not be regarded as a secure contexts except for indicating the latest date at which the platform was used.

A radiocarbon date was secured from the Welshbury charcoal platform (see 2.6.1 above), and there is clearly the potential to gain dating evidence from these features. However, caution needs to be applied before samples are selected, or general conclusions are drawn from the dates obtained.

7.2.2 Effects of tree roots

Prior to the 2003 sample excavation, the charcoal platform at Welshbury had been under conifer plantation. The roots of two mature conifers were within the excavated area and two others were immediately adjacent to it. Although the main root boles of these only penetrated up to *c.* 0.20-0.30m below the ground surface, and charcoal deposits survived intact below these, effected only by occasional individual roots (see 2.7 above).

The presence of tree roots did, however, have a significant effect on the ease with which these deposits could be accessed, and excavation was generally difficult requiring careful removal of root systems, adding to both the time required and the physical difficulty of the excavation process.

During the Welshbury excavation, the main stumps and root bowls were left *in situ*, although it would have been desirable to remove these if fuller excavation were proposed. The removal of full stumps and boles, however, would have been considerably more labour intensive and difficult, and would be a major expense in any future excavations within woodland. In most circumstances it would be necessary to remove these manually as their forcible uprooting by mechanical means would cause significant, and unacceptable damage to buried archaeological deposits over a much wider and deeper area than that already destroyed or rendered inaccessible by the root systems. Even manual removal would be difficult to combine with careful excavation and recording in line with normal archaeological procedure.

7.2.3 Survival of archaeological deposits within woodland

Although the impact that tree throw and woodland management operations can have on archaeological sites is widely reported (Lee 1995) the effects of tree roots on buried archaeological deposits and features has not been well documented (Hoyle 1996). The Welshbury charcoal platform excavation provided an opportunity to make an assessment of this on a feature where it was anticipated that archaeological deposits would be relatively shallow and unprotected by thick deposits of overburden

The conifers which had been on the site prior to the 2003 excavation had been planted in1969, and before these were felled there had been no restrictions on forestry operations in this area. The good survival of thick charcoal deposits within the platform and the lack of apparent damage by earlier root systems would suggest that there is good potential for the survival of all but the most superficial archaeological deposits.

The following, however, needs to be borne in mind before this conclusion is widely extended across the woodland within Dean:

- The Welshbury platform represented only part of one feature within a particular woodland environment (recent conifer plantation) and need not be typical across the woodland as a whole.
- The area is unlikely to have been cultivated prior to planting the conifers in 1969 (Pete Kelsall, Forestry Commission, pers. comm.) and the clearfelling of the site, which pre-dated the excavation, had been undertaken under close archaeological

supervision to ensure that features such as the charcoal platform were not damaged.
- The lack of root damage may not be typical of the long term effects of woodland cover as trees may have been discouraged from the platform to keep it clear for charcoal production during earlier periods, and the recent conifer may have been the only phase of woodland to have directly affected the platform.

7.2.4 Value of sample excavation and recommendations for future applications

The excavation of the charcoal platform at Welshbury indicated that archaeological deposits can survive in areas currently under woodland, although the presence of trees and roots can have a major impact on attempts to excavate these in line with normal archaeological procedure and additional time (and therefore cost) would need to be factored into any future excavation projects in these conditions.

Thus, although it is clear that sample excavation is a technique, which has applications in any future field surveys within the Forest of Dean, this must be:
- Used judiciously.
- Undertaken only where it has the potential to answer specific questions,
- Undertaken only to further characterize archaeological sites, which have already been identified through other types of investigation.
- Undertaken only where there is a strong likelihood that potentially significant deposits may be present.

Sample excavation is likely to be most effective when used as part of integrated approaches to the to further investigation of sites already identified by large-scale investigation such as rapid field reconnaissance or LiDAR survey, and in conjunction with complementary techniques such as detailed topographical survey or geophysical survey.

7.3 Rapid field reconnaissance

7.3.1 Overall discussion of the value of rapid field reconnaissance

Methodological approaches to rapid field survey within woodland are set out in Appendix D, and specification for future surveys are set out in 7.7 below. The following reviews the general value of the technique of systematically walking through areas of woodland and recording visible features.

7.3.1.1 Positive results of rapid field reconnaissance in woodland

The results of the of the pilot rapid field surveys of Chestnuts Wood, Welshbury Wood and Great Berry Wood indicate that there are clear benefits from this type of survey within a woodland environment.

With the exception of some records of post-medieval industrial activity (generally found on the 1st –3rd series 1:2500 scale OS maps) there is usually no indication of the extent to which archaeological features survive within these areas of woodland. Although LiDAR survey (see 7.6 below) has the potential to rapidly identify earthwork features over large areas of woodland, it is currently unable to characterise these features with any degree of accuracy, and not all feature types are captured on the LiDAR images. Where LiDAR is not available, rapid field survey represents the only systematic approach to identifying landscape features within large areas of woodland.

Many of the features identified in these surveys such as charcoal platforms or small quarries, are the types of features which could be anticipated within woodland in the Forest of Dean, and generally relate to activities which took place within a woodland environment. This does not mean that they have no archaeological value, and a better understanding of their status, date and distribution is vital to any understanding of past exploitation of timber and mineral resources in the Forest of Dean.

Although artefacts can generally only be identified within woodland where the ground surface has been disturbed in some way, finds of bloomery slag were recovered during rapid field survey at Chestnuts Wood, Welshbury Wood and Great Berry Wood (see 3.1.4.2 above, 3.2.4.5 above). These finds can be interpreted as evidence of early smelting on these sites, and although the precise location of this activity could not be determined, these represent an invaluable first step in the identification of early smelting sites, broadening current understanding of the early iron industry in the Forest of Dean. Large-scale remote survey techniques such as LiDAR (see 7.6 below) could not identify such artefacts, and intensive methods, such as excavation (see 7.2 above) or geophysical survey (see 7.9 below) are tools for further investigation of these sites once they have been identified.

All surveys also identified linear banks and terraces, which do not appear to relate to woodland related activity (see 3.1.4.5 above, 3.2.4.4 above, 3.3.3.4 above, 4.5.3.4 above). These were initially identified in areas of woodland (Chestnuts Wood and Welshbury Wood), which are at the edges of the Statutory Forest and may also have been under monastic jurisdiction during the medieval period (Hoyle 2003a, 2003b). They were also identified in Great Berry Wood, however, which is in a more central part of the Forest and has no known monastic connections.

Whilst it is possible that apparently similar features in different areas of woodland may not represent evidence of contemporary features of comparable function, a correct interpretation of the distribution of these has the potential to radically change current knowledge of the ways in which the landscape within the Forest of Dean was organised in the past and particularly perceptions about the nature and origins of the woodland in the area.

7.3.1.2 Limitations of rapid field reconnaissance in woodland

Despite its clear value, this technique does have a number of intrinsic limitations:

- Subjectivity: The success of all surveys of this type is dependant on what is essentially a subjective process, in that that the identification of potentially significant archaeological features is dependant on the experience and judgement of the field surveyor. This cannot only result in potentially significant features being unrecognised, but could also have the opposite effect of "over interpretation" of natural landforms.
- Feature identification: Woodland survey and the range of features, which can be expected in these environments, is not a normal part of the training or experience of many archaeologists and some training in basic feature recognition and interpretation is necessary before surveys begin.
- Variability of ground conditions: The variable nature of ground conditions and levels of access and visibility within a woodland environment can have a significant impact on the range of features which can be identified in different areas of woodland.
- Mapping the location of recorded features. It is accepted that features are not only mapped in a schematic way, in accordance with the standard of English Heritage levels 1 and 2 (Bowden 1999), but they are located to a relatively low degree of accuracy making use of small hand-held GPS devices, generally accurate to within 5-10m. In situations where these do not function (not an uncommon situation within woodland), the surveyor is generally left with few other possibilities for estimating their location, as visibility is often poor and mapped features, which could be used as reference points, can be non-existent in some areas. At these times the surveyor can effectively be reduced to guesswork, reducing the levels of confidence, which could be assigned to any interpretation of the distribution of recorded features.
- The ability to physically navigate around areas of woodland in a systematic fashion can be difficult due to factors such as poor visibility, dense ground cover or the lack of mapped reference points.
- Rapid field reconnaissance, even in the best conditions, is only able to identify visible archaeological features. Although identification of ecological signifiers of buried archaeological deposits remains a possibility, little investigation of this has been undertaken in woodland (7.4.2 below) and it cannot be thought of as a reliable technique. Similarly finds are rarely visible in woodland conditions except in exceptional circumstances, and identified features can rarely be dated with any degree of certainty.

Many of these issues are common to most forms of field survey, however, and can be addressed by appropriate training, clear specifications and a rigorous understanding of the limitations of interpretation, which can be applied to the survey results.

7.3.1.3 Value of rapid field reconnaissance in woodland

The pilot work has demonstrated that rapid field survey in the Forest of Dean is an effective technique to recognise and map potentially significant archaeological features which have not previously been documented, and this technique must be seen as a valuable component of any future exploratory survey within the woodland of the Forest of Dean.

It is the principal means of systematically characterising and recording archaeological features in a woodland environment, and should be used as the first stage of any field survey programme, identifying areas where further, more intensive archaeological exploration would be appropriate. Despite the limitations imposed by ground conditions, it is also the most efficient and cost-effective means of recovering potentially significant artefacts such as bloomery slag within a woodland environment.

LiDAR survey (see 7.6 below) does not replace the need for rapid field survey in all areas, although the results of LiDAR survey enables rapid field survey to be targeted towards areas of woodland, that appear to contain potentially significant earthwork features. Rapid field survey in these areas can add to the LiDAR data by characterising the features visible on the hillshaded LiDAR images and also identifying features which do not currently appear on these (see 7.6.2 below).

7.4 Discussion of the value of ecological recording

This recording took two forms (7.4 above, Appendix D):

7.4.1 Relict ecological features

The purpose of recording relict ecological features, such as coppice stools, old hedge lines or pollarded trees, was to identify features which could inform the history of woodland management in the Forest of Dean.

This was only undertaken as part of the 2005 rapid field reconnaissance and was tested in zones A, B and C of the Flaxley Woods survey (the areas where full rapid field reconnaissance was undertaken) and the Great Berry Wood survey.

Discussion

Few relict woodland management features were recorded during the rapid field reconnaissance in Flaxley Woods and the status of many of those recorded was not clear, whilst none was recorded during the survey of Great Berry Wood (3.3.3.8 above, 4.5.3.8 above).

Despite this, the recording of this type of feature may have clear benefits in terms of understanding past woodland management regimes and should continue to be undertaken in all future surveys of this nature.

It is clear, however, that unambiguous specifications should be prepared to stipulate the range of features which should be recorded in this way. These specifications should be prepared following consultation with a qualified ecologist.

7.4.2 Ecology of identified archaeological features

This process consisted of making a basic record of the ecology associated with identified archaeological features, and whether this was visibly different from the surrounding areas of woodland. The purpose of this was to explore the potential of correlating certain plant species or their relative distributions with identified archaeological features of particular types and using these ecological signatures to identify areas where similar features were no longer visible as earth works. Although the original intention was to record the ecology of all identified archaeological features, this was modified during the Flaxley Woods survey to only recording the ecology of features where this visibly differed from the surrounding woodland.

Discussion

Ecological differences were noted on fewer than 10% of archaeological features and in neither survey was there an identifiable pattern of ecological changes between similar types of features (7.4 above).

The following are possible reasons for this:

- There is not necessarily a recognisable ecological difference between different types of archaeological feature.
- The survey was not undertaken by specialist ecologists and subtle ecological differences may have been missed.
- The survey was undertaken in the winter months. Although this is the optimum season for archaeological survey in woodland, this is not the case with ecological survey that is normally carried out in the summer months when flora are at their most recognisable.

This exercise cannot be said to have demonstrated that some types of archaeological feature are not recognisable from ecological differences. It does, however, suggest that ecological survey is unlikely to assist with the identification of all types of archaeological feature. Any attempt to use it in this way will be both counterproductive and at odds with its real value which is to detect evidence for ancient landscape on a larger scale.

Given the above, the ecological component of the survey demonstrated that:

- Ecological survey should be used to detect evidence of earlier landscapes and not simply as a tool to identify archaeological features.
- Ecological survey should not be undertaken as part of the same process as rapid field reconnaissance in woodland, and should be undertaken at a more suitable time of year, perhaps in areas where archaeological survey has already been undertaken.
- Professional ecological advice is required for all future surveys of this nature

7.5 Discussion of the value of placename evidence as an indicator of the location of archaeological features

Stage 1 (documentary research) of the Forest of Dean Archaeological Survey identified a number of placenames within the central Forest, generally containing the elements Berry, Bury or Tump, which suggested the possible site of features of potential archaeological interest.

The value of field and placenames as an indicator of probable archaeological sites is well established (Gelling 1997, chapter 6). Unlike many field and placenames, which generally relate to a clearly defined area (e.g. the extent of the field, or a recognisable feature) placenames within extensive areas of woodland often refer to large areas with no clearly identifiable boundaries.

Accordingly, it was decided to test the value of these names as indicators of archaeological sites within woodland and one of the objectives of the 2005 rapid field survey in Great Berry Wood was to investigate the two placenames on the site (Aconbury, Glos SMR 25382 and Great Berry, Glos SMR 25426), both of which contain elements which could be derivative of “Bury”, or ”barrow” and suggested that earthwork features may have been present (see 3.3.1 above).

Although no earthworks consistent with defended early settlements or funerary monuments were identified in the course of the 2005 rapid field survey, it is possible that the “bury” designation of these names could be indicative of an explanatory name given to an area in which earthworks (the linear and rectilinear banks and terraces identified in the 2005 rapid field survey) were present, and these names may, therefore, have successfully indicated the site of potentially significant archaeological features on the site.

Thus, although the results of rapid field survey in Great Berry Wood were inconclusive in terms of clearly demonstrating the value of those placenames as indicators of potentially significant archaeological features, placenames should continue to be used as a means of targeting areas of archaeological potential within woodland, and may be of particular value as evidence supporting other methods of identifying areas of archaeological potential, such as LiDAR survey (see 7.6 below)

7.6 Discussion of the value of LiDAR for the identification of archaeological features in woodland

The value of the hillshaded LiDAR images is discussed with reference to information which these images display, and their value to inform an understanding of the survival of archaeological features within woodland.

7.6.1 Identification of linear features

LiDAR images are particularly effective in identifying linear features, and particularly in providing an overview of the full extent and interrelationship of these over large areas. Rapid field reconnaissance is essentially a subjective exercise (see 7.3.1.2 above) and many features, particularly linear earthworks, can be difficult to identify in woodland due to a range of factors including excessive undergrowth, difficult topography, orientation of survey transects or uncertainty whether a feature is archaeologically significance (see 4.3.1 above, 4.4.1 above). Many of these difficulties are overcome if rapid field survey is undertaken in conjunction with LiDAR survey as the field surveyor can:

- Target features which are visible on the LiDAR and ensure that they are characterised and assessed during field survey.
- Reinforce an interpretation of ambiguous features, which may have been dismissed without the benefit of the overview provided by the LiDAR survey.

The value of LiDAR to assist rapid field survey in woodland is demonstrated by:

- Comparison between the results of the conventional rapid field reconnaissance on the western slopes of Chestnuts Wood and that undertaken to validate the results of the LiDAR survey (see 4.4 above).
- The identification of a ring ditch (E3) in Flaxley Woods. This can be largely attributed to the LiDAR survey as the feature was obscured by dense undergrowth, and with the exception of the clearly defined ditch on its northern side, its form was masked by more recent quarrying activity. Given the terrain and ground cover in the area, identification of this feature could only be guaranteed in a fairly narrow corridor (perhaps as narrow as 20m), and without the prompting from the LiDAR survey it is possible that this potentially significant feature could have been overlooked.

The images alone were not able to provide details about the precise nature of these features. For example, 1.5m high terraces could not be easily distinguished from 6m high terraces, and relationships between visible features could not be easily determined by analysis of the hillshaded images alone. However, these are minor limitations when compared with the benefits of LiDAR (see above) and a refinement of the processing of LiDAR imagery may address these issues in the future.

7.6.2 Identification of discrete features

The ability of the hillshaded LiDAR images to identify discrete features under *c.* 10m in diameter is limited (Crow 2004). Although it was occasionally possible to match anomalies on the LiDAR images with identified features, this was not always the case, and many anomalies could not be clearly differentiated from the general “background noise” of the images in advance of survey.

Further refinement of the processing of LiDAR imagery may address this issue (B Devereux, University of Cambridge Unit for Landscape Modelling, pers. comm.), and this should not be seen as a significant limitation of the value of LiDAR, as its real value is to facilitate further validatory field survey and allow this to be targeted in an appropriate way.

7.6.3 Prioritisation of areas for rapid field survey

The Forest of Dean contains *c.* 108km^2 of woodland, the vast majority of which has not been subjected to any form of field survey, and is largely an unknown quantity in terms of the range of archaeological features contained within it. The hillshaded images based on LiDAR survey would enable areas of archaeological potential to be rapidly identified within this expanse of woodland, and prioritised for future field survey. This would provide the framework for an efficient and manageable survey programme in an area where there are few other indicators to provide a focus for this.

7.6.4 Facilitation of the process of surveying and recording

The hillshaded LiDAR images produced by the University of Cambridge Unit for Landscape Modelling were rectified to the Ordnance Survey grid and were accurate to a factor of plus or minus 0.10-0.15m (Bernard Devereux Director University of Cambridge Unit for Landscape Modelling, pers. comm.; web: Unit for Landscape Modelling.). This degree of accuracy should be compared with that achievable by the techniques used by rapid field survey in woodland (Appendix D below), where an accuracy of plus or minus 6-10m was considered acceptable and could only be achieved in optimum conditions where the hand-held GPS was working properly.

The scope of the rapid field reconnaissance does not require a high degree of accuracy to achieve its aims of identifying, characterising and recording the relative distribution and disposition of identified features (Appendix D). Despite this, however, the increased levels of accuracy afforded by the LiDAR survey had the following advantages:

- With the hillshaded LiDAR images the extent and location of recognised features can simply be recorded with reference to the visible features, generally by direct tracing. No further surveying was necessary, and these features did not need to be mapped in the field with the exception of indicating the extent to which the image on the LiDAR plot was consistent with the feature visible on the ground. This had the additional timesaving advantage of limiting the extent to which it was necessary to “follow” linear features on the ground to evaluate their full extent. They only needed to be checked at key points, rather than completely followed on the ground to check that this was the same as that shown on the LiDAR image. This not only improves the accuracy of the recording but also significantly speeds up the time needed to locate, survey and record identified features. The cost benefit of this cannot be overstated.
- The LiDAR images present an accurate and up to date image of an area of woodland, which is more comprehensive than the mapping available from the Ordnance Survey. This has a number of significant benefits:
    - Navigation within a woodland environment, where visibility is often limited and where there may be few mapped reference points is greatly facilitated.
    - Not all archaeologically significant features are visible on the hillshaded LiDAR images (see above) and the accurate location of these can be rapidly checked against those features which are visible, increasing the general accuracy of the survey.
    - In situations where the GPS does not function, these features can be used as accurately located “fixed points” not visible on OS maps. This greatly improved the ability to confidently record the location of identified features in this situation.

7.6.5 Limitations and potential of the hillshaded images

One limitation of the hillshaded images used during the survey was the mono-directional way in which these images were “lit”, which had the effect of causing excessive shade in some areas and also failed to highlight some linear features aligned along the same axis as the light source. Although this did not appear to be an issue with the linear features identified in the Flaxley survey, two linear feature identified during the rapid field reconnaissance in Welshbury Wood (A119, A120) were difficult to discern on the LiDAR survey for this reason

This difficulty was partly a product of the relatively poor quality of the paper printouts of the LiDAR images taken into the field, as many of the shaded areas were considerably less obscure when viewed on screen, and the obvious remedial action is to ensure that the highest quality printouts available are taken into the field.

The University of Cambridge Unit for Landscape Modelling have also been experimenting with the production of images based on a synthesis of the significant shading effects when lit from eight possible directions (G. Amable, University of Cambridge Unit for Landscape Modelling, pers. comm.). Images shaded in this way would highlight linear features of any orientation and ensure that no areas are shaded in such a way that features are obscured.

7.6.6 Identification of features of limited or no archaeological significance

In addition to potential archaeological features, the LiDAR survey also identified a number of features of limited or no archaeological significance.

This is of little consequence as normal professional archaeological judgement can easily be applied to these images (in the same way as it is, for example, applied to cropmarks visible on aerial photographs) and the vast majority of these features can be immediately identified and discounted. The ability of the LiDAR images to record features such as forestry tracks or watercourses which are not always accurately depicted on available Ordnance Survey maps facilitated both orientation within areas of woodland and provided accurate points of reference against which features could be located where GPS readings were not available (see above).

7.6.7 Identification of features which were not visible on the ground

Although a number of features visible on the LiDAR plots of Flaxley Woods were considered to represent natural breaks in slope (see 7.6.6 above), these features often appeared less distinct than the “genuine” features on the LiDAR images and greater experience would allow these to be easily discounted by the application of professional judgement outlined above.

In one instance the LiDAR image appeared to show features which were not identifiable on the ground (see 7.6.7 above). This appears to have been the result of exceptional local circumstances and was easily recognized as part of the field survey to verify the LiDAR results.

7.6.8 Conclusion

It is clear that rapid field reconnaissance in woodland is greatly facilitated by LiDAR survey, and the process of removing canopy cover to reveal ground surface features can be regarded as a major development in the archaeological survey of areas of woodland.

Many of the minor problems outlined above can be easily overcome through the application of either professional judgement or manipulation of the data and the principal advantages of using LiDAR survey results can be summarised as follows:

- Rapid analysis of the results of LiDAR survey allows for areas of potential interest to be identified, and improves the efficiency of survey strategies by targeting resources towards areas which are most likely to produce significant results.
- At a more local level, strategies for individual survey operations can be formulated to ensure that identified features can be assessed in the most efficient way possible.

- Features visible on the LiDAR survey can be recorded much more rapidly and with a greater degree of accuracy than is possible through the means normally employed in rapid field reconnaissance in woodland.
- Identified features (not just those of potential archaeological significance) act as a framework within which survey work can identify features not visible on LiDAR in an efficient way.
- Features accurately located on the LiDAR survey can be used as “fixed points”, aiding the correct location of other archaeological features in an environment where these are generally absent.
- Although at the present time, it is considered necessary to “ground truth” all features identified through LiDAR survey, this will become increasingly less important as more LiDAR features are validated, leading to greater confidence in the interpretation of hillshaded images.

7.7 Specifications for future rapid field survey in woodland, including utilisation of LiDAR information

The advantages and disadvantages of the methodological approaches of the rapid field surveys undertaken as part of Stage 2 of the project are set out in Appendix E. The results of this discussion, along with the ground truthing of the features visible on hillshaded LiDAR images, have been used to inform the following specifications for future rapid field surveys in woodland.

7.7.1 Desk-based data collection

The desk-based data collection in advance of the survey should consist of consultation of the following sources:

- Gloucestershire County Sites and Monuments Record.
- Rectified copies of early maps of the area.
- 1st, 2nd and 3rd Series 1:2500 OS maps
- Hillshaded images produced from the LiDAR survey of the area in accordance with specifications set out in Appendix M.

Further general historical research (e.g. the Victoria County History and any other relevant historical sources) need not be accessed in advance of the field survey but should be consulted when the results of the survey are assessed and interpreted.

7.7.2 Field survey

7.7.2.1 Timing of rapid field surveys

Rapid field reconnaissance in areas of deciduous or mixed woodland should always be undertaken in the winter months (ideally January to March) when ground cover is at its lowest, and access and visibility is optimal. Undergrowth is much less of a problem in areas of conifer plantation and field survey can be undertaken at any time of year.

Rapid field reconnaissance in woodland should always be undertaken in advance of any forestry operations, particularly clearfelling or thinning, as the detritus from these processes can have a detrimental effect on access and visibility.

7.7.2.2 Reconnaissance methodology

Systematic coverage

Each surveyor or survey team should operate in a single zone (see below), and complete the survey within that zone before beginning another.

Where LiDAR features have been identified from the hillshaded images, survey should initially target these and record them in accordance with the specifications set out below. Subsequent to this, the areas demarcated by the recorded LiDAR features should be systematically surveyed. Where LiDAR features have not been identified surveyors should, as far as possible, systematically walk along transect lines spaced at a distance of between *c.* 30m- 50m.

In practice strict adherence to these specifications will be constantly revised to take account of local conditions, although the key factor is for surveyors to have “sight of“ 100% of the surface area of the zone.

Survey zones

The 2005 Flaxley survey demonstrated that, in practice, the demarcation of the survey into separate zones merely served the function of:

- Ensuring separate survey teams did not overlap.
- Ensuring that there was a record of landuse and accessibility for each feature.

Accordingly zones should be differentiated on the basis of different types of woodland cover, which have similar levels of ground cover and accessibility.

In practice, it is also acceptable to utilise other visible landscape features such as forestry tracks as ways of demarcating survey zones where these are available, and although it is not necessary to actually map the boundaries of the survey zones, it is necessary to make a record of the area covered by the rapid field reconnaissance.

Feature recognition and recording strategies

Rapid field survey is dependant upon subjective assessments of the significance of identified features, and also an ability to identify features which may only survive as low earthworks, prone to be obscured by undergrowth or detritus (see 4.3 above, 4.4 above). Comparison between the results of rapid field surveys at both Welshbury and Chestnuts Woods with the hillshaded LiDAR images highlighted the potential limitations of rapid field reconnaissance in woodland.

The significance of some features or landforms may not be apparent during the field survey, and may only become so when the results of the survey are assessed. To address this, future surveys should be more willing to record doubtful features, and equally willing to discard them during the analysis phase.

The results of rapid field reconnaissance should be regarded as only one suite of information leading to a better understanding of the archaeological potential of an area of woodland, and must wherever possible draw on other available data sets, particularly those, such as LiDAR, which can provide an objective framework in which rapid field survey can be undertaken.

The following should be normal procedure in all future rapid field surveys within woodland:

- The full extent of all identified linear features should be identified. This is best achieved by literally walking along, or adjacent to them during field survey.
- The balance of interpretation should favour the recording of all linear features, however indistinct. This is particularly the case where these are a direct continuation of more clearly defined earthworks, or are visible as linear features on the hillshaded LiDAR plots.
- Although rapid field reconnaissance work should be undertaken in advance of felling operations, where this is not possible, adjacent areas of standing woodland should be inspected to identify indistinct features, which may no longer be visible in the felled areas.
- Surveyors should record linear features such as drainage channels, even though they do not feel they are likely to be of archaeological significance, as these features may follow the line of earlier features that cannot be identified without viewing the survey results in their totality.

7.7.2.3 Recording methodology

Recording equipment

The 2005 rapid field reconnaissance surveys attempted to use systems and equipment which had been used as part of the Scowles and Associated Iron Industry

Survey, and whilst these had been adequate for that project they proved problematic in woodland surveys, particularly in situations where the GPS did not operate.

However, although digital recording was abandoned during the Flaxley and Great Berry Woods surveys, this was for reasons of equipment failure, and the extra time needed to manually upload the data into the project database amply demonstrated the value of digital recording.

Future surveys should make use of both digital mapping and recording systems, but further research will be require to identify systems and equipment which are appropriate for this type of survey.

The possibility of reverting to manual recording systems in particular situation or in the event of equipment failure should, however, always be available.

Landuse and ground conditions

This should be recorded at zone level, and the following information should be recorded:

- Zone identification.
- Ground cover/feature visibility, referenced against a five-point scale from Good to Inaccessible.
- Landuse details, referenced to the landuse information used by the Gloucestershire County Sites and Monuments Record.
- Landowner, or other contact details
- Name of field recorder and date.

