ARCHAEOLOGY AND AGGREGATES IN WORCESTERSHIRE: A RESOURCE ASSESSMENT AND RESEARCH AGENDA

Robin Jackson and Hal Dalwood

With contributions by Victoria Bryant, Annette Hancocks, Neil Holbrook, Derek Hurst, Richard Morton, David Mullin, Elizabeth Pearson and Gail Stoten

30 November 2007

Supported by English Heritage through the Aggregates Levy Sustainibility Fund

Historic Environment and Archaeology Service,
Worcestershire County Council,
Woodbury,
University College Worcester,
Henwick Grove,
Worcester WR2 6AJ

PNUM 3966
WHEAS P2677
Report 1477

Contents

Appendices

Figures

Tables

Archaeology and Aggregates in Worcestershire: a resource assessment and research agenda

Robin Jackson and Hal Dalwood

With contributions by Victoria Bryant, Annette Hancocks, Neil Holbrook, Derek Hurst, Richard Morton, David Mullin, Elizabeth Pearson and Gail Stoten

Project summary

This project was undertaken to assess the archaeological resource of the aggregate producing areas of Worcestershire and was funded through the English Heritage Aggregates Levy Sustainability Fund programme. The project was designed to complement several similar English Heritage ALSF-funded projects and to address the key ALSF aim of 'developing the capacity to manage aggregate extraction landscapes in the future'.

The project was undertaken by the Historic Environment and Archaeology Service of Worcestershire County Council (WHEAS) working in collaboration with Cotswold Archaeology (CA), the two largest providers of services to the aggregate industry in the county. The project was desk-based, comprising an assessment and synthesis of existing data relating to aggregate production areas and in particular that held within the Worcestershire Historic Environment Record (HER).

This report presents the results of the project. It provides a chronological overview and research agenda for the aggregate producing landscapes of Worcestershire, which lie primarily within the Severn and Avon Valleys and their associated drainage catchments. Mapping of the archaeological resource within these areas, documentation of past, present and likely future aggregate extraction areas and methodological considerations are also presented. The report is intended to promote understanding of the archaeological resource and support the development and implementation of future mitigation strategies relating to aggregate extraction within the county.

The report is divided into four parts:

Part 1 The introductory section covers the development of the project and presents a summary of minerals planning frameworks, aims and objectives of the project and the methodology employed. An appraisal and review of current archaeological development control methodologies and mitigation strategies is then provided.

Part 2 The second section of the report presents the results of the assessment of mineral resources within the county and provides an overview of past and present aggregate extraction in Worcestershire and its relationship to archaeology. Lastly the potential future pattern of aggregate extraction in the county is considered.

Part 3 This part of the report presents the archaeological resource assessment in the form of a chronological overview. National, regional and local frameworks are summarised and the character and extent of the resource for each period is presented accompanied by mapping of the resource within the aggregate production areas of the county.

Part 4 The final part of the report summarises the chronological overviews and presents a research agenda for aggregate producing areas of the county. Both general and period specific research goals are identified.

Acknowledgements

This project arose as a result of a series of meetings initially involving staff from Worcestershire Historic Environment Service and Cotswolds Archaeology back in 2002. Initial proposals were for a major project focussing on aggregate extraction along the River Severn and potentially covering Shropshire and Gloucestershire, as well as Worcestershire.

Subsequent extensive consultation and discussion with staff from English Heritage, the adjacent counties and from further afield has resulted in a series of county based aggregate resource assessments of which one has already been completed for Gloucestershire.

Many individuals have therefore contributed to the outcome of the project:

From Worcestershire Historic Environment and Archaeology Service: Hal Dalwood, Robin Jackson, Derek Hurst and Elizabeth Pearson have contributed to the chronological overviews while Alan Jacobs has also provided comment. Mike Glyde, Archaeological Planning Advisor to the MPA has provided much useful information relating to active archaeological conditions as well as specialist aerial photographic advice and images. Victoria Bryant provided HER output and advice while Steven Crowther geo-referenced scanned aerial photographic data and uploaded it onto the project GIS. Steve Rigby has produced the illustrations.

From Cotswold Archaeology: Neil Holbrook, Annette Hancocks, Richard Morton and Gail Stoten have contributed chronological overviews while their illustration team designed the project leaflet.

From Gloucestershire County Council: David Mullin undertook construction of the GIS, rapid ‘cleaning’ of the HER data and data output for specialists. From the same organisation, thanks are also due to Jan Wills and Toby Catchpole who provided input and advice based on their experience of completing the Gloucestershire Resource Assessment.

From Worcestershire County Council Planning Department, Mark Bishop (Senior Planning Officer) and Kirk Denton (Planning Policy Assistant: Minerals and Waste Planning, Economy and Performance) provided considerable advice and input on developing frameworks and trends in minerals planning and extraction.

Minerals operators within the region have also provided considerable input over the past few years into the development of archaeological evaluation and mitigation strategies and the maintenance of a constructive dialogue between quarry operators and the archaeological profession. Of these Malcolm Lawer and Stuart Lawrence from Tarmac, Ross Halley from Lafarge Aggregates and Michael Roberts from Cemex warrant particular mention for their contributions to the debate and to the delivery of successful archaeological projects.

From English Heritage: Buzz Busby, Jenny Marriot, Helen Keeley and Kath Buxton have played important roles in the successful design, implementation and delivery of the project.

Towards the end of the project, a draft of this report was circulated along with a draft of the Gloucestershire Resource Assessment to a wide range of stakeholders. They were asked to provide comment on the report and to attend a conference to provide feedback and promote discussion on the two reports. The circulation of the reports, conference organisation and collation of feedback was undertaken by Rachel Edwards of the Arboretum Archaeological Consultancy, assisted by Hal Dalwood. As a result, many individuals have contributed both formally and informally to the final report. Of these the period discussants Jodie Lewis (University of Worcester; Earlier prehistoric period), Tom Moore (Durham University; Later Prehistoric period), Roger White (University of Birmingham; Roman period), and John Hunt (University of Birmingham, Medieval period) along with the two general discussants Jane Evans (Freelance artefact specialist) and Andy Howard (University of Birmingham;

geoarchaeology) deserve particular mention for their contributions to the debate and the feedback received.

Part 1: Introduction

1. Background

The project 'Archaeology and Aggregates in Worcestershire' was designed and undertaken by Worcestershire Historic Environment and Archaeology Service (WHEAS) and Cotswold Archaeology (CA).

The origins of the project lay in discussions between WHEAS and CA which led in 2002 to the submission to English Heritage of an outline proposal for an ALSF supported project to examine the archaeology of the Central Severn Valley and focussed on the aggregate extraction areas along that valley (WHEAS and CA, 15 May 2002 *Archaeology of the Central Severn Valley Outline project proposal*). This design aimed at cross-cutting county boundaries and included aggregate extraction areas of the Severn Valley in both south Shropshire and north Gloucestershire. However, the latter area was included in a countywide aggregates resource assessment being developed at the same time by Gloucestershire County Council Archaeology Service (GCCAS) and due to potential project overlaps a long period of consultation and discussion with GCCAS and English Heritage resulted. At the end of this process it was determined that the WHEAS/CA project methodology should be designed to mirror the GCCAS project with the scope of the project being restricted to coverage of all aggregate producing areas in Worcestershire. The resulting project outline was submitted in November 2004 (Dalwood 2004) and a detailed Project Design (Dalwood, Hancocks and Jackson 2005) was submitted in February 2005 and commissioned the following month by English Heritage under the Aggregates Levy Sustainability Fund (PNUM 3966). Lastly peer review for this document along with the GCCAS report was provided through widespread circulation of report drafts and a stakeholder conference held in Worcester in November 2006.

The project was structured according to the framework set out in the English Heritage documents Management of Archaeological Projects (MAP2) and Guidance for Applicants. Aims and objectives were drawn up with reference to the criteria published on the English Heritage website for ALSF projects, with the project principally designed to fulfil two of the three main criteria for ALSF projects:

- Projects to increase the understanding and dissemination of knowledge gained from previous work undertaken on aggregate extraction landscapes: both to the local communities and the wider academic and public. This work will also improve our ability to predict future impacts in such environments;
- Projects aimed at developing the capacity to manage the impact of aggregate extraction on historic landscapes in the future. To develop reliable predictive information to enable curators, planners and the industry to better manage the impact of future extraction on the historic environment.

Lastly, although covering aggregate producing areas across the whole county, much of the project has focussed on river valleys where most of the mineral reserves are located. Consequently, given the importance of the Severn Valley, the project has also contributed to an agreed framework for ALSF-funded projects in the Severn Valley and Severn Estuary, as set out in the document '*River and estuary of the Severn – proposals for grant-funded historic environment research*' (English Heritage 2004a). In particular this project addressed the immediate priority for projects which 'aim to synthesise existing data and enhance HERs … with the objective of informing future research' (English Heritage 2004a, section 2.3). The project is thus intended to constitute one element within a broader strategy for informing aggregate extraction (both terrestrial and marine) in the Severn Valley and Severn Estuary.

To these ends the project was also specifically designed to complement the resource assessment project completed in Gloucestershire (Mullin 2005) and those undertaken in other areas, especially those for Warwickshire and within the Severn Estuary.

2. Minerals planning frameworks

Minerals planning policy in Worcestershire is framed by a range of national, regional and local legislation and guidance. These are informed by the particular circumstances which separate aggregate extraction from many other aspects of development control; namely that the distribution of workable mineral resources is restricted, that extraction is usually a long-term but non-permanent operation and that by its nature it has a potentially high environmental impact which requires considerable mitigation and/or control both before, during and after completion of extraction.

2.1 The national legislative framework

Minerals extraction has been controlled across England and Wales since the instigation of Town and County Planning legislation on 1 July 1948 (Town and Country Planning Act 1947) as part of a general initiative to introduce planning control over the development of land.

Many subsequent amendments were made to this act and in 1971 these were consolidated in a new Town and Country Planning Act. This has itself now been considerably amended with the 1981 Town and Country Planning (Minerals) Act and then the 1990 Town and Country Planning Act superseding the 1971 Act of particular importance in terms of the winning and working of minerals. The former established the responsibility of County Councils as the Minerals Planning Authority (MPA) for their areas, while the latter established that each MPA had a duty to prepare a Minerals Local Plan (MLP; now to be replaced by a *Minerals and Waste Development Scheme* – see below).

Further amendments relevant to minerals planning include the Planning and Compensation Act (1991), which made new provisions for dealing with permissions (termed ‘old mining permissions’) granted between July 1943 and July 1948. These had been granted through Interim Development Orders and many had been successively renewed by subsequent planning acts. Specifically the holders of these ‘old permissions’ were required to apply to the local MPA for registration of any permissions they wished to maintain and subsequently to apply for determination of the conditions to which any permission was to be subject.

The subsequent Environmental Act (1995) addressed further old permissions granted in the 1950’s, 1960’s and 1970’s. The act reviewed and updated these permissions requiring MPAs to compile lists of ‘dormant’ and ‘active’ quarries in their areas as well as obliging MPAs to periodically review all minerals permissions (including those granted through the 1980’s) on a regular basis.

Together the three acts (1990, 1991 and 1995) underpinned the development control process for minerals extraction until very recently. Now, as part of a wider overhaul of the planning process arising from the Planning and Compulsory Purchase Act of 2004, the whole MPG framework is being replaced by Minerals Policy Statements (MPS).

2.2 Minerals planning guidance

Although as noted above, the system is undergoing a major review, planning for the minerals industry has been guided since the 1990s by Minerals Planning guidance (MPGs). These are listed below and until recently these have provided the framework within which mineral planning operated, although some have now been replaced as part of a wider revision of the planning system (documents replacing them or adding to them are noted in brackets):

- *MPG 1 General considerations and the development plan system* (1996) sets out national policies on minerals and planning issues and provides advice on the operation of the development control system in relation to minerals (replaced by Minerals Planning Statement 1: Planning and Minerals [henceforth MPS1] in November 2006);
- *MPG 2 Applications, permissions and conditions* provides advice on those aspects of the development control system of particular relevance to minerals extraction and on the preparation and determination of individual planning applications (Part replaced by Annexes 1 and 2 of MPS2);
- *MPG 4* covers the use of powers granted to Local Authorities by the 1995 Environmental Act;
- *MPG 6 Guidelines for aggregates provision in England* aims at providing a framework for Local Authorities to use in developing their local policies for aggregates and particularly to support MPAs in formulating Local Minerals Plans. Regional guidelines annexed to MPA 6 also provide a regional forecast for demand for each region. In the case of the West Midlands the estimated regional production total was for 180 million tonnes of sand and gravel and 150 million tonnes of crushed rock for the period 1992-2006. The West Midlands Regional Aggregate Working Party (WMRAWP) has apportioned the former local authority covering Hereford and Worcester a production target during this period of 22.86 million tonnes of sand and gravel and 10.9 million tonnes of crushed rock. Of this Worcestershire's share is 15.3 and 2.7 million tonnes respectively or an average of 1.1 and 0.2 million tonnes per annum over the period of apportionment (replaced by MPS 1; although the regional apportionment is expected to remain similar);
- *MPG 8* provides guidance for dealing with old permissions from the 1940's;
- *MPG 9* gives advice on the considerations to be taken into account by applicants and MPAs when preparing and determining the conditions to which any new permissions could be subject;
- Lastly *MPG 14 Review of minerals planning permissions* arose as a result of the 1995 Environmental Act's requirements for an initial review and updating of old planning permissions and periodic review of all permissions thereafter. The advice therefore covers the statutory procedures to be followed and the approach to be adopted by MPAs and the minerals industry in the preparation and consideration of updated planning conditions in the review process.

As a footnote, the exploitation of marine aggregates is covered by separate guidance provided by Marine Mineral Guidance 1 Extraction by dredging from the English seabed. Marine aggregates though important are not relevant in Worcestershire.

Minerals Planning Statement 1: Planning and Minerals

Since November 2006, this has become the key document relating to minerals planning in England for the aggregates covered in this report. This forms part of the MPS 1 replacing MPG 1 and MPG 6 and is the 'overarching planning policy document for all minerals in England. It provides advice and guidance to planning authorities and the minerals industry and it will ensure that the need by society and the economy for minerals is managed in an integrated way against its impact on the environment and communities' (http://www.communities.gov.uk/index.asp?id=1504275).

The key objectives of MPS 1 can be summarised as follows:

- To safeguard and conserve minerals as far as possible while maintaining supply to meet the anticipated need.
- To protect areas of designated landscape or conservation value.
- To minimise the production of waste and to encourage use of materials, including appropriate use of high quality materials, and the use of substitute or recycled minerals in place of primary minerals.

- To encourage sensitive working practices during minerals extraction and the sustainable transport of minerals, and to ensure high quality restoration and aftercare after extraction has ceased.
- To secure closer integration of minerals planning policy with national policies on construction, waste management and environmental protection.

MPS 1 outlines a series of policies under headings of Exploration, Survey, Safeguarding [the mineral resource], Protection of Heritage and Countryside, Supply, Bulk Transportation, Environmental Protection, Efficient Use and Restoration.

Key elements of these policies in terms of archaeological planning include:

Safeguarding: the need for definition of Mineral Safeguard Areas (MSAs) within local planning documents to ensure that 'proven resources are not needlessly sterilised by non mineral development, although there is no presumption that MSAs will be worked.'

Protection of Heritage and Countryside: the need to 'consider carefully minerals proposals within or likely to affect regional and local sites of biodiversity, geodiversity, landscape, historical and cultural heritage' and 'adopt a presumption in favour of the preservation of listed buildings, nationally important archaeological remains (including scheduled ancient monuments) *in situ*, and their settings……unless there are overriding reasons of national importance for the development to proceed.'

Supply: the need to 'identify sites, preferred areas and/or areas of search….to provide greater certainty of where future sustainable mineral working will take place' and 'provide for the maintenance of landbanks, i.e. appropriate levels of permitted reserves.' (see also Section 2.2: MPG6). This key concept of landbanks is further defined in Annexe 1 section 4 of MPS 1. It is noted that:

1. 'MPAs should use the length of the landbank in its area as an indicator of when new aggregate permissions for aggregate extraction are likely to be needed. The landbank indicators are at least 7 years for sand and gravel.'

2. 'A large existing landbank bound up in very few sites should not be allowed to stifle competition.'

3. 'MPAs should consider and report on the need to review policies in their local development documents (LDDs) as part of their annual monitoring to the secretary of state. This should be done in time to allow for action before the remaining provision falls below the agreed apportioned level.'

4. 'MPAs should carry out…and publish the results of regular reviews of sites that have not been worked for 10 years or more to assess whether production is likely to begin again.'.

Bulk Transportation: the need to 'promote and enable the bulk movement of minerals by rail, sea or inland waterways to reduce the environmental impact of their transportation.' The latter of these may be of particular importance within Worcestershire due to the potential for bulk movement of minerals on the River Severn.

Restoration: the need to 'take account of the opportunities for enhancing the overall quality of the environment and the wider benefits that sites may offer, including nature and geological conservation and increased public accessibility, which may be achieved by sensitive design and appropriate and timely restoration.'.

To conclude MPS 1 along with MPS 2 (*Controlling and mitigating the environmental effects of minerals extraction in England*; March 2005; replacing MPG 11 and part of MPG 2) now provides much of the relevant documentation and guidance for regional and local planning to follow. A further new document, *Planning and Minerals: Practice Guide* (November 2006) provides further support and guidance relating to the implementation of these revised policies.

2.3 The regional and local framework

Regional planning is supported by the West Midlands Regional Aggregate Working Party (WMRAWP), one of nine such bodies providing information and technical advice to central government on the supply and demand for aggregates in each region. They also monitor supply and demand within each region and provide a forum, which supports the apportionment to individual counties of their share of the regional production target as guided until 2006 by MPG 6 (see above) and now by MPS 1 and MPS 2. The most recent WMRAWP report available is the Annual report for 2004 (issued 2006)

The specific policy framework for aggregate extraction in Worcestershire is currently set out in the 1997 County of Hereford and Worcester Minerals Local Plan (Hereford and Worcester County Council 1997) produced by the County Council in its role as the Minerals Planning Authority (MPA) and informed by the county production targets established in conjunction with the WMRAWP.

The implementation period for this Minerals Local Plan was 1994 to 2003. A new *Minerals and Waste Development Scheme* will eventually replace this and is currently being developed as part of the nationwide overhaul of the planning system as discussed above (Section 2.2). Within Worcestershire planning for waste is being prioritised to meet these new policies and, although a Minerals Core Strategy Development Plan Document will be developed in the short-term, the programme for completion of the new *Minerals and Waste Development Scheme* means that it may not be until May 2010 that the new minerals policies are fully implemented and preferred areas are formally identified (WCC, 2006 *Worcestershire County Council Minerals and Waste Development Scheme*; and information from MPA).

In the interim, the adopted 1997 County of Hereford and Worcester Minerals Local Plan has been designated 'saved policy' and will remain the framework within which new applications will be considered until at least September 2007, and in all likelihood beyond (WCC, 2006 *Worcestershire County Council Minerals and Waste Development Scheme*). As a direct consequence, although local targets are still established and revised regionally, within the county there is now only very limited preferred area provision and applications are being dealt with on a largely *ad hoc* basis (though with reference to the policies set out in Chapter 6 and appendix 2 of the 1997 Minerals Local Plan).

This is important to note, since at the time of writing, the county is only just able to meet its obligation of maintaining a 7 year landbank for sand and gravels (largely through offsetting with recycled secondary aggregates) and is unable to meet the requirement for a 10 year landbank for crushed rock. In such situations the new guidance indicates that:

> 'A landbank below these levels indicates that additional reserves will need to be permitted if acceptable planning applications are submitted. Because individual sites, when permitted, need sufficient reserves to be economically viable, consideration of the landbank needs to be flexible enough to allow for this. A large landbank bound up in very few sites should not be allowed to stifle competition.'

It is therefore perhaps inevitable that in the next few years a number of fresh (or renewed) applications are liable to be addressed through the interim provisions and focus upon mineral reserves which are not designated within the 'saved policy' as preferred areas.

2.4 Environmental constraints

Apart from the minerals specific guidelines and legislation described above, the necessarily high impact of the process of minerals extraction on the local environment means that a range of constraints is in place relating to the natural and historic environment.

The historic environment is provided for nationally and locally by a range of legislation and guidance and in determining any minerals application the balance between these constraints and the need for minerals needs to be found. The highest level of legislative protection for the historic environment derives from the 1979 Ancient Monuments and Archaeological Areas Act, which protects Scheduled Ancient Monuments while listed buildings are protected through the provisions of the 1990 Planning (Listed Buildings and Conservation Areas) Act.

Also of relevance is Article 7 of the 1995 Town and Country Planning (General permitted Development) Order, which restricts the rights to prospect for minerals on a Scheduled Ancient Monument or where the site is within an Area of Archaeological Importance or is registered on a County Sites and Monuments Record (SMR/HER).

Further national guidance on aspects of the historic environment is provided within the framework of Planning Policy Guidance 15 (PPG15) and Planning Policy Guidance 16 (PPG16) which deal respectively with buildings and buried remains. These underpin provision for the bulk of archaeological and historic remains and form the basis of the policies set out in the Worcestershire County Structure Plan 1996 – 2011 (Adopted Plan dated June 2001; Policies SD.2; CTC 16, 17, 18, 19 & 20; M.3) and the 1997 Minerals Local Plan (appendix 2: Policy M.4).

Lastly the Council for British Industry has also formulated guidelines in the form of the Archaeological Investigation Code of Practice for Minerals Operators that aims to ‘promote co-operative and effective working relationships between minerals operators, planners and archaeologists’. This document is currently also under review.

2.5 Relationship of the project to minerals planning

The county has a range of mineral resources used as aggregates, although sand and gravel are the most significant relevant resource for this project. The future demand for sand and gravel and crushed rock is understood to be unlikely to diminish (the current estimate is for 0.871mt per annum for sand and gravel and 0.163mt of rock through to 2019; WMRAWP, 2006 *Annual Report 2004*, 3-4). Consequently, reliable archaeological information on the aggregate-producing areas of the county is now, and will continue to be, important.

The project was not only felt to be opportune in the light of the ALSF criteria and the objectives for the Severn Valley, but also with regard to the circumstances surrounding minerals planning in Worcestershire These circumstances are summarised above; more detailed information regarding the nature and extent of the resource and the past, present and likely future impact of extraction being presented later in the report (Section 6; Appendix 1).

In the absence of a source of reliable archaeological information at a strategic planning level, the project has provided an opportunity to construct a strategic overview of both the extent and character of the aggregate deposits in the county, and the archaeological resource in these areas.

The enhanced understanding resulting from the project will inform future decision-making on priorities for the preservation of nationally important archaeological sites through designation and the management of regionally and locally important archaeological sites through the minerals planning process.

To conclude, the resource assessment and research framework presented will:

- contribute to planning for minerals within the period covered by the 'saved' 1997 County of Hereford and Worcester Minerals Local Plan;
- contribute to the development of the new *Worcestershire County Council Minerals and Waste Development Scheme*; and
- inform the development control process by providing a valuable resource for both historic environment professionals and the aggregate extraction industry.

3. Aims and Objectives

3.1 Aims

The main aim of the project was to improve the amount and quality of archaeological information available regarding the aggregate producing areas, and thus allow more informed advice regarding the archaeological impact of aggregates extraction to be given during:

- Future strategic minerals planning (*Worcestershire County Council Minerals and Waste Development Scheme*);
- Reviews of existing minerals planning permissions;
- Assessment of new applications for minerals planning permission.

The results presented in this report are aimed at providing a vital input into strategic minerals planning and the knowledge base of the archaeology of aggregate areas of Worcestershire. They are further intended to be capable of being used as starting point for further research, if ALSF resources continue in subsequent years.

More detailed aims for the project were also defined (Dalwood, Hancocks and Jackson 2005):

A1. To facilitate decisions regarding strategic planning, management and preservation of archaeological sites and historic landscapes in the aggregate producing areas;

A2. To define the aggregates resource in Worcestershire within the HER;

A3. To identify the areas of past, present and future aggregate extraction;

A4. To assess the state of knowledge regarding the archaeology of the aggregate areas;

A5. To develop an initial archaeological research agenda for the aggregate areas;

A6. To assess methodologies for archaeological evaluation, excavation and mitigation;

A7. To increase public and industry awareness of the archaeology of the aggregate producing areas.

3.2 Objectives

The following objectives were identified in the Project Design (Dalwood, Hancocks and Jackson 2005):

O1. To produce detailed mapping and a written description of the aggregates resource in Worcestershire;

O2. To identify the areas likely to be affected by future aggregate minerals extraction;

O3. To incorporate the existing transcribed aerial photographic data (produced by RCHME) for the aggregate-producing areas into the Worcestershire HER;

O4. To produce a resource assessment of the existing archaeological resource in the aggregate producing areas of Worcestershire;

O5. To produce an initial archaeological research agenda for the aggregate areas, and identify areas where future data capture could answer the questions posed;

O6. To assess current methodologies for archaeological evaluation, excavation, and mitigation;

O7. To make available the information gathered to the archaeological community, the aggregates industry and the wider public.

During the course of the project, it became evident that it would be of considerable benefit for the project to summarise and map areas of former extraction and areas which have been considered in the past for extraction (and therefore could potentially become the subject of applications in the future). Although coverage of pre-WW2 extraction areas could not be attempted within the agreed scope of the project it was possible to largely provide coverage for the post-WW2 period which has supported meeting project aims A3 and A7.

4. Project methodology

Methods used were based around those developed for the Gloucestershire Aggregates Resource Assessment (Mullin 2005). Project specific methods were defined in the current Project Design and are described in greater detail in the project archive, however are summarised below.