Ecological features

This should be limited to the recording of clearly relict features such as coppice stools, old hedge lines or pollarded trees, which are indicative of earlier forms of woodland management. There should be a presumption against recording features of this type where there is any question that they are the result of more recent forestry operations (e.g. natural regeneration of cut stumps). Where identified the following should be recorded:

- Feature identification – unique feature number and zone.
- Feature type – this should be a tick box in which types of ecological feature can be selected.
- Species of ecological feature, if known.
- Dimensions - these should be approximate.
- Confidence of interpretation – this should be recorded against three levels of confidence.
- Description – this allows for a longhand description of the feature.
- Photograph – digital cameras should be used, and although representative photographs should be taken wherever possible, this is at the discretion of the field surveyor.
- Sketch – sketches of features should be made if appropriate.
- Name of field recorder and date.

Archaeological features

Archaeological features should be recorded in the following way:

- Feature identification – unique feature number and zone.
- Location – OS grid reference. It is important to make a record of the level of accuracy of the GPS, and the recording OS grid reference as part of the database allows for future tabulation of the information if necessary, and is essential where features are not recorded digitally.
- Method of location – this is particularly important where features have been located by means other than GPS.

- Feature type – features should be divided into discrete or linear features, and the feature type selected by means of a tick box. The choice should be simple in line with the revised survey record forms, which only allowed for eight options (Appendix M).
- Dimensions – these should be approximate.
- Feature visibility - this should only be used in conjunction with the recording of features visible on the hillshaded LiDAR images, and is a means of recording the fact that images visible on LiDAR plots are not visible on the ground.
- Description – this should be a longhand description of the feature, if appropriate.
- Interpretation - this should be a tick box with allowance for additional interpretations. The choice should be simple in line with the revised survey record forms which only allowed for four options (Appendix K, L.iii).
- Level of confidence in the interpretation of the feature – this should be recorded against three levels of confidence.
- Date of feature - this was recorded if known.
- Finds - this allows for the rerecording of any finds identified in the course of the survey. A specific tick box should allow for evidence of charcoal to be recorded where charcoal platforms have been identified.
- Ecology of feature – this should be a simple Yes/No option tick box with space for comments where the ecology of an identified feature is recognisably different from the surrounding woodland.
- Photograph – digital cameras should be used, and although representative photographs should be taken wherever possible, this is at the discretion of the field surveyor
- Sketch – this allows for sketches of features to made if appropriate
- Name of field recorder and date.

Mapping

The purpose of the mapping of features is to locate them, and allow for some visual impression of their form. Accordingly it should be schematic in accordance with the standard of English Heritage levels 1 and 2 (Bowden 1999). Discrete features (unless larger than *c.* 10 -15m across) should be mapped as points and linear features mapped as lines.

Mapping should be undertaken in an appropriate digital format (see above) with surveying by hand-held GPS, or other “low tech” methods (reference to mapped landscape features, compass bearings, offsets, tapes or pacing) in situations where the GPS does not function.

LiDAR images are accurate to 0.10 - 0.15m (Bernard Devereux, University of Cambridge Unit for Landscape Modelling, pers. comm.), a considerably higher degree of accuracy than can be attained (or is required) for surveys of this type. Thus, where features are visible on the LiDAR imagery, the direct tracing of these should be the principal means of recording their location. Care should also be made to ensure that features are correctly located with reference to visible and mapped landscape features such as tracks, if necessary overriding the location derived for the hand-held GPS.

Provision should also be made for the manual mapping of features in the event of systems breakdown or other unforeseen factors. Where this is the case mapping should be on drawing film overlays to OS or hillshaded LiDAR image base maps at a scale both appropriate to the survey and simple to use. Scales of 1:2000 or 1:4000 have been found to be most useful for this.

The following layers should be taken into the field in both digital analogue format:

- OS base maps.
- Gloucestershire SMR information.

- Hillshaded LiDAR images. The analogue versions of these should be on the highest quality paper available.

7.7.2.4 Team make-up

Rapid field reconnaissance in woodland should be undertaken by small, suitably qualified teams to ensure:

- A methodological, consistent and efficient approach to the survey.
- Consistency of feature recognition.
- Consistency of feature recording.

Undertaking this type of survey as a community project is relatively inefficient in terms of both the time taken to complete the work and the consistency of feature recognition and recording, and should only be undertaken if resources are available to ensure an adequate professional/volunteer ratio to allow for close supervision of volunteers. It may in some circumstances be appropriate for further detailed survey of identified features to be undertaken as a community project if required.

The 2005 pilot work undertaken in Flaxley and Great Berry Woods indicated that, where features were mapped manually, it was barely less efficient to undertake survey work with teams of two, and had an additional health and safety dividend (Appendix D). The proposed use of digital recording systems for future surveys, however, would mean that a single surveyor, working alone in a given area of woodland, is most efficient and this team make-up should be used for future surveys.

In order to comply with Gloucestershire County Council lone working policy, however, and wherever possible, two individuals should operate in the same general area of woodland, remain in communication and meet at regular and pre-determined times during the day.

This system also allows for individuals to confer on interpretation or identification of features if this is felt appropriate.

7.8 Palaeoenvironmental sampling

7.8.1 Value of palaeoenvironmental sampling

The palaeoenvironmental and geoarchaeological sampling in the Flaxley valley identified deposits which contained identifiable and datable organic material. Pollen analysis proved to be of particular value and although geoarchaeological analysis was less informative, this may have been due to the relatively limited nature of the sampling process and this technique was considered to have future potential in the area (Appendix P, 5.7). Although the earliest organic deposits only provided evidence of palaeoenvironmental changes from the later Anglo-Saxon period onwards (Appendix P), it was felt that the valley had potential to contain earlier deposits, particularly to the east of the area sampled where the valley widens.

Analysis of plant macrofossils proved disappointing, however, and this technique may to be of limited value in this particular situation, although larger sample sizes may improve this (but see Appendix P, 6).

The objectives of the 2005 project were limited to an assessment of the potential of the techniques involved (Appendix P), and recommendations were made for both further analysis of existing samples to clarify the preliminary results obtained, and for further sampling work in the area (Appendix P, 7).

7.8.2 Future applications of palaeoenvironmental sampling

It is clear from the results of the palaeoenvironmental sampling that:

- Deposits, which contain both identifiable and datable organic remains, are likely to survive in a number of the areas identified during the desk-based assessment of the palaeoenvironmental potential of the Forest of Dean.
- The techniques used in the Flaxley Valley as part of the pilot field survey are appropriate for future survey of this type. However, future surveys should include the following:
    - Identification of recovered samples of buds and wood would help establish the balance of local versus extra-local vegetation.
    - Sieving should use a mesh size of 200μm or 180μm to ensure better recovery of insect remains.
    - Spheroidal carbonaceous particles (SCPs) should be sampled as part of the pollen analysis to identify the signature of industrial processes.
    - Suitable deposits should be sampled for diatoms (algae) and chironomids (flying insects) to assess changes in water quality in response to industrial activity in the area.

Palaeoenvironmental sampling similar to that undertaken within the Flaxley valley could have a significant impact on the current understanding of the early environment in this area, and should be used to identify periods of landscape change within the wider area of the Forest of Dean.

These techniques will be of most value where they are undertaken in conjunction with other forms of field survey (LiDAR survey or rapid field reconnaissance) which identify areas where surviving features suggest that landuse has changed through time, although they could be applied to selected areas, independent from other surveys, to provide information on the history of the woodland within Dean.

7.9 Geophysical survey

7.9.1 Value of geophysical survey

Both of the sites where geophysical survey was undertaken as part of the pilot survey overlay a sandstone geology (although different forms of sandstone), and at both sites the magnetic response of possible archaeological features was weak. This inevitably affected the number of magnetic anomalies that were available for analysis and reduced the potential of any anomalies to be correctly interpreted. Another effect of this weak response, however, was to reduce “interference” from non-archaeological anomalies common to woodland environments such as tree boles, burrows and roots.

Thus, whilst a woodland environment will inevitably reduce the quality of geophysical data when compared to open-country surveys, this did not significantly hinder the potential of geophysical survey to identify buried archaeological features in these conditions, so long as the raw data is subjected to careful analysis (Ross Dean Substrata Ltd, pers. comm.), and the geophysical survey of the interior of Welshbury hillfort in particular, achieved the objective of identifying evidence of the nature and extent of the archaeology of the site.

The geophysical surveys also detected differences between the past woodland management of the two sites. Analysis of the results of the survey at Fairplay enclosure was hampered by a series of linear anomalies interpreted as cultivation traces relating to tree planting which had disrupted much of the soil levels (Appendix Q, R.i, 4), whilst similar features were not identified during the Welshbury survey where no recent planting or other large-scale forestry operations had taken place. Although the status of these linear anomalies is not clear, as Fairplay is thought unlikely to have been cultivated prior to planting (Peter Kelsall, Forestry Commission, pers comm.), it had been subject to more recent large-scale and mechanised forestry operations than Welshbury, and it would seem likely that it is the effects of this, rather than necessarily pre-planting cultivation, which were detected by the geophysical survey.

Athough magnetometer survey can be used to identify industrial activities (particularly smelting) in most woodland conditions (Ross Dean, Substrata Ltd, pers. comm.), it is clear that a combination of the magnetically unresponsive soils encountered in both surveys, and the effects of recent forestry operations such as tree planting, limits the potential to identify non-industrial features.

7.9.2 Future applications of geophysical survey

The methodology used for the pilot geophysical surveys (Appendix P) was successful within the Forest of Dean and should be applied to future surveys within woodland in this area. The following, must however, be taken into consideration:

- Even the relatively coarse sample intervals used proved difficult to implement in some areas of dense undergrowth (Appendix Q, R.ii), and future surveys in deciduous or mixed woodland should only be undertaken when ground cover is low.
- Given the difficulties caused by the effects of recent forestry operations (see 7.9.1 above) all future surveys to investigate non-industrial features within the woodland of the Forest of Dean, should be undertaken in areas of either established and relatively open woodland such as that found at Welshbury, or in areas which have not been subject to recent major mechanized forestry operations.

Additional time is also required for geophysical survey in woodland. The consequent additional cost is a major factor in determining the value of this technique in any future surveys in Dean, and this technique should be used with caution and only where:

- It has the potential to answer specific questions.
- It has the potential to define details of archaeological sites, which have already been identified through other types of investigation.
- There is a strong likelihood that potentially significant features are present.

Geophysical survey will be most effective where:

- It forms part of an integrated approach to the investigation of sites already identified by large-scale investigation such as rapid field reconnaissance or LiDAR survey.
- It is used in conjunction with complementary techniques, particularly detailed topographical survey. (Appendix Q, R.ii 4.3).

8 Proposals for further field survey in the Forest of Dean

8.1 Summary of the value of the pilot field survey

The pilot field survey undertaken as part of Stage 2 of the Forest of Dean Archaeological Survey has identified that further fieldwork, particularly within woodland, has the potential to identify significant archaeological features and deposits which could radically alter current perceptions about the nature of that landscape in earlier times.

LiDAR survey in the northeastern part of the Forest of Dean has identified extensive patterns of linear and rectilinear features in Chestnuts, Welshbury and Flaxley Woods. The LiDAR hillshaded images show similar features in areas between these woods which are currently under pasture or arable. The overall impression is one of a unified and large-scale system of landscape organisation, unrelated to current enclosure patterns or woodland distribution, and similar to large-scale prehistoric field systems identified in other parts of the British Isles (Fowler 1983, 119-128, figures 45-47).

Rapid field reconnaissance within the woodland was able to validate and characterise these features, and also identify similar earthworks in more central areas of woodland (Great Berry Wood) where LiDAR survey had not taken place, suggesting that these systems may cover extensive areas of the Forest of Dean.

In addition to this, rapid field survey also identified finds and features which may inform current understanding of the nature and extent of the pre-bloomery iron industry in the area

A number of areas suitable for palaeoenvironmental sampling within the Forest have also been identified. The value of this type of survey has been demonstrated by the pilot work undertaken in the Flaxley Valley where datable deposits, which question existing preconceptions of the former landscape in that area, were encountered. A wider application of these techniques could provide invaluable data on the environmental history of the area.

The project has also refined the potential of excavation and geophysical survey within a woodland environment. If used judiciously, these could be important investigative tools, augmenting, and focussing other forms of intensive fieldwork.

8.2 Investigative techniques

No single field survey methodology has the ability to address all archaeological questions in the Forest of Dean, and future survey must make use of a range of complimentary techniques where these are appropriate. Preliminary suggestions for an integrated programme of fieldwork to be undertaken as Stage 3 of the Forest of Dean Archaeological Survey were submitted to English Heritage for comment and discussion in November 2004.

The following research agenda and proposed methodologies for further field survey are based on those proposals, but have been revised where appropriate, on the basis of the analysis of the results of the documentary research (Stage 1) and the pilot field survey (Stage 2).

8.2.1 Research and development

A key element of further archaeological work in the Forest of Dean is to take forward research and the development of innovative techniques, such as LiDAR survey, palaeoenvironmental sampling, and rapid field reconnaissance and recording in a woodland environment.

Further field survey (Stage 3) will not only develop these techniques, but will also make use of more traditional forms of archaeological and historical investigation to complement and contextualise collected information.

As part of this process, the results of field survey techniques, and strategies for further work, will be reviewed and disseminated to a wider archaeological audience through a professional seminar held towards the end of each season's work.

8.3 Key techniques

Further field survey (Stage 3) will make use of the following investigative techniques, which have been, evaluated as part of the pilot field survey stage of the project (Stage 2):

- LiDAR survey. A LiDAR survey of either all or part of the woodland within the Forest of Dean will be commissioned. This work will be undertaken after full consultation with the Forestry Commission who may have an interest in this technique to meet their own woodland management needs. Care will be taken to ensure that any commissioned surveys are undertaken in conjunction with any future initiatives to investigate the archaeology of the adjacent Severn Valley and the Environment Agency will be consulted on their existing LiDAR coverage of the Severn Estuary.
- Rapid field reconnaissance to validate features identified as part of the LiDAR survey and to investigate potential features identified as part of earlier stages of the project. This process will also record features relating to the history of woodland management within each area.
- Palaeoenvironmental sampling of selected areas and identified features to address the question of the environmental history of the woodland.
- Geophysical survey, geochemical sampling, or detailed topographical survey of selected features identified as a result of the rapid field reconnaissance. These techniques will be applied as appropriate and as part of integrated approaches to the further investigation of identified features or areas of archaeological potential.
- Excavation of some features will be necessary to gain further information. This is likely to be particularly appropriate to investigate the status of features identified through LiDAR survey.

8.4 Principal areas of interest

The largest single landuse within the Forest of Dean survey area is woodland covering just over 35% of the area, and approximately evenly split between areas of deciduous, mixed and conifer. Whilst the results of Stage 1 of the survey (Hoyle 2008) have augmented our knowledge of certain aspects of the archaeology of the Forest of Dean, the lack of information on the nature of the archaeological resource within the large areas of woodland in the Forest and particularly the central wooded area remains one of the principal challenges in any understanding of the archaeology of the area.

The need to "Prospect for previously unknown archaeological sites in areas of woodland in which they are currently not known but where analysis of the desk-based data (Stage 1) has found no explanation for their absence except a lack of investigation" was identified in the project design for Stage 1 of the project (Hoyle 2001). Field survey within woodland, undertaken as part of, either the outreach programme of Stage 1 of the project, or as part of the Scowles and Associated Iron Industry project, has indicated that numerous, often significant, archaeological remains are present as unrecorded features in these areas.

8.5 Research priorities

The following broad archaeological themes should be addressed within the woodland of the Forest of Dean.

Although itemised separately, these themes are facets of what would, in effect, represent a holistic approach to an understanding of the research priorities for the Forest of Dean.

8.5.1 Patterns of settlement and other activity within the Forest of Dean

The lack of information on the nature of the archaeological resource within the large areas of woodland in the Forest of Dean has already been stated, and this lack of knowledge is particularly acute in terms of understanding the nature of settlement and related activities during the periods pre-dating the Norman conquest and of the impact the establishment of the Royal Forest had there.

8.5.2 The pre-bloomery iron industry

This theme concerns the investigation of the early industrial history of the Forest of Dean, and particularly the pre-industrial revolution iron industry. The relationship between extraction sites, smelting sites, secondary processing sites, fuel production sites (particularly charcoal), and patterns of contemporary settlement and communications have not yet been the subject of any substantive research.

8.5.3 The environmental history of the Forest of Dean

This theme will attempt to identify the nature of the landuse within the currently wooded areas at different periods, and the agencies which have changed this through time. Particular attention will be paid to the date of origin of the woodland in selected areas, the identification and dating of episodes of agriculture, industry or clearance, and the history of woodland management.

8.5.4 The impact of landuse on the selected archaeological features

This theme will identify features with the potential to produce both dating evidence and palaeoenvironmental information, and also investigate the impact of different types of woodland cover and management have had on survival and recognition of archaeological remains.

8.6 Logistical approach to further field survey (Stage 3)

Field survey within most woodland environments is subject to seasonal constraints (see 8.6.2 below) and the essential logistical consideration for further field survey (Stage 3) is to ensure that this is undertaken at times of year when ground conditions are most suitable. A Gantt chart outlining a proposed logistical approach to further field survey in the woodland of the Forest of Dean is found in Appendix S.

With the exception of the proposed LiDAR survey, which should, for reasons of economy, be undertaken over as wide an area as possible as a single operation (Appendix M), a staged approach to further survey will be adopted. Areas of particular archaeological potential will be identified and subjected to a range of archaeological survey techniques. Not all survey techniques will necessarily be appropriate in each area and more detailed specifications will need to be drawn up for each area in advance.

Techniques will include rapid field reconnaissance, palaeoenvironmental sampling, remote sensing, excavation or topographical survey as appropriate. Reports will be produced at the end of each stage of investigation and these will be used to inform strategies for later stages of investigation within each area.

Further field survey (Stage 3) is currently envisaged as three seasons of exploration. Each season's work will last approximately one year and will have the potential to act as a "stand alone" project. This will have value in terms of meeting identified research priorities and will allow periodic assessment of the effectiveness of the techniques used.

8.6.1 Identification and nature of the survey areas

Suitable survey areas will be identified in as part of the preparation for each season's fieldwork. It is recognised that it may not be possible to cover the whole of the wooded area of the Forest of Dean and areas will be prioritised on the basis of the following:

1. The results of the LiDAR survey.
2. Other indicators of potential archaeological significance such as placenames or the incidence of known archaeological sites, finds or features.

The seasonal approach to field survey is designed to maximise the window of opportunity for field investigation within the woodland environment, and it is anticipated that a number of discrete areas of interest will be investigated each season.

8.6.2 Seasonal constraints on the programme

The following seasonal constraints will affect the project programme.

8.6.2.1 LiDAR survey

Given the effects that leaf cover and undergrowth can have on the effects of LiDAR survey in woodland (Peter Crow, Forestry Commission pers comm.), this type of survey should be undertaken in January or February.

8.6.2.2 Preliminary field survey

The results of the project seminar on rapid field reconnaissance within woodland (see 1.1.1 above) indicated that, within broadleaved or mixed woodland, rapid field reconnaissance is best undertaken in winter and early spring (January, February or March) when ground cover is at its lowest. Work in coniferous woodland, however, is less constrained by this, as canopy cover is generally sufficient to prevent dense undergrowth becoming established.

The seasonal constraints of LiDAR survey (see 8.6.2.1 above) will affect the selection of survey areas for the first season's exploration, assuming that this will take place directly following the LiDAR survey. Thus although general preparation would take place in the winter preceding the LiDAR survey, the analysis of the results of the LiDAR and identification of priority search areas for Area 1 will have to be undertaken during the period most suitable for the preliminary field survey (i.e. January, February or March). To compensate for this, the first stage of field survey will concentrate on areas of coniferous woodland where seasonal constraints are less crucial.

8.6.2.3 Excavation and detailed topographical survey

Ground conditions are less crucial for these activities as areas of interest will already have been identified. Consequently it is likely to be acceptable for these to take place during the early winter months (October, November, December) when undergrowth is beginning to die down in areas of broadleaved or mixed woodland. As with the preliminary rapid field survey, a flexible approach will be adopted wherever possible to ensure that optimum ground conditions are exploited wherever possible.

8.6.2.4 Palaeoenvironmental analysis

There are no seasonal constraints on this activity, although access to some areas may be improved during the winter months when ground cover is on the decline. Conversely, waterlogged ground conditions may be problematic in these areas, particularly if vehicle-mounted power augers are used to collect samples. As with the preliminary rapid field survey, a flexible approach will be adopted wherever possible to ensure that optimum ground conditions are exploited.

8.6.2.5 Geophysical survey

The success of geophysical survey within areas of broadleaved or mixed woodland is dependant on the ability of the geophysicist to navigate through the area under investigation. Given this, geophysical survey, although not necessarily as subject to seasonal constraints as rapid field reconnaissance, should not be undertaken in deciduous or mixed woodland when undergrowth is likely to be high, although it may be acceptable for this to take place during the early winter months (October, November, December) when undergrowth is beginning to die down. As with the preliminary rapid field survey, a flexible approach will be adopted wherever possible to ensure that optimum ground conditions are exploited, particularly with regard to the timing of geophysics in relation to woodland cover.

8.6.3 Timing

It is not necessary for all processes to be completed in one area before work can start on the next. Depending on ground conditions and team size, it would be possible for two areas to be investigated concurrently or more detailed survey to be undertaken in one whilst rapid reconnaissance is undertaken in another.

8.6.4 Programme of work

The process of further research for each area will be undertaken in the following way and in the following order:

8.6.4.1 Preparation

The preparation of a research strategy for the area would define research priorities and identify features of potential archaeological significance which should be targeted during field survey. This stage will also include any further documentary investigation and the preparation of any summary information to be taken into the field to inform and assist fieldworkers.

8.6.4.2 Rapid field reconnaissance

Rapid and systematic field reconnaissance of the survey area will be based on pre-agreed methodologies, search patterns and recording specifications. Typically this will consist of transects at *c.* 30m intervals, although it is recognised that in woodland conditions methodologies are 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 take account on features visible as a result of LiDAR survey or to ensure that the full extent of selected groups of features is adequately mapped. Rapid field reconnaissance will record the following:

- The presence, or otherwise, of features identified as a result of the LiDAR survey.
- Current visible extent and condition of all known archaeological sites or structures known within the survey area.

- The presence or otherwise of visible archaeological features where these have been suggested either by placename or other evidence.
- Any other features of potential archaeological significance identified within the survey area.
- Evidence of earlier woodland management such as pollarded trees, coppice stools or relict trees.
- Assessment of areas which would be suitable for geophysical or geochemical survey or palaeoenvironmental sampling.

8.6.4.3 Analysis and reporting

Analysis of the results of the rapid field reconnaissance will include the preparation of summary reports on that phase of work to include identification of areas which would be suitable for geophysical survey, geochemical survey, palaeoenvironmental sampling, further excavation or more detailed landscape survey and creation of specifications for that work. This process will assess the value of the rapid field reconnaissance methodology within the area, and make recommendations for modification of this for work in subsequent areas.

8.6.4.4 Detailed field survey

This will include geophysical, geochemical survey, palaeoenvironmental sampling, further excavation or detailed topographical survey in accordance with the specifications formulated above.

8.6.4.5 Analysis and reporting

This process will include analysis of the results of the detailed field surveys (see 8.6.4.4 above). It will also include the preparation of summary reports on that phase of work, incorporating an assessment of the value of the survey methodologies used, and recommendations for modification of these for future field surveys.

8.6.4.6 Synthesised report

The final stage of the field survey will consist of a report bringing together the interim reports of earlier stages and synthesising the results. This report will also include recommendations to for the management of the archaeological resource identified during the survey.

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The project was managed by Jon Hoyle, Senior Project Officer, who supervised the project team made up of:
Aisling Tuohy: Assistant Project Officer.
Danielle Wootton: Assistant Project Officer.

Jon Hoyle devised the field survey methodology and logistics in consultation with members of the project team.

The field survey was undertaken by Jon Hoyle and Danielle Wootton assisted by Naomi Payne of Gloucestershire County Council, Archaeology Service.

The field survey data was inputted into the project database and mapped onto the Gloucestershire County Council GIS by Aisling Tuohy.

The report was prepared by Jon Hoyle with the assistance of:.

- Aisling Tuohy, who took particular responsibility for:
  - The desk-based work to identify areas of palaeoenvironmental potential.
  - The preparation of some of the Appendices.
  - The figures.
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Rudge T	1803	*History of the County of Gloucestershire*
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Scott-Garret C	1956	Romano-British sites at Chestnuts Hill and Popes' Hill *Transactions of the Bristol and Gloucestershire Archaeological Society* 75, 199-202
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Standing IJS	1988	Dating the Dean Road *The New Regard* 4, 35-43
Standing IJS	1997	The landscape of the Forest of Dean in the 17th Century A study based on contemporary maps Bristol University Dissertation for an MA in Local History – submitted June 1997
Tylecote RF	1986	*The Prehistory of Metallurgy in the British Isles* Kings Lynn
Walters B	1989	A survey of prehistory in Dean c. 12,000 BC to AD 43 *Dean Archaeology 2*

Walters B (ed)	1991	Summary observations and additions to the archaeological record. *Dean Archaeology,* 4, 38-47
Walters B	1992a	*The Archaeology and History of Ancient Dean and the Wye Valley* Cheltenham
Walters B	1992b	*The Forest of Dean Iron Industry* Dean Archaeological Group Occasional Publication No.4
Webb A	2000	*Early medieval Dean* *The Forest of Dean and West Gloucestershire 409 to 1272 AD* Dean Archaeological Group Occasional Publication No. 6 Lydney
Wheeler REM & 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 Antiquities in London IX Oxford
Wildgoose P	1993	The Forest of Dean as a major centre of the iron industry from Roman to medieval times. Unpublished MLitt thesis.

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
BGS	2004	Digital geological data (both Solid and Drift) supplied by the British Geological survey and incorporated as layers on the Gloucestershire County Council GIS
GCRO	1792	Map of Estates of Lord Gage Gloucestershire County Record Office Document GRO PC23
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.
Gwatkin G	1992	Rectified copy of Littledean and Newnham Tithe Map (1839) at scale 1:10,560 (Map no: 8)
Gwatkin G	1992	Rectified copy of Blaisdon and Huntley Tithe Map (1839) and Flaxley from Map of Boevery Estate (1862) 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: 13b)
Gwatkin G	1992	Rectified copy of Mitcheldean Tithe Map (1840), Abinghall Tithe Map (1838) and Longhope Tithe Map (1841) at scale 1:10,560 (Map no: 11)
Gwatkin G	1993	Rectified copy of English Bicknor Tithe Map (1838) and Staunton (1845) at scale 1:10,560 (Map no: 20)
Gwatkin G	1993	Rectified copy of Alvington Enclosure Map (1813) and Woolaston Tithe Map (1841) at scale 1:10,560 (Map no: 25)
Gwatkin G	1993	Rectified copy of St Briavels (1842) and Hewelsfield (1841) Tithe Map including Brockweir 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 and Bream 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 including Newerne (1839) at scale 1:10,560 (Map no: 63)

Gwatkin G	1995	Rectified copy of Tidenham Tithe Map (1845) including Lancaut (1939) at scale 1:10,560 (Map no: 82)
Gwatkin G	1996	Rectified copy of West Dean (North) Tithe Map including Lydbrook and Lydbrook (1959) at scale 1:10,560 (Map no: 104)
Gwatkin G	1997	Rectified copy of East Dean Tithe Map including Ruardean and Drybrook (1856) at scale 1:10, 560 (Map no: 106)
Gwatkin G	1997	Rectified copy of East Dean: Cinderford Tithe Map (1856) at scale 1:10,560 (Map 107)
Gwatkin G	1997	Rectified copy of East Dean Tithe Map including Cinderford, Ruspidge, Soudley and Shakemantle (1856) at scale 1:10,560 (Map no: 108)
Gwatkin G	1997	Rectified copy of West Dean (South): Parkend (1834-35/1840) at scale 1:10,560 (Map no 116)
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
OS	2004	Digital mapped Information based on recent Ordnance Survey data forming a layer within the Gloucestershire County Corporate GIS
Peterken GF	1995	*Natural Woodland: Ecology and Conservation in Northern Temperate Regions* Cambridge University Press
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)
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

Appendix A Contributors to Specialist Seminars

A.i Woodland Archaeology Seminar, 24th June 2003.

Contributor	Subject
Tim Yarnell, Forestry Commission	Forestry Commission: Introduction and overview
Angela Simco, Independent Archaeological Consultant	Survey of Ancient Semi Natural Woodland in England
John Roberts , Gwynedd Archaeological Trust	Survey of Ancient Semi Natural Woodland in Wales; working with ecologists
Jonathan Wordsworth, Council for Scottish Archaeology	Survey of conifer plantations in Scotland
Jim McNeil , South Yorkshire Archaeology Service	Management plans for Ancient Semi-Natural Woodland in South Yorkshire
Nicola Bannister , Freelance Landscape Archaeologist	Management plans for the Woodland Trust
Tim Hoverd, Herefordshire Council, Archaeology Department	Archaeological survey to inform woodland grant and forestry schemes.

A.ii Second Specialist Seminar to discuss field survey techniques, October 14th 2004.

Contributor	Subject
Jon Hoyle, Gloucestershire County Council Archaeology Service	Summary of project and identification of key issues
Peter Crow, Forestry Commission	LIDAR: Possible applications for further work in the Forest of Dean
Chris Salter, Oxford Materials Laboratory	General overview of the bloomery iron industry and identification of key issues in the Forest of Dean
Ross Dean, Substrata Ltd. & Chris Carey, Exeter University	Applications of geophysical survey and soil chemistry analysis sampling strategies in the Forest of Dean drawing on the experience of the Exmoor Iron Project
Andy Payne, English Heritage, Centre for Archaeology	General applications of geophysical survey in the Forest of Dean, working within the limitations of a wooded environment
Vanessa Straker, English Heritage, Southwest Region	Overview of applications of Palaeoenvironmental analysis to establish the environmental history of the Forest of Dean
Discussion chaired by Jan Wills, Gloucestershire County Archaeologist	Development of strategy for further work in the Forest of Dean

Appendix B Welshbury Charcoal Platform: Samples and contexts

B.i Charcoal samples

Seven charcoal samples were taken from the following contexts:

- Context (+)
- Context 2
- Context 3 spit 1
- Context 4, spit 1
- Context 5
- Context 5, basal spit (Spit 3)
- Context 11

The following bulk samples of charcoal-rich deposits were also taken:

No.	Context	Quantity
1	3 spit 1	10 lt.
2	3 spit 1	10 lt.
3	5 spit 1	10 lt.
4	5 spit 1	10 lt.
5	3 spit 2	10 lt.
6	5 spit 1	10 lt.

No	Context	Quantity
7	3 spit 1	10 lt.
8	5 spit 2	10 lt.
9	5 spit 1	10 lt.
10	5 spit 2	10 lt.
11	5 spit 3	10 lt.
12	11 spit1	10 lt.

B.ii Context summary

No	Above	Below	Same	Interpretation
+	1			Leaf Litter/forest floor covering the whole of the excavated area.
1	NOT EXAVATED	+		Forest soil below Context (+) in area outside of charcoal platform.
2	3	+	10	Charcoal impregnated soil below Context (+) in the area of the charcoal platform
3	6	2	4	Charcoal deposit at base of platform – residue of charcoal burning *in situ*
4	6	2	3/5	Charcoal-rich deposit at interface of Contexts 3 & 5
5	7	+	4	Charcoal-rich soil representing down-slope spread from platform, perhaps as deliberate preparation of platform between burns.
6	NOT EXAVATED	3	8/9	Undisturbed subsoil
7	8	5		Soil surface on downslope side of platform below spread 5
8	NOT EXAVATED	7	6/9	Undisturbed subsoil
9	NOT EXAVATED	3	6/8	Stony variation within subsoil 6
10	8	5	2	Natural forest soil
11	12	3		Fill of gully 12 – could not be distinguished from 3
12	6	11		Gully at upslope edge of platform

Appendix C Welshbury Wood 2003: Radio Carbon date

SUERC

Director: *Professor A B MacKenzie*

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Rankine Avenue
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Email: **g.cook@suerc.gla.ac.uk**
Telephone: **01355 223332**
Direct Dial: **01355 270136**
Fax: **01355 229898**

RADIOCARBON DATING CERTIFICATE

21 December 2007

Laboratory Code	SUERC-16310 (GU-15879)
Submitter	Jon Hoyle Archaeology Service Gloucestershire County Council, Environment Department Shire Hall Gloucester, GL1 2TH
Site Reference **Sample Reference**	Welshbury Hill, Charcoal platform 2003 Glos 22117
Material	Charcoal : Hazel (Corylus avellana)
$\delta^{13}C$ relative to VPDB	-26.2 ‰
Radiocarbon Age BP	140 ± 35

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

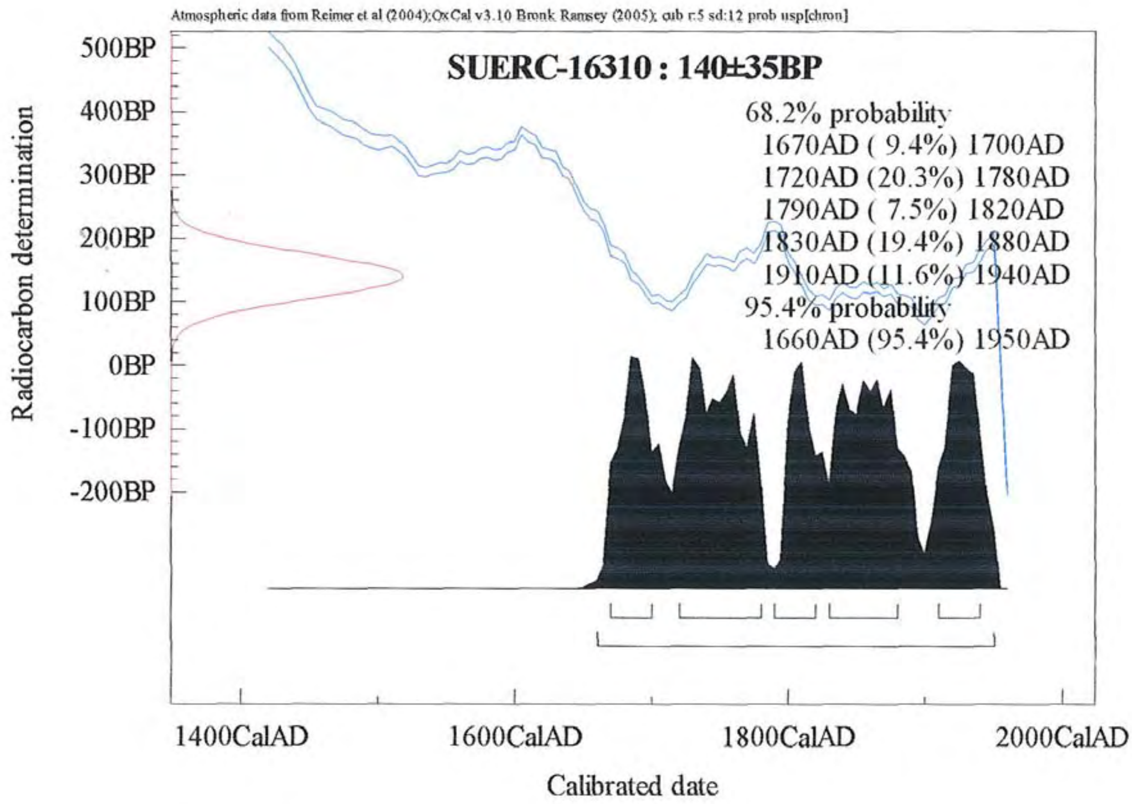
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 21-12-07

Checked and signed off by :- Gordon Cook Date :- 21.12.07

Calibration Plot



Appendix D Welshbury Wood 2003, Assessment of charcoal samples

D.i Introduction

This report provides an assessment of the charcoal recovered from the platform in terms of its potential to provide data on the woodland environment in which the platform was sited and the character of the timber/wood with which the clamps were constructed. Suitable material for dating was selected from all samples. Seven of the twelve soil samples collected are included in the current assessment.

D.ii Methods

The samples contained large fragments of well-preserved charcoal with frequent pieces of whole and radial fragments of round wood. Partially charred wood was present in Context s 4 and 11.

Three pieces of charcoal representing the overall type of wood included (i.e., narrow round wood and amorphous fragments) were selected from each sample': These were prepared using standard techniques (Gale and Cutler 2000) and examined using a Nikon Labophot-2 microscope at magnifications up to x400. The anatomical structures were matched to reference slides of modern wood. The age and diameter of the round wood was recorded but it should be noted that the charring process reduces wood volume reduce by up to 40%.

D.iii Results

The results are presented in Table 1. The taxa identified included alder (Alnus glutinosa), birch (Betula sp.), hazel (Corylus avellana), ash (Fraxinus excelsior), cherry/ blackthorn (Prunus sp.), oak (Quercus sp.), lime (Tilia sp.) and wayfaring tree or guelder rose (Viburnum sp.). The wide range of species represented is of considerable interest, since local woodland predating the conifer plantation was believed to have consisted predominantly of small-leaved lime (as indicated by the natural woodland towards the summit of the hill). Although lime was recorded from Context 2, it was not present in the remaining samples examined. The examination of a larger fraction of the charcoal recovered from the platform would provide a better understanding of the local woodland.

The charcoal consisted of pieces of round wood which mainly ranged in diameter from 5 - 35mm, although some larger fragments were also present, and it was therefore possible to record the age at felling and growth rates (Table 1). The season of felling was also noted for some pieces (Table 1). The growth rates varied from slow to fast but were mostly fairly moderate and none of the wood appeared to be growing in stressed conditions. The (possible) regular reuse of the platform suggests that wood was supplied from managed woodland and if a greater quantity of charcoal were examined, it may be possible to obtain evidence of cycles of rotation related to species type.

D.iv C14 dating

The material examined consists of juvenile wood and thus provides abundant charcoal from each context for conventional dating. See Table 1 for species and weights.

D.v Recommendations

Although traditional methods charcoal production have been well documented (Edlin 1949; Armstrong 1978), first hand knowledge of working charcoal platforms from the archaeological evidence is sparse and very few have been excavated. Work on the current site has provided an important opportunity to address this situation. The dating of selected samples will indicate the period and extent of use. Samples included in the assessment indicate the use of narrow round wood from mixed broadleaf species. Since the charcoal collected consisted mainly of intact round wood with the potential to provide significant data, it is recommended that samples indicated on Table 1 should be included in a full analysis, and, in addition, similar material retrieved from the remaining (as yet unprocessed samples) soil samples. The results should be presented in a full report with reference to the following:

1. The range of taxa and type of wood included in charcoal production at this site.
2. Data implicating woodland management and the rotation of coppice related to species. Also the season of felling and evidence of preferential selection of species.
3. Evidence of woodland composition related to spit level.

Thus further work should be carried out on four samples from Context s 2, 3, 5 (basal spit and area of main section) as indicated on Table 1 and, in addition, from selected productive soil samples (as yet unprocessed).

D.vi Costs

The following costs are based on a daily rate of £155 which includes all expenses except the return carriage of the samples.

Identification of 4-8 samples	0.5 - 1 day	£77-£155
Report	1-2 days	£155 - £310
Total	1.5 - 3days	£232 - £465

D.vii References

Armstrong, L. 1978 Woodcolliers and Charcoal Burners, Horsham and Singleton
Edlin, H.L. 1949 Woodland crafts in Britain, Batsford
Gale, R. and Cutler, D. 2000 Plants in Archaeology, Westbury and Royal Botanic Gardens, Kew

Rowena Gale, Folly Cottage, Chute Cadley, Andover, Hants SP 11 9EB
Honorary Research Associate, Royal Botanic Gardens, Kew
Visiting Research Fellow of the Dept. of Archaeology, University of Reading
11th November 2003

Table 2: Welshbury Wood: the assessment of charcoal recovered from charcoal burning platform 22117

The assessment is based on the identification of 3 fragments of charcoal from each sample. The Table also indicates material suitable for C14 dating (the weights, in gm, are shown in brackets).

Cont	Context description	Total no. of fragments	Taxa identified	C14	Recommendations
+	Leaf litter/forest floor covering the whole of the excavated area	6	1 x alder *(Alnus glutinosa),* wide round wood, radius 40mm, 14 growth rings, moderate to fast growth, bar *in situ*, felled when dormant.	Yes (18 gm)	No further work
			1 x ash (*Fraxinus excelsior*) from wide round wood	Yes (21 gm)	
			1 x birth (*Betula* sp)	Yes (1 gm)	
2	Charcoal impregnated soil below Context (+) in the area of the charcoal platform	11	2 x birch *Betula* sp), round wood, radius 23+	Yes (21 gm)	Identify the remaining fragments
			1 x line (*Tilia* sp) round wood, diameter 22mm including bark, 12 growth rings	Yes (10 gm)	
3 Spit 1	Charcoal deposit at base of platform – residue of charcoal burning *in situ*	20 +	1 x birch (*Betula* sp) round wood, diameter 16mm, 8 growth rings, moderate growth, bark *in situ*	Yes (10 gm)	Identify the remaining fragments
			1 x birth (Betula sp) round wood, radius 35+mm, fast-grown, e.g. ring width 5mm		
			1 x ash (Fraxinus excelsior), round wood, diameter 8mm, 9 annual rings, slow-grown	Yes (2 gm)	
4 Spit 1	Charcoal deposit at interface of Context s 3 and 5	3	3 x birth {*Betula* sp), round wood, diameter *c.* 25mm (very abraded and only partially charred		No further work
4	Charcoal deposit at interface	3	3 x birth {*Betula* sp), round wood,		No further work

Cont	Context description	Total no. of fragments	Taxa identified	C14	Recommendations
Spit 1	of Context s 3 and 5		diameter *c.* 25mm (very abraded and only partially charred)		
5 basal spit	Charcoal-rich soil representing down slope spread from platform, perhaps as deliberate preparation of platform between burns	*c*. 40	1 x birch (*Betula*) sp, round wood diameter 5mm, 5 annual rings	Yes (1 gm)	Identify remainder of sample
			1 x oak (*Quercus* sp) round wood, diameter, 25mm, 11 annual rings, outer rings very narrow	Yes (6 gm)	
			1 x alder (Alnus glutinosa), fragment	Yes (5 gm)	
5 Area of main section	Charcoal-rich soil representing down slope spread from platform, perhaps as deliberate preparation of platform between burns	*7*	1 x oak (*Quercus* sp), round wood, diameter 11mm, 3 annual rings, bark *in situ*	Yes (2 gm)	Identify remainder of sample to obtain data on round wood
			1 x *Prunus* sp round wood, diameter 28mm, 14 growth rings, inner rings wide, outer rings very narrow, bark *in situ*	Yes (9 gm)	
			1 x Viburnum sp, round wood, diameter 10mm, 7 annual rings	Yes (2 gm)	
11	Fill of gully 12	*10+*	1 x ash (*Fraxinus excelsior*) diameter 25mm, 8 growth rings, moderate growth	Yes (19 gm)	Mainly fragmented pieces so not worth doing more. Some pieces only partially charred
			1 x ash (*Fraxinus excelsior*), round wood, diameter 27mm, 7 growth rings, bark *in situ,* felled when dormant		
			1 x hazel (Corylus avellana), large fragment	Yes (7 gm)	

Appendix E Methodologies for rapid field reconnaissance

E.i Chestnuts Wood survey, 20003

E.i.i Methodology

Desk-based data collection

A list of potentially useful sources was prepared (Hoyle 2003b, Appendix 1) and presented to the Friends of Chestnuts Wood, and community volunteers who then collected relevant data from a variety of published and unpublished map sources. The information from these sources was used to inform the field survey where appropriate and was integrated into the discussion of the archaeological and historical background to the survey area.

Field survey

The methodology needed to be flexible enough to achieve the project objective and also accommodate a variable number of community volunteers. The following methodological framework was adopted:

- The survey area was divided into 8 zones (Zones A-H), generally defined by forestry tracks or other visible features.
- Participants in the survey were assigned to a survey team. The main variable throughout the survey was the number of volunteers present at any one time. This resulted in the personnel working in each zone fluctuating continuously, so that survey teams consisted of between two and eight people, with ensuing variation in the methodological approach adopted.
- Each team was responsible for undertaking survey in a single zone. Once survey was completed in that zone, the team moved on to another zone
- Each zone was walked in transects between *c.* 15 and 20 metres apart. Strict transect control was not always be possible in the terrain and this approach was reviewed in some zones, particularly where team size made control of this difficult. In practice each zone was covered in as even and systematic fashion as was possible, based on the premise that the ground surface of each part of the survey area should have been within sight of at least one participant.
- Details of each identified feature were recorded on a dedicated pro-forma (Appendix J), and mapped at scale 1:1000. The written record was the main record of form and dimensions of features. The mapped record was schematic in accordance with English Heritage Level 2 recording (Bowden 1999) and, although it was not possible to specify recording details for all prospective features, the following levels of detail were adopted:
    - Discrete features (e.g. charcoal hearths) or features under *c.* 3-5m in diameter, were recorded as a point.
    - Linear features such as banks, walls or ditches or terraces were recorded as a line – positive and negative features were differentiated on the survey record sheet rather than the map.
    - Large features, such as quarries were recorded in outline. Internal details, or integral mounds of spoil relating to these features were not separately mapped. A number of contiguous features were amalgamated into a single feature. Simple hachures were used to indicate direction of slope.
    - The extent of large above ground features (e.g. mounds) were recorded in outline. Contiguous features could be amalgamated and simple hachures used to indicate direction of slope
- Where possible features were located using hand-held GPS (Global Positioning System), although other recording and measurement systems (compass bearing or pacing) were used where the GPS did not function properly in the woodland.
- Each mapped feature was clearly marked with the correct record number.
- Photography was not used to record features.

- Ground conditions and visibility of features were not recorded as part of this exercise.

E.ii Welshbury Wood survey, 2005

E.ii.i Methodology

Desk-based data collection

Pre-field survey desk-based data collection consisted of consultation with the County Sites and Monuments Record and a very rapid assessment of 1st to 3rd Series Ordnance Survey maps of the area to identify recorded sites not already integrated into the SMR. This level of research was felt to be appropriate to simply identify features, which the survey team would anticipate identifying on the ground.

Field survey

The survey was undertaken by a team of two, and was completed in two working days (approximately 1 day per zone).

Zone A

Zone A had recently been clearfelled and both access and ground visibility were obscured by a series of brash mats laid down by the forestry contractor to protect archaeologically sensitive features and deposits. The location of the brash mats in this zone was recorded to allow the proportion of the total area available for survey, and the potential of the brash mats to have obscured significant archaeological features, to be assessed.

It had originally been planned to walk Zone A within the “insulae” demarcated by the brash mats left by the felling. However, this proved to be impracticable and the survey team walked a systematic sequence of parallel transects, generally across the slope (i.e. along the contour). Although the distance between walk lines varied depending on factors such as topography and groundcover, the surveyors maintained sight of 100% of the ground surface. All visible earthworks, or features considered to be of potential archaeological significance were recorded.

Recording was undertaken in the following way:

- Each identified feature was assigned an individual number and described on a pro-forma (Appendix K). These pro-formas were manually filled in as part of the survey process. The principal difference between these pro-formas and those used in the Chestnuts Wood survey was that the location of the feature (10 figure gird reference) was recorded on each sheet, where features had been located by GPS. The accuracy reading (EPE) was also recorded. Features mapped as an area or lines were assigned a single grid location for rapid spatial location.
- Features were located on site in relation to the Ordnance Survey grid using a hand-held GPS. The methodology allowed for the location of features by other “low tech” methods in the event of the GPS not functioning.
- Mapping was schematic in accordance with the standard of English Heritage levels 1 and 2 (Bowden 1999).
    - The location of identified features was mapped on overlays to OS base maps at scale 1:2000.
    - Discrete features (unless larger than *c.* 10 -15m across) were mapped as points. Linear features were mapped as lines. Hachures were only used where deemed necessary by the surveyor to increase clarity.
- The interpretation of certain types of common feature was written on the field drawings in order to facilitate analysis of the results.
- Photography was not used to record identified features.

Zone B

Zone B was under standing conifer. Trees were widely enough spaced to allow easy access, undergrowth was limited by the density of canopy cover and visibility of the ground was barely impeded.

The survey team followed the existing forestry racks, which ran approximately at right angles to the slope of the hill at a spacing of c.15m. This allowed them to maintain sight of 100% of the ground surface, and also to systematically monitor progress of the survey with reference to visible landscape features. The team left the racks to record features identified in the area between them, returning to the racks to continue the survey when this had been completed.

The recording process was identical that undertaken in Zone A.

E.iii Great Berry Wood survey 2005

E.iii.i Methodology

Desk-based data collection

Desk-based research consisted of checking the existing SMR records for the area, which consisted of a large post-medieval quarry (Glos SMR 10529) and a number of extractive pits and possible trackways identified from aerial photographs the area (Glos SMR 22683, 22684), which have not been validated by field survey.

Field survey

Reconnaissance methodology

The reconnaissance methodology was consistent with that undertaken during the rapid reconnaissance in Flaxley Woods.

Survey zones

Survey zones were designated in a similar way to that used in the Flaxley survey, although there was a greater tendency to utilise features such as paths and track, which were more abundant in this area, as zone boundaries.

Recording methodology

The recording of archaeological features at Great Berry Wood was undertaken in the same way as at Flaxley Wood, with the following differences:

- No ecological features were recorded in this survey, although this reflects the fact that none were recognised rather than indicating a change in recording policy.
- The revised archaeological features recording forms were used throughout this survey.
- In Zone A no features were mapped on site. All locational recording was undertaken by recording GPS readings on the feature record sheets.

E.iv Flaxley Woods survey, 2005

E.iv.i Methodology

Desk-based data collection

The desk-based data collection consisted of consultation with the Gloucestershire SMR and reference to the results of the LiDAR survey of Chestnuts Wood, Welshbury

Wood and Flaxley Woods undertaken by the University of Cambridge Unit for Landscape Modelling for the Forestry Commission.

Field survey

Reconnaissance methodology

In the areas where full rapid field reconnaissance was undertaken each team undertook survey in a single survey zone (see **above**). Each survey zone was, as far as was possible, systematically walked, along transect lines spaced at a distance of between *c.* 30m- 50m. In practice strict adherence to transect lines proved problematic due to factors such as topography and groundcover, the need to leave lines to record visible features, and particularly the need to follow the full extent of linear features. Zones were, therefore, effectively surveyed in a way which allowed surveyors sight of 100% of the surface area of the zone.

Survey zones

Although it was the original intention to use visible landscape features such as tracks or paths to define survey zones, these were too widely spaced within Flaxley Woods to demarcate reasonable working areas, and each contained too diverse a range of woodland types to allow for easy generalisation of ground conditions, accessibility or feature visibility. Accordingly it was determined that recording zones should be differentiated on the basis of different types of woodland cover, which tended to have similar levels of ground cover and accessibility.

In practice the demarcation of the survey into separate zones merely served the function of:

- Ensuring separate survey teams did not overlap.
- Ensuring that there was a record of landuse and accessibility for each feature.

Accordingly, it was not felt necessary to map the boundaries of the survey zones, and areas with similar landuse and levels of accessibility were designated as separate zones for purely logistical reasons.

Recording methodology

Unlike previous walkover surveys, the field team recorded three separate types of information (see 4.5.2.2 above, Appendix K). The original intention had been to undertake all recording digitally using dedicated pro-formas on the iPAQ hand-held computers, which linked directly with the digital mapping and could be uploaded directly in the County SMR. As the pilot work progressed this was abandoned primarily for reasons linked with the problems and limitations of the digital mapping system (see **above**). The implications of this for digital recording in the field can be summarised as follows:

- The database could not be opened unless a feature was recorded on the digital mapping system.
- The use of mapped “dummy” features was considered, but the digital database did not have a field for recording either OS Grid Reference, or the means of feature location if GPS had not been used (see below). Recording this information in the longhand “description” field was considered, although difficulties experienced with the functioning of the equipment caused this to be abandoned.
- Problems were experienced with the functioning of the equipment (see **above**), which rendered attempts at modification of, or “working around” the existing digital database for the purposes of the pilot field survey impracticable.

Accordingly all recording was undertaken on A4 paper pro-formas, which were manually copied into a digital database at the end of the field survey.

Landuse and ground conditions

The following information was recorded at zone level on a pro-forma:

- Zone identification.
- Ground cover/feature visibility, referenced against a five-point scale from Good to Inaccessible.
- Landuse details, referenced to the landuse information used by the Gloucestershire SMR. It was originally intended to record canopy cover as a percentage, although it was felt that the existing SMR division of more or less than 65% canopy cover, would suffice for this.
- Contact details – this was effectively landownership details
- Name of field recorder and date.

Recording of relict ecological features

The survey made a record of relict ecological features such as coppice stools, old hedge lines or pollarded trees. These were individually recorded as separate features in the same way as archaeological features, but on a separate pro-forma, which included the following:

- Feature identification – unique feature number and zone.
- Feature type – this was a tick box in which types of ecological feature could be selected.
- Species of ecological feature.
- Dimensions – these were approximate.
- Clarity of interpretation – this field attempted to indicate a level of confidence in the recognition of the feature. This was recorded against three levels of confidence.
- Description – this allowed for a longhand description of the feature.
- Photograph – digital cameras were used during the survey and it was policy to take photographs of identified features
- Sketch – this allowed for sketches of features to made if appropriate
- Name of field recorder and date.

Recording of archaeological features

Archaeological features were recorded on a pro-forma, which included the following.

- Feature identification – unique feature number and zone.
- Feature type – this was a tick box in which types of archaeological feature could be selected. It divided features into discrete or linear features
- Dimensions – these were approximate.
- Feature visibility - this was specifically designed to allow for recording of areas where the LiDAR information suggested that features were present, and where it was anticipated that these might not be visible on the ground. This information was recorded against three possible levels of visibility, allowing for acknowledgement that, without prompting (particularly from the results of LiDAR survey), the feature may not have been recognised.
- Description – this allowed for a longhand description of the feature.
- Interpretation - this was a tick box with 24 options and allowance for additional interpretation. This field included information recording the level of confidence in the interpretation of the feature, recorded against three levels of confidence.
- Date of feature - this was recorded if known.
- Finds - this allowed for the rerecording of any finds identified in the course of the survey. A specific tick box allowed evidence for charcoal to be recorded where charcoal platforms had been identified.
- Ecology of feature – this field was an attempt to identify and record differences in ecology between identified archaeological features and the surrounding woodland. The purpose of this information was to inform questions of whether plant identification could be used as an indicator of certain types of archaeological feature in future surveys within woodland. This recorded if the

ecology on an identified feature was noticeably different from the surrounding, and also recorded the principal species growing on identified features.
- Photograph – digital cameras were used during the survey and it was policy to take photographs of identified features
- Sketch – this allowed for sketches of features to made if appropriate
- Name of field recorder and date.

This form was refined in the course of the survey. This refinement proved necessary for the following reasons:
- The print version of the digital database recording pro-formas extended over two sheets of A4 and proved too cumbersome for site use. This was compressed to allow each feature to be recorded on a single sheet of A4.
- The digital recording form had assumed that all records would be related to a feature whose position had been mapped in either digital or analogue form. In the event the pilot work experimented with the possibility of not mapping features on site and, instead, recording their location with reference to recorded grid co-ordinates. One of the modifications was to add a field to allow this to be recorded. The revised form allowed up to five OS grid references to be recorded to accommodate the location of linear or large area features.
- The original recording form had not allowed for the method of location of features in areas where the GPS did not operate to be recorded. A field was added for this purpose.
- Many of the fields in the original form were simplified to reflect the actual range of features which were encountered during survey. For example the Feature Type field was reduced from 16 to eight tick boxes whilst the Feature Interpretation field was reduced from 24 to four pre-selected choices.
- The ecology field was simplified to a simple Yes/No option with space for comments, eliminating the need to record ecology where this was identical to the surrounding woodland.