4.1 Minerals resource mapping

Mineral resource areas were defined using the published minerals resources assessment and the summary accompanying mapping (Fig 1; Bloodworth *et al* 1999). Digital versions of the mapping and underlying data were purchased under license for the duration of the project from the British Geological Survey (BGS). The mineral resource linework used in the BGS mapping is largely derived from their own digital dataset known as DiGMapGB-50 Version 1 (1:50,000 scale). The background and limitations to these digital geological maps and to the DiGMapGB-50 dataset in particular are explained in information notes supplied by the BGS with the project mapping. Copies of these notes are held as part of the project archive and any users of the current report should be aware of these limitations.

In brief, the limitations derive from the fact that the mapping was only designed to show the broad distribution of those mineral resources which may be of current or potential economic interest. The mineral resource data presented are thus based on the best available information, but are not comprehensive and their quality is variable. The data shows the extent of inferred mineral resources, that is those mineral resources that can be defined from available geological information. These have not been evaluated by drilling or other sampling methods, nor had their technical properties characterised, on any systematic basis. The mineral resources defined on the map thus show areas within which potentially workable minerals may occur. These areas are not of uniform potential and they take no account of planning constraints that may limit their working.

Despite these limitations, this data represents the most comprehensive and readily available source of mapping of mineral resources for Worcestershire and has consequently been used as the base mapping for this assessment.

The data was integrated into a project GIS (ArcView 3.3) for the duration of the project and used to define study areas.

4.2 Definition of the Project Study Area

The study area for the project is shown on Figure 2. This was defined on the basis of aggregate producing geology as described above (Section 4.1).

Geologies within Worcestershire identified as aggregate producing are:

- River sand and gravel;
- Bedrock sand and gravel;
- Glacial sand and gravel;
- Igneous rocks;
- Ironstone;
- Limestone (Oolitic, Silurian and Carboniferous);
- Quartzites.

For the purposes of this study it is assumed that all mapped reserves are potentially exploitable with the exception of urban areas and the Bredon Hill area (as these are specifically excluded from future extraction by minerals planning guidance and other environmental constraints).

The resultant potentially exploitable aggregates cover an area of 319km^2 within the county (*c* 18%). The main areas of soft aggregate extraction within the county largely fall within major river valleys and consist of:

- The Severn Valley;
- The Teme Valley;
- The Avon/Carrant Valley;
- The Arrow Valley;
- Deposits associated with the Bow Brook.

Glacial outwash deposits of gravel, sand and clay have also been subject to limited exploitation in eastern Worcestershire around the Lenches.

Hard aggregates are less extensively exploited within the county but comprises:

- Igneous rock and limestone historically exploited from the Malvern and Abberley Hills;
- Limestone exploited in the extreme south east of the county in the area of Broadway;
- Bedrock sands and gravels being exploited in the north of the county.

The Project Design had intended that definable and discrete study areas would be identified within the aggregate production areas of the county following the approach that had been adopted in the resource assessment produced for Gloucestershire. In the event, the very limited areas of hard rock extraction present and the pattern of distribution of sand and gravel deposits across the county have resulted in a change in approach. In particular the distribution of sand and gravel reserves across the county is very irregular being either strung along the Severn Valleys and tributaries within its catchment (principally the Avon/Carrant, and the Teme), along the Arrow Valley in the north-east of the county or irregularly scattered in small islands elsewhere as along the Bow Brook.

This prevented the identification of separate study areas and instead a single study area was mapped within the GIS (Fig 2). This single study unit was used as the basis for extraction of all archaeological data held within the Worcestershire HER within the study area (Section 4.5). This extracted data has formed the basis for countywide consideration of the character and distribution of the archaeological resource within the study area. On occasion some spatial division has been identified within the archaeological record and thus within the chronological overviews (Sections 11 to 21) distinction is sometimes made between the River Severn north and south of Worcester, the River Avon and other individual river valleys.

4.3 Permissions mapping

Mapping and limited data relating to permissions granted since 1947 through to 1995 accompanied the minerals resource data purchased from the BGS and was also held on the county GIS as a consequence of consultation between the MPA and the BGS.

The project has updated and enhanced this data using information held by the Service and the Minerals Planning Department to include permissions granted since 1997 and therefore not covered by the BGS (Bloodworth *et al* 1999; Fig 3). Active and worked out quarries are

identified along with those for which an application is in progress and those identified as preferred areas within the 1997 County of Hereford and Worcester Minerals Local Plan.

In addition, areas proposed by landowners and the industry during preparation of the Minerals Local Plan in the early 1990s, or subsequently the subject of enquiries by the industry or landowners (but which were either refused, shelved or withdrawn), have also been mapped (Fig 4). These are identified as sites which may form the subject of future applications as pressure on remaining reserves increases (Section 2.3).

Data has also been included in the project on whether the applications included any consultation on archaeology and whether any archaeological conditions were required as a result.

Summaries of information relating to all identified quarries are held in Appendix 1 with further information retained in the project archive.

4.4 Aerial photographic mapping

Only one area of enhancement of the HER was undertaken. Since the National Aerial Photographic Mapping Programme has not yet reached Worcestershire, the existing transcribed aerial photographic 1:10560 maps for the county produced by the RCHME in 1980 were scanned.

Following cropping and basic cleaning of these images, they were incorporated as a single rasta layer on the project GIS. These provided an important and comprehensive source of information for the project on cropmark sites destroyed without record during past aggregates extraction. They also provided an important information source for areas as yet unaffected by extraction but which represent an important element of the surviving archaeological resource.

Due to mapping resolution (at 1:10560) the information available has not been reproduced on the larger scale mapping presented within this report though the coverage was consistently consulted during analysis and proved to be especially useful during consideration of the Iron Age and Roman periods (Sections 14 and 15).

The scanned maps have also been incorporated on the HER and guidance has been produced for their use and viewing, providing a useful tool in managing aggregates landscapes based on sand and gravel where a considerable element of the archaeological resource comprises cropmark evidence.

4.5 HER data analysis (David Mullin)

Archaeological data was extracted from the Worcestershire County Council HER database using Microsoft Access to query the data by specific period for each record.

Both Monument and Activity records were queried in this way and the resulting searches copied into the project database. This data was entirely based on HER data and no attempt was made to check or verify these data. It should be remembered that the data represents "point in time" data and reflects the information (records) held within the HER at the time it was captured for the project (June 2005).

This record is acknowledged as being considerably biased by the pattern of past investigation and relative visibility of archaeological sites in differing landscapes and at different chronological periods, rather representing a 'true' reflection of areas of past human activity (Section 4.7; Figs 5 and 6).

The periods used and the date ranges for data capture were based upon those used by the HER (Table 1), though subsequent discussion in Sections 11-21 uses a more refined chronology (as discussed in Section 10).

Period	From	To
Palaeolithic	500000 BC	10001 BC
Mesolithic	10000 BC	4001 BC
Neolithic	4000 BC	2351 BC
Bronze Age	2350 BC	801 BC
Iron Age	800 BC	42 AD
Roman	43	409
Post-Roman	410	1065
Medieval	1066	1539
Post-medieval	1540	1900
Modern	1901	2050

Table 1: HER Period definition and date ranges

The project database was converted into DBF4 format to enable it to be incorporated within the project GIS (ArcView 3.3). This process unavoidably converted all HER data (point, line and polygon) to points. Data for monuments and activities for all periods for the entire county was produced and the density of the records calculated (based on a calculation of 1,726 km^2 for the area covered by the county of Worcestershire).

The project GIS was then used to query the archaeology within the study area and a series of maps and tables produced. These were supplied to the external specialists, along with printouts of full HER records for each site (Section 4.6).

The record density for the aggregate producing areas of the county (excluding urban areas) was also subsequently calculated, to allow a comparison of the relative record density within the aggregate producing areas and the county as a whole. The results are presented below (Tables 2-4).

4.6 Limitations of HER data (Victoria Bryant and David Mullin)

4.6.1 General restrictions on the information extracted from the HER

Due to the way in which the data has been classified by the HER, the following caveats must be applied when using the data:

- All datasets may contain data which covers more than one period, for example flint finds may be recorded as Neolithic and Bronze Age and appear in both layers;
- Linear features such as roads and tracks have been converted to points and may not be obvious in some areas;
- The majority of prehistoric cropmark sites have been assigned an Iron Age date by the HER. They will therefore be over-represented in this period and under-represented in others;
- Post Roman period records include entries from charter bounds, which may or may not be represented by upstanding archaeology;
- Medieval records also include some 17th to 19th century records and some of unknown date (such as quarries and parks and gardens). Records for this period include large amounts of ridge-and-furrow recorded from aerial photos.

4.6.2 Information supplied to specialists

The following information was also provided to support specialists working on the chronological overviews. This further outlines the principal limitations of the data extracted

for the project from the Worcestershire HER and is relevant not only to the process by which the project was completed but also to a number of files held within the project archive.

The HER record has been compiled over 25 years and as is typically the case with SMR/HERs, the standard of the data varies enormously from good to very poor. At the time of the ALSF project a 3 year programme to comprehensively clean, correct and enhance the record has just commenced but the data used for this project is largely as it has always been (though some distinct anomalies were removed).

As described above (Section 4.5) British Geological Survey data was used in conjunction with the Worcestershire HER's GIS and associated SQL database to produce an event theme (map) of all the sites on aggregates (the ALSF Project GIS).

Subsequently, Adobe PDF files of the HER reports for all sites identified were created to provide information to the specialists. This information was ordered by broad period, as were the themes. For each period two PDF report files were supplied, for example Roman Activities and Roman Monuments. These reports were derived directly from the Historic Environment Record and contained all the digital information held including sources, etc. These were supported by two Excel tables for each period, following the same format, for example Roman Activities and Roman Monuments. These were derived from the attribute tables of the event themes created by Dave Mullin for the project. They contained basic information comprising the WSM (Worcestershire Sites and Monuments) number, NGR (National Grid Reference), description and period.

Additional information on individual sites was available on request and through the Worcestershire on-line reports catalogue (http://www.worcestershire.gov.uk/home/wccindex/archeo_dr_index.htm), which provides digital copies of a large proportion of the grey literature for the county.

4.6.3 Period specific restrictions

For medieval monuments:

Due to the large number of records in this category the PDF reports were divided into three and records of ridge-and-furrow were excluded although ridge-and-furrow sites were recorded through the associated Excel spreadsheet.

For post-medieval monuments:

Due to incorrect data in the HER, the Excel spreadsheet contains a large number of WW2 sites. As a result two separate PDF reports were produced for post-medieval monuments one with the WW2 sites removed and the other containing only WW2 sites.

For modern monuments:

In addition to the PDF of modern monuments a copy of the PDF of WW2 sites derived from the post-medieval monuments listing was provided (see above), though because these occurred in the post-medieval monuments event theme the do not appear on the Modern Monuments Excel spreadsheet.

4.7 Data summaries

Data presented below has been drawn from the HER and summarises and compares by period, the numbers of monument and activities recorded across the whole county and within the aggregate production areas defined for the project.

This data clearly demonstrates how information is concentrated on aggregate producing areas, although this is recognised in part to reflect the better visibility of sites on gravel terraces (cropmarks and fieldwalking particularly focus on these areas) and the considerable quantities of sites for some periods which have been identified as a result of archaeological responses to quarrying activity.

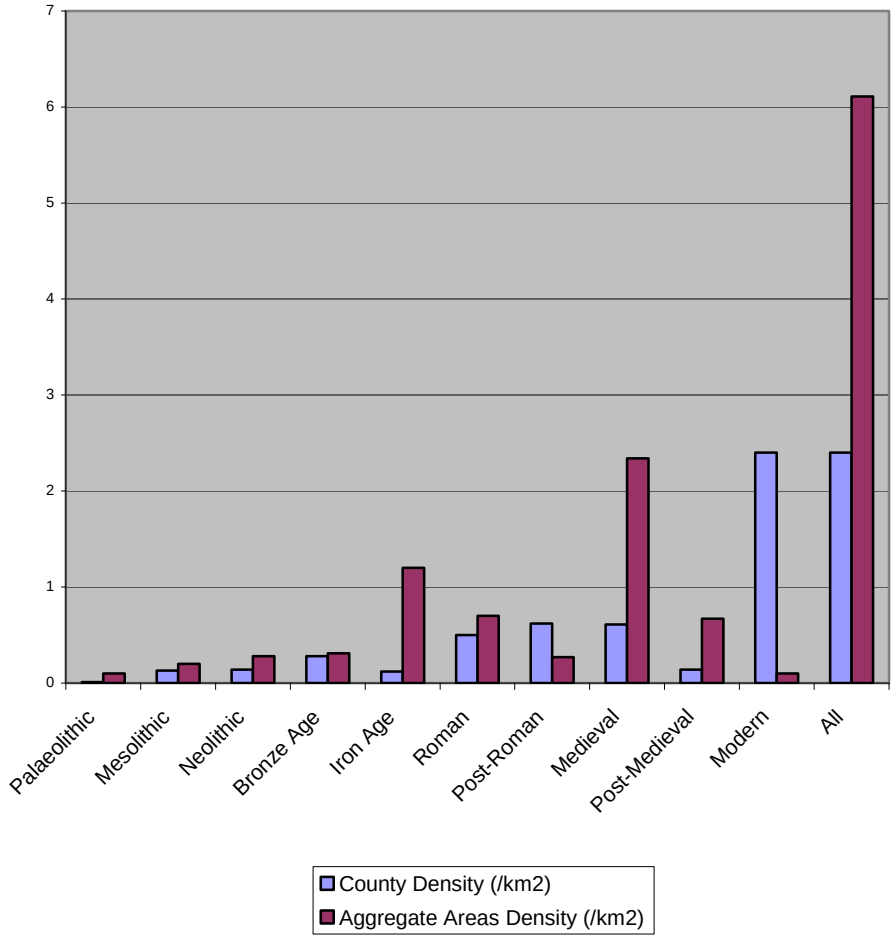
Period	Monuments	Activities	Total	Density (/km2)
Palaeolithic	5	29	34	0.01
Mesolithic	21	199	220	0.13
Neolithic	79	158	237	0.14
Earlier Prehistoric	105	386	491	0.28
Bronze Age	93	121	214	0.12
Iron Age	748	121	869	0.50
Later Prehistoric	841	242	1083	0.62
Roman	253	800	1053	0.61
Post-Roman	120	118	238	0.14
Medieval	3490	656	4146	2.40
Post-Medieval	931	224	1155	0.67
Modern	60	81	141	0.08
All	5800	2507	8307	4.81

Table 2: HER data summary for the county

	Monuments		Activities		Total		
Period	**No**	**%**	**No**	%	**No**	**%**	**Density (/km^2)**
Palaeolithic	0	0	11	32	**11**	**32**	**0.10**
Mesolithic	5	24	58	29	**63**	**29**	**0.20**
Neolithic	42	53	46	29	**88**	**37**	**0.28**
Earlier Prehistoric	47	45	115	30	**162**	**33**	**0.51**
Bronze Age	51	55	47	39	**98**	**46**	**0.31**
Iron Age	353	47	30	25	**383**	**44**	**1.20**
Later Prehistoric	404	48	77	32	**481**	**44**	**1.51**
Roman	64	25	157	20	**221**	**21**	**0.70**
Post-Roman	36	30	23	20	**87**	**24**	**0.27**
Medieval	657	19	91	14	**748**	**18**	**2.34**
Post-Medieval	198	21	48	21	**219**	**19**	**0.67**
Modern	14	23	19	24	**33**	**23**	**0.10**
All	1420	25	530	21	**1950**	**24**	**6.11**
% of county	**25**	**25**	**21**	**21**	**24**	**24**	**n/a**

Table 3: HER data for the aggregate areas (percentages expressed are of the countywide total)

Table 4: Relative Record Density



4.8 Mapping HER bias

Although detailed analysis of the variable distribution of data held by the HER lies beyond the remit of the current project some consideration of the overall patterning of the record is presented in two distribution plots which show the density of records (activities and monuments) across the county by 1km² (Figs 5 and 6).

This mapping reveals how certain areas of the county have a high level of record, such as the south-east, while others, such as the north and north-west, have particularly poor representation. As noted previously, these do not reflect the 'real' distribution of archaeological sites in the county, merely the distribution of the record, and these wider patterns within the record should be kept in mind when examining the data distributions presented later in the report.

Of particular relevance to consideration of the potential aggregate producing areas of the county, the following are noted:

- There are some rather moderately and poorly covered sections of the Severn south of Worcester, probably reflecting a combination of lack of previous investigation allied to the high potential for alluvial masking of sites within these areas (compare Figures 5 and 6 with Figure 7). Given the pattern of former and active quarrying (Section 8.3), the high potential for future exploitation of sand and gravel reserves in

this area (Section 9.4.1) and problems of developing effective archaeological prospection and mitigation strategies for such alluviated areas (Section 5.3), this is a matter of considerable concern.

- The especially poor record for the Teme and Stour Valleys is of some concern as both contain sand and gravel reserves of which those in the Stour have been subject to considerable levels of former exploitation and where potentially viable reserves remain (Section 8.7 and 9.4.1).

- There is a higher quality record for the south-east of the county reflecting considerably more development-led archaeological fieldwork (including that associated with mineral extraction), a high suitability of these areas for prospection through fieldwalking and aerial photography and a tradition of fieldwork by local groups.

5. Appraisal and review of development control methodologies and archaeological mitigation strategies

5.1 Background

5.1.1 Introduction

The following provides a summary of approaches currently adopted in Worcestershire which are based upon wider methodological strategies employed by archaeologists in relation to development control.

Typically following initial expression of interest by a minerals operator (or other prospective developer), good practice dictates that a Brief will be issued by the Archaeological Planning Officer for pre-determination assessment and evaluation of the application.

The Brief will outline the methods, approaches and sampling levels the Planning Officer considers appropriate for the site. Early consultation is recommended either with the Archaeological Planning Officer directly or via an Archaeological Consultant and/or Contractor (see below).

The minerals operator may employ either an Archaeological Consultant to draw up a detailed specification and tender documentation (to be sent to Archaeological Contractors) or an Archaeological Contactor may be approached directly to draw up a detailed specification. In either case the resultant documentation has to meet the requirements of the Brief and to be approved by the Planning Archaeologist.

Within Worcestershire, any archaeological project should be undertaken according to the Standards and guidelines for archaeological projects in Worcestershire, a document produced by the Planning Advisory Section of WHEAS a copy of the latest version of which is included as an appendix to this report (Appendix 3).

The completion of the assessment and evaluation allows archaeological matters to be taken into account when the application is subsequently determined. Although refusal on archaeological grounds is possible, it is more likely that any permission granted is likely to include conditions relating to archaeology. As at the pre-determination stage, the likely process would be for a Brief to be issued by the Archaeological Planning Officer outlining the methods, approaches and sampling levels the Officer considers appropriate for mitigation of the impact of the development on archaeological remains at the site.

5.1.2 Assessment and evaluation

In most cases, good practice determines that a staged approach to assessment and evaluation of the site is followed, each stage informing its successor and ultimately leading to documentation (one or more reports) that can be included as part of an Environmental Impact Assessment/Environmental Statement.

The staged approach should typically comprise the following elements:

1 A desk-based assessment (DBA) will be used to collate the already known information on the site and determine the most appropriate fieldwork approaches. This should be based primarily on information held within the County Historic Environment Record (HER) and may also commonly include a site visit/walkover survey, cartographic analysis and on occasion plotting of existing aerial photographic coverage.

2 Upon completion of the DBA, non-intrusive field techniques are normally applied. Commonly applied approaches include walkover survey/site inspection, geophysical

survey, fieldwalking and metal detecting. Earthwork survey and building recording may also form part of the evaluation process or may be identified at a later stage within any mitigation strategy developed.

3 These are followed by use of intrusive field techniques; most commonly machine trenching but also potentially including use of test pitting and borehole/auger survey.

Throughout this process a series of reports should be produced gradually refining the understanding of the archaeological resource and the approaches to be taken in the next stage.

A final report should be produced to draw all of the information together from all stages of work undertaken. This should provide an assessment of the date, range, extents, character, survival and significance of archaeological deposits which might be present. Often the report will also identify some areas as having higher potential than others. This report should be capable of supporting production of any Environmental Impact Assessment/Environmental Statement which may be required for the site.

Based upon information contained in the final report it should be possible to determine an appropriate mitigation strategy for any archaeological remains which are likely to be present within any given proposed extraction area.

5.1.3 Mitigation strategies

A range of mitigation strategies or outcomes may be recommended by the Archaeological Planning Officer. In rare instances no archaeological constraints will be placed upon the application. Similarly rarely, it is possible that it will be recommended that planning permission be refused on archaeological grounds. More commonly it might be recommended that an area of significant deposits is taken out of the application area or most commonly some form of mitigation strategy to record archaeological deposits prior to extraction will be recommended. The proper fulfilment of the recommended mitigation strategy will then form a planning condition placed upon the application.

Mitigation strategies include watching briefs, programmes of salvage recording or in some cases full excavation of selected areas. Often a combination of these approaches will be identified as appropriate, depending upon the different archaeological requirements of different parts of the application area. Contingency provisions are also commonly recommended as a matter of good practice reflecting the variable and often unpredictable nature of the archaeological resource. A further Brief will be issued detailing these requirements and again methods and sampling levels considered appropriate will be outlined. As during the evaluation, the minerals operator may use either an Archaeological Consultant or go directly to an Archaeological Contactor. In either case, once again the resultant documentation has to meet the requirements of the Brief and to be approved by the Planning Archaeologist.

The archaeological methods and approaches used and recommended in relation to minerals planning, follow those currently in use for all types of intrusive development. It should, however, be noted that the potential scale of minerals extraction and necessarily wholly destructive nature of the operation to archaeological deposits single them out from many other development types. A range of methods may be considered and these are outlined below for both shallowly buried sites as well as for deeply buried ones.

5.2 Approaches to non-deeply buried sites

Methodologies for investigation of non-deeply buried sand and gravel terrace sites or rock exposure sites are well developed and are covered by commonplace approaches to archaeological evaluation and any subsequent mitigation strategies applied.

These are applicable to most of the aggregate producing areas within Worcestershire though some limitations apply. In particular limitations apply within areas where alluvial deposits

may have buried archaeological deposits deeply below the current ground surface (Fig 7) effectively masking them from detection by conventional approaches (see below, Section 5.3). Other restrictions are less commonplace but are noted as far as possible.

5.2.1 Assessment and evaluation

The effectiveness of the various approaches used in the evaluation of archaeological sites has recently been assessed (Hey and Lacey 2001). This survey was based upon the results of twelve major projects covering a range of site types, periods, topographical circumstances and diverse land-use histories. All had been evaluated through a suite of techniques and large areas had subsequently been examined and planned during subsequent large-scale excavation and watching brief. These therefore provided an opportunity to compare the extent, range, detail and complexity of results as revealed with the predictions made at evaluation as well as to examine how alternative trenching samples and strategies at the evaluation stage might have affected the predictions.

The project concluded that:

> *'All non-intrusive methods of evaluation had merits in certain circumstances, for example desk-based assessment for developing effective strategies for evaluation sites, fieldwalking for locating sites with durable artefactual remains and prehistoric sites that only survive in the ploughsoil, and geophysics for revealing remarkable detail about feature layout for those sites with magnetically-enhanced soils. These methods were all comparatively cheap, but they all had some serious failings and none were even moderately successful at evaluation the range of archaeological remains that survived on these projects. Machine trenching was the only effective means of predicting the character of the sites in this study and, even though it was more expensive than the other methods, the improved quality of information and greater certainty from which to devise a mitigation strategy, made it cost effective. In practice, all the projects adopted more than one technique of evaluation and the combination of judiciously selected methods proved to be a powerful predictive tool.* (Hey and Lacey 2001, vii).

In respect of the trenching samples the survey also concluded that a sampling level of 2% presented a high risk for missing significant deposits and observed that the character of the site was an important factor. Even for sites with linear features (ditches), substantial remains and clustered features (eg Roman settlements) a sample level of between 3-5% was observed as necessary for producing a moderately good assessment, while sites characterised by more scattered and ephemeral remains (eg Bronze Age or early medieval settlements) could be missed even at these sample levels.

The conclusions of this survey and the recommendations made have increasingly affected approaches across the country and currently form the benchmark for projects in Worcestershire, with a minimum 4% trenching sample now typically recommended. It is therefore within such a methodological framework that evaluation strategies should be developed for prospective aggregate extraction sites in Worcestershire, thereby reducing risk to both the archaeology (in terms of damage) as well as to the prospective minerals operator (in terms of unexpected costs and/or delays).

5.2.2 Mitigation

Following completion of an evaluation, a range of mitigation strategies may be recommended depending upon the potential significance and extent of the archaeological resource predicted through the evaluative process. These may include the following:

- Excavation;
- Salvage recording;

- Watching brief;
- Earthwork survey;
- Building recording;
- Strip map and sample.

In the light of the recognised unpredictability of the archaeological resource, contingencies (both time and resources) are also commonly required to enable unexpected discoveries to be adequately recorded.

5.3 Deeply buried sites

The nature of sand and gravel resources means that they are often located within the floodplain of a river valley as well as upon the higher terraces flanking the river. As a result, both archaeological deposits as well as the sand and gravel reserves can be deeply buried by alluvial deposits accumulated over many hundreds or even thousands of years of silt deposition following overbank flooding. Within Worcestershire between 2.00m and 3.00m of alluvium may be typically encountered in the Severn Valley from Worcester southwards, with thicker accumulations at some locations such as over former channels (Fig 7). Lesser depositions are also present north of Worcester and within the other river and lesser tributary floodplains, however, most have areas where alluvium may be present at variable thickness.

Where present, alluvium on floodplain sites affects all stages of all development-led fieldwork, from evaluation through to design of appropriate and effective mitigation strategies.

Fieldwork methodologies for evaluating and investigating these sites clearly pose different problems to 'normal' conditions such as might be experienced on a 'typical' shallowly buried rural site as described above (Section 5.2). This is largely due to the potential for significant remains to be deeply buried beneath and within the alluvial sequences, thus masking the deposits and rendering many of the techniques commonly applied less effective and in some cases wholly ineffective (eg geophysical survey, fieldwalking and cropmark analysis are particularly affected).

Techniques which remain effective in such circumstances include machine trenching or test pitting. However, these pose considerable logistical problems due to the depths involved and the consequent difficulties of excavating sufficient sample areas (ie 4% plus) to the depths at which deposits might be encountered while maintaining a safe working environment for the archaeologists involved. The situation is further complicated by the frequent presence of complex palaeoenvironmental and other geoarchaeological deposits as well as the alluvial horizons which are liable to require specialist input beyond the capabilities of most staff regularly operating in the field.

One of the inevitable consequence of the challenges posed by such sites is that appropriately informed decisions are needed to made at all stages by the archaeologists involved in the process of evaluation, investigation and protection of them. Close co-operation between Curator, Consultant/Contractor and Mineral Operator is a key factor in the development of appropriate strategies at both evaluation and mitigation stages of any aggregates extraction site in such an environment. It is also essential that those involved in the decision making process have a good understanding of the character, importance and potential of such sites, especially those sites where the phases of human activity are not clearly defined. Apart from allowing clear aims and objectives to be established at each stage and thus ensuring an effective project design, this facilitates communication with quarry operators allowing them to be clear about the circumstances and implications for their development.

5.3.1 Evaluation

At the evaluation stage, a number of techniques for approaching deeply alluviated sites these have been successfully studied, developed and advocated by archaeologists in recent years including nationally (see for instance Needham and Macklin 1992; Brown 1997, 41-2 and 219-35); regionally as in the Thames Valley (Needham 2000) and the Trent Valley (Challis 2004, Brown *et al* 2005; 2007); and locally as at Wellington and Moreton, in the Lugg Valley (Griffin and Jackson 2003; Jackson and Miller 2006; Bapty 2007) and at Ripple, in the Severn Valley (Miller *et al* 2004).

The following approaches have proved particularly useful (though the effectiveness of some of these techniques in the Severn Valley has yet to be tested):

1. The use of wide trenches (5m or more) enables sufficient areas of deeply buried horizons to be safely examined and improves the chances of revealing deposits relating to former phases of human activity. The use of wide trenches also facilitates effective sampling and observation of palaeoenvironmental and alluvial sequences. It is, however, problematic to achieve a sufficient sample (*c* 4-5%) due to the considerable volumes of material resulting from the excavation of such trenches and thus approaches are used to enable trenching to be more effectively targeted.

2. Increasingly, as in the Trent Valley, it is being recommended that trenching be both preceded and supplemented by the use of ground-based and airborne remote sensing techniques; borehole data, coring or augering; deposit modelling (of both surface and sub-surface topography); and specialist geoarchaeological advice to allow trenching to be targeted to areas of higher potential and thus reduce the percentage of the overall application requiring consideration.

   Specialist ground-based geophysical techniques are being developed which have an increasing role in evaluating alluviated landscapes and targeting subsequent programmes of evaluative trenching. These include Ground Penetrating Radar (GPR) and Electrical Resistivity (ER) survey. Although waterlogged and clay rich deposits can limit the effectiveness of GPR, such surveys can be used to map sub-surface features such as gravel islands and palaeochannels. In conjunction with surface modelling, through traditional survey or use of new techniques such as LiDAR (Light Detection and Ranging – an airborne remote sensing technique which records microtopography over large areas from the air), these allow deposit modelling and assessment of potential areas of activity in an environment where traditional site prospection (through techniques such as cropmark assessment, magnetometry, resistivity and fieldwalking) is unlikely to be effective due to the masking effect of alluvial deposits. This information can be especially useful in conjunction with the data from minimally intrusive techniques (boreholes, augers, etc) and specialist geoarchaeological input to produce models of the palaeotopography of floodplain sites. These are commonly almost featureless now but in the past may have had considerable topographic variation which in turn may have influenced the manner in which they were exploited by contemporary communities. This then allows evaluative trenching to be more carefully targeted reducing the overall impact and logistical problems that this can pose.

3. Lastly, the availability of specialist on-site advice on a range of environmental procedures (insects, pollen, molluscs, plant macrofossils, etc) is essential at this stage to inform effective sampling to enable assessment these potentially important aspects of the palaeoenvironmental record.

5.3.2 Mitigation strategies

Beyond completion of any evaluation, there is usually a requirement for further work (mitigation) in the form of excavation, salvage recording and/or maintenance of a watching brief.

During such work, there is a clear need to develop a strategy for the recording and sampling of the alluvial and palaeoenvironmental sequence alongside the investigation of any deposits relating to phases of human activity which may be revealed.

This has a number of implications for any mitigation strategies designed (over and above those normally applied) and these mostly apply to salvage recording exercises where a degree of archaeological control can be applied during preliminary groundworks. At Wellington in Herefordshire particularly effective approaches adopted by WHEAS have included:

1. Use of an archaeologically-determined approach to 'overburden' stripping which provided alternating long sections and areas stripped in plan to variable and archaeologically determined depths. The areas revealed in plan provided opportunities for the identification and investigation of archaeological features, while the long sections enabled understanding, sampling and recording of associated alluvial and palaeoenvironmental deposits (within former channels) which need to be recognised as a key element of the archaeological record in their own right.
2. The depth of stripping to reveal areas in plan could be varied, as the depths at which archaeological remains occurred varied across the valley floor. The process was informed by evidence from the long sections and the previous strip. Provision was made for excavation to more than one plan horizon during any one strip since significant deposits potentially occurred at different levels within one area.
3. Recording of alluvial sequences and associated palaeochannels is a specialised field which would usually require the regular presence of a geoarchaeologist on site. This is expensive and impractical in that few specialists are available and sites are often worked over many months each year. At Wellington, Herefordshire David Jordan of Terra Nova worked with the field archaeologists from WHEAS on site to create a system for recording alluvial sequences and trained them to use it. In brief, deposits revealed in section were drawn, and detailed alluvial profiles recorded at regular intervals using specially designed pro-forma. Alongside a 'traditional' context-based stratigraphic record, these provided details of subtle variations in sediment structure, ped structure, staining, mottling, panning, coatings and evidence of rooting, cracking and worm action. Photographs, box samples and monoliths were taken to accompany the record. Periodic visits by the specialist team ensured that the system was being properly used and that atypical alluvial strata were examined. This supported recognition of post-depositional change, especially in relation to its effect upon stratified deposits and feature/layer definition. It also ensured that the resultant archive could be used to determine whether the boundaries of texture and colour related to parent material, depositional, or post-depositional processes, rather than conventional archaeological interpretations.
4. Contingencies were available to allow for the excavation and recording of any areas of important archaeological or palaeoenvironmental deposits, which were unexpectedly revealed. At Wellington, the evaluation process has so far been effective in identifying major concentrations of activity and therefore contingency provisions have largely been required to address deposits of relatively limited extent, often only comprising small single filled features. In such cases, the establishment of a contingency (both time and budget) should allow the relatively rapidly excavation of deposits with bulk sampling ensuring the maximum retrieval of artefacts and ecofacts as well as material which may be of use for AMS dating.
5. In those cases where more somewhat extensive deposits were present, the areas affected were still unlikely to have been identified through a 4-5% sample evaluation. Here, their appropriate treatment was secured as a result of long-established good communications with the quarry operator which facilitated negotiation of increased contingency provision (both time and financial resources). Although it is recognised that this situation may not always be the case, the benefits of good lines of communication are evident.

Further, support for understanding and recording geoarchaeological remains is available through the recent English Heritage publication *Geoarchaeology. Using earth sciences to understand the archaeological record* (English Heritage 2004b). In addition, a research project to develop a Soil Analysis Support System (SASSA) being undertaken at the University of Stirling will provide web-based information and decision making and analytical tools to support archaeologists working in the field (including when to call in specialist advice) and should prove to be of considerable benefit when working on deeply alluviated sites (http://www.sassa.org.uk/index.php/Soil_Analysis_Support_System_for_Archaeology).

Lastly, the developer involved should always be made aware in such floodplain environments of the potential for circumstances which neither the evaluation could be expected to anticipate, or the contingency adequately cover. If such an approach is taken, many developers will seek ways to accommodate the archaeology. In the case of quarrying, the redesign of the restoration and landscaping may be particularly useful, since areas are often left unquarried to form islands or peninsulars in the resultant lakes. Through consultation with, and the co-operation of, the relevant local authority minerals planning teams, the relocation of such areas can allow preservation *in situ* of areas of significant deposits. Although there are concerns with this approach due to the potential for dewatering and subsequent degradation of the quality of preservation of archaeological deposits, the increasing practice of 'wet working' is liable to considerably reduce any impact on deposit preservation.

5.4 The archive

The project archive will be deposited at:

Worcestershire County Museum
Hartlebury Castle
Hartlebury
Near Kidderminster
Worcestershire DY11 7XZ
Tel Hartlebury (01299) 250416

Relevant Project GIS layers and themes have been incorporated into the Worcestershire HER.

Copies of the report have been deposited with the following:

- Worcestershire Historic Environment and Archaeology Service's HER, Planning Advisory Service and Field Section
- Cotswold Archaeology
- Worcestershire Minerals Planning Department
- English Heritage

Online copies of the report are available as PDFs through both the WHEAS website http://www.worcestershire.gov.uk/home/wcc-arch.htm and the Archaeological Data Service (ADS @ http://ads.ahds.ac.uk). Hrad copies are available on request from Worcestershire Historic Environment and Archeology Service.

Part 2: Mineral resource assessment

6. Topography, geology and geomorphology

The western side of Worcestershire is both dominated and largely demarcated by the Malvern, Suckley and Abberley range of hills (Fig 8). The Malverns are formed by the oldest rocks in the county dating from some 600 million years ago. These comprise a variety of Pre-Cambrian igneous and metamorphic rocks. To the north, the area of the Suckley and Abberley Hills comprises younger, Silurian (440 million years old) shales and limestones, the outcropping ridges of the latter, harder stone alternating with the intervening lower land of the softer shales.

To the east of the Malvern Hills, and extending across a large part of the county, the solid geology is dominated by clays. These comprise Keuper Marl of Triassic age (200 million years) and Lower Lias clay of Jurassic date (195 million years). The Keuper Marl, also often referred to as Mercian mudstone, forms a gently rolling landscape interspersed by occasional low ridges of sandstone, while the Lower Lias clay forms an almost flat plain (Fig 8). A major feature of the latter landscape is Bredon Hill. This is a massive Jurassic Limestone outlier of the Cotswolds which lie to the south and east bounding the Lower Lias and otherwise only extending into the county its south-easternmost corner at Broadway.

To the north of the county, Bunter Sandstone and Keuper Sandstone of Triassic and Permian age (225-280 million years) form a landscape of rolling hills with steep sided valleys, the Bunter Sandstone forming prominent escarpments north-east of Bromsgrove and west of Kidderminster (Fig 8). Lastly, to the north-west and north-east of these sandstones, lie carboniferous rocks, some of which contain coal measures.

Extensive areas of the county are also covered by drift deposits, laid down during the climatic fluctuations of the Ice Ages (Fig 1). Around the Lenches, near Evesham, these comprise glacial sand and gravel deposited in association with boulder clay at the ice margins. However, more typically across the county, drift deposits comprise fluvio-glacial terraces of sand and gravel accumulated rapidly in valleys downstream of the ice margins. The succession of climatic fluctuations has produced a series of sand and gravel terraces in the main river valleys, the main ones being along the rivers Severn and Avon. These each have a series of five terraces at increasing heights and distances from the present river courses; the highest and most distant fifth terrace deposits representing the oldest formations. Further fluvio-glacial sand and gravel deposits also extend along the other two main tributaries of the Severn within the county, the Teme to the west and to a lesser extent the Stour to the north.

7. Mineral resources and aggregates in Worcestershire

Although Britain as a whole is mineral rich, there is only a limited range available within Worcestershire. Commercially exploitable minerals within the county comprise sand and gravel (including moulding sand derived from sandstone), limestone, dolomite, igneous and metamorphic rock, ironstone, clay, coal and salt (Fig 1).

Of these, three principal types of mineral aggregates are or have been quarried in Worcestershire and are relevant to this survey. These are sand and gravel, limestone and igneous rocks, although the latter are not actively quarried in the county at the present time.

Clay, although not relevant to the current survey, remains a locally significant resource supplying brick manufacturing plants in the Stourport area, while historically coal and salt were also exploited, the Worcestershire saltfield being exploited until the 1970's (Hereford and Worcester County Council 1997; Bloodworth *et al* 1999).

7.1 Sand and gravel

Sand and gravel is the most important aggregate produced in Worcestershire. The sand and gravel resources are extensive and include both drift deposits exploited for sand and gravel and sandstone bedrock deposits which are crushed for sand (Fig 1). At the time of writing, there are eight active quarries exploiting sand and gravel and sandstone bedrock (including Silica Sand) in the county (Figs 3 and 9-12).

Production averages *c* 0.85mt (million tonnes) per annum and is focussed along the Severn Valley (WMRAWP 2004 and data provided by Worcester County Council MPA for Mines and Quarries Survey 2006). The WMRAWP regional apportionment for the county is 0.871mt per annum for the period through to 2019 assuming demand remains relatively stable across this timeframe.

7.1.1 Drift deposits

Drift deposits of Quaternary age include both glacial deposits in eastern Worcestershire, and extensive fluvio-glacial sands and gravels in the valleys of the Severn, Avon, Stour and Teme.

River sand and gravel deposits include spreads beneath alluvium forming the floors of river valleys and river terrace deposits flanking the valley sides. Past and present sand and gravel quarries are concentrated in the Seven and Avon Valleys and along the River Stour (a tributary of the Severn) and the Carrant Brook (a tributary of the Avon), but there are quarries which utilise more localised deposits. The Teme Valley has not formed a focus for exploitation in recent years but has been exploited historically.

Deposits in the main production areas can exceed 10m thickness but are more typically in the 3.00m to 6.00m range, with thinner deposits elsewhere. As noted above, current production is focussed along the Severn Valley (Figs 10 and 11), however, future commercial pressure added to diminishing available reserves may result in the pattern of exploitation changing in the future to incorporate the less extensive and thinner reserves found beyond those areas currently forming a focus for extraction, or, a return to previously heavily exploited reserves along the Avon and Carrant Valleys.

The recent summary of later prehistoric evidence from Worcestershire highlighted the significant range of excavated evidence from the river valleys (Hurst 2002), and this can be matched for later periods. From an archaeological perspective, the Severn Valley and the Avon Valley are particularly significant areas of early settlement and land division, and were intensely exploited from the later prehistoric period. The Avon Valley and its tributary the Carrant Brook was an early focus of aerial photographic research, which identified extensive evidence for prehistoric and Romano-British sites on the river terraces (Webster and Hobley 1964). This led to the early characterisation of the river gravels as significant archaeological areas in the West Midlands. Both valleys have been prime *foci* of archaeological fieldwork and research since the 1970s, due to a constant demand for sand and gravel and the near-ubiquitous presence of archaeological remains. The archaeological resource of the Stour is less well known while that of the Teme is poorly understood, due in part to the absence of development-led fieldwork including that driven by sand and gravel extraction.

Glacial sand and gravel deposits are present in the north-east of the county and include deposits of sufficient thickness and extent to have warranted recent commercial exploitation, though no active quarries are currently present. The BGS survey (Bloodworth *et al* 1999 maps three quarries in north-east Worcestershire (at Shirley, Houndsfield Lane and Grimes Hill; Fig 12. 15-17) but the Minerals Local Plan (Hereford and Worcester County Council 1997) states that none were in production in 1994. However, commercially viable reserves may still be present since although deposit thicknesses are generally less than 10.00m, localised deposits may exceed 20m where they infill over former channels and hollows (Bloodworth *et al* 1999). The archaeological resource of the north-east of the county to which these deposits are restricted is poorly known.

7.1.2 Bedrock (crushed sand)

Bedrock deposits represented by sandstones of the Triassic Sherwood Sandstone Group, around Kidderminster/Stourport and north of Bromsgrove (Kidderminster Formation and Wildmoor Formation) have also been exploited for sand (mainly silica sand used in foundries for casting but also for building sand). Production of aggregates from these sources is currently confined to the area north of Bromsgrove (Fig 12).

These aggregate producing areas lie within a much wider area of ancient woodland landscape and have not been specifically characterised in terms of archaeological monuments or historic landscape, but the broad outlines of settlement history and land-use in Worcestershire's woodland landscapes are understood (Dyer 1991).

7.2 The Cotswold limestone.

Limestone is the only form of crushed rock aggregate now produced in Worcestershire. Limestone aggregates have been produced from a range of sites in the past, however, production is now limited to a single quarry at Fish Hill, Broadway (Fig 9.11). The following areas can be identified as having potential for hard rock exploitation:

(a) *Silurian limestones* that occur in narrow, strongly faulted zones west and north of the Malvern Hills. The majority lies within the Malvern Hills AONB and are not subject to any current working, but limestones have also been previously worked north of the Malvern Hills, notably in the Abberley Hills area;

(b) *Jurassic Inferior Oolite* forms the Cotswolds and Bredon Hill. The entire outcrop in Worcestershire lies within the Cotswold AONB. The limestone is now only worked for building stone and aggregate at Broadway, in the far south-east of the county and within the AONB.

Within the county Bredon Hill and the small area of the Cotswold scarp at Broadway represent are important historic landscapes, and in Worcestershire Bredon Hill is significant for prehistoric monuments including Iron Age hillforts. The inclusion of all the oolitic limestone areas within the Cotswold AONB suggests that large-scale expanded extraction of this aggregate in the future is unlikely, although small localised quarries may be permitted for specific projects such as church restoration or dry stone walling.

As noted above only the quarry at Fish Hill, Broadway is active at this moment in time. Production levels are not available but the county has a regional production allocation in the order of *c* 0.163mt (million tonnes) per annum for the period through to 2019 assuming demand remains relatively stable across this timeframe (WMRAWP 2004 and data provided by Worcester County Council MPA for Mines and Quarries Survey 2006).

7.3 Igneous rocks

The Precambrian igneous rocks forming the Malvern Hills are an area of steep-sloped upland, long used for grazing. The Precambrian Malverns Complex rock is composed mainly of intrusive rocks including diorites, tonalites, minor granites and ultrabasic rocks.

Quarrying was widespread on the Malvern Hills producing building stone and roadstone until the 1980s (Fig 10. 6-9) but the entire aggregate-producing area now lies within the Malvern Hills AONB and there are no active quarries exploiting this resource. Although a potential source of good quality aggregate, future extraction is unlikely to be permitted on anything but a restricted scale.

The area contains an important range of archaeological monuments, and constitutes an important historic landscape. The area has been studied in detail by English Heritage (Bowden 2005).

8. Overview of former aggregate extraction and archaeology

The following overview covers operational (active) and former quarries (worked out) as well as the preferred areas for extraction identified within the 1997 Minerals Local Plan for the County (MLP; Hereford and Worcester County Council 1997). The information presented is drawn from the MLP, from the 1990 Minerals Local Plan Consultation Draft and from the British Geological Survey (BGS) Minerals Resource Mapping and associated documentation (Bloodworth *et al* 1999).

All known mineral planning permissions within Worcestershire which are shown on the BGS Mineral Resources Map and included in the accompanying report are covered. These represent the known situation at 31st January 1999 and are understood to include all permissions granted since 1st July 1948 and all IDO permissions, whatever their subsequent status in relation to legislation relating to the Planning and Compensation Act 1991 and the Environment Act 1995 (Bloodworth *et al* 1999).

In the light of the restrictions on the BGS survey and developments over the period since its publication, data on aggregate extraction permissions used for the project has been augmented by information gathered from a range of sources including colleagues from the Worcestershire Minerals Planning Authority, the Worcestershire Historic Environment Record, quarry operators and archaeological contractors. This has allowed incorporation of permitted extensions and permitted new applications which have arisen since 1999 and therefore represents an accurate point-in-time data source as far as reasonably achievable within project resources.

The resultant mapping (Figs 9-12) and information has provided the basis for a summary of both formal and informal archaeological responses to quarrying and the results of any archaeological interventions made over the past.

No attempt has been made to map or quantify aggregate extraction pre-dating 1948, although those quarries which produced significant archaeological finds prior to this date are considered within this document. It is, however, recognised that the pattern and distribution of pre-1948 quarrying is of considerable relevance to understanding the potential extent of workable aggregates and the potential impact of past working on the archaeological resources of the county. Further, it is noted that these historic quarries warrant more detailed consideration at some point as in themselves they form an important, but poorly understood, element of the archaeological record for the county.

8.1 Avon and Carrant Valleys

This area encompasses a concentration of numerous former sand and gravel extraction sites and preferred area sited on the terraces of the River Avon and its tributary the Carrant Brook (Fig 9; Table 5). One additional site, at Strensham, is identified in the 1997 MLP as a preferred area (Fig 9.2). This has been subject to a pre-determination archaeological evaluation but is currently ‘on hold’ due to concerns about access and transport, though these may well be overcome (information from MPA). Further sites within this area have been the subject of both formal applications and informal enquiries in the past and remain likely focal areas for future consideration (see below).

The earliest reported finds resulting from quarrying in this area derive from the terraces of the River Avon where as long ago as 1863 a Bronze Age urn was reported from Ballast Hole Gravel Pit at Charlton, while in 1882 an archer’s wristguard of probable Beaker date was recorded at Aldington (Smith 1958). In the first half of the 20th century Bronze Age metalwork was recorded at Cropthorne (Smith 1958) and in the 1930’s quarrying at Salter’s

Lane, Lower Moor uncovered two Beakers and a small 'food vessel' accompanying crouched inhumations (Else 1943; Fig 9.4).

In 1954 and 1958/9 two Anglo-Saxon cemeteries were excavated at Carrant Brook Quarry, Overbury and Conderton (Evison and Hill 1996; Fig 9.8), but the full archaeological potential of these terraces was not properly recognised until the mid 1960's when as a result of aerial reconnaissance (Webster and Hobley 1964) numerous cropmark complexes were recorded representing later prehistoric and Romano-British enclosures, field systems and a range of other sites, including potential Neolithic and Early Bronze Age monuments.

Rescue excavations followed along the Carrant Valley as a result of the threat of quarrying to several of these cropmark sites. During the late 1960's and through the 1970's major Iron Age settlement remains and small Romano-British cemetery site were extensively recorded at Beckford (Oswald 1974; Britnell 1975; Wills forthcoming; Fig 9.9). To the west, in the 1980's targeted rescue excavations covered a small part of a large quarried area at Aston Mill Quarry, Kemerton revealing early prehistoric artefacts, pits and ring-ditches along with Iron Age, Romano-British and Anglo Saxon period settlement remains (Dinn and Evans 1990; fig 9.7). More recently a staged evaluation of a site at Huntsman's Quarry, Kemerton during the mid 1990's resulted in an extensive programme of salvage recording of a Late Bronze Age settlement as well as Neolithic and Beaker period features (Napthan *et al* 1997a; Jackson 2005; Fig 9.6).

The archaeological resource of the area removed as a result of permitted aggregate extraction where no archaeological planning constraint or other provision was made cannot be estimated at present. However, quarrying at Gellester's Farm, Bredon's Hardwick in the 1970s and 1980s (46ha; Fig 9.1) and the unexamined areas of Aston Mill Quarry (comprising a considerable proportion of this 155ha site; Fig 9.7) are of particular note as they covered extensive areas within a landscape which has been demonstrated to be archaeologically rich and diverse at both a regional and national scale. Further consideration and estimates of the potential loss to the archaeological resource resulting through these operations does not fall within the scope of the current project, but would warrant further analysis once accurate and comprehensive mapping is available of the cropmark evidence recorded prior to extraction within these areas.

Lastly, it is noted that the area is not only important for the sites spread along the terraces of the Avon and Carrant Valleys, but also for the significant sites lying on and around Bredon Hill which separates the two valleys. The limestone resources of this hill have been widely quarried in the past for building stone as is evident from even a cursory examination of Ordnance Survey Mapping. Here, of particular significance are the Iron Age hillforts at Bredon Camp and Conderton Camp both of which have been the subject of programmes of excavation (Cruso Hencken 1938; Thomas 2005), while a double Beaker burial discovered on Bredon Hill in 1963 (Thomas 1967) is also an important find.

8.2 South-east Worcestershire (Broadway and Cleeve Prior)

In the past, this area has been subject to both hard rock (limestone) and sand and gravel quarrying, however, is currently only subject to limestone quarrying at the county's sole hard rock quarry at Fish Hill, Broadway, a long-standing permitted site lying on the county's border with Gloucestershire (Fig 9.11; Table 6).

Despite this relative lack of modern or extensive aggregate extraction in the area, the earliest documented finds resulting from quarrying in the whole county derive from this area, from near Cleeve Prior. Here in 1811, there is an account of 'two earthen pots, the one containing gold and the other silver Roman coins, found by a labourer while digging stone in a quarry'.

To the east, near Broadway, during the 1930's and 1940's, finds from a small sand and gravel quarry (Broadway Gravel Pit; later Milestone Ground; Fig 9.10) came to the attention of a local archaeologist, Miss C N Smith. With the help of a small team of enthusiasts she

excavated and recorded Roman skeletons, ditches and pits associated with pottery, brooches and other finds indicative of Roman settlement (Smith 1943; 1944; 1946). Some highly decorated Late Neolithic pottery was also found, and featured in an article in the Proceedings of the Prehistoric Society for 1936, which for the first time identified the important style of Late Neolithic pottery known as Grooved Ware (Hazzledine 1936). It was not until 2006 that a more important Grooved Ware assemblage was found in Worcestershire, at Clifton Quarry, in the Severn Valley.