Mapping

The original intention was to map all features on site in a schematic way in accordance with the standard of English Heritage levels 1 and 2 (Bowden 1999), the purpose of the mapping being to locate the identified feature, and allow for some visual impression of its form. In this fashion discrete features (unless larger than *c.* 10 -15m across) were to be mapped as points and linear features mapped as lines. It was assumed that mapping would be undertaken in digital format making use of hand-held computers (Compaq iPAQ) mapping onto dedicated layers of an ArcPad GIS.

Surveying was principally to make use of hand-held GPS, although other “low tech” surveying methods (reference to mapped landscape features, compass bearings, offsets, tapes or pacing) were to be utilised as deemed logistically efficient.

In the course of the survey this mapping methodology was modified in the following ways:
- Digital mapping was reliant on the hand-held GPS (which had a direct link to the IPAQ) functioning properly. Although few problem had been identified when this methodology had been utilized as part of the field survey stage of the Scowles and Associated Iron Industry Survey (Hoyle *et al* 2004) two major problems were encountered during the Flaxley survey
    - GPS coverage was not available for extensive areas of conifer plantation on a west-facing slope (Zone A), and proved intermittent in other areas. Without an integral GPS locator, it proved too difficult to map features on the digital base maps on the iPAQs, using traditional surveying methods such as measurement or compass bearing, and in these situations it was much more rapid (and accurate) to map on gridded film overlays to Ordnance Survey base maps at scale 1:2000.

- The equipment used for the Flaxley survey was that used as part of the Scowles and Associated Iron Industry Survey. One of the iPAQs “froze” during the early stages of the Flaxley survey effectively rendering it useless. The remaining IPAQ developed a faulty socket for the cable which linked it to the hand held GPS (an essential element of the integral GPS function) which also rendered it effectively useless as a tool for this survey.
- Prior to this it had been noted that the batteries for both iPAQs appeared to have a limited life, which again meant that they were of limited value for all-day survey. This limited battery power also had the effect of rendering the iPAQs extremely slow when involved all functions involving the map layers.

This combination of events led to the decision early in the project to abandon digital mapping as part of the Stage 2 pilot work. It was felt that the experience of this gained in the Scowles and Associated Iron Industry Survey would be sufficient to allow for an assessment of the benefits and disadvantages of this technique, and that the pilot work should concentrate on assessing the value of manual mapping.

Accordingly all mapping was undertaken on gridded drawing film overlays to A3 OS base maps at scale 1:2000.

During the Flaxley survey, all features were originally mapped in this way, although this methodology was later modified to limit mapping to linear and large area features, as the location of discrete features could easily be generated from the recorded OS grid co-ordinate from the project database.

Team make-up

The field survey phase of the Scowles and Associated Iron Industry Survey indicated that 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, and that this efficiency saving over-rode the slight advantages of a two person team, such as wider archaeological judgement and opinion in the field, or assistance in carrying equipment. The Health and Safety benefits of two-person teams, however, were an over-riding consideration in determining suitable team-size for that survey where it was essential to ensure safe working practice in areas where terrain and ground conditions could be very difficult.

Accordingly it was proposed to use the pilot work in Flaxley Woods to test logistical issues with a view to determining a field survey methodology, which combined logistical efficiency with safe working practice.

The team make-up during the rapid field reconnaissance in Flaxley Woods and Great Berry Wood therefore consisted a two teams, one made up of two individuals, and another consisting of a lone worker.

In order to comply with Gloucestershire County Council lone working policy the two teams met at regular and pre-determined times during the day.

Appendix F Chestnuts Wood 2003: Rapid field survey: Primary records

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
A1	A 3/3	Ditch	Linear cut	Track/Drainage ditch	Possible
A2	A 2/3 &3/3	Cut	Linear feature	Holloway	Possible
A3	A 2/3	Bank	Linear bank	Bank enclosure	
A4	A 3/3	Cut	Linear features	Holloway	Possible
A5	A 3/3	Cut	Linear features	Track/Drainage ditch	Possible
A6	A 3/3	Cut	Linear features	Track/Drainage ditch	Possible
A7	A 3/3	Cut	Uncertain linear feature	Track/Drainage ditch	
A8	A 3/3	Cut	Linear depression	Track/Drainage ditch	
A9	A 3/3	Cut	Linear depression	Track/Drainage ditch	Possible
A10	A 3/3	Cut	Linear depression	Track/Drainage ditch	
A11	A 3/3	Cut	Linear depression	Track/Drainage ditch	
A12	A 2/3	Cut	Shallow depressions	Quarry	Possible
A13	A 2/3	Ditch	Deep ditch	Holloway/Ditch	Uncertain
A14	A 2/3	Ditch	Holloway / Linear ditch	Holloway/Ditch boundary	Possible
A15	A 2/3	Ditch	Shallow ditch-like feature	Track	Possible
A16	A 2/3	Bank	Low bank	Banked enclosure?	Possible
A17	A 1/3 & A 2/3	Ditch & bank	Holloway/Linear depression & enclosure bank	Banked enclosure	Probable
A18	A 1/3 & A 2/3	Ditch	Holloway next to field boundary	Holloway/Ditch boundary	Possible
A19	A 1/3	Ditch	Shallow holloway	Holloway	Possible
A20	A 1/3	Ditch	Shallow ditch	Track	Possible
B1	B 1/3	Cut	Large depression	Holloway	Possible
B2	B 1/3	Ditch	Ditch with water - Pool approximately half way along ditch	Drainage ditch	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
B3	B 1/3	Cut	Hollow feature with Steep Sides	Quarry	Uncertain
B4	B 1/3	Cut	Charcoal platform	Charcoal platform	Probable
B5	B 1/3	Cut	Charcoal platform	Charcoal platform	Probable
B6	B 1/3	Cut	Charcoal platform	Charcoal platform	Probable
B7	B 1/3	Bank	Linear bank/terrace	Bank interpretation unclear	
B8	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B9	B 1/3	Cut	Charcoal platform	Charcoal platform	Probable
B10	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B11	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B12	B 2/3	Structure	Pile of stones	Unclear	
B13	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B14	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B15	B 2/3	Platform	Oval platform - Not charcoal hearth	Platform	Possible
B16	B 3/3	Platform	Semi elliptical platform	Platform	Possible
B17	B 3/3	Cut	Charcoal platform	Charcoal platform	Probable
B18	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B19	B 3/3	Cut	Charcoal platform	Charcoal platform	Probable
B20	B 3/3		Small amount of slag scatter near track		
B21	B 3/3	Cut	Platform	Charcoal platform	Uncertain
B22	B 3/3	Cut	Platform	Charcoal platform	Uncertain
B23	B 3/3	Cut	Row of holes descending eastwards from track	Quarry	Possible
B24	B 3/3	Cut	Overgrown trackway with adjacent pit	Quarry	Probable
B25	B 3/3	Cut	Small hole	Unclear	

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
B26	B 3/3	Cut	Charcoal platform	Charcoal platform	Probable
B27	B 3/3	Cut	Charcoal platform	Charcoal platform	Probable
B28	B 2/3	Cut	Charcoal platform -No burning	Charcoal platform	Possible
B29	B 2/3	Cut	Charcoal platform -No burning	Charcoal platform	Possible
B30	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B31	B 2/3	Cut	Hole	Quarry	Possible
B32	B 2/3	Cut	Possible quarrying	Quarry	Possible
B33	B 2/3	Cut	Hole - Possible quarrying	Quarry	Possible
B34	B 2/3	Cut	Hole - Possible quarrying	Quarry	Possible
B35	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B36	B 2/3	Cut	Charcoal platform	Charcoal platform	Possible
B37	B 2/3		Trackway	Trackway	Probable
B38	B 2/3		Hollow	Tree Throw	Possible
B39	B 2/3	Cut	Pit/Hollow	Quarry	Possible
B40	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B41	B 2/3	Cut	Possible quarrying	Quarry	Possible
B42	B 2/3	Bank	Boundary bank or drainage ditch	Bank associated with drainage ditches	Possible
B43	VOID	Void	Void	Void	VOID
B44	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B45	B 2/3	Cut	Charcoal platform	Charcoal platform	Probable
B46	B 2/3	Ditch	Ditch	Un	
B47	B 2/3	Banks	Three long mounds	Drainage	Possible
B48	B 2/3	Cut	Disturbed ground	Un	
B49	B 1/3	Platform	Large platform	Platform - Possible log store	
B50	B 1/3	Cut	Possible quarrying	Quarry	Possible
C100	C 1	Ditch	Ditch	Quarry	Possible

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
C101	C1	Cut	Sub circular feature	Quarry	Possible
C102	C1	Cut	Holloway	Holloway	Probable
C103	C1	Cut	Amorphous quarry/Sub-circular depression	Quarry	Possible
C201	C2	Cut	Shallow sub circular depression	Quarry	Possible
C202	C2	Terrace	Terrace	Terrace	Uncertain
C203	C2	Ditch	Linear ditch	Quarry/Ditch	Possible
C204	C2	Ditch	Linear ditch	Quarry/Ditch	Possible
C205	C2	Ditch	Linear ditch	Quarry/Ditch	Possible
C206	C2	Bank	Two low banks	Quarry/Ditch	Possible
C207	C2	Cut	Pit	Quarry	Uncertain
C208	C2	Platform	Platform	Charcoal platform	Possible
C209	C2	Cut	Circular depression	Quarry	Possible
C300	C3	Terrace	Linear terrace	Terrace	Probable
C301	C3	Cut	Linear ditch	Ditch drainage	Probable
C302	C3	Cut	Amorphous cut	Pit	
C303	C3	Cut	Holloway	Holloway	Probable
C304	C3	Cut	Holloway	Holloway	Probable
C305	C3	Ditch	Ditch drainage	Ditch drainage	Probable
C306	C3	Cut	Circular depression	Un	Uncertain
C307	C3	Platform	Sub circular platform	Charcoal platform	Uncertain
C308	C3	Cut	Sub circular depression	Charcoal platform	Uncertain
C309	C3	Holloway	Holloway	Holloway	Possible
C400	C4	Cut	Hollow	Quarry	Possible
C401	C4/OLD OS	Structure	Hollow area & Masonry Remains	Lodge structure	Probable
C402	C4	Cut	Rectangular pit - stone-Faced	Lodge structure	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
C403	C4	Cut	Quarry pit	Quarry	Probable
C404	C4	Platform	Amorphous platform	Un	
C405	C4	Cut	Charcoal platform	Charcoal platform	Probable
C406	C4	Cut	Charcoal platform	Charcoal platform	Probable
C407	C4	Cut	Charcoal platform	Charcoal platform	Probable
C408	C4	Cut	Charcoal platform	Charcoal platform	Possible
C409	C4	Cut	Charcoal platform	Charcoal platform	Possible
C410	C4	Cut	Charcoal platform	Charcoal platform	Probable
C411	C4	Cut	Charcoal platform	Charcoal platform	Possible
C412	C4	Terrace	Terrace Vague	Natural slope	Uncertain
C450	C4	Cut	Amorphous depression	Un	
C451	C4	Cut	Circular depression	Un	
C452	C4	Track	Track	Trackway	Probable
C453	C4	Cut	Circular depression	Tree Throw	Possible
C454	C4	Cut	Amorphous depression	Charcoal platform	Probable
C455	C4	Cut	Circular depression	Tree throw	Probable
C456	C4	Cut	Circular depression	Charcoal platform	Possible
C457	C4	Cut	Circular depression	Charcoal platform	Probable
C458	C4	Cut	Amorphous level area	Charcoal platform-Doubtful	Uncertain
C459	C4	Cut	Amorphous level area	Charcoal platform-Doubtful	Uncertain
C460	C4	Track	Track	Trackway	Probable
C500	C5/OLD OS	Structure	Well	Well	Probable
C501	C5/OLD OS	Structure	Remains of Lodge	Lodge structure	Probable
C502	C5/OLD OS	Bank	Low bank	Lodge structure	Probable
C503	C5/OLD OS	Terrace	Low terrace	Lodge structure	Probable
C504	C5/OLD OS	Structure	Remains of wall	Lodge structure	Probable
C505	C5/OLD OS	Cut	Circular quarry	Quarry	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
C506	C5/OLD OS	Bank	Two irregular banks	Quarry Waste	Possible
C507	C5	Cut	Circular hollow	Quarry	Possible
C508	C5	Cut	Circular hollow	Quarry	Possible
C509	C5	Cut	Irregular hollow	Quarry	Probable
C510	C5	Cut	Circular hollow	Quarry	Possible
C511	C5	Cut	Irregular hollow	Quarry	Possible
C512	C5	Cut	Irregular hollow	Quarry	Possible
C513	C5	Cut	Circular hollow	Quarry	Possible
C514	C5	Cut	Circular hollow	Quarry	Possible
C515	C5	Cut	Irregular hollow	Quarry	Possible
C516	C5	Cut	Irregular hollow	Quarry	Possible
C517	C5	Cut	Circular hollow	Quarry	Possible
C518	C5	Cut	Irregular hollow	Quarry	Possible
C519	C5	Cut	Irregular hollow	Quarry	Possible
C520	C5	Cut	Circular hollow	Quarry	Probable
C521	C5	Cut	Charcoal hearth	Charcoal platform	Possible
C522	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C523	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C524	C5	Linear feature	Linear feature	Path-Very unclear	Uncertain
C525	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C526	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C527	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C528	C5	Bank	Bank of Lane	Trackway bank	Probable
C529	C5	Cut	Triangular cut	Unclear	
C530	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C531	C5	Cut	Charcoal hearth	Charcoal platform	Probable
C532	C5		No description	Uncertain	

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
C533	C5	Linear hollow	Linear hollow	Holloway	Possible
C534	C5	Cut	Amorphous shallow hollow - No charcoal	Un	
C535	C5	Cut	Amorphous hollow - No charcoal	Un	
C536	C5	Cut	Shallow depression - No charcoal	Charcoal platform	Possible
C537	C5	Cut	Shallow circular depression	Quarry	Possible
C538	C5	Cut	Shallow depression with charcoal	Charcoal platform	Probable
C539	C5	Cut	Amorphous hollow	Quarry	Probable
C540	C5	Cut	Circular cut	Quarry	Probable
C541	C5	Cut	Levelled area	Charcoal platform	Possible
C542	C5	Cut	Shallow platform	Charcoal platform	Possible
C543	C5	Cut	Roughly circular platform Some charcoal visible	Charcoal platform	Probable
C544	C5	Cut	Roughly circular platform Some charcoal visible	Charcoal platform	Probable
C545	C5	Cut	Very amorphous level area with dark soil	Charcoal platform	Possible
C600	C6	Cut	Platform - small	Charcoal platform	Uncertain
C601	C6	Cut	Large platform with very dark soil	Charcoal platform	Possible
C602	C6	Terrace	Slight terrace	Terrace	Uncertain
C603	C6	Cut	Linear cut	Quarry	Uncertain
C604	C6	Cut	Platform with dark soil	Charcoal platform	Possible
C605	C6	Cut	Sub circular cut	Quarry	Probable
C606	C6	Terrace	Linear terrace	Terrace	Possible

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
C607	C6	Track	Linear hollow	Trackway	Possible
C608	C6	Terrace		Terrace	Uncertain
C609	C6	Terrace	Linear terrace	Terrace	Uncertain
C610	C6	Platform	Sub circular platform with dark soil	Charcoal platform	Possible
D1	D 1/3	Cut	Bank or cut feature	Banked enclosure	Possible
D2	D 1/3	Cut	Long depression	Quarry	Possible
D3	D 1/3	Cut	Circular depression	Quarry	Possible
D4	D 1/3	Platform	Large platform	Unclear	
D5	D 1/3	Cut	Shallow circular depression	Unclear	
D6	D 1/3	Cut	Shallow depression	Quarry	Possible
D7	D 1/3	Platform	Circular platform	Charcoal platform	Possible
D8	D 1/3	Cut	Circular shallow depression	Quarry	Possible
D9	D 1/3	Bank	Bank Enclosing Woodland	Banked enclosure	Probable
D10	D 2/3	Platform		Charcoal platform	Possible
D11	D 2/3	Cut	Oval quarry	Quarry	Probable
D12	D 2/3	Platform	Shallow circular platform	Charcoal platform	Probable
D13	D 2/3	Gully	Linear depression	Unclear	
D14	D 2/3	Platform	Shallow platform	Charcoal platform	Possible
D15	D 2/3	Cut	Elongated quarry like feature	Quarry	Probable
D16	D 2/3	Cut	Elongated quarry like feature	Quarry	Probable
D17	D 2/3	Cut	Elongated quarry like feature	Quarry	Probable
D18	D 2/3	Cut	Elongated quarry like feature	Quarry	Probable
D19	D 2/3	Cut	Oval depression	Quarry	Possible
D20	D 2/3	Cut	Quarry like feature	Quarry	Probable
D21	D 2/3	Cut	Roughly circular shallow feature	Quarry	Probable
D22	D 2/3	Cut	Shallow sub circular feature	Quarry	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
D23	D 2/3	Platform	Distinct platform	Charcoal platform	Possible
D24	D 2//3	Cut	Roughly circular pit	Quarry	Probable
D25	D 2/3	Cut	Tear shaped shallow depression	Quarry	Possible
D26	D 2/3	Cut	Double pit	Quarry	Probable
D27	D 2/3	Platform	Indistinct platform	Charcoal platform	Possible
D28	D 3/3	Cut	Shallow circular hollow	Quarry	Possible
D29	D 3/3	Platform	Shallow platform	Charcoal platform	Possible
D30	D 3/3	Cut	Shallow circular pit	Quarry	Possible
D31	D 3/3	Cut	Deep Kidney shaped pit	Quarry	Probable
D32	D 3/3	Cut	8 shaped depression	Quarry	Probable
D33	D 3/3	Cut	Linear hollow	Quarry	Probable
D34	D 3/3	Cut	Quarry like feature	Quarry	Probable
D35	D 3/3	Cut	Linear quarry like feature	Quarry	Probable
D36	D 3/3	Cut	2 sub circular quarries	Quarry	Probable
D37	D 3/3	Platform	Flat Oval platform	Charcoal platform	Possible
D38	D 3/3	Cut	Elongated quarry like feature	Quarry	Probable
D39	D 3/3	Cut	Extensive quarrying	Quarry	
D40	D 3/3	Cut	Trapezoidal quarry like feature	Quarry	Probable
E1	E 2/2	Cut	Linear quarry	Quarry	Probable
E2	E 2/2	Cut	Roughly circular hollow	Quarry	Possible
E3	E 2/2	Cut	Linear quarry	Quarry	Probable
E4	E 2/2	Terrace	Shallow terrace	Terrace	Possible
E5	E 1/2	Cut	Quarry	Quarry	Probable
E6	E 1/2	Platform	Platform	Charcoal platform	Probable
E7	E 1/2	Shallow hollow	Shallow hollow – Possible surface quarrying		
E8	E 1/2	Pond	Roughly circular pond/hollow	Pond/Hollow	Possible

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
E9	E 1/2	Cut	Shallow quarry	Quarry	Probable
E10	E 1/2	Cut	Shallow quarry	Quarry	Probable
E11	E 1/2	Cut	Shallow quarry	Quarry	Possible
E12	E 1/2	Bank	Linear bank	Quarry Spoil	Possible
E13	E 1/2	Cut	Amorphous quarry	Quarry	Possible
E14	E 1/2	Pond	Roughly circular hollow	Pond/Hollow	
E 15	E 1/2	Structure	Square shaped low stone wall	Lodge structure	Possible
F1	F 1/3	Cut	Irregular hollow	Quarry	Probable
F2	F 1/3	Cut	Small sub circular hollow	Quarry	Uncertain
F3	F 1/3	Mound	Elongated mound	Quarry spoil	Possible
F4	F 1/3	Cut	Amorphous quarry	Quarry	Uncertain
F5	F 1/3	Structure	Low stone wall/Bank	Bank/Wall adjacent to forestry track	Probable
F6	F 1/3	Platform	Sub circular levelled areas with bank	Charcoal platform	Uncertain
F7	F 1/3	Cut	Sub circular level area	Charcoal platform	Uncertain
F8	F 1/3	Platform	Possible platform with ditch	Platform with ditch	Possible
F9	F 1/3	Cut	Shallow sub circular depression	Charcoal platform	Uncertain
F10	F 1/3	Cut	Oval hollow with bank	Quarry (possible saw pit)	Uncertain
F11	F 1/3	Cut	Sub circular platform	Charcoal platform	Possible
F12	F 1/3	Cut	Amorphous quarry like feature	Quarry	Probable
F13	F 1/3	Terrace	Linear terrace	Terrace	Probable
F14	F 1/3	Cut	Elongated depression	Quarry	Probable
F15	F 1/3	Cut	Elongated depression	Quarry	
F16	F 1/3	Cut	Small circular depression	Quarry	Uncertain
F17	F 1/3	Cut	Small circular depression	Quarry	Uncertain
F18	F 1/3	Cut	Small oval depression	Quarry	Uncertain
F19	F 2/3	Cut	Lozenge-Shaped quarry	Quarry	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
F20	F 2/3	Cut	6 Small sub circular depressions	Quarry	Probable
F21	F 2/3	Cut	Large circular quarry	Quarry	Probable
F22	F 2/3	Cut	Quarry	Quarry	Probable
F23	F 2/3	Bank	Slight circular bank surrounding platform	Bank with Possible platform	Uncertain
F24	F 2/3	Cut	Sub circular depression	Quarry	Probable
F25	F 1/3	Shallow depression	Oval shallow depression	Charcoal platform	Uncertain
F26	F 1/3	Cut	Circular shallow depression	Charcoal platform	Uncertain
F27	F 1/3	Cut	Shallow feature	Quarry	Possible
F28	F 2/3	Platform	Large flat area with dark soil	Charcoal platform	Probable
F29	F 2/3	Platform	Circular platform	Charcoal platform	Uncertain
F30	F 2/3	Platform	Sub circular platform	Charcoal platform	Uncertain
F31	F 2/3	Platform	Flattened platform	Charcoal platform	Uncertain
F32	F 2/3	Platform	Oval platform	Charcoal platform	Possible
F33	F 2/3	Platform	Circular platform	Charcoal platform	Possible
F34	F 2/3	Cut	Circular depression	Quarry	Uncertain
F35	F 2/3	Cut	Oval pit	Quarry	Possible
F36	F 2/3	Cut	Shallow pit	Quarry	Possible
F37	F 2/3	Cut	Roughly circular quarry	Quarry	Possible
F38	F 2/3	Platform	Flat platform	Charcoal platform	Possible
F39	F 2/3	Platform	Flat platform	Charcoal platform	Possible
F40	F 2/3	Platform	Roughly circular platform	Charcoal platform	Possible
F41	F 2/3	Cut	Shallow pit	Quarry	Probable
F42	F 2/3	Cut	Shallow pit	Quarry	Probable
F43	F 2/3	Cut	Deep pit	Quarry	Probable
F44	F 3/3	Cut	Deep pit	Quarry	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
F45	F 3/3	Cut	Shallow circular hollow	Quarry	Possible
F46	F 3/3	Cut	Shallow pit	Quarry	
F47	F 3/3	Cut	Angular pit	Quarry/Saw pit	
F48	F 3/3	Cut	Shallow depression	Quarry	Possible
F49	F 3/3	Cut		Quarry	Probable
F50	F 3/3	Cut	Circular pit	Quarry	Possible
F51	F 3/3	Cut	2 Linked pits	Quarry	
F52	F 3/3	Cut	Small shallow circular pit	Quarry	Possible
F53	F 3/3	Cut	Oval pit	Quarry	Possible
F54	F 3/3	Cut	Circular pit	Quarry	Possible
F55	F 3/3	Platform	Shallow platform	Charcoal platform	Possible
F56	F 3/3	Platform	Platform	Charcoal platform	Probable
F57	F 3/3	Platform	Small Roughly circular platform	Charcoal platform	Possible
G1	G 1/2	Hollow	Amorphous hollow	Natural watercourse	Uncertain
G2	G 1/2	Cut	Area of quarrying	Quarry	Probable
G3	G 1/2	Cut	Amorphous hollow	Quarry	Probable
G4	G 1/2	Terrace	Terrace	Terrace	Probable
G5	G 1/2	Cut	Group of amorphous quarries	Quarry	Probable
G6	G 1/2	Cut	Linear group of quarries	Quarry	Probable
G7	G 1/2	Terrace	Small terrace	Terrace	
G8	G 1/2	Charcoal hearth	Roughly circular level area	Charcoal platform	Possible
G9	G 1/2	Terrace	Terrace	Terrace	
G10	G 1/2	Charcoal hearth	Roughly circular level area	Charcoal platform	Possible
G11	G 1/2	Cut	Roughly circular cut	Quarry	Probable
G12	G 1/2	Cut	Possible residue of quarrying	Quarry	Possible

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
G13	Not mapped	Cut	Roughly circular level area	Charcoal platform	Possible
G14	G 2/2	Cut	Roughly circular level area	Charcoal platform	Possible
G15	G 1/2	Stone Spread	Spread of stones	Un	
G16	G 1/2	Bank	Stony Linear mound	Bank/Ditch upcast	
G17	G 1/2	Cut	Roughly circular level area	Charcoal platform	Possible
G18	G 1/2	Cut	Irregular cut feature	Quarry	Probable
G19	G 1/2	Hollow	Circular shallow depression	Charcoal platform	Possible
G20	G 1/2	Cut	Excavate hollow	Quarry	Probable
G21	G 1/2	Hollow	Circular depression	Charcoal platform	Probable
G22	G 1/2	Bank	Linear Ridge	Bank status unclear	Possible
G23	G 1/2	Hollow	Circular shallow depression	Charcoal platform	Possible
G24	G 1/2	Hollow	Circular level area	Charcoal platform	Possible
G25	G 1/2	Hollow	Circular level area with dark earth	Charcoal platform	Probable
G26	G 1/2	Hollow	Circular level area	Charcoal platform	Possible
G27	G 1/2 & 2/2	Cut	Line of quarries on face of terrace	Terrace/Quarry	Probable
G28	G 2/2	Terrace	Irregular terrace	Terrace	
G29	G 1/2	Terrace	Slight irregular step	Unclear	Uncertain
G30	G 2/2	Bank	Low stony bank	Bank adjacent to path	Probable
G31	G 2/2	Charcoal feature	Charcoal feature with visible charcoal	Charcoal platform	Probable
G32	G 2/2	Bank & ditch	Earth bank and ditch	Bank & ditch	Probable
G33	G 2/2	Bank, ditch and mound	Collection of features Including hollow with spring head	Natural spring	Probable
G34	G2/2	Ditch	Wide ditch between conifer plantations	Ditch	Possible
G35	G 2/2	Hollow	Circular hollow	Unclear	

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
G36	Not mapped	Wheel ruts	Parallel channels	Wheel ruts	Possible
G37	Not mapped		Tracks not mapped	Ruts	
G38	G 2/2	Bank	Shallow Linear bank	Unclear	
G39	G 2/2	Ditch	Ditch	Unclear	
G40	G 2/2	Hollow	Circular hollow	Timber store	Possible
G41	G 2/2	Bank and ditch	Linear bank with some sandstone and ditch	Drainage?	
G42	G 2/2	Cut	Roughly circular platform - No charcoal	Charcoal platform	Possible
G43	G 2/2	Cut	Oval cut	Charcoal platform	Possible
G 44	G 2/2	Cut	Same feature as G26		
G 45	G 2/2	Cut	Circular hollow	Tree throw	Possible
G 46	G 2/2	Cut	Quarry pit	Quarry	Probable
G47	G 1/2	Cut	Circular flat area	Quarry	
G48	G 1/2	Cut	Circular pit	Quarry	Probable
G49	G 1/2	Shallow hollow	Circular hollow area	Charcoal platform	
G50	G 1/2	Cut	Circular shallow hollow	Quarry	Probable
G51	G 1/2		Parallel wheel ruts	Wheel ruts	
G52	G 1/2	Timber structure	Wooden platform over shallow pit In quarry	Covered pit	
G53	G 1/2		Terrace	Track To Quarries	Possible
H1	H 2/6	Bank	Slight bank beside track levelling To Possible platform	Platform with bank	Uncertain
H2	H 2/6	Hollow	Slight hollow	Hollow	Uncertain
H3	H 2/6	Platform	Platform below track	Platform	Uncertain
H4	H 2/6	Platform	Circular platform	Charcoal platform	Possible