Lastly, at Broadway Hill (at Fish Hill Quarry; Fig 9.11), the discovery of a skeleton in 1954 and reports of finds including a sword, led the Evesham Historical Society to undertake preliminary investigations of what turned out to be an Anglo-Saxon cemetery. As a result of the preliminary investigation, in 1955, five disturbed and three intact graves were subsequently excavated by the Ministry of Works (Cook 1958).

8.3 Severn south of Worcester

This area is the most active sand and gravel production area of the county at present with three operational quarries located along the east bank of the River Severn, at Bow Farm, Ripple, Clifton and Ryall/Saxon's Lode (Fig 10; Table 7). Ryall has been extended on several occasions and all three have additional areas currently under consideration for extraction or which have been previously subject to consideration (and therefore may potentially be revived if commercial pressures and/or economic circumstances change).

Historically, there appear to have been only a small number of quarries along this stretch of the river, possibly reflecting the frequent deep burial of sand and gravel deposits by alluvium, making them difficult to access. However, quarrying is recorded in Kempsey, just south of Worcester, as long ago as 1835. Here 'several fragments of sepulchral urns, cups, and pans of various shapes and sizes, evidently belonging to the time of the Romans and Romanised or later Britons, were……dug out of a gravel bed' (Allies 1852). These derived from what were described as stone cists and over the subsequent four to five years at this and an adjacent quarry (the Parish Gravel Pit) further similar features and Roman finds were made including brooches and a coin. Nearly 100 years later, quarrying in the hamlet of Draycott, also in the parish of Kempsey, in early 1934 disturbed a complete handled Beaker though no associated burial or other Beaker deposits were recorded (Hawkes 1935).

Formal archaeological responses to quarrying in this area were very limited until recent years, and in the case of Bow Farm, Ripple the lack of a conditioned mitigation strategy remains an issue for considerable concern since the only archaeological condition relating to this large area (62ha; Fig 10.5) remains one allowing access. Desk-based assessment, geophysical, fieldwalking and metal detector surveys and limited evaluation trenching of the site were completed with the support of the ALSF in 2003-4 (EH PNUM 3369; Deeks and Jackson 2003; Cox 2003; Miller *et al* 2004). This identified Late Neolithic/Early Bronze Age remains of probable national significance in the form of a substantial timber post, set upright in a pit. No further posts were recorded within the limited evaluation sample but the post-pit and four further pits appeared to extend the line of a (?later prehistoric) pit alignment known from cropmark evidence, while the post-pit can provisionally be interpreted as representing one element of an early prehistoric timber monument set in a clearing on the river floodplain. Well-preserved palaeoenvironmental remains and associated alluvial deposits provided important evidence for floodplain development and local environment. Other potentially significant deposits included an Iron Age ditched and embanked trackway leading from the nearby Towbury Hillfort towards the river. Unfortunately, despite the clear potential national and regional significance of these deposits, it has not proved possible to secure resources to support a mitigation strategy for this site while quarrying proceeds, and wholesale loss of this important archaeological landscape without further record seems probable.

The initial quarry at Clifton covered 86.7ha and was permitted in 1988 prior to the implementation of PPG16 (Fig 10.1). As at Ripple, this permission only included an archaeological access condition and this entire area was worked without any archaeological

input from the mid 1990s through to 2005. In contrast, in recent years two extension applications have been subject to pre-determination evaluation conditions (Miller, Darch and Griffin 2001; Vaughan 2005a) and a newly permitted area covering nearly 17ha is now the subject of an agreed programme of archaeological mitigation. Salvage recording and contingency provision established for the first phase of operations has allowed the recording of unexpected but important evidence for Late Neolithic, Bronze Age, Iron Age and Roman activity on the Severn floodplain (Andy Mann pers comm). Of particular (national) significance was the identification of a wealthy Late Neolithic pit group containing Grooved Ware, polished stone and flint axes and large quantities of flint. In the same area but of probably Bronze Age date, a well preserved burnt mound and associated pits and other features were also recorded. Highly important evidence for the local environment between 6000 to 4000 years ago was also recovered from the silted up remains of a former channel of the River Severn identified during the evaluation and alongside which the activity noted above was located. Future stages of work will allow excavation of an area of Bronze Age activity and Iron Age settlement defined through the evaluation and salvage recording within other areas of the quarry extension.

In contrast to Ripple Quarry and the initial stages of Clifton Quarry, that at Ryall has been the subject of evaluation and a staged programme of mitigation in advance of extraction over a considerable number of years (Fig 10.4). This resulted in excavation of a defined area of high potential by Cotswold Archaeology in 2002 allowing recording of a small Late Bronze Age henge, numerous Iron Age pits containing burnt grain and a Roman farmstead, as well as an unanticipated but significant and rare example of an Anglo-Saxon settlement (http://www.cotswoldarch.org.uk/annual_review_2002/ryall_roman.htm; Barber and Watts 2006).

Together, the recent history of archaeological investigation at these sites has demonstrated the very high archaeological potential of these floodplain areas and terraces south of Worcester. However, despite this high potential (which includes exceptional potential for good preservation of rare early prehistoric and later dated waterlogged remains and associated palaeoenvironmental deposits), the area remains poorly understood by archaeologists. In part this reflects the relative lack of areas of large-scale development on the floodplain and adjacent terraces. However, a large part of the problem of developing an understanding of these areas also lies in the effects of alluvial masking of archaeological deposits on the floodplain, which as noted earlier (Section 5.3) means that many traditional archaeological prospection methods do not work while others are logistically more difficult and considerably more demanding of resources.

8.4 Worcester City

As an urban area, Worcester is now excluded from extraction and is not widely considered within this document, however, sand and gravel were worked in and around the city in the past. Quarrying documented within the city includes Perdiswell Pit, Bilford Lane Pit, Henwick Pit (Himbleton Road) and St John's Pit.

Archaeological finds resulting from these quarries are limited but include a bronze torc of Iron Age date found at the Perdiswell Gravel pit as long ago as 1840 (Allies 1852). Both Henwick Pit and Bilford Lane Pit produced Palaeolithic finds during the 1920s, while the latter has also produced a Neolithic polished stone axe. These demonstrate the considerable archaeological potential of the aggregate deposits which underlie the city, deposits which since they are effectively excluded from future extraction (by the presence of the city) have potential value as a preserved area of deposit which may contain Palaeolithic material though this should be better demonstrated before reliance is placed on such a model (James Dinn pers comm).

8.5 Severn north of Worcester (to Stourport)

This group of sand and gravel extraction sites is focussed on the 2nd terrace of the River Severn, north of Worcester and around the villages of Holt and Grimley and at Larford, Astley which lies just to the south of Stourport (Fig 11.5 and 6; Table 8).

Aggregate extraction in this area is restricted to sand and gravel quarrying and has a long history dating back into the 19th century, and probably earlier. Since at least the 1960s quarrying around Holt and Grimley has been on a large scale and is focussed around Ball Mill, effectively forming a single large quarry which has been extended on numerous occasions to cover a total area in excess of 200ha (Fig 11.5). Quarrying remains active at the site, current working focussing at Retreat Farm to the south of the processing plant site at Ball Mill. The Retreat Farm workings are nearly exhausted at the time of reporting and attention is shifting towards an earlier permission (now under revision) at Church Farm East and proposed extensions at Church Farm West and Church Farm South. Production from this quarry is in the region of 250,000 tonnes/annum thus comprising nearly a third of the county's annual apportioned target. To the north, a large area was quarried in the 1950s at Larford, Astley but this area is no longer actively worked.

The earliest documented archaeological discovery associated with quarrying along this stretch of the Severn area is of an early prehistoric axe hammer reported from 19th century workings at Ball Mill Gravel Pit (Smith 1957, 16). However, the rich archaeological potential of the area was not recognised until systematic aerial reconnaissance was undertaken of the midlands gravels by A Baker and J Pickering from the 1950s onwards. These allowed the impact of ongoing quarrying on the cropmark complexes around Astley and Holt/Grimley to be recognised.

The first formal response to quarrying was at Larford Quarry, Astley, investigated between 1956-9. The initial focus was a ring-ditch excavated by Charles Green with support from the Ministry of Works and four men provided by the contractors (Green 1962). Members of the Kidderminster and District Archaeology Society were also involved and subsequent to investigation of the ring-ditch between 1956-9 they recorded three sites which included an Iron Age pit, two Romano-British settlement enclosures and an oven or hearth and a sandstone-lined well (Walker 1958; 1959).

Between 1965-7 the first formal archaeological response to the ongoing operations at Ball Mill was undertaken comprising salvage recording and a watching brief on Romano-British remains being revealed within the area known as Church Farm South (Peltenburg 1967). Subsequently in 1970-2 and 1974-5 a series of rescue excavations and salvage recording were undertaken at Top Barn Farm and Holt Castle Farm. These revealed evidence for indeterminate Late Neolithic to Beaker period and Iron Age activity but most significantly allowed the recording of five Early Bronze Age ring-ditches and associated funerary deposits (Hunt, Shotliffe and Woodhouse 1986).

Extensive areas continued to be quarried around Holt and Grimley within long extant permitted areas without archaeological record until recently, however, the advent of PPG16 has seen a series of evaluations and salvage recording of areas affected by extensions, new access roads and conveyors (Edwards 1989; Shelley 1989; Edwards 1991; Jackson 1991a). Latterly ALSF support has allowed plotting of elements of the cropmark complexes which have already quarried away allied to evaluation and recording of a surviving portion of a permitted area at Retreat Farm Quarry (Deeks, Jackson and Steinmetzer 2004). Further evaluative work has also been completed in recent years. This has been associated with proposed extensions to the east (Church Farm East; Fagan 1992) and to the west of the current quarry plant site (land south of Top Barn, now Church Farm West; Edwards 1997; Miller 2003; Deeks 2004).

Together these investigations (both rescue excavations and planning led evaluation and mitigation) have considerably supported the development of an understanding of the character and date of the cropmark complexes in this area. These complexes are now

recognised to represent the more readily visible elements of a diverse and rich archaeological landscape characterised by early prehistoric activity focussed around the funerary monuments, near Holt and at Larford, and Iron Age and Romano-British activity focussed on a series of settlement enclosures extending along the west bank of the Severn.

As in the Carrant and Avon Valley, the impact of quarrying on the archaeological resource of areas of this landscape, where there were no archaeological constraints or provisions, cannot be estimated at present. However, extensive areas of this important archaeological landscape were clearly removed and further consideration and estimates of the potential loss to the archaeological resource resulting through these operations would be warranted. Such work does not fall within the scope of the current project but should be undertaken and should include completion of the process of accurate and comprehensive mapping of the cropmark evidence which provides the sole record of the archaeological resource prior to extraction.

8.6 Teme Valley

The Teme Valley contains potentially exploitable sand and gravel deposits, which are most extensive near its confluence with the River Severn but extend all the way to the county's western border. There are no active quarries along the Teme and indeed none are located on the BGS mapping. However, historically Ordnance Survey mapping shows gravel pits along parts of the valley and, although the reserves are limited and transport links are poor making them currently unattractive for exploitation, they may potentially become a focus at some point in the future due to economic pressures and the working out of more readily exploitable reserves.

Archaeologically this area is the most poorly understood in the county (see Figs 5 and 6) but the archaeological potential of the area covered by these reserves is suggested by an antiquarian find from a 19th century quarry at Lindridge of a 'chisel-like implement of green coloured stone…Perforated at one end with a countersunk hole at each corner, a third hole between, only partly drilled, other end sharpened' (Smith 1958, 17; possibly a bracer or wristguard?).

8.7 Severn and Stour Valleys (north of Stourport and around Kidderminster)

This area has been subject to sand and gravel quarrying in the past, although there are presently no active sand and gravel quarries in the area (Fig 11; Table 9). The area has also formed a focus for a number of small quarries exploiting the Wildmoor Sandstone formation, a fine-grained and weakly cemented stone which was used widely in the past to produce silica sand for the foundry castings industry but is now more commonly used as a source of building sand. All of these have also been worked out.

Sand and gravel quarrying was undertaken at a relatively large-scale at Lickhill Quarry and the adjacent Brant Farm Quarry (Blackstone; Fig 11.8 and 9), near Stourport in the Severn Valley and at a moderate scale at Puxton and Cookley in the Stour Valley. Other lesser sites were also present exploiting both sand and gravel and silica sand but with the exception of Brant Farm, Blackstone none have received any archaeological investigation. The latter was subject to a major rescue excavation in the 1970s. Subsequent joint operation of this site with its neighbour, Lickhill Quarry, was associated with applications to extend the quarry in 1997 and again in 1999. A pre-determination evaluation of the 1997 application and a watching brief condition placed on the 1999 application failed to identify deposits of any note. The 1970s excavation and salvage recording work has unfortunately never been fully published, an issue identified below as a priority for Iron Age research within the county (Section 14.5.1) and one being addressed by an ongoing ALSF project to assess the project archive (Derek Hurst pers comm). However, in the absence of detailed information, interim reports are of considerable value and record significant Iron Age settlement remains along with evidence for Neolithic and Romano-British activity (Hunt 1972; 1973; 1977). These demonstrate the high archaeological potential of this area as do a series of significant

discoveries made during salvage recording along two pipelines running through this area in the 1990s (Dinn and Hemingway 1992; Jackson *et al* 1996a).

8.8 North-east Worcestershire (Bromsgrove and Redditch)

Sandstones of the Triassic Sherwood Sandstone Group lying to the north and east of Bromsgrove (Kidderminster Formation and Wildmoor Formation) have been quarried in the past for silica sand used in foundries for casting and more recently for building sand. Production of aggregates from these sources is currently confined to the north of Bromsgrove, where there are four active quarries (Fig 12.5-8; Table 10).

Glacial sand and gravel deposits are also present in the far north-east of the county, north of Redditch. These include deposits of sufficient thickness and extent to have warranted recent commercial exploitation at Shirley, Houndsfield Lane and Grime's Hill, though no active quarries are currently present (Fig 12.15-17; Table 10).

The archaeological resource of this part of the county is generally poorly known and there are no recorded finds and no archaeological conditions associated with any of the mapped quarries in this area, although there has been consultation at planning permission stages associated with extensions permitted since 1989. Despite the paucity of archaeological evidence, during the medieval and later periods documentary research shows that these quarries lie within a much wider area of ancient woodland landscape for which the broad outlines of settlement history and land-use are understood (Dyer 1991).

8.9 Malvern Hills and Abberley Hills AONBs

This area has been widely quarried in the past for both building stone and roadstone, however, within the Malvern Hills no active quarrying has been undertaken since the 1980s while in the past few years the last active quarries within the Abberley Hills have also closed. Prior to this a range of rock types were exploited across the area, comprising sandstone (Hollybush; Fig 10.6), limestone (Woodbury, Shavers End, Penny Hill, Rodge Hill; Fig 11.1-4) and igneous rocks (Tank, North Malvern Scar and Gullet; Fig 10.7-9; Table 11). Quarrying on any significant scale is considered highly unlikely in the future due to conservation measures associated with the AONBs and problems of access, although some small-scale quarrying may potentially be permitted to supply local building stone for use in the immediate area, especially if required for repair to churches and historic buildings.

There has been no formal archaeological response to any of these quarries and no finds have been reported, however, the area contains an important range of archaeological monuments, and constitutes an important historic landscape. The Malvern Hills area has recently been studied in detail by English Heritage (Bowden 2005).

Quarry name	Operator/applicant	Status	Archaeological response	Permissions
Salters Lane Quarry, Lower Moor	Avon Gravels Ltd	Worked out	Finds reported and recorded in 1930s 1947, 1962, 1979 - No conditions 1989 – Access condition 1995 – Access condition	Commenced by 1920s Permitted 1947 Extended 1962, 1979, 1989 & 1995
Strensham Quarry, Mill Lane, Upper Strensham	Cemex	MLP Preferred area (currently 'on hold')	Requirement for staged programme of pre-determination evaluation	N/A
Gellester's Farm Quarry, Bredon's Hardwick	RMC Western Aggregate	Worked out	No conditions	Permitted 1975 Extended 1984
Upper Moor Quarry	-	Worked out	No condition	-
Offenham Quarry	-	Worked out	No condition	-

Table 5.1: Quarries in the Avon Valley (as shown on BGS mapping 1999 or subsequent applications; Fig 9)

Quarry name	Operator	Status	Archaeological response	Permissions
Aston Mill Quarry, Kemerton	Gloucester Sand and Gravel Company Ltd Huntsman's Quarries	Worked out (MLP preferred area remains unworked but contains poor quality reserve)	No conditions 1984-5 - Rescue excavation and salvage recording	Permitted Extended 1983
Carrant Brook Quarry, Overbury and Conderton	Gloucestershire Sand and Gravel Company	Worked out	No condition 1954 & 1958/9 -Rescue excavation and salvage recording	Permitted 1950s
Huntsman's Quarry, Kinsham Lane, Kemerton	Huntsman's Quarries	Worked out	1988 - Access condition 1993 – Conditioned programme of works (Evaluation and salvage recording 1994-6)	Permitted 1988 Extended 1993
Beckford Quarry	Huntsman's Quarries	Worked out	No conditions 1972-9 - Rescue excavation and salvage recording	Permitted 1960s Extended 1980

Table 5.2: Quarries in the Carrant Valley (shown on BGS mapping 1999 or subsequent applications; Fig 9)

Quarry name	Operator	Status	Archaeological response	Permissions
Fish Hill Quarry, Broadway	Baille Brind Quarry Company Smith & Sons (Bletchington) Limited	Active	No conditions 1954 - Human remains reported 1955 - Rescue excavation 1997 – Evaluation. No conditions required	Permitted 1950 Extended 1954 Extended 1997
Milestone Ground Quarry, Broadway	-	Worked out	No conditions 1940s - Rescue excavation	Active in 1930s and 1940s

Table 6: Quarries in south-east Worcestershire (shown on BGS mapping 1999 or subsequent applications; Fig 9)

Quarry name	Operator	Status	Archaeological response	Permissions
Clifton Quarry, Severn Stoke	Tarmac	Active	1990 – Access condition 2001 – Proposed extension subject to pre-determination evaluation 2005 – Revised extension subject to pre-determination evaluation 2006 to date – Conditioned programme of mitigation	Permitted 1990 Extended 2006
Holly Green 1	-	Worked out	No conditions	-
Holly Green 2	-	Worked out	No conditions	-
Holly Green 3	-	Worked out	No conditions	-
Ryall House Farm Quarry, Ryall	Hills Aggregates Ltd	Worked out	Access condition	Permitted 1989
Ryall House Farm Quarry - North, Ryall	Cemex UK	In planning	Pre-determination evaluation required	N/A
Ryall House Farm Quarry - Saxon's Lode Farm, Ryall	Cemex UK (formerly RMC)	Active	Conditioned programme of works (Evaluation and excavation)	Permitted 2001
Bow Farm Quarry, Ripple	Cemex UK (formerly RMC)	Active MLP Preferred area to south	Access condition 2003-4 – ALSF supported staged evaluation	Permitted 1988 (Working commenced 2005)

Table 7: Quarries on the Severn – south of Worcester (shown on BGS mapping 1999 or subsequent applications; Fig 10)

Quarry name	Operator	Status	Archaeological response	Permissions
Ball Mill Quarry	Ball Mill Sand and Gravel Co	Worked out	No condition	Worked 1950s
Ball Mill Quarry – Church Farm	Ball Mill Sand and Gravel Co Tarmac	Worked out. Now site of quarry plant	No condition 1965-7 - Rescue excavation and salvage recording	Worked 1960s
Ball Mill Quarry – Church Farm (North)	Tilcon Limited	Worked out	No condition 1991 - Access road construction subject to salvage recording	Permitted 1980 Worked early 1990s
Ball Mill Quarry – Church Farm (East)	Tarmac	Active	Pre-determination evaluation 1992 No condition	Permitted 1991 Commenced 2007
Ball Mill Quarry – Church Farm (South)	Tarmac	In planning (refused but may go to appeal)	Requirement - Conditioned programme of works to be agreed (Brief produced requiring evaluation trenching as first stage)	N/A
Ball Mill Quarry – Church Farm (West)	Tarmac	Permitted (but requires SMC)	Pre-determination evaluation Requirement - Conditioned programme of excavation to secure SMC	Permitted 2007
Ball Mill Quarry – Retreat Farm	Tarmac	Active	Access condition 1992 - Conveyor corridor salvage recorded Retrospective DBA and evaluation through ALSF 2004	Permitted 1989 Worked 1995-date
Ball Mill Quarry – Top Barn Farm/Holt Castle Farm	Ball Mill Sand and Gravel Co	Worked out	1964, 1980, 1984 - No conditions 1970-72, 1974-5 - Rescue excavation and salvage recording 1988 – Evaluation (undertaken in 1989)	Permitted 1964 Extended 1980 & 1984 & 1988
Copcut Farm Quarry	-	Worked out	No condition	-
Larford Farm Quarry, Astley	Severn Valley Sand and Gravel Company	Worked out	No conditions 1956-8 - Rescue excavation and salvage recording	Worked 1950s
Titton Quarry	-	Worked out	No condition	-

Table 8: Quarries on the Severn – north of Worcester (to Stourport; shown on BGS mapping 1999 or subsequent applications; Fig 11)

Quarry name	Operator	Status	Archaeological response	Permissions
Lickhill Quarry, Stourport-on-Severn	Roger Constant and Company Ltd	Worked out	No conditions	Permitted 1948 Extended 1983 Extended 1986
Brant Farm Quarry, Blackstone, Stourport-on-Severn	Birmingham Sand and Gravel Company Roger Constant and Company Ltd	Worked out	1970 - No condition 1972-3, 1977 - Salvage and rescue excavation 1997 – Pre-determination evaluation but no subsequent condition 1999 – Watching Brief condition	Permitted 1970 Extended 1997 Extended 1999
Stourhill Quarry	-	Worked out	No condition	-
Bonemill Quarry	-	Worked out	No condition	-
Hoo Farm Quarry (Wilden Lane)	-	Worked out	No condition	-
Highfield Quarry	-	Worked out	No condition	-
Zenith Quarry	-	Worked out	No condition	-
Hoo Road Quarry	-	Worked out	No condition	-
Barnet Hill Quarry	-	Worked out	No condition	-
Puxton Quarry	-	Worked out	No condition	-
Court Farm Quarry, Wolverley	R & D Aggregates Ltd	Worked out	No conditions	Permitted 1966 Extended 1987

Table 9: Quarries in the Severn and Stour Valleys (north of Stourport and around Kidderminster; shown on BGS mapping 1999 or subsequent applications; Fig 11)

Quarry name	Operator	Status	Archaeological response	Permissions
Shut Mill Quarry	-	Worked out	No condition	-
Belbroughton 1, 2 and 3	-	Worked out	No condition	-
Chadwich Lane Quarry, Madeley, Bromsgrove	Stanley N Evans Ltd Salop Sand and Gravel Supply Ltd	Active	No conditions 2007 – Pre-determination evaluation	Permitted 1980 Extended 1983 Extension application - 2006
Sandy Lane Quarry (Harbour Hill/Hilltop), Wildmoor	Stanley N Evans Ltd Cleanaway Ltd	Active	No conditions	Permitted ? Extended 1979
Cinetic Sands (Wildmoor) Quarry, Sandy Lane, Wildmoor	John Williams (Cinetic Sand) Ltd Jack Allen Holdings Limited	Active	1951, 1971 – No conditions 1989 – Consultation (no conditions) 2007 – Agreed programme of works	Permitted 1951 Extended 1971, 1989 Extension application - 2006
Chadwick Mill Farm (Pinches 1-3), Wildmoor Lane	C H Pinches Ltd Leigh Interests Ltd Onyx UK Brian Hill Haulage	Active	No conditions (though consultation in 1989)	Permitted ? Extended 1985 Extended 1986 Extended 1989
Belle Vue	-	Worked out	No condition	-
Marlbrook	-	Worked out	No condition	-
Limehouse Lane	-	Worked out	No condition	-
Shepley, Lickey End	Shepley Sand Company Ltd RMC Western Aggregates Cemex UK	Worked out	No conditions	Pre-dates 1947 First permitted 1947 Extended 1978
Cattespool Farm Borrow Pits		Worked out	No condition	-
Shirley Quarry	-	Worked out	No condition	-
Houndsfield Lane, Wythall	Wythall Sand and Gravel Company	Worked out	No conditions	Permitted ? Extended 1980
Grime's Hill Quarry	-	Worked out	No conditions	-
Lowan's Hill Farm Quarry (Hewall Rd)	-	Worked out	No conditions	-

Table 10: Quarries around Bromsgrove and Redditch (shown on BGS mapping 1999 or subsequent applications; Fig 12)

Quarry name	Operator	Status	Archaeological response	Permissions
Shavers End Quarry, Shavers End	ECC quarries	Worked out	No conditions	Permitted 1951 Extended 1986
Woodbury Quarry, Shelsley Beauchamp	Streetley Mineral Ltd Lafarge Aggregates	Worked out	No conditions	Permitted 1970 Extended 1980 (deepened)
Penny Hill Quarry, Martley	Wasteline Ltd	Worked out	No condition	-
Rodge Hill Quarry, Abberley Hills	-	Worked out	No condition	-
Tank	-	Worked out	No condition	-
North Malvern Scar	-	Worked out	No condition	-
Gullet	-	Worked out	No condition	-
Hollybush	-	Worked out	No condition	-

Table 11: Quarries within the Malvern Hills and Abberley Hills AONBs (shown on BGS mapping 1999 or subsequent applications; Figs 10 and 11)

9. Future mineral extraction

9.1 Patterns of supply and demand

Future minerals extraction in Worcestershire will principally be driven by the requirements to meet the WMRAWP sub-regional allocation for the county of 0.871mt/annum sand and gravel and 0.163mt/annum crushed rock through to 2019. Planning for this will be influenced by the additional requirement of maintaining a 7-year landbank for sand and gravel and a 10-year landbank for crushed rock.

The proximity of the West Midlands conurbation and expanding urban areas within Worcestershire (such as Worcester, Redditch and Kidderminster) suggest that it is unlikely that demand will reduce, especially for sand and gravels which form the focus of exploitation in the county and in this report. Indeed, the ongoing review and consultation process being undertaken by the West Midlands Regional Assembly, to revise the 2004 Regional Spatial Strategy, indicates that the government will expect considerably more housing to be built than the originally projected figures (these figures were used by WMRAWP in developing sub-regional apportionments to 2019). Three options are being considered at present for the period to 2026. Option One is based on a continuation of current WMRSS policies (381,000); Option Two has been derived from advice and further discussion with Strategic Authorities (491,000) and Option Three meets the overall levels of housing demand associated with the Government's latest household projections and the need to replace obsolete stock which will be demolished (575,000; http://www.wmra.gov.uk/page.asp?id=283). One of these options (Option 3) indicates that demand for building materials such as sand and gravel may increase by as much as two thirds compared with the original figures used by the WMRAWP.

As discussed above, planning to meet these demands (increased or not) will initially be met by the 'saved' 1997 County of Hereford and Worcester Minerals Local Plan (MLP) and subsequently by its replacement in the form of the Worcestershire Minerals and Waste Development Scheme. This situation makes determining where minerals exploitation might focus difficult to establish since, apart from a couple of outstanding preferred areas remaining from those identified in the 1997 MLP, minerals will have to be identified and 'won' by the industry on an *ad hoc* basis.

Due to this situation, it is impossible to predict with any certainty which areas may come under pressure for exploitation in the future and the following observations are made following informal discussions with industry representatives and with representatives of the MPA allied to consideration of the unavoidable issue that minerals can only be exploited where viable reserves exist or may exist. However, it is stressed that the following are observations rather than a reflection of any policies or intent on the part of any of the interested parties.

9.2 The future of sand and gravel exploitation in Worcestershire

The currently identified sub-regional apportionment for production of 0.871mt/annum of sand and gravel will need to be met and possibly increased as discussed above. The allocated provision in 2004 (the last year for which detailed figures are available) was barely sufficient to cover the required 7-year landbank (even allowing for a contribution from re-cycled materials) and, although formal figures are not available, this appears to remain the case.

In meeting this, it is suggested that resources along the Severn are liable to attract considerable attention due to a combination of suitable reserves and the relatively ease of transportation either by major road or use of the River Severn. The trend towards wet working of minerals, which have previously tended not to be exploited, also suggests that these reserves may come under pressure. Further the Severn is the current principal focus of extraction in the county with four substantial active quarries. Of these, one (Bow Farm, Ripple) has recently become operational and has a preferred area identified within the 1997

MLP lying to the south of permitted area; another (Ryall/Saxon's Lode) has an extension under consideration; and two others (at Ball Mill, Grimley and at Clifton, Severn Stoke) have recently permitted extensions being worked. Importantly, reserves from Bow Farm, Ripple are being shipped from a purpose-built wharf up the Severn for processing at Ryall from which they can readily be transported by road.

This may imply two directions to applications in the immediate future. Firstly, further extensions may be sought to these quarries, either into new areas or into previously considered areas which for one reason or another have been refused or deferred (as at Ball Mill, Clifton and Ryall/Saxon's Lode). Secondly, new applications may arise for areas previously ignored as unworkable (too wet and deeply buried) or inaccessible, but which now may be viable through a combination of new working practices and use of the Severn for transportation of reserves to a location more suited to processing and onward transportation.

Changing practices, improved technology for extraction and processing, the use of more sustainable transport (either rail or river), commercial pressures and the need to meet sub-regional allocation may also lead to other areas than the Severn corridor being considered. The areas mapped by the project which have previously been subject to enquiries by the industry or considered for inclusion in the 1997 MLP but which have not been taken up for a variety of reasons (including issues of access) may provide a guide as to where potentially suitable reserves exist (Figure 4).

These potential areas lie, not only within the Severn corridor (discussed above) but also, in the Stour Valley and north of Bromsgrove (in the north of the county) and along the Avon and Carrant Brook in the south-east of the county. The latter area has been subject to extensive quarrying in the past and appears to contain viable riverine sand and gravel reserves, however, problems of transportation and other non-archaeological constraints have restricted new applications in recent times in this catchment. Currently the only area under consideration in this area is at Strensham, a preferred area defined in the 1997 MLP (Fig 9.2). However, previously considered areas of reserve within the Avon/Carrant include land at Ashton-under-Hill, Wick/Cropthorne, Fladbury, Kemerton, Charlton and Harvington as well as additional areas at Kemerton and Hill and Moor. All of these have been withdrawn, deferred or refused but could come into consideration again under changing commercial circumstances, altered planning constraints or developments in methodology to allow more environmentally friendly extraction and transportation. Similar circumstances may exist for the potentially rich reserves lying around Kidderminster, for instance in the Wolverley and Cookley area to the north where a large area was considered during preparation of the 1997 MLP. Lastly, glacial sand and gravel deposits are present in the north-east of the county, north of Redditch. These include deposits of sufficient thickness and extent to have warranted recent commercial exploitation, though no active quarries are currently present. However, commercially viable reserves may still be present since although deposit thicknesses are generally less than 10.00m, localised deposits may exceed 20m where they infill over former channels and hollows (Bloodworth *et al* 1999).

9.3 The future of crushed rock exploitation in Worcestershire

The currently identified sub-regional apportionment for production of crushed rock is 0.163mt/annum of crushed rock. Production figures were not available in 2004 (the last year for which detailed figures were presented for the region) to estimate whether provision met the required 10 year landbank, however, figures for 2003 suggested that considerably less than half the required reserves were available. This situation does not seem to have changed and in the light of AONB designations for the areas in which rock reserves are present (the Malvern and Abberley Hills, to the west, and the edge of the Cotswolds to the far south-east; Fig 1) seems likely to remain unresolved or to be addressed through re-apportionment to areas beyond the county where extraction may be permitted.

9.4 Implications for the archaeological resource

9.4.1 Sand and gravel

As noted above (Section 4.7) the archaeological record for sections of the Severn south of Worcester is only moderately to poorly defined in the HER, while that for the Stour Valley is poorly defined. In the Severn Valley, this is understood to largely reflect alluvial masking of Roman and earlier sites on the Severn floodplain, however, in the Stour Valley this probably reflects low levels of previous archaeological survey. The Carrant and Avon Valleys are considerably better represented in the HER, in part reflecting past archaeological responses to sand and gravel extraction.

Severn Valley
As discussed in Section 5.3, alluvial masking considerably reduces the effectiveness of archaeological prospection and can affect the delivery of well informed, archaeological development control decisions. Research in the alluviated area of the Severn Valley (the section south of Worcester) is included in the presentation, by chronological period, of a Resource Assessment and Research Agenda for aggregate producing areas of the county (Parts 3 and 4). For the Roman and earlier sections (Sections 11 to 15), the problems of alluvial masking and the very high research potential of the floodplain and Severn as a whole are raised, while the Research Agenda specifically highlights the high potential of the archaeological resource of this area and problems of investigation and understanding of alluviated areas (Section 22.2.2). For the non-alluviated part of the River Valley (north of Worcester), there are fewer problems but one area of concern is the overall impact of previous extraction around Ball Mill at Grimley and Holt (Fig 11.5) and at Larford (Fig 11.6). Detailed assessment of this impact has not been possible within the scope of the current project but would support decision making regarding the potential significance of any surviving fragments of this landscape which may be affected by future proposals.

The Severn Valley has been identified above (Section 9.2) as an area with a high potential for future applications for sand and gravel extraction and therefore the problems outlined are of particular concern in delivering effective archaeological responses during strategic planning (such as advice during preparation of the Minerals and Waste Development Scheme) or in addressing individual applications in this area.

Stour Valley
This area has been identified as an area of high potential for Mesolithic research (Section 12.5.5), however, it remains of unknown potential for other periods. This largely reflects low levels of previous archaeological investigation in the area (see Figs 5 and 6), a situation which will restrict the effectiveness of archaeological decision making and provision of advice during strategic planning relating to potential future mineral exploitation in this area.

Carrant and Avon Valleys
This area also has a potential for future mineral exploitation. In contrast to much of the Severn Valley and the Stour, this area has a strong tradition of archaeological investigation and is well represented in the HER (see Figs 5 and 6). Concern here focuses on the overall impact of previous extraction especially within the Carrant Valley (see Fig 9). Detailed assessment of this impact has not been possible within the scope of the current project but would support decision making regarding the potential significance of any surviving fragments of this landscape which may be affected by future proposals.

9.4.2 Crushed rock

Hard rock extraction is deemed at this point in time to be liable to be confined to the quarry at Fish Hill, Broadway (Fig 9.11) and to constitute only a minimal potential threat to the archaeological resource.

Part 3: Resource assessment

10. Archaeological and historical research frameworks for the aggregate-producing areas in Worcestershire

Although there was no archaeological research framework for the aggregate producing areas of Worcestershire prior to the production of this document, a number of national and regional frameworks were of relevance to the project.

At a national level the project was undertaken within the broad framework provided by English Heritage's strategic priorities for archaeology (English Heritage 2003 – EoP98). In particular the project related to the strategic priority of 'Promoting under-studied or vulnerable areas' (EoP98 Programme 2) as well as carrying forward the development of the regional research framework (EoP98 Programme 8).

At a regional level, the project was developed within the context of, and informed by, the West Midlands Regional Research Framework for Archaeology. Although the latter was unpublished at the time of the project, a range of individually authored papers were available as downloads from the University of Birmingham web site (http://www.arch-ant.bham.ac.uk/wmrrfa/index.htm). Of particular local importance were the period-based overviews of the archaeology of Worcestershire produced as part of this process covering the later prehistoric period onwards (earlier prehistoric overviews were only produced at a regional or site specific level). Although designed to contribute to a regional perspective rather than a local or aggregates focussed one, these overviews provided an up-to-date framework for interpreting areas within Worcestershire. Lastly, although the urban area of Worcester has been omitted from the assessment (due to exclusion from potential future extraction), the draft of the *Worcester Urban Archaeological Strategy: An outline research framework for the archaeology of Worcester* (Worcester City Council, unpublished document dated November 2006) has also been consulted.

Locally, the principal source of information on the historic environment is the Worcestershire Historic Environment Record (HER), although Worcester City Council maintains a separate HER, for that local authority area. The Worcestershire HER holds data within a GIS, and is reasonably complete although some important information is not currently accessible as digital data within the GIS. In terms of the areas of aggregate resource, evidence from aerial photographs was considered important to the project. Aerial photographic data was available in the form of hand-drawn interpretive transcripts, produced in 1980 by the National Monuments Record as 1:10,560 overlays for Ordnance Survey maps. Details of the use and limitations of this data by the project have been provided earlier in this document.

Lastly, a recently undertaken resource assessment of the Palaeolithic period in the Midlands (the Shotton Project; Buteux, Keen and Lang 2005) provided a further important data source and contemporary framework. Through the pilot HER development work undertaken within that project and accompanying text, this effectively provided the Palaeolithic framework for the current project.

The research framework presented has been compiled by a range of archaeologists working in the region drawn from Worcestershire Historic and Environment and Archaeology Service and Cotswold Archaeology. Each section covers a chronological period and has been written to a broad template established at the outset. It is recognised that the chronological framework used, like any other, has certain weaknesses and that considerable overlaps exist (especially for the prehistoric period), however, that used is based partly upon the period divisions within the HER (since these dictated the data supplied to the project) and the divisions used within in Hunter and Ralston's (1999) national review *The Archaeology of Britain* since these were felt to provide an up-to-date interpretation of current understanding of the chronological framework. Each section states the chronological framework used and is accompanied by a brief discussion of national, regional and local frameworks. A description

of the archaeology of aggregate production areas within Worcestershire for the relevant period is then presented, followed by sections considering material culture, environment and key sites for the period. Lastly discussion and research directions are presented. The only exceptions to this model are the earlier and later post-medieval period sections where discussions of material culture and environment have been considered in separate sections covering the whole post-medieval period.

Lastly, the input of the wide range of stakeholders, including local, regional and national specialists, resulting from the peer review process has also provided considerable input to this report.

11. Palaeolithic (Robin Jackson)

11.1 Background

11.1.1 Introduction and chronology

The study of the Palaeolithic forms an aspect of Quaternary Science which incorporates, along with archaeology, the closely associated studies of Pleistocene (or Ice Age) geology and environment. As a result it is very much a multi-disciplinary field often requiring close co-operation and co-ordination between a wide range of specialists.

This period was dominated by a massively fluctuating climate, switching from cold, glacial conditions to warm, temperate ones across much of Britain and northern Europe. The most severe glaciation (Ice Age) is known as the 'Anglian' and can be dated to between 478,000 and 423,000 years ago (Bowen 1999). At its most severe, the Anglian ice sheet covered Britain as far south as London. The most recent glaciation, the Devensian, can be dated to between 110 and 12 kya and at its maximum an ice sheet extended as far south as Birmingham. Others glacial stages exist both before the Anglian and between the Anglian and Devensian but remain the subject of much research and debate. The chronology of the period is commonly discussed in terms of oxygen isotope stages (OIS), which equate to periods of climatic and environmental change.

Archaeological period	OIS	Years BP	Climate	Quaternary stage (British)
Upper Palaeolithic	2	24,000 – 13,000	Mainly cold	Devensian
(*c* 40,000+)	3	59,000 – 24,000		
Middle	4	71,000 – 59,000		
Palaeolithic	5a-d	117,000 – 71,000		
	5e	128,000 – 117,000	Warm	Ipswichian
	6	186,000 – 128,000	Cold	Wolstonian
	7	245,000 – 186,000	Warm	
Lower	8	303,000 – 245,000	Cold	
Palaeolithic	9	339,000 – 303,000	Warm	
	10	362,000 – 339,000	Cold	
	11	423,000 – 362,000	Warm	Hoxnian
	12	478,000 – 423,000	Cold	Anglian
	13	524,000 – 478,000	Warm	Cromerian

Table 12: Palaeolithic chronology (after Wymer 1999 and Barton 1997)

Throughout this period, the transition from cold, glacial or stadial periods (even numbered OIS') to warm, interglacial or interstadial periods (odd-numbered OIS') was the key

instigator for the migration of animals as well as human populations. Since Britain was a peninsular of Europe rather than an island for most of this period, the presence or absence of human occupation was principally determined by the fluctuating climate and changing environment. Conditions alternated between glacial tundra (when humans were absent) and warm wooded environments (associated with full interglacial conditions) and open (mammoth) steppe grasslands (associated with early glacial stages) when conditions were suitable for human occupation.

The archaeological record for the period is conventionally divided into three periods, the Lower, Middle and Upper Palaeolithic. This covers the period from the appearance of the earliest tools around 2.6 million years ago to the end of the last Ice Age about 10 kya (thousand years ago).

In Britain and across Europe, the earliest records of humans have until recently dated back to around 500 kya (OIS 13), however, finds at Pakefield, Suffolk are indicating that Lower Palaeolithic occupation may date back a further 200 thousand years (to about 700kya; probably in OIS 17; Parfitt *et al* 2005), while some finds from southern Europe are now understood to be as old as 800kya. A number of key British sites date to this period, including the exceptionally well preserved deposits at Boxgrove. These were associated with remains of the earliest human species currently recognised in Europe, Homo Heidelbergensis, at about 500kya (Roberts and Parfitt 1999). Boxgrove has also produced large quantities of Acheulian flint handaxes.

The division between the Lower and Middle Palaeolithic is identified through a change in lithic technology at about 250 to 200 kya, approximately co-inciding with the warm conditions of OIS 7 (*c* 230 kya to 190 kya). This Middle Palaeolithic technology is known as the Mousterian (Barton 1997), which in Europe is often associated with early Neanderthals (a species who had first appeared in Europe some time after the 400 kya) and then classic Neanderthals (Homo Neaderthalensis) from about 130kya. In Britain there is a major break in evidence for human occupation during this period from about 190 kya to 60 kya (start OIS 6 – end OIS 4), probably due to rising sea levels making Britain into an island for the first time.

At about 60,000 years ago, the land bridge was re-established (as sea levels fell) and Britain was reoccupied. Most British Mousterian tools date from this last cold dry stage between 60kya-30kya (OIS 3). At this time, mammoth steppe faunas (Coygan faunas) were present and these were characterised by animals such as wild horse, reindeer, spotted hyenas, wolves, cave lion and mammoths. Lastly, the later transition to the Upper Palaeolithic in Britain occurs at about 40,000 BP. This is defined by the appearance of evidence for occupation by Cro-Magnon man (Homo sapiens). These are the first anatomically modern humans and potentially overlapped Neanderthals for some 10,000 years. The relationship between the two species and the reasons for the disappearance of Neanderthals remain the subject of considerable debate which includes the possibility of genocide of the Neanderthals by modern humans (Barton 1997).

The Upper Palaeolithic extends until about 10,000 years ago and is further sub-divided. Early Upper Palaeolithic occupation pre-dates the Last Glacial Maximum at *c* 18,000 BP when the British Isles appears to have been abandoned. Re-colonisation at about 12,600 BP (at the end of OIS 2) represents the start of the Late Upper Palaeolithic through to about to about 10,000 BP with an interruption during the extremes of the last cold phase, the Loch Lomond stadial at *c* 11,300-10, 200 BP.

11.1.2 Research frameworks

Following a long period of relative neglect, the Palaeolithic has received considerable attention in Britain over the past fifteen years. This has resulted from a number of key discoveries including the exceptionally well preserved Lower Palaeolithic site of Boxgrove, where hominid remains were discovered along with large quantities of faunal remains and artefacts (Pitts and Roberts 1997; Roberts and Parfitt 1999). More recently, an even earlier

Lower Palaeolithic site at Pakefield has received much attention (Parfitt *et al* 2005) as has the Middle Palaeolithic site at Lynford, a potential Neanderthal mammoth butchery site (Boismier *et al* 2003).

Allied to these key discoveries, an extensive survey of the Lower and Middle Palaeolithic archaeology of England's river valleys, The English Rivers Palaeolithic Project (Wymer 1996) has prompted renewed discussion of the goals of Palaeolithic research within Britain (Gamble and Lawson 1996). More widely, a five year Leverhume-funded project, the AHOB (Ancient Human Occupation of Britain), is undertaking a wide programme of multidisciplinary research aimed at addressing a number of key topics concerning patterns of human occupation in Britain during this period. The West Midlands has also been involved with the ALSF supported Shotton Project using the AHOB goals and focussing them to provide a regional research framework to underpin the development of a regional research network (Buteux and Lang in press; Buteux, Keen and Lang 2005; Lang and Keen 2005). Indeed, based upon the success of this project, a further ALSF supported nationwide initiative is now being carried out through the National Ice Age Network (www.iceage.org.uk). This is facilitating the compilation of a new research framework for the British Palaeolithic as well as providing accessible overviews and information aimed at a wider audience.

Within this broad framework, one key issue for the West Midlands (and therefore for Worcestershire) is that it effectively marks the furthest point of human expansion and adaptation north-westwards in Europe during these severe climate fluctuations.

11.1.3 Nature of the evidence

The primary source of archaeological evidence for the Palaeolithic comprises stone tools, though the Upper Palaeolithic includes a range of other materials including antler, bone and ivory tools and use of perforated seashells for decoration. Flint was the main stone raw material utilised in tool manufacture, although in areas where flint is not present (including across the Midlands) other stone raw materials such as quartzite were also utilised.

Lower Palaeolithic material is comparatively basic in its lithic technology, and two principal traditions have been identified. These are the 'Acheulean tradition', characterised by bifacially worked, teardrop-shaped, handaxes, and the flake and core tools of the 'Clactonian tradition' (Barton 1997).

Middle Palaeolithic material is somewhat more developed and is dominated by flint of the Mousterian tradition, typified by use of the Lavallois technique that employs a prepared flint core. This allows a greater degree of control in the production process, which is based around the creation of 'tortoiseshell-shaped' flakes subsequently used in the creation of flake-based tools (Barton 1997).

Upper Palaeolithic material comprises a wide range of tools based upon narrow blades derived from prepared cores. The period is typologically sub-divided based upon a number of separate definable flintworking typologies/industries. The Early Upper Palaeolithic in Britain has three sub-divisions. The earliest is characterised by unifacial leaf points known as Jerzmanovice points which are found widely spread south of the late glacial margin (implying that they may have also been present further north but sites have been lost). These date from as early as *c* 34,500 BP. Subsequently comes the Aurignacian tradition (*c* 32,000 – 30,000 BP). This is typified by nosed-scrapers, straight scrapers and busked burins but also includes leaf points. These are only thinly distributed and are restricted to the western part of the British Isles. Lastly comes the more widely distributed Gravettian tradition (*c* 28,000 – 22,000 BP) characterised by such implements as large tanged points (Font Robert points).

The Late Upper Palaeolithic can also be sub-divided into the Late Upper Palaeolithic (characterised by the Creswellian flint industry; dated *c* 12,600 – 12,000 bp) and a rather diverse tradition during what is termed the Final Upper Palaeolithic. The latter includes a

'penknife point' phase (post-dating 12,000 bp) and also a long blade phase often including 'bruised blades' (dated to after the end of the last stadial at *c* 10,300 bp; Barton 1997).

In contrast to majority of archaeological evidence for later periods, Lower, Middle and Upper Palaeolithic discoveries are often made in contexts well below the modern surface level, and frequently within operational sand and gravel quarries. The sand and gravel deposits (or 'aggregate') represent the remnants of past landscapes and ancient floodplains, including Middle and Late Pleistocene deposits associated with the deposition of Palaeolithic artefacts as well as contemporary palaeontological remains (flora and fauna).

The alternation of glacial and interglacial periods provided extreme conditions within which these sand and gravel deposits were laid down by ancient river systems. Subsequent erosion and redeposition by later glacial phases has often completely removed or significantly altered earlier land-surfaces and even removed complete ancient river courses and terrace systems from the landscape. They also created the rivers and associated terrace systems that survive today. The step-like system of river terraces was created by the successive cycles of glacial and interglacial conditions and provides a crude method of dating archaeological finds found within them. However, caution must be exercised in interpreting and dating remains since much of the terrace material has the potential to have been reworked from earlier (higher) terrace depositions.

Study of associated palaeontological remains, through detailed analysis of vertebrates, pollen, insects and snails amongst others, also plays a key role in research into this period. It allows reconstruction of the fluctuating climate and landscape conditions within which early humans co-existed with the plants and animals they gathered and hunted.

Although buried landsurfaces and cave sites provide highly important evidence, the vast bulk of Palaeolithic remains have been revealed as a result of aggregate extraction and specifically the working of sand and gravel. The English Rivers Project, the Shotton Project, the AHOB Project and the Ice Age Network have all ensured that this fact is highlighted and have also ensured that up-to-date information on the Palaeolithic resource is now available both to archaeologists and quarry operators working nationally and regionally.

11.2 Palaeolithic Worcestershire

11.2.1 General

The Palaeolithic record, as for much of the country, is dominated by redeposited artefacts recovered from river terraces during sand and gravel extraction operations, though chance surface finds are also recorded (Fig 10). As yet no cave sites in Worcestershire have produced Palaeolithic material.

The quantities of Palaeolithic material recovered from the county have seen a dramatic rise in numbers over the past 40 or so years. There were only 9 Lower and Middle Palaeolithic artefacts recorded during Derek Roe's survey of 1968, yet by the time of Wymer's 1996 survey the number had grown to 51, while in 2004/5 the Shotton Project estimated that the figure may have risen to over 70 (Buteux, Keen and Lang 2005). Since then access to collections has allowed Lang and Keen (2005) to list some 160 Palaeolithic items, of which over 90% have derived from quarries particularly those at Aston Mill (77 artefacts, including 20 handaxes) and Beckford (63 artefacts, including 24 handaxes). These in turn have allowed more detailed information to be incorporated into the HER and supported the development of more accessible models for the period (Victoria Bryant pers comm.; Lang and Keen 2005; Lang *et al* 2006).

11.2.2 Lower Palaeolithic

Pre-Anglian material has not been firmly identified within the county to date and there seems little scope for *in situ* discoveries to be made due to truncation by the Anglian ice sheet or

deep burial below later glacial drift deposits. However, to the east and west, deposits relating to the ancient river systems of the Bytham in Warwickshire and of the Mathon in east Herefordshire are of such date. The former of these has produced *in situ* Lower Palaeolithic finds while the latter has the potential to produce such material (Lang and Keen 2005).

There is the potential for material within Worcestershire relating to the Hoxnian Interglacial which follows the Anglian period at around 400 kya (OIS 11). This period is richly represented in East Anglia and the Thames Valley, but in common with the rest of the Midlands, Worcestershire has no certain Hoxnian deposits or remains (Lang and Keen 2005). This may be attributable in part to the lack of a river valley system draining north-east and east out of the region across East Anglia and thus providing a colonisation/migration route to and from the rest of Europe (as had the now obliterated Bytham).

In Worcestershire, the earliest potential Palaeolithic artefacts derive from the highest of the Avon terraces (5th Terrace; Lang and Keen 2005). The 5th Terrace deposits are currently dated to the interglacial at OIS 9 (339,000 - 303,000 BP) and, within the county, have the greatest potential for producing Lower Palaeolithic remains. The Allesborough Beds on the 5th Terrace, near Pershore, demonstrate this potential having produced important molluscan and faunal evidence (Fig 13.1). The recent surface find of a fine-grained dolerite handaxe from the same area (Derek Hurst pers comm) highlights the potential of these deposits. A further surface find has been recorded at Harvington from an area of Avon 5th Terrace deposits, while similarly dated Bushley Green Terrace deposits on the Severn have some potential and have produced palaeontological evidence.