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
H5	H 3/6	Platform	Circular platform	Charcoal platform	Possible
H6	H 3/6	Cut & mound	Small circular depression with mound of stones	Charcoal platform	Possible
H7	H 3/6	Terrace	Terrace	Terrace	Probable
H8	NOT	Platform	Circular platform	Charcoal platform	Uncertain
H9	H 3/6	Platform	Platform	Charcoal platform	Possible
H10	H 3/6	Cut	Depression or pit	Quarry	Uncertain
H11	H 2/6	Platform		Platform	Uncertain
H12	H 2/6	Cut	Amorphous quarry	Quarry	Possible
H13	H 2/6			Uncertain	
H14	H 4/6	Structure	Overgrown stone terrace	Path	Probable
H15	H 4/6	Hollow	Roughly circular hollow with dark soil	Charcoal platform	Possible
H16	H 4/6	Cut	Ovoid platform Some charcoal	Charcoal platform	Probable
H17	H 4/6	Cut	Roughly circular platform	Charcoal platform	Uncertain
H18	H 4/6	Terrace	Terrace with gentle slope To SE	Terrace	Possible
H19	H 4/6	Cut	Ovoid platform some charcoal	Charcoal platform	Possible
H20	H 4/6	Platform	Platform	Charcoal platform	Probable
H21	H 4/6	Cut	Narrow gully	Ditch drainage	Probable
H22	H 5/6		Cut quarry	Quarry	Probable
H23	H 4/6	Stone Spread	Spread of stone	Possible slippage from H14	
H24	H 3/6	Cut	Charcoal platform	Charcoal platform	Probable
H25	H 3/6	Cut	Sub circular quarry	Quarry	Probable
H26	H 3/6	Cut	Ovoid quarry	Quarry	Probable
H27	H 3/6	Cut	Horseshoe shaped hollow	Quarry	Possible
H28	H 3/6	Terrace	Amorphous terrace	Track	Possible
H29	H 3/6	Terrace	Slight terrace	Track	Possible

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
H30	H 3/6	Cut	Amorphous depression - No charcoal	Un	
H50	NOT	Cut	Circular pit	Quarry	Possible
H51	H 3/6	Cut	Oval pit	Quarry	Possible
H52	H 3/6	Mound and hollow	Shallow hollow with mound	Quarry	Possible
H53	H 3/6	Cut	Roughly circular shallow pit	Quarry	Possible
H54	H 3/6	Cut	Circular pit	Charcoal platform	Possible
H55	H 3/6	Cut	Roughly circular pit	Quarry	Possible
H56	H 3/6		Elongated hollow	Quarry	Uncertain
H57	H 3/6	Cut	Sub circular depression	Quarry	Possible
H58	H 3/6	Cut	Circular flattened area	Charcoal platform	Possible
H59	H 4/6	Cut	Shallow Linear depression	Quarry	Uncertain
H60	H 4/6			Trackway	
H61	H 5/6		Possible stone wall	Trackway	
H62	H 5/6	Cut	Circular depression	Quarry	Uncertain
H63	H 5/6	Platform	Small circular platform	Charcoal platform	Uncertain
H64	H 5/6	Cut	Large Amorphous cut	Quarry	Probable
H65	H 6/6	Cut	Amorphous quarry	Quarry	Probable
H66	H 5/6	Cut	Amorphous quarry	Quarry	Probable
H66??		Path	Path at junction of H60	Z	
H101	H 6/6	Cut	Sub circular quarry	Quarry	Probable
H102	H 6/6	Cut	Small shallow quarry	Quarry	Probable
H103	H 6/6	Cut	Elongated quarry	Quarry	Probable

NO	MAP	FORM	DESCRIPTION	INTERPRETATION	CERTAINTY
H104	H 6/6	Cut	Kidney shaped pit	Quarry	Possible
H105	H 6/6	Cut	Extensive area of quarrying	Quarry	Possible
H106	H 6/6	Track	Track	Track - forestry	
H107	H 4/6	Platform	Large Ovoid platform	Charcoal platform	Possible
H108	H 4/6	Platform	Large Ovoid platform	Charcoal platform	Possible
H109	H 6/6	Platform	Platform	Charcoal platform	Possible
H110	H 6/6	Platform	Oval platform	Charcoal platform	Possible
H200	NO		Possible charcoal platform	Charcoal platform	Possible
H201	NO	Path	Path with rubble on downslope	Path	Possible
H202	NO	Track	Branch track from main track	Track	Possible
H203	NO	Bank/Wall	Low bank or wall	Bank/Wall	Probable
H204			Extremely large quarry NW of track	Quarry	Probable

Appendix G Welshbury Wood 2005: Rapid field survey: Primary records

NO	INTERPRETATION	CERTAINTY	CHARCOAL PRESENT	EAST	NORTH	MAP	POINT FEATURE
101	Charcoal platform	Possible	?	367740	215748	1	Y
102	Charcoal platform/Platform	Possible	N	367726	215744	1	Y
103	Charcoal platform/Platform	Possible	N	367727	215765	1	Y
104	Charcoal platform/Platform	Possible	N	367710	215768	1	Y
105	Charcoal platform	Possible	Y	367716	215787	1	Y
106	Charcoal platform/Platform	Possible	Y	367732	215783	1	Y
107	Charcoal platform	Possible	Y	367733	215795	1	Y
108	Charcoal platform/Platform	Possible	Y	367701	215753	1	Y
109	Charcoal platform	Possible	Y	367694	215755	1	Y
110	Charcoal platform/Platform	Possible	Y	367686	215733	1	Y
111	Charcoal platform/Platform	Possible	N	367676	215745	1	Y
112	Charcoal platform/Platform	Possible	Y	367657	215771	1	Y
113	Charcoal platform/Platform	Possible	N	367658	215778	1	Y
114	Charcoal platform/Platform	Possible	N	367638	215764	1	Y
115	Charcoal platform/Platform	Possible	N	367639	215755	1	Y
118	Charcoal platform/Platform	Possible	N	367619	215775	1	Y
119	Bank/Natural	Uncertain	X	367620	215752	1	N
120	Bank	Possible	X	367592	215801	1	N
121	Charcoal platform/Platform	Possible	Y	367593	215814	1	Y
122	Charcoal platform/Platform	Possible	Y	367598	215832	1	Y
123	Quarry	Uncertain	X	367593	215844	1	Y
124	Charcoal platform/Platform	Possible	?	367623	215838	1	Y
125	Charcoal platform/Platform	Possible	Y	367701	215821	1	Y

NO	INTERPRETATION	CERTAINTY	CHARCOAL PRESENT	EAST	NORTH	MAP	POINT FEATURE
126	Charcoal platform/Platform	Possible	?	367737	215819	1	Y
127	Quarry	Probable	X	367794	215845	1	N
128	Quarry	Probable	X	367798	215815	1	N
129	Quarry	Probable	X	367802	215797	1	Y
130	Quarry	Probable	X	367798	215790	1	Y
131	Quarry	Probable	X	367791	215798	1	Y
132	Quarry	Possible	X	367825	215805	1	Y
133	Quarry	Possible	X	367808	215779	1	Y
134	Quarry	Possible	X	367804	215767	1	Y
135	Charcoal platform/Platform	Possible	Y	367830	215777	1	Y
136	Quarry	Probable	X	367941	215735	1	Y
137	Slag	Probable	X	367972	215732	1	Y
139	Charcoal platform/Platform	Uncertain	N	367941	215731	1	Y
140	Charcoal platform/Platform	Probable	Y	368043	215741	1	Y
141	Charcoal platform/Platform	Probable	Y	367920	215613	1	Y
142	Charcoal platform/Platform	Probable	Y	368090	215727	1	Y
143	Charcoal platform/Platform	Possible	N	367994	215578	2	Y
144	Charcoal platform - Excavated	Probable	Y	367977	215516	2	Y
145	Platform	Possible	N	368009	215534	2	Y
146	Charcoal platform/Platform	Possible	Y	368056	215438	2	Y
147	Charcoal platform/Platform	Possible	N	368028	215453	2	Y
148	Charcoal platform/Platform	Possible	Y	368024	215457	2	Y
149	Charcoal platform/Platform	Probable	N	367924	215569	3	Y
150	Charcoal platform/Platform	Probable	Y	367928	215485	3	Y
151	Unknown – Possible quarry	Uncertain	X	367979	215497	3	Y
152	Charcoal platform/Platform	Possible	N	367955	215409	3	Y

NO	INTERPRETATION	CERTAINTY	CHARCOAL PRESENT	EAST	NORTH	MAP	POINT FEATURE
153	Platform	Probable	N	367978	215371	3	Y
154	Platform	Uncertain	?	368027	215400	3	Y
155	Terrace	Uncertain	X	368028	215438	3	N
157	Platform	Probable	N	367989	215385	3	Y
158	Terrace	Possible	X	367999	215382	3	N
159	Charcoal platform/Platform	Probable	N	368015	215342	3	Y
160	Quarry	Probable	X	367940	215286	3	Y
161	Charcoal platform/Platform	Probable	Y	367962	215327	3	Y
162	Platform	Probable	N	368042	215321	3	Y
163	Charcoal platform	Probable	Y	368073	215271	3	Y
164	Holloway	Probable	X	368079	215230	3	N
165	Unknown	Uncertain	X	367998	215177	3	Y
166	Charcoal platform/Platform	Probable	Y	367966	215212	3	Y
167	Charcoal platform/Platform	Probable	Y	367965	215220	3	Y
168	Platform	?	N	367938	215216	3	Y
169	Terrace	Possible	X	367862	215108	3	N
170	Well	Possible	X	367856	215151	3	Y
AREA 1	Area needing further investigation					3	N

Appendix H Great Berry Wood 2005: Rapid field survey: Primary records

Table 3: Great Berry Wood 2005: Slag

ZONE	NO	EAST	NORTH	DESCRIPTION
B	200	361918	215113	Finds of slag from trackway separating zones A & bank (N bank this path is not metalled nor does it appear on OS map - all fragments are within a *c.* 2m area along path. N bank proximity to features 202, 203. Finds retained - path searched for *c.* 15m to SE & SW - no further slag found.
B	229	361944	215157	Fragments of bloomery slag recovered from path surface between the points recorded by GPS
B	230	361987	214958	Fragment of tap slag and a piece of coal, visible on path surface over an area of *c.* 0.5m.
B	231	361793	214950	Fragments of bloomery slag visible in exposed ground of path (radius of 0.5m). N bank the path does not appear to have been metalled. Other fragments (not retained) in surface for distance of *c.* 1.5m to N. N bank - occasional bloomery slag fragments visible in path surface as far N as 232.
B	232	361826	214994	Area of darkened soil with numerous fragments of what appears to be post-bloomery slag - possible fuel ash slag - may correspond to a slight mound here, but this is by no means clear - appears to be late dumping of post - bloomery slag - similar slag fragments visible along path for *c.* 30m. Mound not really visible when viewed from N. Some samples retained.

Table 4: Great Berry Wood 2005: Mounds

ZONE	NO	EAST	NORTH	DESCRIPTION
A	106	361891	215142	Extremely vague rise - may only rise on SE side, and possible Merge into slope to NW. Not at all clear as a feature only really visible from the S
B	203	361918	215122	Small mound- may be assoc. with quarry pit 109 - appears to fill pit/platform 202 - N bank slag found to S of this feature
B	204	361923	215123	Vague flat topped mound/platform. Only really visible from S - faces of slope at *c.* 20 degrees - only really recorded due to proximity to 201, 202 & 203 - would probably not have been visible in other parts of the wood.
Y	41	361734	215395	Roughly circular mound. No pit visible for it to be upcast. However, may be slight 'dip' to S of mound.
Z	23	361690	215234	Oval linear mound beside trackway

Table 5: Great Berry Wood 2005: Charcoal platforms

ZONE	NO	EAST	NORTH	DESCRIPTION
A	11	362084	215281	Semi - circular platform on N side of hill cut into slope. Dark soil apparent in NW of platform.
A	12	362084	215289	Very dark area *c.* 10m S of platform. Spread visible as footpath has worn grass away – no visible platform
A	13	362069	215281	Platform *c.* 4m S of F12. Possible charcoal platform and F12 (dark soil) is possible Spread from F13. Track/path cuts into it making it hard to define.
B	202	361920	215128	Vague curved hollow - may in fact be a platform which has been obscured by spoil from quarry 109
B	216	361969	215083	Probable charcoal platform - seems to have definite charcoal spread to the W
C	2	361789	215034	Small indistinct charcoal platform

ZONE	NO	EAST	NORTH	DESCRIPTION
C	3	361795	215014	Small indistinct charcoal platform
C	4	361789	215002	Indistinct probable charcoal platform
C	5	361789	214998	Indistinct possible charcoal platform - may have low bank in S side. N bank low bank is part of C7
C	6	361779	214992	Very vague platform type feature - not a 'classic' charcoal platform - recorded due to charcoal-rich soil downslope
C	8	361793	214973	Possible charcoal platform
C	12	361755	215037	Spread of charcoal to S up around S side.
Y	25	362024	215328	Small charcoal platform (possible) with dark soil present. Cut into slope of hill, adjacent to path.
Y	32	361975	215476	Classic charcoal platform - large sub-circular platform cut into NW facing hillslope. Extremely dark soil and pieces of charcoal on platform. Slight lip around extent and clear upper and lower steps. On E side there is a slight depression in the external lip - entrance?
Y	35	361960	215396	Large sub-circular charcoal platform with very dark soil and a pronounced lip around the lower step. Like F32, this appears to be broken in one place, this time on the E side.
Y	36	361960	215400	Another possible charcoal platform, very close to F36. Again, the soil on the platform is very dark. This feature lies NW of F36.
Y	37	361941	215244	Circular platform next to F9. Very dark soil within platform. Circular bank on outside of platform is 1m in width.
Y	38	361773	215344	Sub circular charcoal platform. *c.* 8m x 8m. Upper and lower step present. Very dark soil in platform.
Y	43	361641	215343	Large sub-circular charcoal platform. Very dark soil in platform. Fairly elongated & large for a charcoal platform - possible re-utilised as one?
Y	45	361639	215208	Circular charcoal platform - soil very black in platform
Y	29	362002	215394	Large platform cut into the side of the ENE facing slope of the hill. No dark soil/charcoal visible, suggesting it may have been a building platform.
Y	42	361723	215368	Small sub-circular platform. No charcoal visible. May be related to F40 (large deep Q) (I.e. small trial pit perhaps) as ground slightly undulates around the area of activity surround the quarry.
Z	14	361651	215129	Large round charcoal platform with outer bank and upper and lower steps. Outer bank is *c.* 25m high and *c.* 1m high. Very dark soil and charcoal pieces.
Z	19	36156	21524	Charcoal platform cut into slope which is visible from track above (to NE). Oval shape with very clear upper and lower step.

Table 6: Great Berry Wood 2005: Other platform features

ZONE	NO	EAST	NORTH	DESCRIPTION
B	210	361860	215014	Discrete platform - may be formed partly by holloway 209. Status absolutely unclear but N bank 211 to N
B	233	361881	215032	Distinct platform - levelling E/W *c.* 15 - 20m and N/S *c.* 10m. Face only really visible on S side *c.* 1m high - N edge merges with hill side.

Table 7: Great Berry Wood 2005: Quarries

ZONE	NO	EAST	NORTH	DESCRIPTION
A	4	361709	215192	Area of quarrying and upcast - area *c.* 30m^2 and up to 2m deep.

ZONE	NO	EAST	NORTH	DESCRIPTION
A	8	361939	215197	Discrete sub-circular quarry& mound- mound has been utilised as a bike ramp. *c.* 8m diameter, 2m deep cut at an angle of *c.* 70 degrees.
A	9	361950	215226	Circular quarry- cut at *c.* 70 degree angle - *c.* 6m across & 2m deep. Assoc. mound utilised as bike ramp.
A	107	361884	215097	Sub-circular hollow - banks of spoil visible on SW & NE sides
A	109	361914	215123	Linear hollow – probably old quarry pit - distinct mound (c. 1m high) to E (along line of path separating zones A & B
B	218	361922	215094	Vague - roughly sub-circular hollow - appears to have spoil as its E side - may therefore be a quarry scoop, but generally hollow & amorphous. The area around 218 is generally irregular, but a few amorphous, sub-circular shallow scoops were recorded separately
B	219	361958	215135	Sub-circular hollow
B	220	361920	215100	Large area of probable post med quarrying - consists of mounds of spoil, some discrete sub-circular hollows, but mainly deep lined trenches (c. 5m wide, sides @ 45 degrees running N/S)
B	221	361940	215153	Sub-circular hollow - some banking to S
B	222	361933	215133	Very vague hollowed area - no real sides to E & SE - possible natural landform - but may be result of shallow quarrying
B	225	361979	215120	Vague sub-circular hollow
B	227	361991	215108	Vague overgrown hollow
B	201	361922	215088	Vague amorphous hollow area - possible quarrying - one of a number in this area
B	215	361948	215043	Irregular hollowed area to N of 213 - may just be natural
B	205	361829	214967	Sub-circular hollow – probably an old quarry- appears to cut terrace/Bank 206 - some spoil on S side
B	103	361865	215263	Circular quarry
C	14	361757	215056	Large quarry cut into the hillside.
C	13	361737	215025	Steep sided hole that may be either a quarry or a saw pit
Y	39	361753	215376	Small oval quarry with mound on NW side
Y	40	361748	215350	Quarry- oval shaped with mound from upcast on N side *c.* 1m in height. quarry *c.* 2m deep.
Y	44	361639	215338	Small sub-circular depression. Possible Tree throw or small quarry feature
Y	47	361723	215101	Very deep circular quarry
Y	26	361988	215349	Small oval quarry pit
Y	27	361978	215356	Small oval quarry pit - could be a saw pit
Y	28	362012	215384	Small oval quarry pit - N bank looks like quarry as concave but soil is extremely dark downslope (NE) - possible a charcoal platform? There are a number of slight possible platforms cut into this hillside
Y	33	361960	215470	A number of small quarry pit extending over an area of *c.* 40 x 40m.

Table 8: Great Berry Wood 2005: Linear quarries

ZONE	NO	EAST	NORTH	DESCRIPTION
A	1	361782	215295	Linear shallow quarry
A	2	361757	215270	Linear quarry- probable continuation of F1. Very shallow (c. 0.25 - 0.75) and *c.* 1m across. Sides cut at *c.* 70 degrees gradient. Probably the same feature as A101
A	3	361674	215228	Banana shaped' quarry cut at an angle of *c.* 45 degrees - flat bottomed – very shallow

Table 9: Great Berry Wood 2005: Terrace features

ZONE	NO	EAST	NORTH	DESCRIPTION
A	108	361819	215065	Very vague linear terrace facing S face max *c.* 1m high - angle of slope varies from *c.* 25 - 30 degrees - runs approx. due E/W. Same feature as C 1
B	212	361888	215025	Terrace - very indistinct in places - disappears into area of dense bracken - status unclear - may in fact continue E of this point and be the same feature as B213 - in fact B212 & B213 do seem to be the same linear feature - separated by a patch of bracken.
B	213	361935	215040	Terrace - at SO 61948 15041 may have a return to N of *c.* 5m before merging with slope.
B	224	361950	215141	Curvilinear bank/terrace - follows B223 - proximity to quarries in this area may suggest that this mound is in fact the result of quarrying and may just be a linear mound of quarry spoil.
B	228	361981	215116	E facing terrace - just follows B227 may be a continuation of 224 - but not clear - visible for *c.* 1m in grass to N of woodland
C	1	361885	215083	Vague linear terrace - continuation of feature recorded in Zone bank - perhaps less clear in Zone *c.* terrace Continues on a bearing of 260 degrees W becomes increasingly vague and low to W - eventually just peters out. N bank 361788 215039 - terrace visible on rutted Forestry track at this point - continuation of (1) (not clear - this terrace *c.* 1m high face at *c.* 30 degrees - traceable for *c.* 3m to W of track. This feature may have already been recorded in Zone A. Same as A108
C	9	361763	214986	Short linear terrace - soil both to N & S (and forming terrace) - very charcoal-rich and dark - status unclear - may be charcoal drift from platforms upslope - not clearly a discrete charcoal platform but vague level area (c. 4m wide) on N. side - N bank approx. parallel with C7
C	10	361765	214983	Terrace - status unclear - parallel with C7. Fairly dark soil - may be assoc. with charcoal burning but no visible platform to N. level area to S - soil fairly charcoal-rich here. N bank although interpreted as a charcoal platform this feature was actually defined by its upper (N) terrace No clear sides to W & E.
D	1	361751	214971	Linear terrace Widening to SW - bank N side - presumably soil, very dark in colour - presumed to be an old Q, but very narrow in places - could this be a large saw pit? (N bank story of Italian POW's)
Y	31	362000	215432	Slight terrace on NE slope of hill - curves round with natural hillside. Relationship with holloway (adjacent) is not clear - may underlie
Y	46	361707	215128	Linear terrace running roughly N - S across slope.
Z	20	361574	215224	Linear terrace which is faintly visible lower down the slope from the N end of F18. It is on a slightly different alignment (NNE & SSW) and appears to meet with F18 at its S end. The precise relationship is not clear however. Gradient of slope 40 degrees, slope of terrace is 1.5m, distance to next terrace is 10m at N end.
Z	21	361572	215308	Wide linear terrace visible close to (above) steep break in slope on NW side of hill. orientated NE - SW. Gradient is 40 degrees (width of slope is 4.5m)

Table 10: Great Berry Wood 2005: Bank features

ZONE	NO	EAST	NORTH	DESCRIPTION
A	5	361814	215173	Very slight bank running E - W. Possible natural - not convincing. Possibly accentuated by bramble that appears to be growing slightly more abundantly here. Slope - c.5m wide and rises at gradient of *c.* 35 degree. Whole bank *c.* 12m across. Slopes on N side much more shallower *c.* 10 degrees gradient.
B	206	361806	214951	Linear bank running parallel to main road & *c.* 15m from it - consists of low bank to W, steeper terrace to E and shallow ditch on W side - possible The remains of an enclosure bank - appears to terminate at 208.
C	7	361767	215006	Small vague bank - perhaps with slight ditch to the NW - status of this feature very unclear - perhaps banding of charcoal burning activity/old fence line associated with quarry to W. N bank the soil downslope of this feature is very dark and appears to be the spread from charcoal burning
Z	17	361593	215184	Slight linear bank with an EW orientation (up slope to down slope rather than with the contours on hill). May be accentuated by conifers growing on it.
Z	18	361624	215120	Slight bank visible running N - S along contours of hill. Possibly continues to S but very faint. W facing aspect 2m high but very gradual slope. Further N the bank is still visible curving round to the NE with the curve of the slope. The feature is about 200m long.
Z	22	361569	215302	Linear bank orientated NNW - SSE. Appears to meet F21 at a 90 degree angle but relationship is not clear. At S end, feature continues on other side of trackway and appears to join up with F18?

Table 11: Great Berry Wood 2005: Stone spreads

ZONE	NO	EAST	NORTH	DESCRIPTION
D	2	361758	214941	Area of mossy rubble – probably the site of saw mill run by Italian POW's.

Table 12: Great Berry Wood 2005: Bank and ditch features

ZONE	NO	EAST	NORTH	DESCRIPTION
D	3	361753	214934	Bank & ditch - clear entrance *c.* 5m from N end - quite regular feature appears to be rectilinear - may be assoc. with saw mill/camp for Italian POW's.

Table 13: Great Berry Wood 2005: Ditch features

ZONE	NO	EAST	NORTH	DESCRIPTION
B	207	361849	214959	Linear ditch, curving around S edge of zone bank - deepens to S - takes water from modern road gully into impenetrable boggy patch at SW end of zone B.

Table 14: Great Berry Wood 2005: Other features

ZONE	NO	EAST	NORTH	DESCRIPTION
A	6	361896	215182	Slight rise running roughly N - S for approx. 10m. Possibly returning round and running E - W. Very vague small quarry feature inside but no enough upcast to have created the rise. (Quarry not recorded)
Z	15	361590	215116	Very clear break in slope NNW - SSE, gradient of *c.* 60 degrees below and 30 degrees above the break. Not obviously archaeological but possibly enhanced? (very dubious)

Table 15: Great Berry Wood 2005: Hollow features

ZONE	NO	EAST	NORTH	DESCRIPTION
A	100	361696	215279	Vague linear hollow - in places looks like one half of a vehicle track.
A	101	361732	215261	Irregular curvilinear hollow - variable depth - possible quarry pitting Probably the same feature as A2
A	104	361840	215109	Linear H
A	105	361840	215903	Vague linear hollow - possible slight bank to S - not at all clear as a feature - possible Vehicle track
B	208	361858	214980	Linear hollow - appears to cut 206 - probable an old quarry- some mounds to the N - probable spoil - also separated from 209 by mound
B	209	361862	214987	Linear hollow - runs parallel to 208 - linear spoil heaps to W & E - runs as far as road - runs approx. N/S. In fact 209 may be a linear Holloway running from SO 61873 14949 (11) at edge of main road - runs on a magnetic N bearing to point C SO 61864 15036 (8) - this feature becomes increasingly less clear to N
B	214	361916	215055	Amorphous hollow - status unclear could be old Q
B	223	361946	215145	Vague linear hollow - possible track to quarries - not clear whether the feature follows 224 to N & W or whether it just appears to be related to it.
B	226	361994	215117	Vague hollow - hollowing may relate to quarrying

Table 16: Great Berry Wood 2005: Trackways

ZONE	NO	EAST	NORTH	DESCRIPTION
Y	30	362025	215416	Pathway not marked on OS map which is defined by very clear earthworks on each side. Possible holloway
Y	34	361986	215429	Trackway with two paths, an upper end and a lower one. This length of trackway forks in two, one section going straight ahead (E) to meet with the deep holloway (F30) and one curving round to the S to connect with the other track further up its length. A further N - S ditch appears to represent another path linking with the big trackway.

Appendix I   Flaxley Woods 2005: Rapid field survey: Primary records

Table 17: Flaxley Woods 2005: Quarry features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	3		368634	215860	Y	Circular quarry feature *c.* 1m in depth located in area of small quarries. (see also F4, 5 & 6)
A	4		368635	215870	Y	One of a group of quarry pits (see also F 3, 5 & 6)
A	5		368637	215870	Y	One of a group of quarry pits (see also F 3, 4 & 6)
A	8		368627	215903	Y	Large quarry pit, close to others nearby
A	9		368626	215912	Y	Quarry pit, with mound of upcast on west side. Part of a linear group of quarries (F4- F9)
A	10		368645	215957	Y	Quarry pit cut into raised area
A	11		368641	215963	Y	Quarry pit cut into side of raised area
A	12		368644	215973	Y	Shallow oval quarry -Pit cut into top of raised area
A	22		368632	215821	Y	Circular quarry *c.* 9x7m with mound on E side
A	23		368633	215808		Ovoid quarry *c.* 0.75m in depth. Located to immediate S of F22 and smaller quarry- circular in shape adjacent to larger ovoid quarry, Small circular dip *c.* 1m squared and *c.* 0.2m deep (see F26).
A	26				Y	Small circular quarry pit adjacent to F23
E	4	37	368634	215870	Y	Numerous large quarry pit dug into a long linear 'Bank' (geological seam?). Pieces of stone visible on surface. Also visible on LiDAR. Located at approximately 368350 216870 (no GPS reading) close to road
E	26		368274	216406	N	Sub -circular quarry cut into feature that resembles other terraces which we have been recording as such - the fact that a quarry has been dug through it suggests that this is a geological feature e.g. a seam of building stone. The terrace is not visible on the LiDAR
E	25		368270	216424	N	Two medium sized quarry pits and associated upcast? Appears to be in a line with quarrying further N (which cuts enclosure)

Table 18: Flaxley Woods 2005: Possible quarry features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	30		368640	216113	Y	2 small hollows (cut into the 'Bank' (see F25) shown on the LiDAR) with associated mounds. Probable quarrying. Coppiced trees (E3) growing on top of the mounds.
B	100		368618	215766	Y	Shallow depression
B	108		368551	215793	Y	Vague linear hollow
B	109		368563	210506	Y	Sub-circular hollow
A/B	111		368612	215820	Y	Vague linear hollow with bank on E side
B	117		368495	215722	Y	Vague sub-circular hollow
B	118		368491	215732	Y	Roughly circular hollow
B	122		368545	215720	Y	Shallow sub-circular hollow
B	123		368550	215699	Y	Vague sub-circular hollow

Table 19: Flaxley Woods 2005: Charcoal platform features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	1		368675	215813	Y	Circular charcoal platform with upper step (0.8m) with no lower step. Large chunks (c. 4m squared) of charcoal visible on ground
A	2		368656	215807	Y	Possible charcoal platform
A	14		368641	215993	Y	Possible charcoal platform cut into raised area - quite marginal.
A	15		368630	216025	Y	Platform cut into W side of raised area. Many medium/large pieces of stone on platform ad down below. Moss covering stones
A	16		368649	215999	Y	Long oval platform cut into bottom of raised area. Dark soil on pl. Difficult to define E and W sides as at base of raised area so no earthworks
A	20		368540	216020	Y	Area of dark soil - possible charcoal platform disturbed by tree growth. Immediately downslope from obvious pl (19) with very dark soil.
A	21		368590	216010	Y	Charcoal platform, approx. circular with diameter of c.5m. cut into side of slope. Spread of charcoal comes quite far out to the W.
A	24		368629	215855	y	Charcoal platform Upper step *c.* 50m sloping shallow gradient probably Due to erosion. Considerable spread of very dark soil.
A	29		368586	216112	Y	Charcoal platform. Very large upper step where it has been cut into the slope. Other charcoal platforms in area are cut into slope at W facing direction. This one is cut into the slope so that if faces SW.
A	31		368494	216064	Y	Possible charcoal platform - very difficult to make out but soil is very dark and charcoal is present. Upper step just visible but very eroded. Situated next to F33, another (but smaller) charcoal platform.
A	32		368490	216070	Y	Possible charcoal platform located next to F31 (another charcoal platform)
A	33		368445	216075	Y	Area of dark soil and slight cut into slope- possible charcoal platform
A	35		368419	216022	Y	Charcoal platform cut into slope on W side of Flaxley Woods. Black soil slightly further down the slope.
A	37		368478	216114	Y	Charcoal platform with lower step. Concave bottom.
B	120		368527	215731	Y	Sub-circular hollow/platform
B	110		368556	215805	Y	Vague platform - defined to N by slope, to E by bank. Not really very clear - yew tree E105 grows in middle
B	102		368616	215769	Y	Sub rectangular area defined by irregular mound of spoil (Banks) - considerable amount of charcoal-rich soil in upcast from animal burrow? N bank when viewed from E, this feature appears to be much more regular. Although apparently rectilinear, this feature is probably actually defined by low irregular banks, and is probably not a structure.
B	107		368603	215749	Y	Amorphous sub-circular platform may be defined by low banks, but not clear.

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
B	126		368527	215730	Y	Very overgrown, and degraded looking platform - charcoal-rich soil visible to S.
B	127		368659	215739	Y	Very overgrown, and unclear platform features - very charcoal-rich soil however.
C	38		368462	216100	Y	Charcoal platform adjacent to C37 and not as well defined.
C	40		368476	216122		Possible charcoal platform or other platform, cut into slope. Soil not especially dark and earthwork not obvious-uncertain.
C	41		368482	216128	Y	Charcoal platform or other platform cut into slope and terracing. No dark soil or charcoal, concave.
C	42		368494	216127	Y	Charcoal platform cut into slope. Dark soil and pieces of charcoal
C	43		368504	216125	Y	Charcoal platform. Dark soil and pieces of charcoal on platform.
C	202		368465	216080	Y	Very distinct charcoal platform - located on line of C200 *c.* 150m from track

Table 20: Flaxley Woods 2005: Other platform features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	2		368656	215807	Y	Possible charcoal platform
A	13		368644	215984	Y	Round flattened area close to other quarrying - could be platform or shallow quarry - no evidence of charcoal burning in the soil
A	17		368630	216010	Y	Platform cut into side of slope. Approximately circular, but cut by forestry track on NE side.
A	19		368550	216020	Y	Large platform - possibly for hut? No charcoal on platform
B	106		368598	215775	Y	Small vague platform - perhaps defined by banks *c.* 0.2m high
B	119		368492	215728	Y	Vague sub-circular hollow/platform
B	105		368613	215772	Y	Vague sub-circular platform
B	116		368502	215709	Y	Vague and small roughly circular platform

Table 21: Flaxley Woods 2005: Mounds

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
B	104		368574	215790	Y	Area of small low mounds - 5 recorded all of similar dimensions. Possible upcast from no longer visible badger sett/possible tree throw

Table 22: Flaxley Woods 2005: Hollow features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	18		368620	216010	Y	Located within linear hollow
B	103		368603	215753	Y	3 vague circular hollows
B	124		368549	215718	Y	Vague linear hollow
B	128		368650	215730	Y	Vague linear hollow

Table 23: Flaxley Woods 2005: Enclosure feature

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
E	3	18	368634	215860	Y	Visible on LiDAR. Sub circular feature with bank and ditch. Secondary mound visible on E side. The ditch can be followed all the way around, but does become less visible in the S. ditch at its deepest is *c.* 1.5m and *c.* 2m across. Very overgrown with bramble. Feature very difficult to discern - have to start in N where ditch is deep and follow around on the inside. Otherwise very difficult to see due to the undergrowth.

Table 24: Flaxley Woods 2005: Other

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
B	121		368527	215716	Y	Amorphous area of very charcoal-rich soil - down slope of 120 - some irregular bumps in area but no obvious charcoal platform

Table 25: Flaxley Woods 2005: Linear quarries

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
B	114	LA			Y	Linear hollow (in places a terrace Basically consists of a terrace on E side where cut into slope of hill - some tracking on W and in places a hollow in between.
E	2	36	368276	216515	Y	Deep linear hollow - probable quarrying following a seam. cuts through F3. Visible on LiDAR. Smaller circular quarries (not recorded) further down at end of hollow also probable. Following seam
E	7	40	368059	217205	Y	Linear hollow, probably a quarry, which is visible on the LiDAR survey
E	8	41	368088	217219	Y	Linear hollow close to feature 7 – probably a quarry. Visible on LiDAR
E	9	42	368067	217265	Y	Linear hollow - another possible quarry pit. (see features 7 &8) visible on LiDAR)
E	18	50				Linear quarry corresponds to L50 LiDAR
E	22	52			Y	Shown on LiDAR. Linear quarrying running in N - S direction. Contiguous (?) mounds on W side of quarrying make up slight bank. Towards N end (up towards forest road) becomes much less deep, but mound on W is still very visible. Seems very 'regular' for quarrying - unsure if definite quarry. In N appears to be ditch and bank

Table 26: Flaxley Woods 2005: Terrace features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
B	125	27			Y	Reasonably distinct terrace coincident with L27 - This feature becomes more vague W of c 15729. N bank This feature is recognisable as far E as the track, but appears degraded in the E most *c.* 20m where piles of spoil are visible to its N. Its height remains a fairly constant 2m with a face at *c.* 40 degrees. This area photographed - no. 11
C	44	L34			Y	Large linear double terrace. Possibly an enhancement of the natural steep slope in this area.
C	47	6			Y	L-shaped terrace visible on LiDAR and as a distinctive earthwork on the ground. It forms a platform. The size suggests a geological feat. But the way the feat turns may indicated man-made enhancement
C	201	6			Y	Very distinct terrace - height at *c.* 4m but drops to S towards L19 (200) only *c.* 2m high where they meet - quite a rapid drop over *c.* 20m
C	200	19			Y	Distinct terrace ranging in height from 2 - 3m - face of slope fairly shallow, *c.* 40-45 degrees. This feature could be traced as far W as the modern track around the perimeter of the wood. (see LiDAR plot) - visible as a low terrace in woods to W of track and also in pasture field to W - not at all distinct here, petered out to nothing, more or less as per LiDAR plot - barely distinguishable as a feature in the grassy field. A distinct vehicle track *c.* 2m wide where in places formed a clear holloway (<.5m deep). Followed this feature generally to its N (c. 4 - 5m away) but cut through it *c.* 15m to E of main forestry track. This is clearly visible on the LiDAR.
C	204	19			Y	Arbitrarily separated from 200 - no visible change at this point - on entering the conifer plantation 204 gradually diminishes in size and becomes increasingly shallow until merging with hillside at *c.* 120m E of 201 - more or less in line with that shown on LiDAR.
C	205	LB				Very vague terrace /break in slope corresponding to LiDAR feature LB? ? A slight levelling off of the slope of the hill - in places very vague 1m high step on W side, but this was not obvious
C	207	5A			Y	Clear terrace - *c.* 1.5m to 2m high - slope of face fairly shallow - *c.* 30 degrees and, over *c.* 4m becomes less distinct towards track to the S - as far as could be discerned - 207 had a return with 208. But this area was very overgrown and the feature itself was vague.

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
C	208	5B			Y	Description basically as for 207, although in places it is less clear - 208 could not really be traced E of the point at which it appears to hit the track (and it was fairly vague up to this point) - the apparent bank visible E of this may have been banked levelling from the track - *c.* 1 -2 m high, although this interpretation is not clear.
C	209	5			Y	Terrace - *c.* 1.5 - 2m high sloped face at *c.* 35 - 40 degrees (possible 45 degrees) - corresponds to LiDAR feature L5 - this feature appears to stop at L4 as per LiDAR plot. There may be a slight return to 209 where it meets C210 (L4) - this only continues *c.* 8m before merging into natural slope, and its status is not clear.
C	210	4A				Appears to be a forestry track/gap in the trees with some rutting - In fact where C210 meets 209, it appears as a low terrace - *c.* 1m high with a face at *c.* 30 degrees
C	211	5C			Y	Terrace - appears to form a return with 209 (L5) and is of similar dimensions - C211 becomes increasingly low and vague as it goes up hill to E - traceable to *c.* 15 - 20m west of L6 at which point it is only *c.* 0.2 m high
E	1	10	368274	216634	Y	Visible on LiDAR. Terrace running E - W across slope. Defined by forestry tracks, 1 above and one below. The continuation of L28 is difficult to trace between L10 and A1. The general mounding along this line is, however, visible. Conclusion - this represents a natural geological ridge which has been utilised/modified to create lynchets & field boundaries. L10 probably traceable W as far as shown on LiDAR plot, but becomes increasingly low and unclear - situation also confused as deeply rutted Forestry track immediately to its S.
E	10	43			Y	Visible on LiDAR. Terrace sloping at angle of 45 degrees. Fades outs of visibly but LiDAR shows it continuing. Very brambly in the area where it should continue so possible Obscured by ground cover
E	12	45			Y	Visible on LiDAR. Terracing quite slight - forestry track cutting through the bottom of it defines it more than would otherwise notice. Sloping at *c.* 30 degrees. May continue beyond LiDAR towards the holloway (F11) but not very obvious.
E	17	49			Y	Terracing running along forest track in SE-NW direction
E	21	51			Y	Terrace running N - S. visible on LiDAR. Sporadic quarrying on the W side. Appears to fade out towards N end. bank probably level area behind (E) of terrace but appears to slightly dip away after *c.* 2.5m (noticed later)

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
E	19	53			Y	Large terrace running roughly N - S direction down slope. terrace slopes up at *c.* 45 degrees gradient toward E. F20 arcs around and over the top of F19 at the N end. Visible on LiDAR. Appears to be slight bank - dips down slightly towards track on E. c.15m wide on top (noticed after original record made)
E	20	56			Y	Large terrace which appears to curve round. Runs E - W, at E end curves round in arc to NW - SE. Sloping at 45 degrees gradient. Appears to lie over L19
E	24		368256	216368	N (not on paper but may be visible on screen)	The upper terrace curves around from part way along F100?, heading initially W and then round to the N. The point where the upper terrace starts to become less distinct is at SO 68224 16405. Further N, at SO 68234 16435, the upper terrace may be continuing but it is much less obvious here.
E	27		368254	216372	N (not on paper but may be visible on screen)	The lower terrace appears to run N for some distance becoming more indistinct at SO 68217 216417. The line of this feature is masked to an extent by vegetation.

Table 27: Flaxley Woods 2005: Holloway

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
E	11	44			Y	Holloway cutting through terrace (F10) shown on LiDAR

Table 28: Flaxley Woods 2005: Bank features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	25	L2			Y	Large 'bank' linear feature running alongside track for *c.* 350m. The bank contains a number of quarry features (F 14, 13, 12 & 11). The feature is very large and therefore probably geological. The amount of Qs cut into it probably demonstrates exploitation of a particular geology. Recorded because shown on LiDAR survey & probably not archaeological. This feature appears to terminate (S end) where visible as a clear feature on the LiDAR. From this point N it becomes a distinct bank. 15 - 20 m wide - *c.* 2.5m long. Increases in height to N - becoming *c.* 4m high, in the area to the S of its coincidence with the modern forest track. The area to the S of this junction is deeply rutted - suggesting long use a forest track. The N face of this feature is fairly stony in places, and numerous small quarries and platforms (probably also quarries) are cut into this. Where the modern track runs along the top of L2, this is a steep terrace (3-4m) to the W but the E side is much more gentle and appears to be the natural slope of the hill. Where track marks to W of L22 the feature is less clear but is discernable as a low bank c 1.5m high, *c.* 15m wide.
C	48				Y	Faint linear bank orientated E-W which lines up with L6 (3-4 m to the N of it)
C	203				Y	Low earth bank - S side of track with follows 201 - track is visible on LiDAR - earth bank not a ubiquitous feature of track from *c.* 100 - *c.* 200m to E of main forest track

Table 29: Flaxley Woods 2005: Ditch features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	27		368585	216033	Y	Complex system of interlinking ditches. The ditches appear to be hand dug & measure *c.* 0.2m across x 0.5-0.1m deep. The ditches or gullies link into each other and run down the W slope of the hill. They can be found all over an area of *c.* 250m squared. Probably associated with drainage of the slope. They don't respect the modern planting layout. ditches/gullies range from 'straight' linear to curving. (See photo 6 & 7 N face. for photo showing forestry tracks & trees cutting ditches.)

Table 30: Flaxley Woods 2005: Trackways

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	34	33			Y	Trackway visible on ground and on LiDAR - more marked bank on S side. Appears to have wheel ruts like forestry tracks but some medium & small trees are growing along the track. Appears earlier than charcoal platform (33) adjacent as bank contains no black soil. Possibly. holloway modified as is so deep
E	15	47				Forest track running E-W
E	33	26				Forestry track

Table 31: Flaxley Woods 2005: Other features

ZONE	NO	LiDAR NO	EAST	NORTH	VISIBLE	DESCRIPTION
A	28	31				Break in slope – probably not archaeological & very difficult to make out c.20m wide & running N possible for entire length. Probably wouldn't have picked up if hadn't been on LiDAR.
A	36	32			Y	Dry stream bed, visible on LiDAR and clear on ground
B/A	129	22			Y	L22 is the possible return of both L1 and L27. L27 clearly continues E as far as the forestry track although this is less clear with L1 which is a less clear feature. It does not have a return corresponding with L22 - the LiDAR plot does not appear to show this continuation to the E, but this area is in shadow. To the N of L1, L22 would appear to be shadow caused by the natural slope of the hill and this would appear to be the case to the N of L22.
D	50		368735 (from top of slope)	216192 (from top of slope)	Y	Possible palaeochannel. Very wide * deep in parts. Runs *c.* 5 -10m to the NW of another possible Channel (F51). This feature, together with F50 should be visible on LiDAR, but is not. (see also F51). 2 very large yew trees growing inside the feat. Towards top of slope
E	5	38			Y	Visible on LiDAR. Very large feature, probably Geological seam, which is a continuation of F4(L37). Qs are found on the W side. To the E is a large ditch *c.* 0.5m deep visible on the LiDAR as a dark line. The seam at first gives the appearance of terracing on the W side but it followed over to E becomes clear that it is geological. Linear B, flat-topped at least 20m wide.
E	35	58			N	Area in between L45 (F12) & L43 (F10). Nothing visible in this area but has been lots of forestry clearance - LiDAR may be picking up logs etc, very brambly.
E/F	6	39			N	Linear visible on LiDAR but not on ground except for the possibility on the NE side of the track for a short distance (see photo)

Appendix J Chestnuts Wood 2003

J.i Archaeological Record Sheet

Gloucestershire County Council: Archaeology Service
FIELD SURVEY RECORD FORM

Feature No.

Chestnuts Wood 2003	Site Code: CNW03	GSMR 22053

Mapping

Has the feature been mapped on site?	YES		Map Sheet Reference	Map scale
	NO		Zone……..sheet …….of…….	1:1000

Form

Bank		Mound		Lynchet	
Ditch		Cut Feature (e.g. quarry/pit)		Masonry/brick structure	
Other					

Dimensions (metres)

Length		Height	
Width		Depth	

Description

Sketch plan (show north and approximate measurements)

Sketch profile (show orientation e.g. E – W, N – S, and approximate measurements)

Photograph taken?	Yes		Colour Print		How many Colour print?	
	No		Digital		How many Digital?	

Interpretation

Charcoal platform		Quarry		Boundary ditch		Holloway	
Well		Boundary bank		Boundary wall		Unknown	
Other							
Certainty:	Probable		Possible		Uncertain		

Date (if known)

Unknown		Modern (post 1900)		Post-medieval (1540-1900)		Other	
Evidence for date							

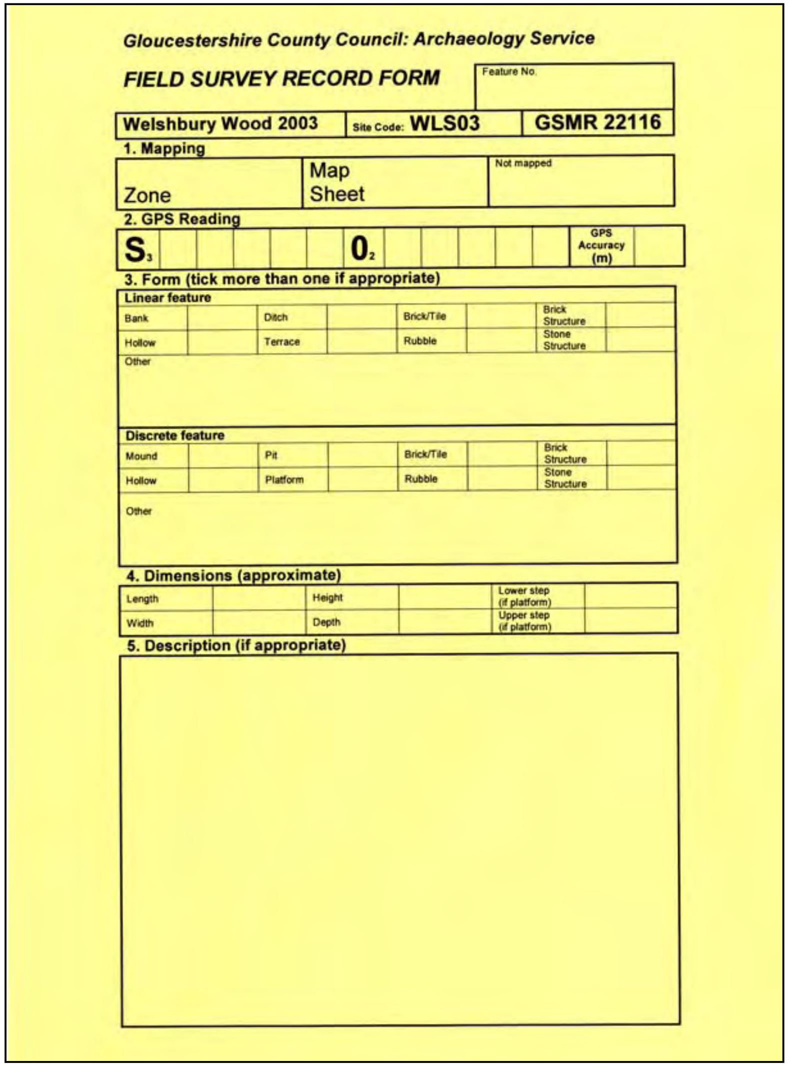
Finds

Summary of finds

Name of person who completed this form			Organisation (e.g. DAG FoCNW)			
Date		Is there a continuation sheet?	YES		Feature mapped on overall site plan (post-fieldwork)	YES	
			NO			NO	

Appendix K Welshbury Wood 2003

K.i Archaeological Record Sheet



Gloucestershire County Council: Archaeology Service

FIELD SURVEY RECORD FORM

Feature No.

Welshbury Wood 2003	Site Code: WLS03	GSMR 22116

1. Mapping

Zone	Map Sheet	Not mapped

2. GPS Reading

S						0						GPS Accuracy (m)	

3. Form (tick more than one if appropriate)

Linear feature

Bank		Ditch		Brick/Tile		Brick Structure	
Hollow		Terrace		Rubble		Stone Structure	

Other

Discrete feature

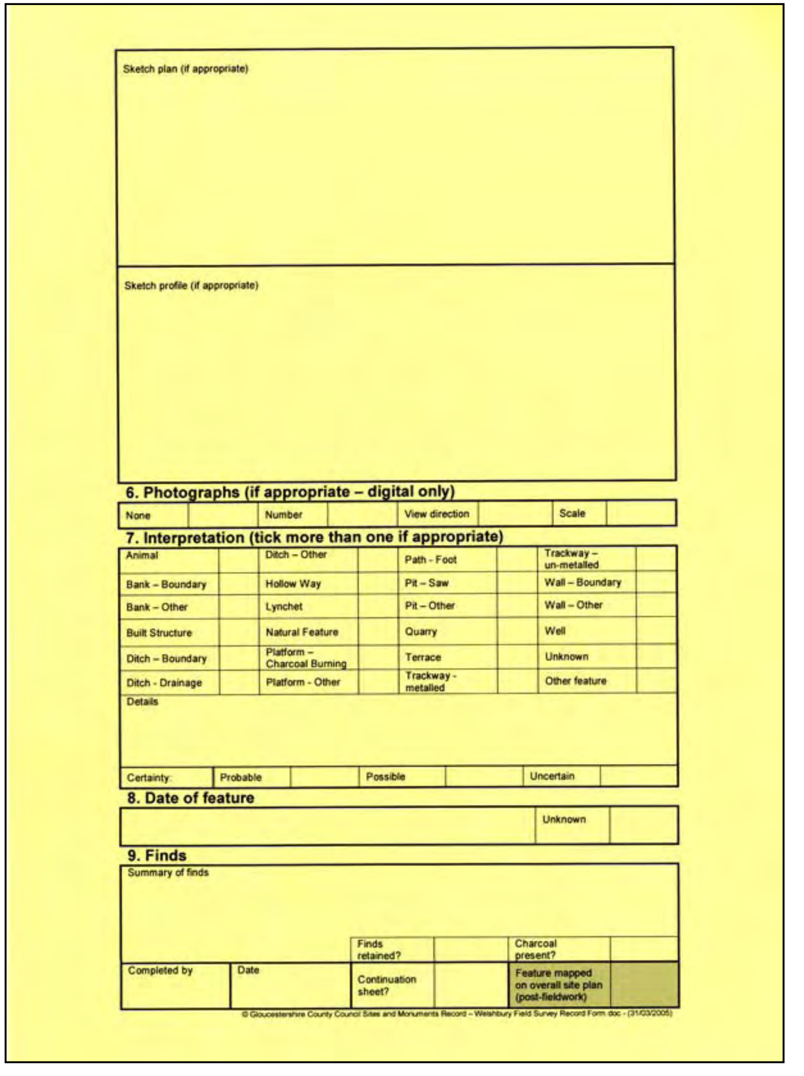
Mound		Pit		Brick/Tile		Brick Structure	
Hollow		Platform		Rubble		Stone Structure	

Other

4. Dimensions (approximate)

Length		Height		Lower step (if platform)	
Width		Depth		Upper step (if platform)	

5. Description (if appropriate)



Sketch plan (if appropriate)

Sketch profile (if appropriate)

6. Photographs (if appropriate – digital only)

None		Number		View direction		Scale	

7. Interpretation (tick more than one if appropriate)

Animal		Ditch – Other		Path - Foot		Trackway – un-metalled	
Bank – Boundary		Hollow Way		Pit – Saw		Wall – Boundary	
Bank – Other		Lynchet		Pit – Other		Wall – Other	
Built Structure		Natural Feature		Quarry		Well	
Ditch – Boundary		Platform – Charcoal Burning		Terrace		Unknown	
Ditch - Drainage		Platform - Other		Trackway - metalled		Other feature	

Details

Certainty:	Probable		Possible		Uncertain	

8. Date of feature

	Unknown	

9. Finds

Summary of finds

		Finds retained?		Charcoal present?	
Completed by	Date	Continuation sheet?		Feature mapped on overall site plan (post-fieldwork)	

Appendix L Flaxley Woods/Great Berry Wood 2005

L.i Survey Zone Record Sheet

SURVEY ZONE RECORD

1.1 Zone ID

Survey Area:	Zone.