11.2.3 Middle Palaeolithic

The 4th Avon Terrace deposits can be dated to the Ailstone-Stensham Interglacial at OIS 7 (245,000 -186,000 BP) and thus have potential for producing early Middle Palaeolithic material, predating human abandonment of the British Isles at *c* 190kya (Lang and Keen 2005). Rich palaeontological material from Ailstone, Warwickshire and Strensham, Worcestershire (Fig 13.2) have been associated with this pre-abandonment interglacial and can be related to the Avon 4th Terrace (Bridgeland, Keen and Maddy 1989; de Rouffignac *et al* 1995). No Palaeolithic artefacts have been recovered from the 4th Avon Terrace in Worcestershire, yet, just beyond the county boundary, this terrace has produced a significant concentration of material at Twyning, Gloucestershire. Avon 4th terrace derived material has also been recorded a short distance into Warwickshire, at Tiddington and Little Alne. The Twyning artefacts cause problems of interpretation since typologically they appear Lower Palaeolithic but geomorphologically it is difficult to explain their presence in Terrace 4 deposits (Lang and Keen 2005).

As across the rest of Britain, Worcestershire was abandoned by humans from the end of OIS 7 or early OIS 6 (*c* 190 kya) for a period of about 130,000 years until OIS 4 (at about 60 kya). Despite this absence of evidence for human activity, the county has produced important remains dating from this period (Lang and Keen 2005). These include the rich, OIS 5e dated, faunal remains from fossiliferous deposits at Eckington and Cropthorne. These are associated with deposits at the base of Avon Terrace 3 and include hippopotamus and other species indicative of a temperate climate considerably warmer that that of the modern day.

Following re-colonisation of the British Isles at about 60 kya, the later Middle Palaeolithic record for the West Midlands is relatively sparse, but is dominated by material collected by Paul Whitehead from two quarries in Worcestershire, those at Aston Mill and Beckford in the Carrant Valley (Fig 13.3 and 4; Lang and Keen 2005). They derive from the Carrant Main Terrace (which equates to Avon Terrace 2) and include reworked and heavily rolled Lower Palaeolithic material presumably derived from an earlier terrace (?Terrace 5) as well as Middle and Early Upper Palaeolithic material. Middle Palaeolithic material includes flint and a single quartzite tool along with small finely made bifaces and Lavallois type prepared cores. Although reworked into material deposited somewhat after the end of the Middle Palaeolithic (organic deposits within Terrace 2 at Beckford having been dated to 27,650+250

BP; Birm-293), these provide strong evidence for human reoccupation (?Neanderthal) of this area during OIS 3 (after 60kya; Lang and Keen 2005).

11.2.4 Upper Palaeolithic

No Jerzmanovice points, of the earliest Early Upper Palaeolithic tradition, have been recovered from Worcestershire; however, an Aurignacian nosed-scraper and a shouldered scraper have been recovered from Aston Mill Quarry (Fig 13.3). If correctly attributed, these are highly significant finds representing not only the sole artefacts of this date from the West Midlands but also the most easterly findspot of this tradition in the British Isles, perhaps implying activity of a group moving up from south-western Europe, across the Severn Valley Plain and Gloucestershire, and into the Vale of Evesham (Jacobi and Pettitt 2000). Indeed the collections from the Aston Mill and the nearby Beckford Quarry contain material indicative of the likely existence of rare Early Upper Palaeolithic campsites along the Carrant Brook (*ibid*). No Gravettian finds have as yet been recovered from Worcestershire, although a Font Robert point recovered from just over the border into Gloucestershire, at Barnwood (*ibid*), suggests there is the strong potential for material of this date to be recovered from the Carrant Valley.

The Late Upper Palaeolithic record in the county is limited to a shouldered point and a backed blade fragment recovered from Huntsman's Quarry, Kemerton (Fig 13.5; Bellamy 2005), and a possible broken blade of this date recovered from the same area by the Shotton project (Buteux, Keen and Lang 2005). This limited pattern reflects the lack of findspots of Late Upper Palaeolithic date in the region as a whole.

11.2.5 Key sites, assemblages and discussion

As discussed above, the most productive area in the county for Palaeolithic material has been the 2nd Avon Terrace within the Carrant Valley south of Bredon Hill (Fig 13; Carrant Main Terrace). Particularly high concentrations have been recovered from the two quarries regularly monitored on this terrace (at Aston Mill and Beckford), while just beyond the county this terrace has also produced finds in Gloucestershire (at Twyning Quarry) and in Warwickshire (at Bidford).

These sites provide the most abundant evidence for Middle Palaeolithic and early Upper Palaeolithic activity in the region and are of considerable importance in understanding the spread of human (?Neanderthal) re-occupation of Britain at some time after 60 kya. Given the wealth of Quaternary environmental sites in this area, it has been observed that rich archaeological sites of this age will be probably be encountered at some stage (Lang and Keen 2005). Avon Terraces 4 and 5 also have some potential for producing earlier material dating from the Lower Palaeolithic and earlier part of the Middle Palaeolithic.

Although former quarrying operations have heavily exploited the Avon Terraces, there are currently no active quarries affecting them within Worcestershire. However, a preferred area for extraction identified within the last Minerals Local Plan is currently under evaluation at Strensham and will exploit some 25ha of 2nd Avon Terrace deposits if permitted. Evaluation at Carrant Brook Farm, Ashton-under-Hill of a subsequently shelved application for sand and gravel extraction indicates the commercial potential for future applications along the Avon Terraces in the Carrant Valley, while preliminary enquiries about a site in the Avon Valley north of Bredon indicate that commercial pressures may lead to a resumption of quarrying in that area.

Of the active quarries in the Severn Valley at the time of the Shotton Project, four were visited, at Grimley/Holt, Clifton, Ripple and Ryall. All of these lay in the Severn Valley (Terraces 2 and 3) and were assessed as being of very low potential as a result of deposition by outwash from Irish Sea ice down the Ironbridge Gorge and beyond (Buteux, Keen and Lang 2005). This effectively will have destroyed any pre-existing Quaternary or Palaeolithic sites older than that of the Dimlington Interstadial in OIS 2. Furthermore, Severn deposits

were noted as having a high quartzite and low limestone content and therefore provide a hostile environment for the preservation of fossil remains relating to early flora and fauna. Despite this observation, the 4th and 5th Terraces of the Severn have produced Palaeolithic artefacts and if subject to future exploitation have some potential for the survival of Middle or even Lower Palaeolithic material.

11.3 Research directions

The following issues have been identified for the period and require addressing through research and other initiatives. These largely derive from the West Midlands Regional Research framework document produced by Buteux and Lang (2002) and the results of the Shotton Project (Buteux, Keen and Lang 2005; Lang and Keen 2005):

1. Palaeolithic archaeology is not well served by PPG 16 and other development control mechanisms since provision is rarely made for pre-Holocene archaeology which may be found 3 or 4 metres below surface level. Further, aggregate companies are not required to report any discoveries made, archaeological or palaeontological. This leads to a vicious circle: the remains are not found because they are not looked for, and they are not looked for because it is believed they are not to be found. The problem is exacerbated by the lack of readily accessible guidance on appropriate procedures to deal with the potential of deeply-buried remains, and by the limited degree of contact and mutual understanding between the curatorial and contract archaeology community on the one hand and the Palaeolithic archaeology and Quaternary research community on the other hand.

2. Many of the people who make discoveries of Palaeolithic material are not professional archaeologists and are often quarry workers or independent collectors. Very little communication is maintained between the curatorial and contract archaeologists, on the one hand, and the discoverers on the other hand. Although there are opportunities to report finds through museums and the Portable Antiquities Scheme, the effectiveness of such mechanisms is limited. Further many professional archaeologists working in the field as well as members of the general public are not able to recognise many of the stone tools of this date found in the Midlands due to the use of non-flint raw materials.

Both of these key problem areas have been partially addressed by the Shotton Project and this work is being maintained and extended by the ongoing Ice Age Network Project.

The heightened awareness of the potential for Palaeolithic deposits within quarries created by these projects is already addressing some of these problems. It is hoped that it will prove possible through consultation with the aggregates industry for the Ice Age Network to develop a set of appropriate protocols for the reporting and subsequent investigation of any potential deposits of this date.

For Worcestershire, a new tool to help identify areas of potential for Palaeolithic material has been developed by WHEAS working with the Shotton Project. This has been designed for use by non-specialists but also provides readily accessible information for specialist researchers. It comprises an interpretive mapping layer produced within the HER's GIS and based upon the mapped Quaternary Geology for the county. The mapping layer provides date ranges for the deposition of the sand and gravel terrace deposits and type sites for the county, allowing more ready understanding of the Palaeolithic potential of areas proposed for future development including aggregate extraction (Lang *et al* 2006).

Within Worcestershire and beyond, along with other initiatives established through the Shotton Project and the National Ice Age Network, this should in the long term enable the acquisition of additional data and better understanding of existing data. In turn this will allow some of the key research questions for the period to be addressed.

Key research questions for Worcestershire can be identified and are again largely drawn from the West Midlands Regional Research Framework and the Shotton Project:

1. Was there any human activity in the county at the Hoxnian Interglacial (400kya)? And if not, can any of the other data from geological or palaeoenvironmental sources help explain this absence?

2. What is the date of the first appearance of the Lavallois technology in the region – the Lower to Middle Palaeolithic transition (300kya to 180 kya)? In particular the problem raised by the finds from the 4th Avon Terrace at Twyning needs addressing since typologically they appear Lower Palaeolithic but geomorphologically their presence is difficult to explain. Does this therefore indicate a late continuation of the Acheulean tradition?

3. For the period 180 kya to 60 kya - Is there any evidence for human occupation during this period and if not, (as seems probably the case), can the high quality palaeoenvironmental data from the area help to explain this absence?

4. For the period 60 kya to 30 kya - What is the evidence from the county to support development of an understanding of the extent and date of re-colonisation (?by Neanderthals) at end of Middle Palaeolithic? The evidence from any future quarrying operations affecting the Avon 2nd Terrace is liable to be of key importance here given the large quantity of finds relevant to this issue already recovered from quarries in the Carrant Valley.

5. For the period from 40 kya, what is the evidence for the first anatomically modern humans in Worcestershire and is there any evidence to help develop an understanding of their relationship with Neanderthal populations?

6. What is the nature and chronology of Upper Palaeolithic material culture in the area?

7. What evidence is there to help develop an understanding of the relationship between upland and lowland landuse and between open and cave site activities? Can these support understanding of population mobility, subsistence strategies and social networks?

12. Mesolithic (Robin Jackson)

12.1 Background

12.1.1 Introduction and chronology

The British Mesolithic commences at around about the end of the Devensian glaciation approximately 10,000 years ago. Within the archaeological record this is most noticeably marked by the adoption of microlithic flint technology, use of which lasts to about 6000 years ago (*c* 4000 BC) when Neolithic traditions including use of ceramics first appeared (Mithen 1999).

Climatic warming and amelioration throughout this period initiated widespread environmental changes with open late glacial environments being replaced by birch and pine woodland. As warming continued these were in turn replaced by dense forests of oak, elm, and lime. A range of woodland species replaced the open habitat species of the late glacial landscape and included red deer, roe deer, aurochs, boar and elk. In addition sea levels began to rise, leading eventually to the establishment of Britain as an island separate from Continental Europe about 8,500 years ago (Mithen 1999).

Microliths (small, finely worked flint tools) form the dominant component of artefactual assemblages from this period and, along with the waste products from their production, provide the most common evidence for Mesolithic activity.

Changes in microlithic technology can be observed at around about 8,500 years ago when broad blade assemblages gave way to narrow blade dominated ones. This is used to divide an Earlier Mesolithic from a Later Mesolithic and may reflect the changing environmental conditions necessitating different hunting (subsistence) strategies and therefore different toolkits (Mithen 1999).

Some local and regional variations have also been observed in terms of when this change from Earlier to Later Mesolithic technologies occurred as well as in the forms of some of the microliths in use. These may be significant and indicate the emergence of distinct regional groupings and cultural traditions affecting material culture as much as altered subsistence strategies responding to a changing environment.

Settlement patterns are generally understood to have been essentially mobile, incorporating sizeable territories within annual movements. As Myers (in press) has observed much of the mobility of these communities will have been in the form of task-groups moving from, and ultimately returning to, a small number of established residential bases. These task-groups will have created a series of temporary activity locations allowing exploitation of a range of upland and lowland environments within a single annual cycle of exploitation.

Very little research has yet been undertaken in relation to Mesolithic social structure, social organisation, belief systems and ‘lifeways’ due to a consistent tendency over the years for research to focus almost exclusively on the functional and economic aspects of the Mesolithic record (Young 2000).

12.1.2 Nature of the evidence

Surface scatters of flint tools and waste provide the most abundant form of data for the period. Apart from microliths, scrapers, burins, awls and axes are also found. Tools made from organic materials are rare but include antler mattocks and barbed points. A number of non-utilitarian artefacts are also known such as beads of shale and cowrie shell. Human remains are present in the archaeological record but are very rare (Mithen 1999).

Other direct evidence for the period includes buried remains and associated artefactual and ecofactual assemblages which are rare. These mostly comprise small pits or concentrations of material accumulated in the hollows left by fallen trees (tree-throws). On occasion postholes and/or stakeholes as well as shallow gullies may also be found. These are usually interpreted as the remains of shelters or windbreaks and sometimes are associated with hearths or at least evidence of fires indicating the former presence of hearths (Mithen 1999).

Cave sites and rock shelters are known from areas where local geologies provide such features, while coastal areas produce middens containing large quantities of shell along with bone and artefacts. Buried landsurfaces have occasionally been recorded containing scatters of flint and other cultural material, in some instances surviving below Neolithic monumental structures such as long barrows. On very rare occasions waterlogged material is found and adds considerable evidence for worked wooden artefacts and in the case of Starr Carr, in Yorkshire, preserved wooden structural remains.

Lastly, indirect evidence from the palaeoenvironmental record is important. Local pollen diagrams provide evidence for environment change through the Mesolithic (see 9.3 below). These enable development of an understanding of some of the wide range of resources which would have been available to local populations and thereby the changes in resources which must have had an impact on the lifeways and economic strategies of Mesolithic populations. Increasing and much debated evidence has also emerged for deliberate use of fire during the Later Mesolithic to create forest clearings (see Young 2000 for a summary). As forest regeneration occurred within these, the resultant plant resources would have both attracted increased game for hunting and provided a wider range of exploitable plant resources for the local population.

12.1.3 The Mesolithic of the West Midlands

A number of recent reviews have established a broad framework for the region and considerably advanced our understanding of the Mesolithic in this part of Britain. These include reviews of the evidence from the West Midlands (Myers in press), the East Midlands (Myers 2001; 2006) and more local reviews including the claylands of the East Midlands (Clay 2002) and the Trent Valley (Knight and Howard 2004).

Most relevant of these for Worcestershire is Myers' review for the West Midlands (in press) that establishes a context and framework within which the evidence for the county can be considered. This demonstrates that, as across much of the country, the Mesolithic record in the region is dominated by surface assemblages, in particular from areas of high ground. The highest concentrations are located around the southern edge of the high ground forming the Birmingham plateau. This apparent focus of activity coincides with areas characterised by free-draining soils, elevated locations and many small watercourses. Such an environment provides a wealth of excellent hunting locales with numerous hillside vantage points overlooking watering points but lying below the skyline (Myers 2006; in press). Such free draining sites are predominantly based on Red Sandstone dominated geologies and it has been suggested that these may have provided particularly favourable habitats for exploitation due to relatively low levels of undergrowth and thus high degrees of visibility for hunting game under the woodland canopy (Mellars and Reinhardt 1978; Jackson *et al* 1996a). However, other less deterministic models for the patterns of activity observed may also apply (see papers in Young 2000 for further discussion).

Away from these high ground locations, surface scatters are widely distributed but are often limited in scope in comparison with these denser concentrations. This pattern may reflect repeated utilisation of a preferred 'core area' by local populations and more sporadic and transient use of other areas within a broader 'home range' (temporary camps) though again such models may be overly deterministic.

Further, considerable caution should be exercised in placing too much reliance on models created on the basis of existing data as the record is limited in quantity and is also liable to be

biased for a number of reasons. For instance, apparent gaps in the record include a notable paucity of sites on alluviated floodplains and major river terraces or indeed sites which have a sufficient range of artefact types to warrant identification as potential base camps. This pattern has been noted, by Saville (1981) and Hingley (1996) amongst others, and may well be attributable to the masking of sites by alluvium or lack of proper investigation during past gravel extraction on the terraces.

Another factor affecting distribution patterns is that discoveries are often made by chance during investigations of sites dating from the later prehistoric onwards. As a result any earlier prehistoric component of the site record such as a Mesolithic flint assemblage, is usually only given limited attention. Therefore it is readily overlooked, to the extent that on occasion finds do not make it onto the HERs/SMRs.

Lastly, consideration should be made of the fact that the distribution of recorded material is also liable be considerably biased by the chance pattern of past investigation (the Cambridge effect). For the Mesolithic record, given that most sites are finds scatters, this means that there is a heavy reliance on areas where locally based individuals and specialist interest groups have undertaken fieldwalking. In the absence of any systematic survey, collection bias is therefore undoubtedly a factor in the HER/SMR records for the region. In the light of this, in terms of distribution of activity, it may be of considerable significance that where regular or systematic collection has occurred, as in north and north-east Warwickshire, that Mesolithic material forms a significant and regular component of surface flint assemblages and that these assemblages also often chronologically mixed including Neolithic and/or Bronze Age flintwork (Hingley 1996, 7; Barfield in press; Myers in press).

Apart from surface scatters, flint concentrations are also relatively regularly recorded in and around tree throws and shallow hollows, which are often recorded as chance finds during excavations of sites of other dates. Other features such as postholes and shallow gullies have also been recorded in a surprisingly high number of incidences on the limited occasions when excavations have investigated surface scatters as at Bourne Pool, near Aldridge, West Bromwich (Gold and Gathercole 1956) and Kisses Barn, Polesworth, Warwickshire (Palmer 1992).

Other elements of the resource in the region include cave and rock shelter sites such as those in the Wye Valley in Herefordshire or in Staffordshire as at the Wetton Mill Rock Shelter (Kelly 1976; Saville 1986).

12.2 Mesolithic Worcestershire

The Mesolithic record for the county is dominated as it is elsewhere by surface assemblages complemented by a small number of excavated remains and palaeoenvironmental records. Distribution is widely spread across the whole county but as for most periods, the record is biased towards aggregate extraction areas (Fig 11; 63 sites at an average density of 0.20 sites/km² as opposed to an average countywide density of 0.13 sites/km²; Tables 2-4). As elsewhere in the Midlands, the numbers of recorded findspots of Mesolithic material within the county as a whole have risen dramatically in the past 30 years from the 25 recorded in 1977 (Wymer) to the 70 identified in 2002 (Myers in press) and as many as 220 present during the current survey (although see below).

Surface scatters in the north of the county indicate relatively dense concentrations of activity around Wolverley and Cookley, Kinver and Kidderminster Foreign. The latter area includes Lightmarsh Farm, the most extensively investigated Mesolithic site in the county (Fig 14.1). Here, a total of 1,482 flints were recovered including 88 artefacts characteristic of a Later Mesolithic narrow-blade industry (Jackson 1994; Jackson *et al* 1996). The flints were recovered from an area focussed around a feature interpreted as a tree throw. Postholes, a shallow gully and a possible pit were also recorded. The site had survived due its location within a slight hollow on a hillside above a stream. A shallow deposit of colluvium (hillwash) had accumulated within this hollow burying the features slightly deeper and thus beyond the

reach of the plough. The site has been interpreted as the remains of a hunting camp at which a small shelter was constructed around the site of a fallen tree. Burnt stone, charcoal and charred hazelnut shells indicate the presence of a fire. A single radiocarbon date from a charred hazelnut shell provided an earlier 8th millennium BC date for the activity (8004 to 7592 cal BC; OxA-4327; 8800+80 BP). This is an early date for a narrow-blade industry and, although caution should be exercised in using an individual date, is potentially of considerable significance as an indicator of an early trend to miniaturisation and geometrification in the region. The field within which this site was recorded, as well as several investigated on the pipeline in the immediate vicinity, also produced Mesolithic material. These are possibly indicative of further occupation locales, knapping episodes and/or satellite activities. These sites form part of a recognised focus of intensive activity spread along the southern margins of the Birmingham plateau and noted above. As previously suggested, this apparent focus on high ground may reflect the regular exploitation of a favourable hunting environment.

As noted earlier, a range of factors may bias the distribution of known scatters and therefore caution should be exercised in viewing other areas of the county as ones of only limited activity. Factors include the loss or non-detection by conventional means (especially fieldwalking) of certain elements of the Mesolithic (and other early prehistoric period) site repertoire. This may particularly be the case for floodplain sites. In both the Severn and Avon Valleys, the comparatively low incidence of Mesolithic (and other earlier prehistoric period) sites may be more a reflection of alluvial masking of prehistoric landsurfaces than non-utilisation of these areas. In the light of this observation, the discovery in Droitwich of a relatively large assemblage of flint including probable Mesolithic material both from within an alluvial sequence and as residual material within later deposits is of considerable potential importance (Hurst 1987; Bradley 1989; Barfield 2006; Fig 14.2). One suggestion is that the brine springs at Droitwich may have been set within a relatively open landscape (see environmental discussion above) and that the area was particularly attractive to game (?salt licks) and therefore people, the latter as hunters of the game and gatherers of the salt and particular plants which thrive in salty conditions (Barfield 2006; Derek Hurst pers comm). Also of note is the recovery of a small quantity of Mesolithic material from alluvium in a small trial trench in Evesham (Napthan, Hancocks and Pearson 1996; Fig 14.3), finds which highlight the potential for alluvial masking of Mesolithic sites located on floodplains.

Lack of awareness of identified material, false perceptions and non-recognition of Mesolithic material probably also play a significant role in forming impressions of low levels of Mesolithic activity in some parts of the county. For example, examination of records undertaken for this survey has shown that all three major quarries along the Carrant Valley in Worcestershire (at Beckford, Aston Mill and Huntsman's Quarry, Kemerton; Fig 14.4, 5 and 6) have produced small but significant assemblages of Mesolithic material in association with tree-throws and natural hollows. All of these were incidental finds within the context of investigations focussing on later periods of activity and as such received little attention in the published reports.

Lastly, rapid assessment indicates that many of the Mesolithic sites resulting from the data searches of the HER are in fact flint scatters which have not been dated to anything more specific than the prehistoric period, yet still appear in a search for Mesolithic sites. This also affects the data used for this assessment for the Neolithic and Bronze Age periods. This is part of a general problem for flint studies in the region reflecting the lack of detailed specialist analysis of material in the region, the paucity of site-specific published lithic assemblages for comparison and the fact that many assemblages are chronologically mixed (Barfield in press; Myers in press). For some of these flint assemblages and especially for individual findspots, dating is never likely to be precise due to absence of diagnostic tools or waste products. However, within the County, the past 10-15 years have seen a number of staff working in local units who have a level of knowledge which begins to address some of the problems of recognition, while for the purposes of this report rapid assessment of the HER data has allowed records to be separated into 'confirmed' and 'unconfirmed' artefacts based upon whether specialist analysis has been undertaken of material. It is therefore notable within the 'confirmed' records that a Mesolithic element has been recognised in fieldwalked

assemblages recovered from a range of pipeline projects since these provide transects across wide stretches of the county (Dinn and Hemingway 1992; Jackson 1993; Jackson *et al* 1996a; Jackson *et al* 1996b). Similarly, recent rapid assessment of a number of fieldwalking assemblages collected by voluntary groups and individual collectors indicates the high potential of such assemblages across the county and specifically within aggregate extraction landscapes (Alvaro Mora-Ottomano pers comm). Several of these have been shown to have a strong Mesolithic element but also include Neolithic and later material. This suggests that specialist assessment and analysis would undoubtedly allow many flint scatter sites to be more specifically dated and understood than at present and also that distribution is more widespread and material more commonplace than appears to be the case at first sight.

12.3 Environment (Elizabeth Pearson)

12.3.1 National frameworks

The significant and widespread changes in vegetation over the British Isles which relate to post-glacial warming and the natural development of a wooded landscape are largely demonstrated by pollen profiles from off-site peat deposits. These survive either in the form of blanket bogs in upland areas, fen peats and infilled palaeochannels or shallow depressions in lowland river valleys. These deposits provide the bulk of the environmental evidence for the Mesolithic period. The lowland peaty depressions or channel fills exist in prime areas for gravel extraction, and thus are of importance for this research agenda/assessment. As well as documenting natural woodland succession, small clearances can sometimes be detected in the pollen profiles. These may have been caused by natural events (fire, wind, disease, destruction by beavers) or deliberately by people to encourage large game to browse on the undergrowth, or encourage the growth of other useful plants. Charcoal fragments in peat deposits have also produced evidence for burning, which would have resulted in woodland clearances, whether natural or deliberately created. Short-term clearances are, however, difficult to detect unless the sampling intervals are small (around 2cm).

The changes in vegetation are also accompanied by a change in the nature of river courses and the floodplain environment. Geomorphology (and sometimes the use of mollusc and insect studies, for example) has shown that rivers in lowland areas, tended to be wide and shallow, usually with multiple (braided) channels during the Mesolithic period. This type of floodplain environment would have been marshy, with many gravel islands, and would have been prone to rapid change with flash floods and movement of gravel. This poses some problems for recovery of archaeological evidence because of the likelihood of erosion; although recognition of these processes may aid interpretation of any surviving evidence. The river floodplain is an important resource, nonetheless, as it would have provided important routes for travel in a largely wooded landscape, and would provide a relatively diverse range of food and craft resources. Archaeological remains are likely to be found below and within alluvium, as there was a low level of alluvium build-up until more intensive woodland clearance and cultivation of soils in the Bronze Age.

Direct evidence for human subsistence from environmental remains is rare, as a low level of waste is likely to have been produced at small temporary bases, and much of the organic material (plant, wood, insect, and pollen remains, for example) would have rapidly decayed. It is mostly hazelnut shell or tuber/rhizome fragments that have been exposed to fire and discarded or placed in pits, hollows or middens; or animal bone in dry cave sites that have survived in dry environments. However, a range of organic remains has been recovered from a small number of waterlogged sites, for example at Starr Carr in Yorkshire. New floral evidence of seasonality has been recovered at Starr Carr (Dark 2004), although this is a level of interpretation which is only possible where there is a relatively diverse range of animal and plant remains.

Interpretation of matters such as perception of the landscape or expression of regional and local identities from environmental evidence has been even more rare. Largely, this is

because direct evidence of Mesolithic culture from biological remains is scarce, but also partly because these are concepts which environmental archaeologists have been slow to adopt. The concept that some forest clearings or 'gaps' (Brown 2000; Section 13), indicated by environmental data of Neolithic date, may have ritual significance could equally be applied to the Mesolithic environment. Where the Neolithic environment is considered, the possibility of a clearing having ritual significance is more likely where there are ritual monuments or artefacts in the vicinity, or where the location does not seem suitable for pastoral agriculture or encouragement of game. This type of interpretation may be more difficult for a Mesolithic landscape, where the direct evidence of human activity, for comparison with the environmental evidence, is more limited. Some input into models of Mesolithic lifestyles or of subsistence activities could be achieved if there were more discussion of plant and animal species which could be potential food or craft sources. Plant species which are likely to have been present around woodland clearings at this time which could have been a useful food resource include cherry (*Prunus* species*)*; nettle (*Urtica dioica*); crab apple (*Malus sylvestris)*; and willow (*Salix* species).

12.3.2 Mesolithic environment of the West Midlands

Environmental evidence has been recovered from only a small number of sites dated to the Mesolithic period in the West Midlands outside of Worcestershire. A late glacial peat deposit under a medieval manor house in the centre of Birmingham has been studied, where insects demonstrated a colder climate than today around 11,000 years ago (Hodder 2004). A particularly significant site for the early prehistoric period onwards is a sequence of deposits infilling a palaeolake at Kings Pool, Stafford. Here, pollen from late Mesolithic peat shows that woodland clearance is slightly earlier than expected when compared to other pollen studies in the region (Pearson, Greig and Jordan 1999).

12.3.3 Mesolithic environmental evidence from Worcestershire

Environmental evidence from sites of Mesolithic date is sparse. However, there is direct evidence for human activity at Lightmarsh Farm near Kidderminster (Fig 14.1; Jackson *et al* 1994; 1996a). Here, charcoal flecks were visible in some Mesolithic features. In one shallow feature, charcoal fragments and charred fragments of hazelnut (*Corylus avellana*) were abundant, in association with occasional charred indeterminate tissue fragments and grass (Gramineae) stems. A single fragment of grass rhizome was also recovered from a second feature. A radiocarbon date of 8004 to 7592 cal BC (OxA-4327; 8800+80 BP) was obtained from the hazelnut fragments.

The remaining evidence is from off-site peaty or organic clay deposits. Less than 1km away from Lightmarsh Farm, pollen samples were examined from river valley peat at Cookley in the River Stour valley (Fig 14.7; Jackson *et al* 1994; 1996a; Greig forthcoming). These are dated at the base to only slightly earlier than the Lightmarsh Farm date (9160±80 BP; BIRM – 974) and show an early Mesolithic succession from birch (*Betula* sp) and pine (*Pinus* sp) dominated woodland to more mixed woodland of oak (*Quercus* sp), lime (*Tilia* sp), alder (*Alnus* sp) and hazel (Coryloids). There is no major visible decrease in forest cover resulting from Mesolithic activity in the pollen diagram from Cookley, suggesting that tree clearance was not taking place on a major scale in the Stour valley at this time. There is, nevertheless, some slight evidence of woodland clearance which may result from either human activity or natural events such as storms or lightening strikes (Jackson *et al* 1994; 1996a).

The environment, approximately 20km to the south, at Impney Farm near Droitwich appears to have been significantly different (Fig 14.8; Williams *et al* 2005). Here, peat deposits sampled in the Salwarpe valley are almost entirely Mesolithic in date. They were dated at one location to 9700-9200 cal BC (9925±63 BP; Wk-13643) at the base, and 8740-8410 cal BC (9315±58 BP; Wk-13642) towards the top of the Mesolithic sequence. There was a hiatus in the sequence at this point, and it is uncertain whether peat deposition ceased, or whether there has been subsequent erosion of the deposit. The overlying deposit shows a mixing of medieval, post-medieval and modern material. All cal BC dates are quoted at 95%

probability. Radiocarbon dating and pollen work showed that it formed during the early Mesolithic period, and that the area was unusually open and deforested. Signs of burning hint at a human presence, probably burning to clear woodland, or maintain a clearance. The brackish conditions caused by the local brine wells may be of importance. A landscape feature of this nature may have acted as a 'salt-lick' attracting large mammals such as deer, and hence hunter-gatherer communities (Derek Hurst pers comm) who would have had an incentive to artificially create and maintain an open area to maximise the potential for hunting game. Evidence for Mesolithic activity, a flint assemblage, and possible intact deposits and features, is known at Dodderhill nearby (Myers in press; Hurst 1987; Barfield 2006) to which the clearance may be related.

Late Mesolithic to Early Neolithic peat was identified at the base of a sequence dated from 4690-4450 cal BC (5712± 46 BP; Wk-17838) located in the Severn valley at Clifton Quarry (Fig 14.9; Head and Pearson 2005). The pollen sequence, at an evaluation stage, shows an environment comparable to the Mesolithic 'wildwood' at Cookley, although pollen sampling intervals were not sufficiently close to detect small forest clearings. More detailed work on this profile is in progress.

To the east, at Gwen Finch Nature Reserve near Birlingham, peat deposits were identified within a large meander of the River Avon and were dated to the Earlier Neolithic at the base (3520 to 3355 cal BC at 95% probability; 5470 to 5305 cal BP; Bretherton and Pearson 2000). These were seen in section and sampled by augering, but as the base of the peat was not reached, it is possible that Mesolithic deposits may exist.

12.4 Key sites/assemblages and discussion

The most extensive assemblage of Mesolithic material and the only one to have been associated with a range of surviving features is that recovered during salvage recording at Lightmarsh Farm, Kidderminster Foreign (Fig 14.1; Jackson *et al* 1994; 1996a). This site occupies higher ground between two areas of aggregate extending along the Severn and Stour Valleys around and to the north of Kidderminster. The site and associated surface scatters illustrate the high Mesolithic potential of the surrounding area, a potential enhanced by the local availability of the Cookley pollen diagram (Fig 14.7), which provides a detailed environmental context for these sites.

This area of high potential for Mesolithic activity extends to the north and east, around the southern margins of the Birmingham plateau, where a concentration of potentially similar sites have been recorded in the form of surface flint scatters. Within Worcestershire these are focussed on aggregate producing areas around Wolverley and Cookley and Kinver (Fig 14.7). Since the pipeline and the Wolverley and Cookley area are the only areas to have subject to any notable level of research (the latter through fieldwalking by the local community), it seems likely that this area has a very high potential for the recovery of Mesolithic remains as both surface scatters and more importantly in the form of, potentially well preserved, *in situ* remains.

The assemblages from tree-throws and hollows on excavated and salvage recorded sites along the Carrant Valley, as well as the Mesolithic components of recently recorded surface scatters from pipelines and other locations, are small but significant indicators of the potential of the gravel terraces to provide some *in situ* deposits as well as surface scatters indicative of the overall distribution of Mesolithic activity in the landscape.

Lastly, the evidence for Mesolithic flint scatters at alluviated sites such as Droitwich and Evesham, along with the detailed environmental information derived from palaeochannel deposits within the Severn, Avon, Salwarpe and Stour Valleys suggests that floodplains also have a very high potential for the survival of Mesolithic deposits. It is perhaps within such alluviated areas that there is the greatest potential for the survival of nationally significant Mesolithic deposits with the possibility for preservation of *in situ* waterlogged occupation deposits associated with a phase of Mesolithic activity.

12.5 Research directions

12.5.1 Extent, distribution and identification of Mesolithic sites

The key issue for the county is, as Myers (in press) has observed for the region as a whole, that there has been a lack of consistent approaches or systematic surveys for Mesolithic sites either to provide more data or address the apparent gaps in coverage of the region. Thus the potential extent and distribution of Mesolithic activity remains poorly understood. In the light of this observation, it is considered highly significant that where more detailed surveys have occurred Mesolithic finds appear relatively common.

Myers has also highlighted the need to undertake surveys to systematically check distributions against soil types and geology in order to determine whether apparent gaps in distributions are real (Myers in press). Recent survey of the claylands of the East Midlands has shown that, contrary to the previous impression of limited utilisation of these landscapes during both the Mesolithic and Neolithic, they were in fact extensively, though not intensively, exploited (Clay 2002; Clay 2006) and this may potentially be the case in Worcestershire. It may also be of note in terms of defining areas for future site prospection that the survey suggested a distribution bias in favour of south-facing slopes or ridges, prominences and headlands, especially since the key site at Lightmarsh Farm in Worcestershire occupied a slight hollow on a south/south-west facing slope. Both systematic fieldwalking of wide landscape areas which have not traditionally been surveyed (such as on clay-based geologies), allied to targeted fieldwalking of selected areas, would help provide a better balance within the record and understanding of the distribution of Mesolithic sites. Therefore any opportunities to secure funding for programmes of such fieldwalking or encourage and provide specialist support to local groups undertaking fieldwalking should be promoted.

The methods used for any survey also need to be considered. Myers (in press) has suggested that the potentially small size of Mesolithic sites may be a crucial factor in whether they are detected in programmes of prospective fieldwalking. In Leicestershire, 20m intervals of fieldwalking proved considerably more effective than 30m ones in neighbouring Northamptonshire. Certainly the focus of distribution at Lightmarsh Farm in Worcestershire was little more than 20m across while at Otterhole Farm, Buxton (Derbyshire), 10m interval test pitting revealed two discrete scatters each no more than 5m in diameter (Jones 2003 cited in Myers in press). This suggests that even 20m intervals may be inadequate in cases where Mesolithic sites might reasonably be expected. Thus curators need to specify higher than normal sampling levels for fieldwalking in areas of high Mesolithic potential and also perhaps require them as a contingency or supplement to normal interval walking if this has produced any Mesolithic material however limited in quantity (Myers in press). Any future collection of material (either professional or avocational by local groups) carried out to address these gaps in distribution or enhance and investigate the potential Mesolithic resource should be undertaken using appropriate collection strategies and supported by appropriate specialist analysis of any material recovered.

There is also a need to revisit both published and unpublished flint assemblages which have not examined by specialists to rationalise dating of the ‘prehistoric flint’ and consolidate the existing evidence (Myers in press). This is not likely to reduce the number of Mesolithic records for the county, rather it would improve the quality of the data for the Mesolithic as well as for the subsequent Neolithic and Bronze Age periods thereby improving the reliability of decision making based around these sites.

Lastly, the imbalance in distribution mapping created by the poor visibility of sites in alluviated areas and those not suited for fieldwalking must be acknowledged and any opportunities to redress this during research, evaluation or mitigation projects should be taken through ensuring that awareness is raised of the potential importance of even very small quantities of Mesolithic material as indicators of activity.

12.5.2 Material culture, chronology and regionality

There are currently no certain sites of Early Mesolithic occupation or other activity focus recorded in the county, although the relatively early date of the Late Mesolithic assemblage and activity at Lightmarsh Farm should be noted along with palaeoenvironmental evidence covering this period. It is also the case that there are only a very small number of confidently identified Late Mesolithic sites. This may to a large extent reflect the lack of specialist analyses noted above, however, within region as a whole and indeed nationally there is considerably more evidence for Late Mesolithic activity than for that of the Early Mesolithic. One important regional research priority identified by Myers is to examine the nature of the transition from Early to Later Mesolithic assemblages (informed by sites like Lightmarsh Farm) and determine the true balance of representation of the two periods through ensuring that specialist analysis of material is undertaken and checking that early material is not missed.

One interesting aspect for the region raised by Lightmarsh Farm is that the radiocarbon date is somewhat early for a Late Mesolithic assemblage. Although caution should be taken in that only a single radiocarbon determination is available from the site, this may indicate a regionally early move towards miniaturisation and geometrification (Jackson *et al* 1996). The period of transition from Mesolithic to Neolithic also warrants attention since it is also poorly understood.

Lastly, in respect of material culture, issues such as the procurement of flint (which does not occur locally and therefore had to be imported) and use and availability of other raw materials for tools and non-utilitarian artefacts would considerably benefit from further consideration and data collection.

12.5.3 Preservation and environment

It has been noted above that where surface scatters have been investigated or sites located during intrusive fieldwork, rare *in situ* deposits including traces of ephemeral structural remains have surprisingly regularly been encountered in this region. The potential of improved conditions of preservation within shallow colluvium filled depressions apparently favoured by Mesolithic populations. These provide considerably more valuable information about Mesolithic settlement, material culture and lifeways (see 12.5.4 below) than can be achieved through analysis of surface scatter assemblages and unstratified material. Research excavation and development led targeting of surface scatters should therefore be encouraged to determine whether surviving features are present and extend the quality and quantity of *in situ* deposits available for analysis and therefore develop improved understanding of the nature of the resource (Myers in press).

In common with the rest of the country, any sites with preserved organic remains which include artefacts and/or settlement remains would be of great importance. Although there is only limited potential countywide for the survival of such remains, former marshy areas, watercourses (palaeochannels) and alluviated floodplain environments have a demonstrable Mesolithic presence as noted above. Areas such as the broad floodplain of the River Severn, although relatively limited in extent, have a high potential for the preservation of waterlogged deposits including organic artefacts, settlement remains and well preserved palaeoenvironmental deposits. Any such deposits encountered are liable to be of national importance and their potential presence in floodplain environments should be considered within any development control measures being implemented.

These floodplain locations also have the greatest potential for the recovery of detailed palaeoenvironmental sequences from abandoned river channels. The need for high-resolution pollen diagrams where there is the potential for charcoal remains to indicate deliberate use of fire to create habitat mosaics and clearances and thereby encourage game has been noted previously (Myers in press) and is emphasised here.

The importance of peat deposits within infilled channels and hollows in floodplain areas are evident. Nevertheless, although organic remains, primarily pollen, are often well preserved, the environmental profile is generally dominated throughout by wet channel flora or fauna. It is necessary to maximise the significant data from these deposits, and attention needs to be focused on the small-scale changes to the nature of the channel, small-scale changes in woodland cover, or presence of species which were potentially a resource. Preservation of macrofossil remains in peat deposits (for example plant and insect remains) is generally poor in Worcestershire compared to pollen. Where survival is good, combining these strands of evidence is important. Brown (2000) has described the use of insects and diatoms, for example, as providing 'thick descriptions' which provide more detailed environmental evidence than is possible with one type of evidence alone. Closely spaced sampling intervals should therefore not simply be applied to pollen but to all types of evidence and radiocarbon dating.

In the light of the demonstrably high potential for palaeochannel and other floodplain peat deposits of Mesolithic and later date in the County, these should be mapped, recorded and sampled where possible as has been done for considerable parts of the Trent Valley (Havelock *et al* 2002; Baker 2003; Challis 2004). For example, both Cookley and Droitwich are areas where relict river channels and marshy areas are visible on OS maps, although these are largely undated. Recording and improved HER mapping of already recorded discreet peat deposits in the County would be a useful tool for the management of the palaeoarchaeological resource, using information from desk-based assessment, borehole data held by the Service and the MPA, Wildlife and Conservation sources, and local knowledge. There is also a considerable potential for the mapping of palaeochannels visible on aerial photographs and already available LiDAR images. These former channels provide key elements of early landscapes and have a high potential to contain organic deposits which could then be targeted for sampling and dating programmes. This would not only support Mesolithic research frameworks but contribute to those for later periods as well.

12.5.4 Mesolithic Lifeways

It is also necessary to encourage approaches to analysis that are less typologically dominated and that take more than a simple subsistence driven or functionalist viewpoint. In this way wider theoretical issues and interpretive approaches can be considered allowing issues to be explored such as perception of the landscape or expression of regional and local identities through variable material culture (see Young 2000). For instance, there are some indications that typologically distinct sub-types such as the Midlands basally trimmed microliths may reflect expression of separate cultural identities. Consequently it is important to allow for such possibilities and ensure that the presence/absence and spatial extent of any such sub-styles is established (Myers in press). Such considerations are important because, although the data available must be recognised as very limited at present, it is only through attempts to achieve a fuller understanding of the way in which the landscape was inhabited and perceived that we are likely to be able to better predict, understand and thereby manage the surviving resource.

12.5.5 Past, present and future aggregate extraction

Finally the potential impact of aggregate extraction upon Mesolithic landscapes should be considered. By their very nature sand and gravel quarries tend to be sited on river terraces and floodplains which both have a high potential for the survival and recovery of Mesolithic remains. The impact of past aggregate extraction is not necessarily evident and certainly the focus of those investigations along the Carrant Valley highlighted as having produced Mesolithic finds was not on Mesolithic archaeology.

Perhaps of greater concern is the impact of former extraction on sites which due to past planning policies and lack of clearly visible archaeological remains were not subject to any archaeological provision. One example is a site just to the south-west of Cookley and north of Kidderminster. This lies in the 'core' of identified Mesolithic activity in the county on the

edge of the Birmingham plateau at Wolverley Court Farm. Extraction occurred here from the mid 1960's and was extended in 1987 taking the total area to 20ha. No archaeological provision was required and the site is now worked out. For the future, the area will probably remain an attractive one to aggregate extraction companies as shown by a preliminary enquiry in 1992 about a 55ha area just to the north of the River Stour at Cookley. This was not pursued but the aggregate reserves in this area are liable to come under pressure from applications in the future.

For the future, the strong environmental controls now placed upon aggregate extraction applications hold the promise of a much-improved situation. With the higher fieldwalking samples advocated above (Section 12.5.1) and the higher trenching samples now regularly advocated in archaeological briefs, the situation along river terraces and other areas suited to archaeological prospection by fieldwalking and trial trenching is much improved as long as it is recognised that small quantities of Mesolithic finds may potentially reflect the presence of important deposits or assemblages. That said, commercial pressures are leading to an increasing focus in the county on previously unexploited reserves deeply buried below alluvium (as at Ripple). Given the near 'invisibility' of Mesolithic sites in such landscapes and their high potential for preservation of organic remains, some concerns must exist about the ability of archaeologists to identify these during programmes of evaluation and make adequate provision for them within subsequent mitigation strategies. However, hopefully raised awareness of the potential for Mesolithic sites in such environments allied to the regular requirement for maintenance of an archaeological watching brief and contingency provision during site preparation works (topsoil and overburden stripping) may at least allow for such sites to be recognised and their potential better highlighted.

13. Neolithic and Earlier Bronze Age (Robin Jackson)

13.1 Background

13.1.1 Introduction

The Neolithic and Earlier Bronze Age periods in Britain are associated with the first evidence of agricultural practice and distinct changes in site type, cultural material and contexts of deposition which occur from about 4000 BC onwards (Thomas 1991 and 1999; Whittle 1997 and 1999).

The speed, extent and timing of these changes and their meaning to communities are increasingly understood to have been variable across Britain. Debate continues about the manner and nature of the transition from hunting and gathering to agricultural communities and the degree to which the introduction of domesticated plants and animals was accompanied by permanent settlement and the construction of substantial, long-lived and demonstrably domestic buildings. Similar uncertainty surrounds the timing of the adoption of an associated Neolithic cultural 'package' or 'repertoire' and the introduction of new settlement and monument forms into different areas of the country, with some areas apparently devoid of monuments. These debates now extend back in time to cover questions of continuity between Mesolithic and Neolithic communities and forwards in time into the Beaker and Earlier Bronze Age periods, with many now arguing that it was not until the middle of the 2nd Millennium BC that settled agricultural communities were widely present across Britain (Thomas 1991; 1999; Whittle 1999; Parker Pearson 1999).

Despite these unresolved issues, it is beyond doubt that across this period there were fundamental changes in the way people lived and interacted and that these were associated with an increasing range and complexity of site types, material culture and activities. These included the construction of monumental structures in many areas, new approaches to the disposal of the dead, the regular digging and infilling of pits and the selective and structured deposition of artefacts and ecofacts in a variable range of depositional contexts, especially within pits. These reflect greater levels of human impact on, and transformation of, the natural world in the form of visible structures and the adaptation of the environment through increasingly regular establishment of clearings within a previously predominantly woodland landscape. Use of pottery, of domesticated cattle, pigs and sheep/goats and of cultivated cereals and other plants are also evident for the first time and can also be equated with the transformation of, and/or control over, the natural world (Thomas 1999 and 2003; Clay 2002).

13.1.2 Chronology

Based upon the development and changes observable in monument forms, styles of material culture and arenas of deposition throughout the Neolithic and into the Earlier Bronze Age, a number of subdivisions can be made across the period.

For the Neolithic (*c* 4000-2500/2200 BC), a simple division into and Earlier and Later Neolithic can be made at *c* 3000BC or a threefold division into an Early, Middle and Late Neolithic can be used as presented below (Whittle 1999), while the Earlier Bronze Age can be treated a single entity dating from *c* 2500/2200 to 1400 BC (Parker Pearson 1999). An additional sub-division, the Beaker period, is also recognised at the overlap between the Late Neolithic and the Earlier Bronze Age.

As with the basic idea of the introduction of Neolithic culture and forms of expression, it should be noted that the dating and character of these periods and of associated material culture and settlement/monument forms is open to much debate and regional variations almost certainly existed.

The earliest part of the Neolithic is characterised by the first evidence of clearances associated with the earliest animal herding and cereal cultivation (Early Neolithic; *c* 4000 – 34/3300 BC; Whittle 1999). Flint assemblages are characterised by waste products dominated by narrow blades and flakes while typologically distinct tools include leaf shaped arrowheads, serrated flakes, fabricators and end scrapers (Edmonds 1995). Flaked and polished stone axes also make an appearance along with the first pottery in the form of round-based, plain ware pottery bowls and cups. The earliest monumental structures appear in the form of long-barrows, cairns and the first causewayed enclosures.

This followed by a period characterised by the elaboration of causewayed enclosures and the construction of large and complex chambered tombs and cursus monuments (Middle Neolithic; *c* 3400/3300 – 3000/2900 BC; Whittle 1999). The earliest ring-ditches and small round-barrows also date from this period, while stone and timber circles also appear towards the latter end of this timeframe. The Ebbsfleet variant of the highly decorated, but still round based pottery, known generically as Peterborough Ware also appears.

Finally, the Mortlake and Fengate variants of the Peterborough Ware tradition emerge and are then gradually superseded by Grooved Ware, the first flat-based ceramic style (Late Neolithic; *c* 3000/2900 – 25/2200 BC; Whittle 1999). By this time, flint technology had also changed with broader, thicker waste flakes, wider core varieties and a greater variety of (often larger) tools including knives, borers and larger scrapers often worked on both sides as well as at one end (Edmonds 1995). Elaborate flint and stone axes, adzes and leaf points were produced and exchanged over long distances, while henges, barrows, stone and timber circles and some cursus monuments were also constructed, as were the earliest of the palisade enclosures.

The last part of the Neolithic is defined by the introduction of Beaker pottery (overlapping use of Grooved Ware) and associated material culture, the use of which extended into the Early Bronze Age (Whittle 1999; Parker Pearson 1999). The earliest bronze and copper objects (eg flat axes) also define this transitional period through to about 2000 BC. Subsequently, through to about 1700 BC further changes occurred with the introduction of flanged axes and tanged daggers. Ceramic styles included Food Vessels and Collared Urns but Beakers also continued in use. Lastly the period from about 1700-1400 saw increasing regional variation in ceramic styles including Cordoned Urns, Biconical Urns and Trevisker Ware all of which existed in an increasing range of vessel sizes and forms than had been previously seen (Parker Pearson 1999).

During this latter period flint technology (in terms of waste product) is hard to distinguish from that of the Late Neolithic, but diagnostic tools include thumbnail scrapers, barbed and tanged arrowheads, and flaked knives and daggers. Certain prestige items may have been products of specialist knappers while items such as blades and scrapers may have been everyday products and tend to the utilitarian rather uniform (Edmonds 1995).

This period also witnessed the final elaboration of stone circles, further construction of palisade enclosures. A notable change in funerary practice is seen in a shift from an emphasis on the communal to one on the individual, and a move from inhumation to cremation as the predominant practice. Burial still often involved burial below a mound (barrows and ring-ditches) or within a cairn, but the forms of these monuments varied widely and by the very end of this period the practice of burial within urns in flat, unmarked graves had emerged. This change is interpreted by many as representing the emergence of social elites perhaps in turn reflecting the emergence of tribal groupings or chiefdoms (Parker Pearson 1999). The latter may also be identified in the increasing diversity of monument forms and material culture perhaps reflecting an increasing emergence of distinct local identities and forms of cultural expression.