1.2 General groundcover/visibility

(tick one box)

	Inaccessible	Access impossible due to dense undergrowth above waist height - 0% of land form visible (map area)
	Dense	Undergrowth generally above waist height: Access difficult and less than 50% of landform visible
	Poor	Undergrowth generally between knee and waist height: Access not difficult and more than 50-80% of landform visible
	Fair	Undergrowth generally knee height or below: Access generally easy and more 80% of landform visible
	Good	Little undergrowth – more than 80% of landform visible

1.3 Landuse

Type Description (use types below)

Land Use Types		
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

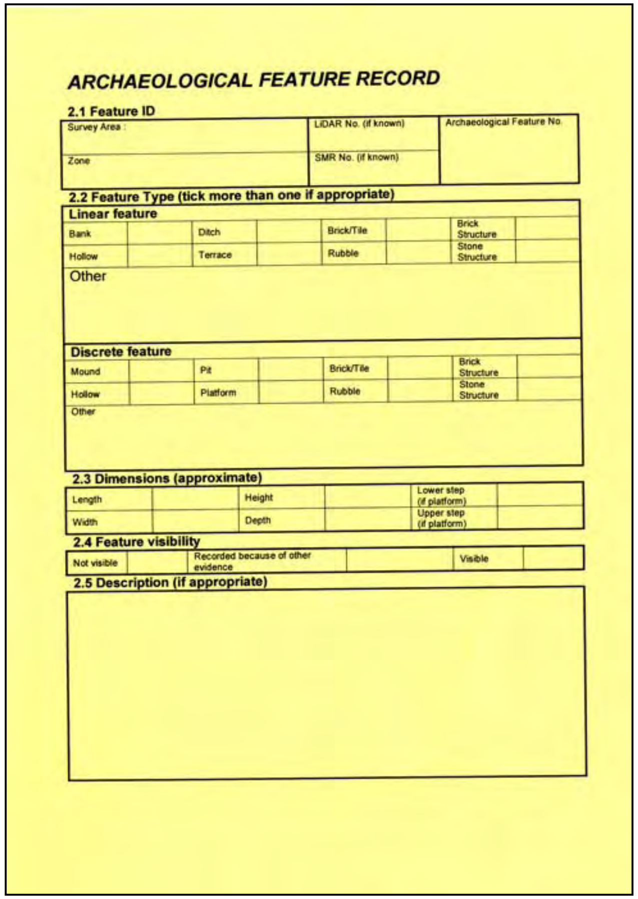
1.4 Contacts

Name (land owner)
Contact details (address and 'phone number)

1.5 Recorded by

Name (field surveyor)	Date

L.ii Archaeological Record Sheet



ARCHAEOLOGICAL FEATURE RECORD

2.1 Feature ID

Survey Area :	LiDAR No. (if known)	Archaeological Feature No.
Zone	SMR No. (if known)	

2.2 Feature Type (tick more than one if appropriate)

Linear feature

Bank		Ditch		Brick/Tile		Brick Structure	
Hollow		Terrace		Rubble		Stone Structure	

Other

Discrete feature

Mound		Pit		Brick/Tile		Brick Structure	
Hollow		Platform		Rubble		Stone Structure	

Other

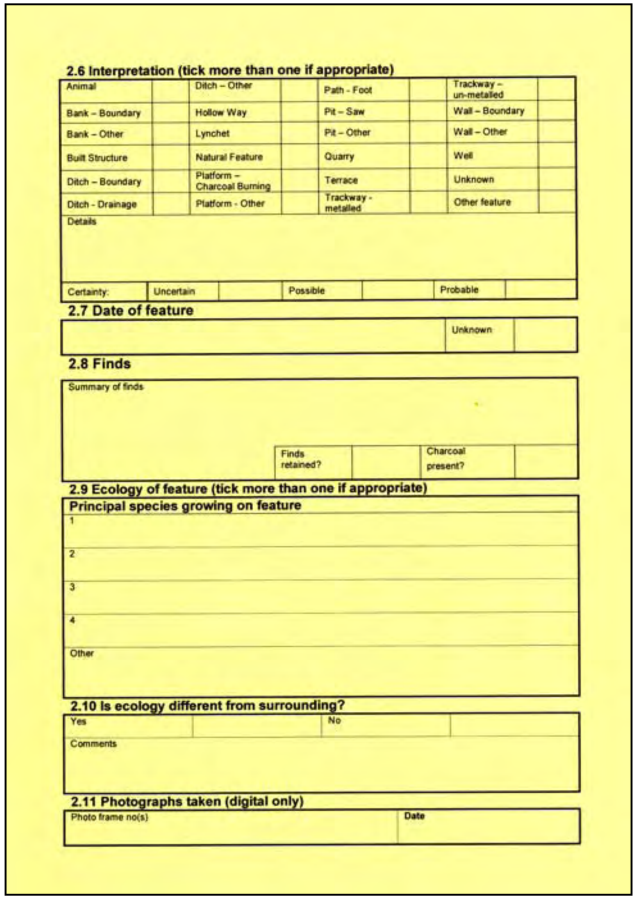
2.3 Dimensions (approximate)

Length		Height		Lower step (if platform)	
Width		Depth		Upper step (if platform)	

2.4 Feature visibility

Not visible		Recorded because of other evidence		Visible	

2.5 Description (if appropriate)



2.6 Interpretation (tick more than one if appropriate)

Animal		Ditch – Other		Path - Foot		Trackway – un-metalled	
Bank – Boundary		Hollow Way		Pit – Saw		Wall – Boundary	
Bank – Other		Lynchet		Pit – Other		Wall – Other	
Built Structure		Natural Feature		Quarry		Well	
Ditch – Boundary		Platform – Charcoal Burning		Terrace		Unknown	
Ditch - Drainage		Platform - Other		Trackway - metalled		Other feature	

Details

Certainty:	Uncertain		Possible		Probable

2.7 Date of feature

	Unknown	

2.8 Finds

Summary of finds

Finds retained?		Charcoal present?	

2.9 Ecology of feature (tick more than one if appropriate)

Principal species growing on feature

1

2

3

4

Other

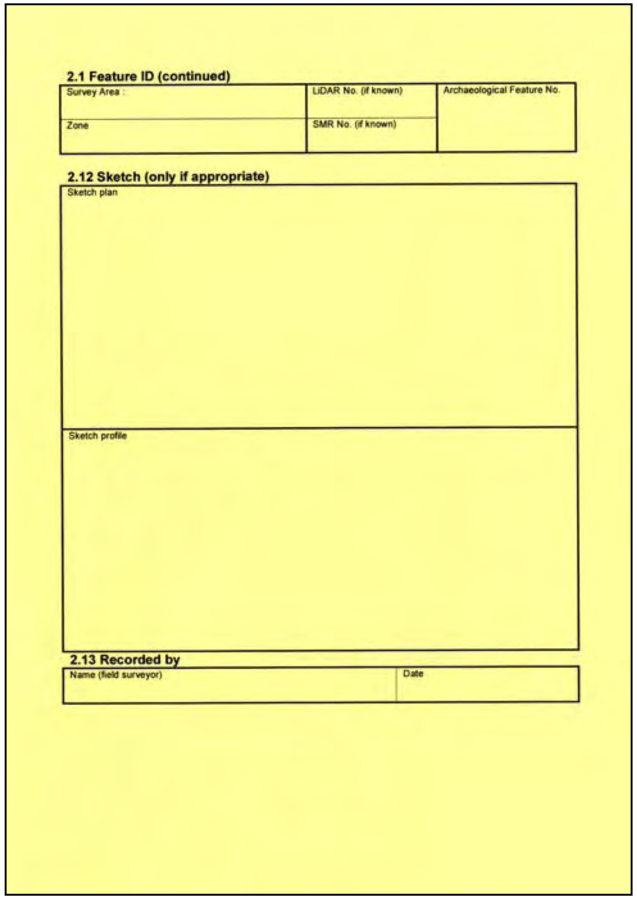
2.10 Is ecology different from surrounding?

Yes		No	

Comments

2.11 Photographs taken (digital only)

Photo frame no(s)	Date



2.1 Feature ID (continued)

Survey Area :	LiDAR No. (if known)	Archaeological Feature No.
Zone	SMR No. (if known)	

2.12 Sketch (only if appropriate)

Sketch plan

Sketch profile

2.13 Recorded by

Name (field surveyor)	Date

L.iii Revised Archaeological Record Sheet for Great Berry Wood

RAPID FIELD RECONNISSANCE ARCHAEOLOGICAL FEATURE RECORD

Archaeological feature number	

21. Feature ID

Survey area	Zone	Lidar Number (if known)	SMR (if known)

2.2 GPS Reading (more than one if not point feature)

												Acc(M)	
												Acc(M)	
												Acc(M)	
												Acc(M)	
												Acc(M)	

How located if not GPS

	Mapped? (tick)

2.3 Feature Type (tick more than one if appropriate)

Linear feature			
Bank		Ditch	
Hollow		Terrace	
Other			

Discrete feature			
Mound		Pit	
Hollow		Platform	
Other			

2.4 Dimensions (approximate)

Length		Height		Lower step (if platform)		Angle of face (degrees)	
Width		Depth		Upper step (if platform)		Angle of sides (degrees)	

2.5 Interpretation (tick more than one if appropriate)

Boundary		Hollow way		Quarry		Charcoal platform		Date (if known)	
Other									
Certainty	Uncertain		Possible		Probable				

2.6 Finds

Summary of finds	Finds retained (tick)	
	Charcoal present (tick)	

2.7 Is ecology different from surrounding

Yes		Comments
No		

2.8 Photographs taken (digital only)

Frame number(s)			View		Scale		Date			
Frame number(s)			View		Scale		Date			
Frame number(s)			View		Scale		Date			
Frame number(s)			View		Scale		Date			
Frame number(s)			View		Scale		Date			

2.9 Feature visibility (if LiDAR)

Not visible		Discernable as a result of LiDAR prompt		Clearly visible	

2.10 Description (if appropriate)

2.11 Sketch (if appropriate)

Sketch plan

Sketch profile

2.12 Recorded by

Name	Date

L.iv Ecological Record Sheet

ECOLOGICAL FEATURE RECORD

3.1 Feature ID

Survey Area :		Ecological Feature No.
SMR No. (if known)	Zone	

3:2 Feature type (tick more than one if appropriate)

Coppice		Relic tree		Discrete clump	
Pollard		Hedge line		Linear clump	
Other					

3.3 Species	%
1	
2	
3	

3.4 Dimensions (approximate)

Height from ground to top of stump or boll (for mature relic trees put FULL)		No. of poles	
Diameter of girth (1m from base) or girth of stool		Max thickness of poles	

3.5 Clarity of interpretation

Unclear (0 - 30%)		Possible (30 - 70%)		Clear (70 – 100%)	

3.6 Description (if appropriate)

3.7 Photographs

Photo frame no(s)	Date

1

3.8 Sketch (only if appropriate)

Sketch plan

Sketch profile

3.9 Recorded by

Name (field surveyor)	Date

2

Appendix M Review of rapid field survey methodologies

M.i Chestnuts Wood Survey 2003

Table 32: Advantages and disadvantages of desk-based data collection methodologies

Element of survey	Advantages	Disadvantages	Action for future projects
Working with members of the community	Fulfilled community involvement objective of project.	Time consuming to organise and monitor. Guidelines on what data to collect and how to present it for collation were not always followed by participants Variable and unpredictable numbers of volunteers with mixed abilities. Resulting information of variable quality and in inconstant formats. Not all volunteers produced any information or undertook the research to which they had agreed.	Factor in additional time for monitoring of this process. Tighter control over the types of data collected and the formats in which it is presented. Only undertake data collection in this way if the purpose of the survey is community involvement.

Element of survey	Advantages	Disadvantages	Action for future projects
Information collected from a wide range of historical sources	Enabled a number of volunteers to be involved, fulfilling community involvement objective of the project Provided useful “background” to the history of the area.	Much diverse data of limited value to the survey was collected. Guidelines on what data to collect and how to present it for collation were not always followed by participants Lack of critical analysis of the relative value and credibility of diverse sources	If the objective of the project is community involvement as wide a range of sources as are available should be consulted. The only information of direct value to inform the survey was that contained in the Sites and Monuments Record and available 19^{th} and early 20^{th} century maps.

Table 33: Advantages and disadvantages of the survey methodology

Element of survey	Advantages	Disadvantages	Action for future projects
Survey undertaken in the early part of the new year	Undergrowth low in areas of deciduous and mixed woodland maximising feature visibility, ease of access and possibly efficiency of GPS.	Weather unpredictable for a community project	Survey in deciduous and mixed woodland should continue to be undertaken at this time of year
Working with members of the community	Fulfilled objective of project	Variable and unpredictable numbers with mixed abilities. Difficult to plan programme for survey. Effects confidence in survey results	Factor in additional time for training of both staff and participants. Factor in additional time to check recorded features Ensure adequate amateur professional ratio Ensure all staff in charge of survey teams are fully competent and familiar with the types of feature likely to be encountered and with the recording methodologies to be adopted
Paper pro-forma recording system	Easy to use, and allowed for flexibility of tasks within teams Cheap to produce	Extra equipment to carry	Continue to use for projects of this kind

Element of survey	Advantages	Disadvantages	Action for future projects
Spatial recording in map form.	Easy to use, and allowed for flexibility of tasks within teams Allowed for visual check of special accuracy Allowed large, or complex features to be recorded Allowed for special recording in the event of the GPS not working	Additional time on site if this is undertaken in conjunction with written records. Difficult to map features by type if this is the only method of recording position. Additional time needed off site to input data	Record GPS readings (where available) for features on recording sheets to allow information to be rapidly added to a simple database (e.g. Excel)
Map recording at scale 1:1000	Easy scale for the inexperienced. Map scale large enough for relatively un-cluttered field records.	Too large a scale for “handy-sized” maps. Encourages “over recording” of features.	Review scale depending on size of survey and make-up of the survey team.
Surveying within pre-determined Zones	Allowed for field teams to have clear demarcation or areas of survey, thus avoiding duplication. Particularly valuable with large groups.	Relies on clear divisions within the woodland, such as paths or tracks. Can lead to mind set in which the boundaries of zones act as the limits of thinking about features	Determine whether this is appropriate on a case by case basis
Landuse and ground conditions not formally recorded for each Zone	There was no advantage in not recording this information	The lack of information on ground condition and visibility of features militated against these factors being included in any discussion of the distribution of recognised features	Ensure that landuse and ground conditions are recorded is all future surveys

Element of survey	Advantages	Disadvantages	Action for future projects
Photographs were not systematically used as a means of recording. This was essentially a product of the fact that high quality digital cameras were not used by the Archaeology Service at the time of the survey. Colour print technology was considered too time consuming to process, too costly in terms of photograph production, and too subject to the effects of poor light to be routinely used in this survey.	This had advantages in terms of the time spent recording each feature, and also the cost benefit of not using the technology, which was available at the time of the survey.	Lack of a photographic record of individual features (a number of general “record shots” were taken)	It was felt that, given the photographic technology available (and affordable) at the time of the survey, the lack of a general photographic record was appropriate. This should be reviewed in the light of technological developments for future surveys.

M.ii Welshbury Wood survey 2003

Table 34: Advantages and disadvantages of desk-based data collection methodologies

Element of survey	Advantages	Disadvantages	Action for future projects
Only SMR and 1st – 3rd Series OS maps consulted	Rapid. Provided information of direct value to the survey.	Assumed SMR fully up to date and comprehensive. Lacked general historical background to the area.	These sources should continue to be consulted as a preliminary to field survey, to alert surveyors to features (e.g. industrial remains), which may be present within the survey area. This should not preclude appropriate general historical research (for example the Victoria County History) particularly when the results of the survey are being interpreted after the field survey has finished.

Table 35: Advantages and disadvantages of the survey methodology

Element of survey	Advantages	Disadvantages	Action for future projects
Part of the survey undertaken in an area of mature conifer plantation.	Access and ground visibility generally good due to lack of undergrowth. Systematic coverage generally easier due to regularity of planting.	GPS may be less efficient due to denser canopy cover (although no problems with this were experienced as part of this survey). Woodland fairly dark due to canopy cover, which may make photography more difficult.	As long as conifer is fairly mature (i.e. it is possible to walk through) there is no reason why rapid field survey cannot be undertaken in this type of woodland.
Part of the survey undertaken in an area of recently clearfelled woodland.	Good satellite coverage for GPS due to lack of canopy cover Clear visibility over relatively long distances which may aid systematic coverage and estimations of location	Access extremely difficult due to spread detritus from felling operations, cancelling out any supposed advantages of systematic coverage in open areas. Features masked by felling detritus.	All surveys should, wherever possible be undertaken in advance of clearfelling or other major forestry operations
Survey undertaken in early spring	Weather generally less unpredictable than in winter months.	Given that this survey covered an area of recently clearfelled woodland and an area of conifer plantation, no particular disadvantages were identified.	Survey in areas of conifer can be undertaken at this time of year

Element of survey	Advantages	Disadvantages	Action for future projects
Working in teams of two.	This had a health and safety advantage as at no time were surveyors working alone. This was of particular value within the clearfelled area Zone A, where felling detritus and brash mats were a considerable trip hazard. Teams of two allowed recording tasks to be split between team members with one undertaking written recording and the other team member being responsible for feature location and mapping. Teams of two allowed for the interpretation of unclear features to be discussed in advance of recording. Teams of two allowed for individuals to walk separate transects, encompassing a wider "search area" than an individual would have been able to command.	Teams of two may be less efficient (in terms of person time) than individuals. Although subsequent testing of this (see M.iii below) suggested that, where features are recorded and mapped manually, this was marginal, and that the health and safety advantage outweighed this consideration	Continue to work in teams of two where recording is undertaken manually. Test efficiency of remote recording systems for future projects

Element of survey	Advantages	Disadvantages	Action for future projects
Paper pro-forma recording system	Easy to use. Cheap to produce Efficient on site if teams of two are employed. Allowed for flexibility of tasks within teams where two person teams were used	Extra equipment to carry. Problematic in bad weather Additional time needed off site to input data	Test efficiency of remote data capture
Spatial recording in map form. NB As part of this project, spatial recording of grid references for point features was also recorded on the paper recording forms	Easy to use. Efficient on site if teams of two are employed. Allowed for flexibility of tasks within teams where two person teams were used. Allowed for visual check of spatial accuracy Allowed large, or complex features to be recorded Allowed for spatial recording in the event of the GPS not working	Additional time on site if this is undertaken in conjunction with written records. Difficult to map features by type if this is the only method of recording position. Additional time needed off site to digitise data.	Explore feasibility of remote data capture for future projects. Explore feasibility of not mapping features and recording all spatial information on text field records.

Element of survey	Advantages	Disadvantages	Action for future projects
Map recording at scale 1:2000.	Easy scale for experienced field recorders as similar to 1:20 employed in standard archaeological excavation records Scale was appropriate for the size of survey area as each survey zone fitted onto a single A4 sheet. Map scale large enough to allow for relatively uncluttered field recording, but small enough to discourage "over-recording".	None identified	Review on a survey by survey basis, particularly in the light of exploration of remote data capture or recording spatial information in written form (see above)
Surveying within pre-determined zones.	Allowed for field teams to have clear demarcation or areas of survey, thus avoiding duplication. This was particularly appropriate during this survey as zones also had clear separate landuses and survey conditions.	Relies on clear divisions within the woodland, such as paths or tracks. Can lead to mind set in which the boundaries of zones act as the limits of thinking about features	Determine whether this is appropriate on a case-by-case basis. Review whether most appropriate to determine this on the basis of clear, mapped landscape divisions, or whether this should be determined on the basis of recognisable landuse changes.

Element of survey	Advantages	Disadvantages	Action for future projects
Recording GPS location of feature	Allowed for “double check” of location of features if these appeared to have been mapped incorrectly. Allowed for rapid location of features without reference to the map sheets.	Limited to grid reference as recorded by GPS (i.e. assumed that this technology would function). No facility for recording how feature had been located if not by GPS. (Neither of these were a problem during the Welshbury survey.) Limited to recording of a single grid reference per feature – did not allow for multiple grid reference for linear or large area features (This was not an issue in the Welshbury survey where mapping was the main system of spatial location)	Allow for multiple grid references if appropriate. Allow for record to be made of other means of spatial location if GPS not working.
Ground conditions not formally recorded for each zone	This was not felt necessary for the Welshbury survey as the two zones fell within distinct areas of different ground conditions which were identified in advance of the survey.	Although ground conditions were recorded as part of the survey, no indication of the impact this had on the visibility of features and the potential of an area to miss selected feature types	Ensure that ground conditions and the effects this has on the visibility of features and their potential to be accurately recognised and recorded is all future surveys

Element of survey	Advantages	Disadvantages	Action for future projects
Photographs were not systematically used as a means of recording. As with the Chestnuts Wood survey (see above), this was essentially a product of the fact that high quality digital cameras were not used by the Archaeology Service at the time of the survey. Colour print technology was considered too time consuming to process, too costly in terms of photograph production, and too subject to the effects of poor light to be routinely used in this survey.	This had advantages in terms of the time spent recording each feature, and also the cost benefit of not using the technology which was available at the tie of the survey.	Lack of a photographic record of individual features.	It was felt that, given the photographic technology available (and affordable) at the time of the survey, the lack of a general photographic record was appropriate. This should be reviewed in the light of technological developments for future surveys.

M.iii Flaxley Woods and Great Berry Woods 2005

Table 36: Advantages and disadvantages of the data recording systems

Mapping technique	Advantages	Disadvantages	Action for future projects
Digital recording of database information	Easy and rapid to use in the field when equipment working correctly. Rapid and easy to upload information into the project database Hand held computer light, small and easy to carry and convenient to use in poor weather conditions. This is of particular importance when this is combined with digital mapping, significantly reducing the amount of equipment which needs to be carried As all digital information is recorded on a single small hand-held computer, this does not allow for easy division of labour when teams of two were employed on the survey. No danger of running out of record sheets in mid survey when replacements cannot be easily obtained	iPAQs proved prone to equipment failure and reduced efficiency due to short battery life. The digital database was heavily reliant on correct functioning of the digital mapping system, and thus the GPS which proved problematic in a woodland environment. iPAQs often slow due to storage of large “base map” files”. Danger of information loss due to catastrophic systems failure	Ensure equipment is in good working order and appropriate for the job Separate (or at least allow for separation of) the digital mapping and database recording to allow one system to function correctly if the other goes down. Consider addressing operational speed issues of iPAQs by using them simply as a means of recording database information and removing large “base map” files.

Mapping technique	Advantages	Disadvantages	Action for future projects
Recording of database information on paper recording sheets	Easy to use Allowed for easy division of labour when teams of two were employed on the survey. .	Relatively cumbersome as file of A4 sheets needs to be taken out on site Danger of running out of record sheets Paper recording systems prone to difficulties in poor weather conditions Time consuming to digitise results after field survey has finished	Explore improved methods of recording this information in digital form

Table 37: Advantages and disadvantages of the mapping systems during the Flaxley and Great Berry Wood survey

Mapping technique	Advantages	Disadvantages	Action for future projects
Digital mapping	Easy and rapid to use in the field when equipment working correctly. Rapid and easy to upload information into the project GIS. Hand held computer light, small and easy to carry and convenient to use in poor weather conditions. This is of particular importance when this is combined with digital recording of database information, significantly reducing the amount of equipment which needs to be carried. As all digital information is recorded on a single small hand-held computer, this does not allow for easy division of labour when teams of two were employed on the survey. No danger of running out of map sheets mid survey.	iPAQs proved prone to equipment failure and reduced efficiency due to short battery life. iPAQs often slow due to storage of large "base map" files". Mapping with the iPAQs was heavily reliant on correct functioning of GPS which can be problematic in a woodland environment. Difficult to locate features with any degree of accuracy on the iPAQ in the absence of GPS readings. Danger of information loss due to catastrophic systems failure The digital mapping bases which had been downloaded onto the iPAQs were essentially consisted of monochrome line data, which could be difficult to comprehend when in the field. The screen size of the iPAQs (c. $6cm^2$) was too small to enable field surveyors to easily grasp scale and context	Ensure equipment is in good working order and appropriate for the job The relative advantages of digital and paper mapping, and the recommended action for future projects is discussed more fully below.

Mapping technique	Advantages	Disadvantages	Action for future projects
Paper mapping on drawing film overlays of OS bases	Easy to use Intuitively simpler to “roughly locate” features in situation where the GPS was not functioning. Allowed for easy division of labour when teams of two were employed on the survey. Allows for rapid verification of correct location of features minimising possibility of recording GPS location incorrectly.	Relatively cumbersome as A3 map sheets too large for easy transfer in and out of standard sized bags. A3 map sheets may be limited to a section limited to a section of survey area which may necessitate carrying additional equipment. Time consuming to digitise results after field survey has finished No easy “on-site” checking that features are correctly located, particularly in relation to each other and visible landscape features. In practice, although where accuracy readings were below *c.* 10m the GPS proved to be remarkably accurate (see below), there were a number of problems with the results of the Great Berry Wood survey with features clearly not relating correctly to features mapped on the OS base maps onto which the survey results were digitised. No “on-site” checking that GPS readings have been accurately recorded by fieldworkers. In practice this type of anomaly proved relatively easy to correct in the case of linear features, although not with discrete features	It is clear that the advantages of digital mapping outweigh those of paper mapping in terms of the speed with which information can be uploaded into the main project database, and also the convenience with which digital equipment can be transported in the field. However, the intuitive facility with which features can be “sketched” onto traditional map bases with reasonable accuracy in situations where electronic location systems do not function is a major factor in favour of traditional mapping systems in this type of survey. This deficiency of the digital map bases could be resolved by utilising Raster map bases which appear more familiar or investigating using LiDAR results as a base map, as unlike the OS map base these show a range of visible landscape features (not just potentially significant archaeology) and as such are intuitively easier to use as a mapping base in situations where the GPS is not functioning efficiently

Mapping technique	Advantages	Disadvantages	Action for future projects
Recording location as OS grid points as part of features record (i.e. no mapping takes place on site)	Speeds up recording by removal of one of the physical actions entailed in this. Results can easily be transferred into a format in which recorded OS grid points are displayed on GIS systems negating need for digitisation of point features and facilitating digitisation of line and large area features.	Lack of accuracy with the GPS may cause problems with linear or large area features made up of a number of points. In practice this was not a problem with discrete features as the GPS readings, although stating an accuracy level of *c.* 10m proved to be extremely accurate although linear features (Figure 18) tended to look artificially regular as a result of the limited number of recorded points which could only be joined by straight lines. Although discrete features (i.e. those recorded as a single OS grid point) could easily be transferred to and plotted from the project GIS, linear and large area features proved relatively time-consuming to plot when back in the office and with this type of feature It was not clear that there was any real cost benefit in not mapping features of this type in the field.	Fieldworkers should take OS map bases into the field to check locations of features if they felt this was appropriate. These could also be used to make a map record of linear features, large area features or other complex features if this was felt to be appropriate. As discrete features would not be plotted on these maps they could be at a relatively small scale to minimise equipment (an A4 map is considerably easier to carry in the field than an A3 one), although appropriate scales for this would be determined on a case by case base the basis.

Table 38: Advantages and disadvantages of equipment trialled in the Flaxley and Great Berry Wood survey

Equipment	Advantages	Disadvantages	Action for future projects
iPAQ hand held computers with ArcPad GIS and digital database	Quick and easy to use when working Convenient size for field survey	Although additional memory had been added to the iPAQ for the Scowles and Associated Iron Industry Survey these instruments could run very slowly, presumably due to the size of the files. Battery life was limited, and these instruments ran increasingly slowly throughout the day rendering them sluggish and difficult to use in the afternoons Weak point at cable link with hand-held GPS causing systems failure. Information needs to uploaded into main computer each evening to minimise risk of data loss due to catastrophic systems failure.	Check that integral batteries are in good order and replace if necessary. Ensure fully charged when field survey begins. Investigate possibility of limiting map bases to make equipment more efficient. Ensure that ancillary equipment is in good working order in advance of surveys and repair if necessary Given the fact that technology of this type is in a continual state of improvement and change, specifications for this type of equipment should be reviewed as in advance of each project.
Hand held GPS	Small, light and easy to use. Battery life adequate for a full day, and spares could easily be carried. Cheap to purchase	Accuracy variable dependant upon satellite reception. May not function in certain landscape conditions	Continue to use this equipment

Equipment	Advantages	Disadvantages	Action for future projects
Digital camera	Small, light and easy to use. Battery life adequate for a full day, and spares could easily be carried. Reasonably cheap to purchase Allows for digital manipulation of very dark images in the woodland No on-cost for processing of photographs. Policy of photographing features ensures a reasonable archive of record shots.	Policy of photographing all features adds time to the recording process. Photographs are of varying value due to nature and visibility of features in undergrowth and woodland. Photographs need to be archived in a systematic way (each evening after fieldwork) to ensure retrievability	Continue to use this technology. Photographic policy should allow for some discretion not to photograph all features, but the default should be “if in doubt – photograph” particularly where features are thought to be of archaeological significance or are representative examples of particular feature types.

M.iv Discussion of the advantages and disadvantages of the validation of LiDAR procedure employed during the survey of Flaxley Woods

The following table identifies the main processes adopted in the validation of the LiDAR results, discusses their advantages and disadvantages and makes suggestions for future projects

Table 39: Advantages and disadvantages of the process of validation of LiDAR in Flaxley Woods

Element of survey	Advantages	Disadvantages	Action for future projects
Identification of features of likely archaeological significance and assignation of LiDAR numbers in advance of field survey	Necessitates some evaluation of the potential significance of the LiDAR images in advance of fieldwork.	In practice pre-determining which LiDAR features were likely to be of archaeological significance, and therefore in need of validation, proved not to be helpful, as a number of these features needed to be sub-divided, or new features added by the field surveyors	Some evaluation of the potential significance of the LiDAR features is needed in advance of fieldwork, as, without this, any validation would be unfocussed. This should, however, be limited to identifying the main types of features which are likely to be present in a given area and not attempting to over-interpret the LiDAR image or assign number to them which may need changing in the field.
Taking printouts at scale 1:10000 into the field	This scale had the advantage of allowing an overview of the potential features	Too large a scale to allow for annotation in the field.	Maps at this scale should continue to be used, but not for the purposes of annotation or identifying detail
Taking printouts at scale 1:4000 into the field	This scale showed detail without loss of resolution. This scale was easy to use with a gridded film overlays in 1mm divisions. This scale was large enough to allow for annotation.		This scale should continue to be used as the basic scale for validating LiDAR results in the field

Element of survey	Advantages	Disadvantages	Action for future projects
Using printouts on normal A4 paper	Readily available.	Image too coarse for fieldwork. Many areas printed out more “shaded” i.e. too black to see any definition than they appeared on screen	Print outs should be on the highest possible quality paper available, preferably photographic quality paper to ensure no loss of detail.
Using gridded drawing film as an overlay	Readily available Easy to scale-up distances if required. Can be annotated in pencil which allows for easy correction if necessary	Relatively opaque. This medium proved difficult to use in the field as it was physically hard to see through especially in poor light, a situation not uncommon within woodland	Overlays to LiDAR plots should be as transparent as possible, clear acetate being preferred. This will require the use of special pens for annotation purposes and care should be taken to ensure that these do not run in wet conditions.

Element of survey	Advantages	Disadvantages	Action for future projects
Incorporating LiDAR validation into rapid field reconnaissance	This had the advantage of ensuring that features other than those visible on the LiDAR plots were recorded.	Slowed down the validation process as it was relatively difficult to concentrate on the validation process if there was a necessity to seek out and record features not visible on the LiDAR	Whether this is a beneficial methodology or not actually depends on the aims and objectives of given survey. One of the aims of the Flaxley survey was simply to validate features visible on the LiDAR survey and consequently it proved most efficient to validate the results of the LiDAR as a separate operation to the general rapid reconnaissance survey. Where LiDAR indicates the likely presence of linear features it is likely to be most efficient for future surveys to demarcate areas within the woodland through the validation of the visible linear features and then undertake rapid field reconnaissance in those areas demarcated by the recognised features.
Using LiDAR images with a resolution of 1m	Clearer at larger scale (1:10, 000 or above) Cheaper as this resolution only requires the original survey to be flown at a lower resolution	Lack of detail at smaller scales. Although this tends not to effect the process of identification of features from the LiDAR images, it does limit the LiDAR images to this single function, where greater resolution has the potential to clarify some detail at smaller scales.	LiDAR surveys should be taken at a scale which allows for hillshading at a resolution of 0.5m, although images at a 1m resolution should also be produced for large-scale assessment of the results.

Element of survey	Advantages	Disadvantages	Action for future projects
Using LiDAR hillshading images lit from only one direction	Relatively easy to produce	As LiDAR images indicate changes in ground surface lighting hillshading images from one direction only can either fail to highlight features which are orientated in such a way that the lighting pattern does not cast a shadow, or can obscure features sited within the shadow of natural topography or larger features.	The University of Cambridge Unit for Landscape Modelling are working on a system by which the shading characteristics of eight cardinal points can be displayed on a single image. This lighting regime should be used for all future LiDAR images.
Using hard copies of LiDAR plots in the field	Easy to produce. Can be produced to scale making them useful as up-to-date maps of the woodland for navigation purposes	Difficult to annotate (see above)	Hard copies should still be produced to scale for navigation purposes. Future projects should explore the possibility of transferring LiDAR data to hand-held computers in digital format
Referencing identified features to LiDAR features	This system enables a record to be maintained of those features which are visible on the LiDAR image and those which are not. This system allows identified features to be recorded with reference to the LiDAR image without the need for further mapping	This system adds an extra tier of recording to the process	In general this system works well and should continue to be used, although it is clearly not the only way of achieving this

Table 40: Relative merits of two person and single person survey teams

Survey factor	One person	Two person	Cost benefit analysis
Paper pro-forma recording system without mapping of features unless considered appropriate	This recording system could easily be managed by a single person, although extra recording time was required for photography	Quicker with a team of two as one could take photographs whilst the other recorded features details. In practice however, one team member was under-employed as part of this system	During the Great Berry Wood survey the lone worker, who was not mapping features recorded 54 separate features, whilst the two person team (who were, for the sake of efficiency mapping features) recorded only 44. Although this is a crude comparison, it does indicate that without the on site mapping of features a single worker is the most efficient way of undertaking this type of survey.

Survey factor	One person	Two person	Cost benefit analysis
Paper pro-forma recording system with mapping of features	Relatively cumbersome operation for lone worker	Two person team allowed for efficient distribution of tasks with one person taking main responsibility for database recording whilst the other	During the Flaxley Woods survey the lone worker recorded 44 separate features, whilst the two-person team recorded 74. Although this crude comparison might suggest that a lone worker undertaking this recoding system is more efficient than a two person team, this only represents a 15% productivity increase, which given the variables inherent in this calculation (such things as recoding features of variable degrees of complexity, or differential terrain and accessibly issues) would actually suggest there is no discernable cost benefit difference between lone works or teams of two when undertaking the survey in this way.
Ease of navigation	No discernable benefit for a lone worker	A two person team has the potential for navigation to be facilitated, although two people could equally complicate this issue	No discernable difference
Feature recognition	No discernable benefit for a lone worker	A two-person team has the potential for feature recognition be facilitated, although two people could equally complicate this issue.	No discernable difference

Survey factor	One person	Two person	Cost benefit analysis
Health and Safety considerations	Lone worker is clearly more hazardous than working a team	Working as a team is clearly less hazardous than as a lone worker.	Although working as a two person team is clearly less hazardous than lone working, simple equipment and reporting strategies can be put into place to ensure that the risks of lone working are within reasonable tolerances, and accordingly there is no discernable benefit in a two person team.
Other considerations			
Digital pro-forma recording system without mapping of features unless considered appropriate		For reasons explained in Appendix A, E.iv.i this was not trialled as part of the pilot field survey. It is envisaged that this system would not be significantly different in cost benefit terms than the recording on paper pro-formas (see above).	
Digital pro-forma recording system with mapping of features unless considered appropriate		For reasons explained in Appendix A, E.iv.i, this was not trialled as part of the pilot field survey. It is envisaged that this system would not be significantly different in cost benefit terms than the recording on paper pro-formas (see above).	

Appendix N Specification for LiDAR survey

A part of the assessment of the value of LiDAR the project team met with Bernard Devereux and Gabriel Amable from the Cambridge Unit of Landscape Modelling, Peter Crow and Tim Yarnell of the Forestry Commission and Simon Crutchley of English Heritage, to discuss the value of hillshaded LiDAR images as a method of identifying archaeological features.

The following general specifications for LiDAR survey of woodland draw on the results of that discussion and informal notes to this meeting, and further discussion with colleagues prepared by Peter Crow of the Forestry Commission (Crow 2005).

N.i Timing

Leaf cover and undergrowth can have an adverse effects on the results of LiDAR survey in woodland, and consequently LiDAR survey should be undertaken in early new year (January or February) when undergrowth is at its lowest and deciduous trees are without leaves.

N.ii Survey density

The results of surveys undertaken at a density of 1 point per m^{2}. were considered too coarse for the purposes of identifying archaeological features. On the other hand a resolution of 4 points per m^2 was considered unnecessarily high.

The hillshaded LiDAR images, however, can be modified to display the information at less than the survey resolution, whereas, it is not possible to display hillshaded LiDAR images as a resolution greater than the survey resolution, as this risks creating features by “filling” gaps in the original survey density. Accordingly it is recommended that the original survey density should be undertaken at as high a resolution as is practicably possible.

Where LiDAR survey is being undertaken in a wooded environment there are the following additional benefits from a relatively high-resolution survey:

- A higher resolution survey increases the percentage of laser pulses which will penetrate the canopy cover to reach the woodland floor, thus increasing the possibility of correctly identifying features, particularly smaller discrete features.
- A higher resolution survey would increase the possibility that the survey results will be of value to other agencies. This may be of particular value where the raw survey data could be used to provide details of the shape, height and structure of the woodland cover.

The principal cost of the survey is determined by the amount of time the aircraft is in the air, and care should be taken to ensure survey is not undertaken at a higher resolution than required. However, there is a basic cost required to undertake the survey at any resolution and the cost increase for higher resolution survey need not be directly proportional to the amount of time in the air, and should decrease relative to this.

Further exploration of the precise costs of surveys undertaken at different resolutions will be required before final decisions can be made on this issue, but it may prove appropriate to consider a compromise survey resolution of 2 points per m^{2}.

N.iii Hillshaded LiDAR image resolution

The hillshaded LiDAR image resolution is a product of the processing of the raw survey data. This raw data is converted to an image through a process known as gridding, by which the x-y co-ordinates of the raw data are applied to a grid of specified cell size (e.g. 1m, 0.5m, 0.25m).

The hillshaded LiDAR images, which were of most value to the identification of archaeological features, were those which had been “gridded” at a 0.5m resolution or less.

N.iv Hillshaded LiDAR image shading

The lighting of the hillshaded LiDAR images should be designed to maximise the identification of potential features, regardless of their orientation, and also to ensure that no features are obscured by excessive shading from adjacent hill slopes.

Comparison of the composite images which combine the results of illumination from eight cardinal points, with the unidirectional images used during the rapid field reconnaissance indicated that, although the majority of features were visible on the uni-directional image, a number were considerably clearer on the multi-directional image.

The GIS currently used by Gloucestershire County Council is ArcGIS. A 3D analyst module could be added to this which would allow Archaeology Service staff to manipulate the data to produce uni-directional images. A further consideration is the possible effect that variations in slope will have on the effectiveness of hill shading as even multi-directional images are likely to be created using a single illumination altitude, whilst 3D analyst would give Archaeology Service Staff direct control over this (S Crutchley, English Heritage pers. comm.)

The relative cost (in staff time) and benefit of direct manipulation of images will need to be considered against the cost of commissioning hillshaded LiDAR images which combine the effects of illumination from eight cardinal points, before a final decision is made on this specification, and it may prove most efficient to commission multi directional images and then undertaken further, minor manipulation as deemed appropriate.

N.v Vegetation and ground cover

Variations in canopy and undergrowth density clearly will have an impact on the efficacy of the results of the LiDAR survey, particularly as different algorithms will be required to effectively remove different densities and types of vegetative cover.

In practice, field validation of the LiDAR results did not discern any particular difference in the value of the hillshaded LiDAR images and the recorded woodland cover, although, it was frequently possible to discern slight changes in the “background noise” on the hillshaded LiDAR images which corresponded to changes in woodland cover (Figure 39).

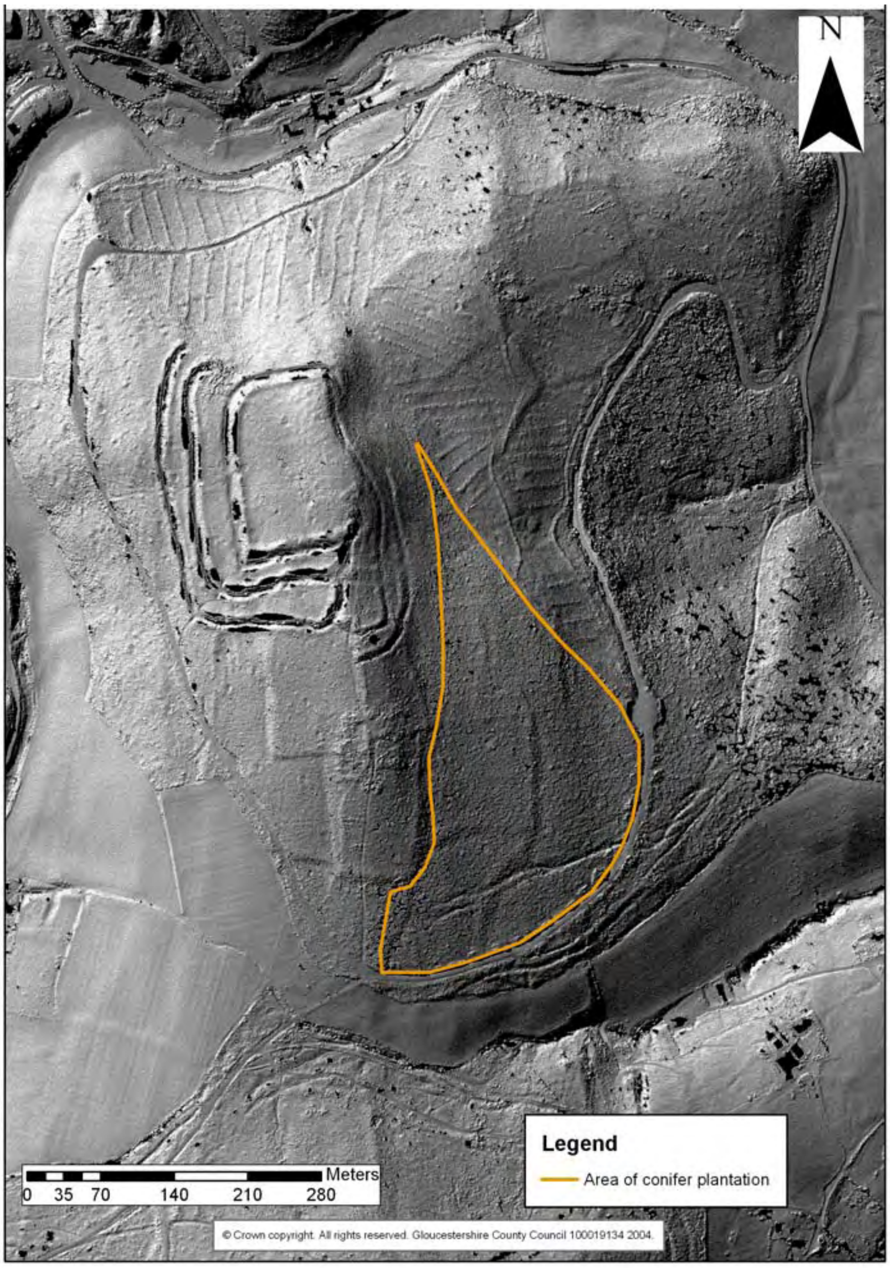


Figure 39: Welshbury Wood LiDAR survey: Effects of differential woodland cover on the hillshaded LiDAR images. © Forest Research

Given the mixed nature of the woodland cover in the Forest of Dean, it would not be feasible to simply target a particular woodland cover type for survey, although, wherever possible, the LiDAR contractor should be provided with data on woodland cover to enable them to make any adjustments to their calculations as appropriate

N.vi Laser pulse footprint and scan angle

Although not discussed at the meeting, research undertaken by a Forestry Commission colleague of Peter Crow indicates that better results are achievable in a woodland environment by combining a large laser pulse footprint with a narrow scan angle (i.e. reducing the arc of the laser sweep to within *c.* 12^0 of vertical), a combination which should increase the quantity of laser pulses which penetrate the canopy cover and reach the ground (Crow 2005).

The disadvantage of this process is that it would reduce the area of ground actually covered by each pass, thus increasing the flying time (and therefore cost) of any survey.

Further discussion with the LiDAR contractor would be required to determine appropriate compromise sweep arcs and footprints to achieve sufficient laser penetration without incurring unreasonable costs.

Appendix O Placenames suggesting Palaeoenvironmental potential within the Statutory Forest

Table 41: Green & Lawn Placenames

NAME	SOURCE
Brandets Green	1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)
How Green	1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)
Knockley Green	1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)
The Sally Green	1835 (Sopwith)
Old Speech House Green	1700 Map (Unknown 17th/18th Century)
Santlo Green	1700 Map (Unknown 17th/18th Century)
Slothins Green	1700 Map (Unknown 17th/18th Century)
Bowling Green	1700 Map (Unknown 17th/18th Century)
Knave Old Green	1700 Map (Unknown 17th/18th Century)
Sweet Green	1700 Map (Unknown 17th/18th Century)
Whetstones Green	1700 Map (Unknown 17th/18th Century)
Cartway Green	1700 Map (Unknown 17th/18th Century)
Stockhalls Green	1700 Map (Unknown 17th/18th Century)
Gabbage Green	1700 Map (Unknown 17th/18th Century)
Greenway Farm	Modern OS (OS 2004)
Ellwood Green	Modern OS (OS 2004)
Woorgreens	Modern OS (OS 2004)
Brandwick Green	Modern OS (OS 2004)
Moseley Green	Modern OS + 1834-5 Map of W. Dean (South) - (Gwatkin 1997, map 116)
Stony Green	Modern OS (OS 2004)
Serridge Green	Modern OS (OS 2004)+ 1856 Map of E. Dean (Cinderford) (Gwatkin 1997, map 106)
Soudley Green	Modern OS (OS 2004)
Bilson Green / Barrats Green	Modern OS (OS 2004) + 1777 Map (Taylor)
Blackpennywall Green	Modern OS (OS 2004)
Rushy Lawn	Modern OS (OS 2004) + 1700 Map (Unknown 17th/18th Century)
Dam Green	Modern OS (OS 2004)
Nofold Green	Modern OS (OS 2004)
Fog Green Well	Modern OS (OS 2004)
Hardrushy Green	1700 Map (Unknown 17th/18th Century)
Green Bottom	Modern OS (OS 2004)
Hart Green	Modern OS (OS 2004)
Joy's Green	Modern OS (OS 2004)
Wigpool Green	Modern OS (OS 2004)
Camomile Green	Modern OS (OS 2004)+ 1859 Map of W. Dean (North) (Gwatkin 1997, map 104)
Horse Lawn	Modern OS (OS 2004)+ 1700 Map (Unknown, 17th/18th Century)
Gout(y) Green	Modern OS (OS 2004)+ 1700 Map (Unknown, 17th/18th Century)
Long Green	Modern OS (OS 2004)

NAME	SOURCE
Camomile Green	Modern OS (OS 2004)
Folders Green	Modern OS (OS 2004)
Upper Whitelea Green	Modern OS (OS 2004)
Taylors Green	Modern OS (OS 2004)
Stonyhill Green	Modern OS (OS 2004)
Lower Whitelea Green	Modern OS (OS 2004)
Fairmoor Green	Modern OS (OS 2004) + 1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)
Farmers Green	Modern OS (OS 2004)
Organ's Green	Modern OS (OS 2004)
Pigeon Green	Modern OS (OS 2004)
Cleeve End Green	Modern OS (OS 2004)
Clementsendgreen Inclosure	Modern OS (OS 2004)
Hoar Green	1777 Map (Taylor)

Table 42: Ham Placenames

NAME	SOURCE
Newnham Bottom	1856 Map of E. Dean (Drybrook) (Gwatkin 1997, map 106)
Coverham Inclosure No.	1860 Map of W. Dean (North) (Gwatkin 1996, map 104)
Coverham Inclosure No.	Modern OS (OS 2004) + 1859 Map of W. Dean (North) (Gwatkin 1996, map 104)
Crooked Ham	1700 Map (Unknown, 17th/18th Century)
Rernham How	1700 Map (Unknown, 17th/18th Century)
Newnham (s) Ridge	Modern OS (OS 2004)+ 1700 Map (Unknown, 17th/18th Century)

Table 43: Meend Placenames

NAME	SOURCE
Deans Meend (e)	1856 Map of E. Dean (Drybrook) (Gwatkin 1997, map 106) + 1700 Map (Unknown, 17th/18th Century)
Ruspedge Meend	1835 (Sopwith)
Carterpiece Meend	1835 (Sopwith)
Kings Meane	1700 Map (Unknown, 17th/18th Century)
Estbidg Mean / Eastbach Meend Inclosure	Modern OS (OS 2004) + 1700 Map (Unknown, 17th/18th Century)
Blind Meend	Modern OS (OS 2004)
Clearwell Meend	Modern OS (OS 2004) + 1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)
Clearwell Meend Inclosure No. 1	Modern OS (OS 2004)
Clearwell Meend Inclosure No. 2	Modern OS (OS 2004)
Clearwell Meend Inclosure No. 3	Modern OS (OS 2004)
Breams Meend	Modern OS (OS 2004) + 1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)

NAME	SOURCE
Breams Meend	Modern OS (OS 2004) + 1834-5 Map of W. Dean (South) (Gwatkin 1997, map 116)
Meendhurst Rd	Modern OS (OS 2004)
Mitcheldean Meend	Modern OS (OS 2004)
Merring Meend	Modern OS (OS 2004)
Coleford Meend	Modern OS (OS 2004)
Gosty Knoll Mean	Modern OS (OS 2004) + 1700 Map(Unknown, $17^{th}/18^{th}$ Century)
Little Dean Meend	1777 Map (Taylor)

Table 44: Meer, Mire, Moor & Moss Placenames

NAME	SOURCE
Mirey Stock	1859 Map of W. Dean (North) – (Gwatkin 1996, map 104)
Berkeley Moor	1856 Map of E. Dean (Ruspidge) (Gwatkin 1997, map 108)
Moor End	Modern OS (OS 2004)
Little Moseley	Modern OS (OS 2004)
Ivymoor Head	Modern OS (GCCAS, 2004) + 1834-5 Map of W. Dean (South) – (Map116)
Broadmoor(e)	Modern OS(OS 2004) + 1700 Map (Unknown, $17^{th}/18^{th}$ Century)
Moorse Ground	Modern OS (OS 2004) + 1700 Map (Unknown, $17^{th}/18^{th}$ Century)
Moor Wood	Modern OS (OS 2004) + 1700 Map (Unknown, $17^{th}/18^{th}$ Century)
Lightmoor Inclosure	Modern OS (OS 2004)

Appendix P Report on palaeoenvironmental sampling

The following document is the report on palaeoenvironmental and geoachaeological sampling undertaken as part of Stage 2 (pilot fieldwork) of the Forest of Dean Archaeological survey.

Appendix Q Geophysical survey design and methodology statement: woodland environment

Q.i Level 1 survey

Q.i.i Survey objectives

To prospect and delimit non-iron working archaeological sites situated within relatively dense woodland.

Q.i.ii Survey Grid

The magnetometer survey will use a temporary survey grid accurately measured in to permanent landmarks or discretely placed permanent marker pegs using a Topcon GTS-605 Total Station.

The temporary grid will be co-registered to the Ordnance Survey National Grid using digital tiles provided by Substrata Limited (Ordnance Survey licence number 100040513).

The survey grid will be composed of continuous 20-metre square sub-grids with partial sub-grids to maximise the area surveyed where practical.

The survey grid location information and grid plan will be recorded using AutoDesk's AutoCAD 2002.

Q.i.iii Survey Equipment and Data Capture

The magnetometer survey will be completed using a Geoscan FM36 fluxgate gradiometer magnetometer and hand-trigger data logger.

The readings will be recorded on 1-metre traverses at 1-metre intervals using zig-zag traversing. Sensor balance will be checked and adjusted at regular intervals.

Environmental conditions including land use, soils, terrain, ground conditions and weather will be recorded and a digital photographic record of the site pertinent to the geophysical survey will be provided.

Q.ii Level 2 survey

Q.ii.i Survey objectives

To locate and record potential archaeological features in areas highlighted by the Level 1 survey assuming approximately 12% of Level 1 survey area.

Q.ii.ii Survey Grid

The magnetometer survey will use the same grid as the Level 1 survey.

Q.ii.iii Survey Equipment and Data Capture

The magnetometer survey will be completed using a Geoscan FM36 fluxgate gradiometer magnetometer and hand-trigger data logger.

The readings will be recorded on 0.5-metre traverses at 0.5-metre intervals using parallel traversing. Sensor balance will be checked and adjusted at regular intervals.

Environmental conditions including land use, soils, terrain, ground conditions and weather will be recorded and a digital photographic record of the site pertinent to the geophysical survey will be provided.

Q.iii Data Processing, Interpretation and Report

Data processing will be undertaken using Geoscan Research's Geoplot 3.00p and Golden Software Inc.'s Surfer 8.03 software.

Anomalies will be digitised and the position of likely sources plotted onto the Ordnance Survey digital landline tiles provided by Substrata.

Anomalies will be colour coded using Substrata's standard scheme to provide the most likely interpretation and presented using AutoDesk's AutoCAD 2002. Anomalies will be numbered and catalogued in the text as systematic groups or individual anomalies as appropriate.

The final report will include a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data. An electronic copy of the raw geophysical data and the digitised anomaly plots will be available to the client and any agreed curatorial body.

Q.iv Standards

All fieldwork, data processing and reporting will follow recommendations set out by English Heritage. Substrata's particular standards for geophysical survey work are:

David A., 1995, *Geophysical survey in archaeological field evaluation*: Research and Professional Services Guideline No 1, Ancient Monuments Laboratory, English Heritage.

English Heritage, 1991 (reprinted 1996), *Management of Archaeological Projects*, ISBN 1-85074-359-2

Schmidt, A., 2002, Geophysical Data in Archaeology: A Guide to Good Practice, ADS series of Guides to Good Practice. Oxford: Oxbow Books, ISBN 1-900188-71-6 (2001 on-line version: http://ads.ahds.ac.uk/project/goodguides/geophys/)

Royal Commission on the Historical Monuments of England (English Heritage), 1999, *Recording Archaeological Field Monuments; A Descriptive Specification*, ISBN 1-873592-40-X

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Appendix R Report on geophysical surveys

The following document is the report on two geophysical surveys undertaken as part of Stage 2 (pilot fieldwork) of the Forest of Dean Archaeological survey.

For cross-referencing purposes the two surveys have been divided under the following headings:

R.i Site 1, Glos SMR 4353: Fairplay enclosure, Cinderford

R.ii Site 2, Glos SMR 5161: Welshbury hillfort, Blaisdon

Appendix S Schematic programme for further field survey (Stage 3) of the Forest of Dean Archaeological Survey – shown as quarter years

Stage 3 - Production of project design and preparatory work

Task	January –March (year 1)	April – June (year 1)	July – September (year 1)	October –December (year 1)
Production of project design for Stage 3				
Preparatory work for Year 1 of the project				

Stage 3 Field survey – Season 1

Task	January –March (year 2)	April – June (year 2)	July – September (year 2)	October –December (year 2)
LiDAR survey				
Analysis of LiDAR				
Finalisation of Area 1 search area				
Preparation for rapid field reconnaissance				
Rapid field reconnaissance in broadleaved woodland				
Rapid field reconnaissance in conifer woodland				
Analysis of results of phase rapid field reconnaissance				
Palaeoenvironmental sampling and analysis				
Geophysical survey and analysis				
Excavation and reporting on results				
Further topographical survey and reporting				
Professional seminar				
Preparatory work for Year 2 of the project				
Outreach				

Stage 3 Field survey – Season 2

Task	January –March (year 3)	April – June (year 3)	July – September (year 3)	October –December (year 3)
Preparation for rapid field reconnaissance r				
Rapid field reconnaissance in broadleaved woodland				
Rapid field reconnaissance in conifer woodland				
Analysis of results of rapid field reconnaissance				
Palaeoenvironmental sampling and analysis				
Geophysical survey and analysis				
Excavation and reporting on results				
Further topographical survey and reporting				
Professional seminar				
Preparatory work for Year 3				
Outreach				

Stage 3 Field survey – Season 3

Task	January –March (year 4)	April – June (year 4)	July – September (year 4)	October –December (year 4)
Preparation for rapid field reconnaissance				
Rapid field reconnaissance in broadleaved woodland				
Rapid field reconnaissance in of conifer woodland				
Analysis of results of rapid field reconnaissance				
Palaeoenvironmental sampling and analysis				
Geophysical survey and analysis				
Excavation and reporting on results				
Further topographical survey and reporting				
Professional seminar				
Preparation of overall report of Stage 3				
Outreach				

Appendix T Abbreviations used in the text

OD	Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AP	Aerial Photograph
BGS	British Geological Survey
C14	Carbon 14
cm	Centimetre
EH	English Heritage
EDM	Electronic Distance Measurer
EN	English Nature
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	Hectare
km	Kilometre
LiDAR	Light Detection and Ranging
m	Metre
NMP	National Mapping Programme
OS	Ordnance Survey
PRO	Public Record Office
SAM	Scheduled Ancient Monument
SMC	Scheduled Monument Consent
SMR	Sites and Monuments Record (Gloucestershire)
SSSI	Site of Special; Scientific Interest
TBGAS	Transactions of the Bristol and Gloucestershire Archaeological Society