13.1.3 Interpretations

Interpretation of the lifestyle and society that these new monument forms, artefacts and depositional contexts reflect is complex and as noted previously remains a matter of debate. It is widely accepted that monuments were built as places where communities in many areas of the country came together and important rituals were enacted. However, the nature and timing of the introduction of these rituals and the character of the settlement and subsistence patterns of the communities using the monuments remain much debated, especially in areas where monuments are uncommon or apparently entirely absent.

One model proposes an Earlier Neolithic characterised by the gradual adoption of long fallow horticulture and animal pasturing by essentially mobile communities who maintained many aspects of Mesolithic lifestyle/s including living in temporary and insubstantial houses (Thomas 1991; Barrett 1994; Whittle 1997; Thomas 1999; Edmonds 1999). More intensive farming and permanent settlement are viewed as a later phenomenon, perhaps not fully realised in many areas until well into the second millennium. In contrast, another school of thought questions the issue of mobility in some areas of Britain where evidence for substantial (and therefore by implication permanent) houses and/or storage of cereals and more intensive horticultural practice has been recovered. Examples include numerous sites in Ireland (Grogan 1996) and Scotland (especially in the Northern Isles; Fairweather and Ralston 1993; Barclay 1996) but increasingly examples are also being located in England as at Lismore Fields, Buxton, Derbyshire (Garton 1991; Jones 2000), at White Horse Stone, near Maidstone in Kent (Oxford Archaeological Unit 2000) and most recently near Milfield, Northumberland (English Heritage 2005). In some instances, these sites can be interpreted as reflecting settled communities with a considerable reliance on arable agriculture, possibly comparable to that identified in Continental Europe. However, it can also be argued that the buildings had a ritual rather than domestic function and that the consumption of cereals and domesticated animals may have been associated with ceremonial events rather than forming a major dietary element.

13.1.4 Nature of the evidence

In contrast with the Mesolithic, the Neolithic and Earlier Bronze Age periods are more readily visible in the archaeological record, reflecting the greater quantity and variety of material culture, the construction of monuments and the increasingly common digging of pits and other features.

In many areas, flintwork and other elements of material culture provide considerable quantities of durable material surviving in the ploughsoil and thus recoverable through fieldwalking. As a result, recorded surface scatters of flint tools and waste along with isolated finds (such as flint arrowheads and flint and stone axes) provide a relatively abundant form of data, especially in localities where flint occurs naturally. Surface finds may reflect casual losses, hunting activities or the location of occupation and production sites as well of monumental activity. Flint and stone tools along with pottery and other less durable items also provide the principal artefacts recovered through excavation, while, as in the Mesolithic, tools made from organic materials are rare, though bone and wooden artefacts are occasionally encountered. Burnt stone often forms a component of the site record especially from probable occupation sites.

Metalwork finds form an important component of the record from the Beaker period onwards. Distinct typological changes occur and can support dating. Metalwork finds are recovered from a variety of contexts ranging from isolated surface finds through grave goods to hoards. In the past many of these were located during excavation, disturbed by ploughing or were found during dredging of rivers but increasingly they are being recovered by metal detecting.

In some parts of the country, monuments survive as standing stones or substantial stone structures, whilst in others timber was used and thus they are less readily identified. Most monument forms included substantial earthworks (banks, ditches and mounds), which

regularly form still visible elements of the landscape. Even where levelled by later ploughing and other activity, ditches and quarries associated with the construction of monuments also survive as substantial below ground features. These are not only revealed through excavation but are also liable on arable land to produce cropmarks, including in many areas numerous ring-ditches, the majority of which probably once demarcated barrows.

Occupation and other non-monumental sites throughout this period are most commonly identified through artefact scatters as noted above. When excavated the artefacts are often revealed to be the sole surviving evidence, although pits are relatively frequently encountered both in isolation and in clusters. Typically these are of limited size and have only a single fill, suggesting they were excavated and filled within a short period of time (Thomas 1991, 1999). Beyond pits, few features are identified though postholes, stakeholes and hearths are occasionally recorded. Only rarely do these provide any coherent pattern indicative of buildings and even in these instances may not represent typical domestic structures, which are more likely to have been temporary structures of the type leaving little or no trace in the archaeological record (though see above). This type of site has been increasingly identified since the implementation of PPG16, suggesting a considerably more intense use of the landscape than had been previously suspected. These are most commonly encountered where large areas are stripped in advance of development as at quarries or on linear projects such as road or pipeline schemes. In those areas where monuments are uncommon or even not present, these provide the most important evidence for the period and even in areas where the record is dominated by monuments the significance of such sites may be overlooked.

Indirect evidence from the palaeoenvironmental record is also important and local pollen diagrams provide particularly significant evidence for environment change throughout the period (see below). As during the Mesolithic, these support understanding of some of the wide range of resources which would have been available to local populations, but more importantly can also reflect the increasing presence of woodland clearances and the introduction of cereal cultivation, evidence for which increases throughout this period.

Lastly there is increasing awareness of the potential importance to Neolithic and Earlier Bronze Age populations (and also those of earlier periods) of natural places such as springs, major rivers, confluences, caves or distinctly visible hills which may have been associated with ancestral beliefs, mythologies and superstitions (Bradley 2000).

13.1.5 The Neolithic and Earlier Bronze Age of the West Midlands

Until the second half of the 20th century, much of the Midland counties were regarded as areas of virtually uninhabited wilderness until the Iron Age or even later (Buteux and Hughes 1995). This was especially the case for the supposedly densely forested river valleys, which form the core of this study. As across much of the country, this impression has been transformed over the past 50 or so years. One of the primary instigators of change has been the use of aerial photography, and this is certainly the case for Worcestershire where the pioneering work of Webster and Hobley in the Avon Valley during the 1960s recorded many new sites including potential Neolithic and Earlier Bronze Age monument forms such as cursus, henges and ring-ditches.

Increasing evidence for the period emerging as a result of rescue and limited research excavation throughout the 1960s, 1970s and 1980s was summarised in the late 1980s (Gibson 1989) but this remained based on a very limited number of investigated sites. As elsewhere in England, it has been the implementation of PPG16 in 1991 that has led to a notable increase in the numbers of Neolithic and Earlier Bronze Age sites being identified and investigated across the region. Quarrying has been a particularly important factor and it is considerable relevance to this survey that the five '*lived landscapes'* discussed within a recent overview of the Neolithic of West Midlands (Ray in press) have all been investigated as a response to gravel extraction.

Despite these increases in information, the record remains very limited in both quality and quantity. Further a considerable new distribution bias has been introduced towards areas where development is more commonplace and larger-scale. It is also notable that in many instances even development-led discoveries of this date are incidental ones made during the course of investigations directed at sites of later dates. However, in conjunction with an increasing body of palaeoenvironmental evidence and cropmark sites, these more recent discoveries have allowed the first tentative steps towards meaningful regional overviews for the Neolithic and Bronze Age periods as part of the West Midlands regional research framework (Ray in press; Dalwood 2002a; Garwood in press) papers from which are available at http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem1 htm.

The overview for the Neolithic (Ray in press) notes that the region possesses few examples of the monument forms regarded as characteristically Neolithic elsewhere in southern Britain and that diagnostic material culture (such as pottery) is also relatively uncommon. Rather than view this pessimistically, Ray suggested that this may reflect a 'different' and perhaps rather diverse Neolithic in the region, one that is populated by pit-groups, ditch-defined structures and various other forms of enclosure. He also observed that, in respect of some site types, at least some parts of the region might be equally or even more 'busy' than the 'traditional' Neolithic landscapes of the southern British chalk downs and river valleys. Another key point made was that the Neolithic might be very hard to perceive across much of the West Midlands due to the 'intractable' characteristics of local geologies. Lastly, a further notable problem for the region is that it has very limited resources of flint raw materials, a point noted in another of the regional research papers (Barfield in press). Given that this is one of the most common and readily visible site indicators and that within the region flint has to be imported or derived from poor quality drift deposits, the problem of site visibility is liable to be considerably increased.

Apart from these recent regional perspectives, more local reviews exist for Warwickshire (Hingley 1999), the East Midlands (Clay 2002) and the Trent Valley (Knight and Howard 2004). These provide more detailed sub-regional summaries based around either large-scale surveys or areas where more intense archaeological activity has occurred than is typically the case across the region or where resources have been available to attempt synthesis of the increasing datasets available.

13.2 Neolithic and Earlier Bronze Age Worcestershire

Worcestershire has received no recent countywide reviews of the evidence for this period, and although the review presented here focuses on the aggregate production areas of the county, it represents the first attempt at drawing the considerable body of information accumulated since C N Smith's review of 50 years ago (Smith 1958).

The Neolithic and Earlier Bronze Age record for the county is dominated (in quantity of records) by surface assemblages of flints and other finds, supplemented by a small number of excavated sites and palaeoenvironmental evidence (Fig 15). Most broad categories of Neolithic and Earlier Bronze Age site type and activity are represented, though some monument forms such as causewayed enclosure remain notably absent and no domestic structures have been identified. The mapping presented (Fig 15) is based upon HER data and thus does not include all Earlier Bronze Age sites since there is no adequate separation of these within the record, however, where possible the more important cases have been included to cover the overlap between the Neolithic and Earlier Bronze Age periods.

As noted for regional and national distribution patterns, aerial photography and recent development-led investigations, especially those associated with aggregate extraction and linear development, have considerably added to the record provided by surface scatters and have contributed towards the growing understanding the nature of Neolithic and Earlier Bronze Age activity in the county. However, as a result the records are biased towards areas affected by such developments and suited to prospection through fieldwalking and aerial

photography such as the terraces of Worcestershire Avon and parts of the Severn Valley. On the other hand, areas are poorly represented where development has been limited and pastoral regimes and/or alluviation have restricted opportunities for site detection through fieldwalking and aerial photography (such as the Teme Valley and the Severn floodplain).

Distribution is widely spread across the whole county but the record is biased towards aggregate extraction areas (an average density of 0.28 Neolithic sites/km² and 0.31 Bronze Age sites/km² as opposed to respective averages of 0.14 and 0.12 sites/km² across the whole county; Tables 2, 3 and 4). This reflects the factors noted previously and it is certainly the case that the County would be almost entirely lacking excavated sites of this period but for salvage recording and excavation undertaken in advance of aggregate extraction.

13.2.1 Surface scatters and other finds

As the most commonly identified forms of evidence for activities of this date, these represent a key source of information and their overall distribution probably provides one of the best indicators of the wide range of environments being exploited by Neolithic and Earlier Bronze Age communities.

A range of factors undoubtedly biases distribution patterns towards the more archaeologically 'visible' landscapes suited to prospection and subject to greater levels of commercially driven investigation. Therefore considerable caution should be exercised when using them as indicators of the extent or intensity of activity; however, they remain a considerable and important source of information, especially for the northern part of the county (Fig 15). Factors biasing distribution patterns echo those for the Mesolithic and again may particularly affect river terrace and floodplain areas. In both the Severn and Avon Valleys, the principal aggregate extraction areas, distribution is particularly liable to be biased towards the relatively high 'visibility' of gravel terrace landscapes. Conversely, in floodplain environments low 'visibility' arising from alluvial masking of prehistoric landsurfaces probably accounts for the low numbers of identified sites rather than non-utilisation of these areas.

As for the Mesolithic, lack of awareness of identified material, false perceptions and non-recognition of Neolithic forms among flint assemblages has probably also played a significant role in forming impressions of low levels of activity in some parts of the county. Just as for the Mesolithic, examination of records undertaken for this survey has shown that most quarry sites and other extensively sampled areas have produced small but significant assemblages of Neolithic and Earlier Bronze Age material. This suggests that material is widespread but that it may not be being recognised by fieldwalkers and/or within fieldwalking and evaluation assemblages.

Also reflecting the pattern for the Mesolithic, rapid assessment indicates that many of the Neolithic and Bronze Age dated sites resulting from the data searches of the HER are in fact flint scatters which have not been dated to anything more specific than the prehistoric period, yet still appear in searches for Neolithic and Bronze Age sites. As noted previously (Section 12), this is part of a wider problem for flint studies in the region reflecting the lack of detailed specialist analysis of material, the paucity of site-specific published lithic assemblages for comparison and the fact that many assemblages are chronologically mixed (Barfield in press).

For some flint assemblages and especially for individual findspots dating is never likely to be precise due to absence of diagnostic tools and/or waste products. However, within the County, the past 10-15 years have seen a number of staff working in local units who have a level of knowledge that begins to address some of the problems of recognition, while for the purposes of this report rapid assessment of the HER data has allowed records to be separated into 'confirmed' and 'unconfirmed' artefacts based upon whether specialist analysis has been undertaken of material. It is therefore notable that a Neolithic element has been recognised in most fieldwalked assemblages recovered from a range of pipeline projects which have provided transects across wide stretches of the county (Dinn and Hemingway 1992; Jackson

1993; Jackson *et al* 1996a; Jackson *et al* 1996b). Similarly, recent rapid assessment of a number of fieldwalking assemblages collected by voluntary groups and individual collectors indicates the high potential of such assemblages (Alvaro Mora-Ottomano pers comm). Several of these have been shown to have a strong Mesolithic element but also include Neolithic and later material. This suggests that specialist assessment and analysis would undoubtedly allow many flint scatter sites to be more specifically dated and understood than at present and also that distribution is more widespread and material more commonplace than appears to be the case at first sight.

13.2.2 Pits, pit groups and domestic activity

No houses or other potential domestic structures have been recorded to date within the county for this period and the excavated record is dominated by a small number of sites which have produced pits and other features but which have no evident monumental association. In common with much of the country, these pits contain what initially appear to be domestic assemblages (resulting from disposal of domestic refuse) but which, on examination, are better seen as containing carefully placed and selected residues of particular events. These might include periods of occupation but also potentially may commemorate periods of feasting, gathering together and other non-residential activities (Thomas 1999, 70).

The most significant of these pit sites identified in Worcestershire derives from recent work (April 2006) at Clifton Quarry, Severn Stoke (Fig 15.1). Here an isolated pit and a nearby small cluster of pits adjacent to a palaeochannel have produced wealthy Late Neolithic structured deposits associated with Grooved Ware (Andy Mann pers comm). One pit was particularly notable containing not only a large assemblage of Grooved Ware and flint tools and waste but also the potentially unique deposition of two virtually complete polished stone axes, large fragments of three of four further heat-shattered and burnt polished stone axes and also one flint axe. The nearby pit cluster also produced Grooved Ware and flint, while assessment of environmental samples indicates that the pits also contained substantial assemblages of charred cereal, fruit and nut remains. Preliminary interpretation of these deposits suggests that the pits may have had a ritual rather than domestic function and that they mark one of more periods of activity in the immediate vicinity. This may relate to short-lived periods of residence but could equally reflect a range of other activities undertaken by an essentially mobile population who marked their presence and their activities by the careful placement of selected material within pits. Initial pollen analysis of the adjacent palaeochannel deposits indicates that they span the Late Mesolithic/Early Neolithic to Late Neolithic/Early Bronze Age period (and thus the period of pit digging) during which time evidence emerges for the establishment of clearings within a predominantly wooded environment.

Elsewhere, evidence for Neolithic activity is more restricted but includes two closely spaced pits at Huntsman's Quarry, Kemerton (Fig 15.2). These were associated with flint and pottery, including material tentatively identified as from a Peterborough Ware bowl. A small quantity of residual Grooved Ware pottery was also recovered from this site (Woodward and Jackson 2005). The nearby site at Aston Mill Quarry, Kemerton (Fig 15.3) included a pair of pits associated with a small quantity of Grooved Ware and Early Bronze Age flint. These were interpreted as domestic and/or ritual activity in the vicinity of, but pre-dating a ring-ditch (Dinn and Evans 1990). Slightly further to the east, at Broadway, Grooved Ware was recorded in the 1930s at a sand and gravel quarry (Fig 15.4). Here sherds from three vessels were recovered from a pit. The site also produced further evidence of Late Neolithic to Early Bronze Age activity in the form of a barbed and tanged arrowhead and a tripartite urn (Hazzledine 1936; Smith 1946).

A final somewhat enigmatic but highly important site with Late Neolithic/Earlier Bronze activity was identified during an evaluation at Ripple Quarry (Fig 15.5). Here, one of a series of pits on a pit alignment known from cropmarks was revealed to contain a substantial post (Miller *at al* 2004). Radiocarbon dating of the post provided a date of 2410–2130 cal BC (at 94.4% confidence; 3809± 39 BP; Wk 14296). Pollen spot samples from the pit indicated the presence of localised clearances and possibly regenerating woodland. Although the other pits

did not contain posts this raises the possibility that the pit alignment might be an early example of land division (or other monumental activity), of similar date to that identified locally at Shenstone, near Lichfield, where a pit alignment was associated with Grooved Ware (Whitehouse 1961 and Longworth and Cleal 1999, cited in Ray in press). Alternatively it might be that at Ripple a later pit alignment respected and re-used an earlier structure. Whichever the case, this is a highly significant site providing evidence for well-preserved Late Neolithic/Earlier Bronze Age activity (including organic remains) surviving deeply buried below alluvium on the floodplain of the Severn. The importance of the discovery lies not only in its date and character but also in that it highlights the potential of areas flanking the River Severn where alluvial deposits are liable to mask prehistoric (and later) remains from detection through fieldwalking, aerial photography and/or geophysical survey. Since aggregate extraction is focussing for the first time on these previously uneconomical areas (due to the logistics of removing the overburden to access the mineral reserves), this is an area of particular concern within this survey.

Sites of Beaker date characterised by the presence of single pits and pit clusters have also been recorded and probably similarly reflect a ritualised marking of short periods of settlement or other activities. For instance, at Huntsman's Quarry, Kemerton (Fig 15.2) this period was characterised by widely dispersed but apparently low intensity activity across much of the site and by one apparent area of more intense activity, focused on a group of three pits. Both the stylistically early Beaker pottery and flint artefacts recovered strongly suggest domestic occupation with a range of activities represented including tool production, hunting, hide working, food preparation and other activities. The small animal bone assemblage was poorly preserved but included both cattle and sheep or goat while barley was represented within the limited charred plant remains recorded. As is commonly the case in features of this date, the material recovered appears to have been carefully selected and deposited within the pits and can be suggested as representing structured deposition reflecting ritual activity associated with one or more periods of use of the site (Jackson 2005).

A second probably domestic Beaker site has been recorded at Longmore Hill Farm, Astley during pipeline construction (Fig 15.6). Here an isolated pit included fragments from at least six fine Beakers and eleven coarseware domestic vessels. The pottery was stylistically early and was accompanied by flint, burnt stone, charred plant remains (cereal and hazelnut shells) and small fragments of burnt animal bone (Dinn and Hemingway 1992). Again a short-lived period of domestic occupation appears to be represented. Small quantities of Beaker pottery recorded at Aston Mill and Beckford (Fig 15.3 and 15.7) probably represent similar activity, as may the pre-barrow material recovered from pits at Holt (Fig 15.10). In all of these cases of Beaker activity, as for the Neolithic period, there remains a notable absence of clear evidence for domestic structures.

13.2.3 Ceremonial monuments

Until relatively recently, Thomas' (2003, 72) observation that 'it is hard to escape the conclusion that some Neolithic communities just didn't build monuments at all' seemed to apply across Worcestershire. However, in the past five or so years, aerial photography has indicated the potential for small monument complexes within the Avon and Carrant Valley around Bredon Hill, although with two exceptions none have received any level of investigation.

Small hengiform monuments (ie those less than 20m across) have been tentatively identified at a number of locations through cropmark evidence within this area. Of these, only that at Bredon's Norton in the Carrant Valley has been tested by excavation (Fig 15.8). Here, small-scale investigation in 2005 by the University of Worcester appears to confirm the identification of the cropmark as a hengiform monument. Significantly, deposit survival was revealed to be surprisingly good despite a recent history of ploughing. Phases of activity identified included a substantial ditch and external bank (?the hengiform monument) with re-use phases including recutting of the ditch, insertion of at least five cremation deposits into

the slighted remains of the bank and finally the cutting of a curvilinear ditch over the line of the earlier one (Jodie Lewis pers comm).

Despite the apparent confirmation of the monumental nature of this particular cropmark enclosure, caution must be exercised in interpretation of circular enclosures as henges or hengiforms the comparative dating of these monuments, as considerable regional and even sub-regional variation in monument form and dating is increasingly being recognised. For example, at Perdiswell just north of Worcester, investigation of a cropmark enclosure thought at one time to represent a henge revealed it to be Middle Bronze Age palisaded enclosure (Griffin *et al* 2002; Section 14.1.3). Further evidence of the potential pitfalls of interpreting these sites has recently been recorded in the Avon Valley where a circular enclosure of apparent hengiform type has been revealed by further emerging cropmarks to be the site of a windmill (Mike Glyde pers comm).

Cursus monuments have also been recognised within the Avon Valley where a good example of the potential of these sites has been recently been demonstrated at Fladbury (Fig 15.9). Although the presence of a probable cursus had long been known from cropmark evidence, it is only over the past couple of years that further cropmarks have emerged revealing a complex of up to five further potential cursus monuments on varying alignments, lying within a large loop of the Avon (Fig 16.1-6). Small investigative trenches across the flanking ditches of one of these (Fig 16.4) revealed them to be typically shallow features. Equally characteristically, no dating evidence was recovered. Other potential monumental structures are also indicated at the site in the form of a possible hengiform, a double ring-ditch and a large, narrow curving feature, the latter possibly indicative of a palisaded enclosure the projected diameter of which would be about 250m (Mike Glyde pers comm.; Fig 16.7-9). Further clusters of small monuments in the immediate area include a cluster of five ring-ditches and an elongated enclosure to the east, at Fernhill Farm (Fig 16.10), to the west a horseshoe-shaped enclosure, a ring-ditch, several small square enclosures and an elongated enclosure (Fig 16.11) and to the south-west an elongated enclosure (Fig 16.12). This concentration of activity bears strong comparison with the small monument complexes known higher up the Avon Valley in Warwickshire such as at Barford, Charlecote and Church Lawford (Loveday 1989; Hughes and Crawford 1995; Palmer in press), in the Upper Thames Valley (Thomas 1999, Chapter 8) and to a degree those in the Upper Severn Valley (Lynch 2000, 128-37).

Despite these discoveries, monuments remain rare and some forms remain apparently entirely absent or wholly untested within the county. For example, no stone or timber circles or larger henge monuments have as yet been firmly identified, although cropmark evidence provides some potential sites. At Severn Stoke a large circular enclosure is apparently associated with an internal post circle, while at Kempsey a complex set of concentric rings of postholes or pits appears to represent a ceremonial monument in the Woodhenge or Catholme tradition. As yet cropmarks or any other form of evidence have failed to reveal any potential examples of causewayed enclosures in the county, however, it should be noted that, based on the ever expanding area over which these and other monuments have been recognised nationally, the Severn and Stour Valleys retain considerable potential to contain monuments either on the floodplains and terraces or sited on promontories and hilltops above the valleys (Ray in press). Given the extensive aerial photographic coverage of the terraces of the Avon Valley and the limited areas masked by alluvium, the potential for major discoveries seems somewhat more limited, although it would be unwise to dismiss the possibility entirely. In contrast, the potential of earlier prehistoric landscape survival beneath the extensive alluviation of the Severn Valley remains largely untested (though see below) while aerial photographic coverage of the Severn terraces is less extensive than for the Avon. Hilltop or promontory locations also retain considerable potential, suggested candidates including Bredon Hill (overlooking both the Avon Valley and its tributary the Carrant Valley) and the Malverns (overlooking the Severn Valley).

13.2.4 Funerary activity

Potential Early to Middle Neolithic funerary monuments in the form of elongated enclosures have been identified through cropmark evidence as noted above around Fladbury (Section 13.2.3) and in the Carrant Valley (Loveday 1989; Dinn and Evans 1990). The latter lie in the cropmark complexes stretching between Kemerton and Beckford (Fig 15.2, 3 and 7). If their identification is correct, these enclosures may represent the ploughed out remains of long barrows or mortuary enclosures of earth and timber construction and they are probably comparable therefore to the elongated enclosures identified within the Warwickshire Avon (Loveday 1989; 2006). Although of different construction and as yet undated, these sites potentially fulfilled similar functions and represent the focal points for similar rituals to the well studied Cotwolds monuments. As with other monumental forms identified within the Avon Valley, the distribution of these elongated enclosures also extends along the river into Warwickshire suggesting perhaps that communities along the river shared similar beliefs.

The Carrant Valley has also produced a potential example of an Early Neolithic crouched inhumation from Wormington Farm, Aston Sommerville (Fig 15.10). This occupied an unmarked grave and was accompanied by single blade-like flint flake (Coleman, Hancocks and Watts 2006, 89). Although there are indications of later disturbance, radiocarbon dating of bone from the inhumation has produced an Early Neolithic date (3650-3370 cal BC; Wk-15335; *ibid*). If the date is accurate this is a highly significant and rare discovery of a flat inhumation grave of this period.

Later funerary monuments and burials are slightly more common, especially in the form of ring-ditches most of which are liable to represent the ploughed out remains of Neolithic and Earlier Bronze Age barrows. Several examples of the latter have been tested by excavation in the Carrant Brook and also in the Severn Valley north of Worcester. Garwood's recent review (in press) noted eight examples of ring-ditches and a double Beaker burial excavated to modern standards in the County with a further nine ring-ditches or Beaker/Bronze Age burials investigated to pre-modern standards. Of these nineteen examples, twelve were excavated as a result of quarrying and since the completion of Garwood's review a further example has been excavated in advance of quarrying at Ryall (Barber and Watts 2006). The most significant of these are the five (out of a group of seven ring-ditch cropmarks) excavated at Holt between 1970-75 (Fig 15.11; Hunt, Shotliff and Woodhouse 1986). Examples of both double and single ring-ditches were investigated and revealed to be associated with a range of accompanied and unaccompanied cremation deposits. Of particular note was the recovery of at least eight Collared urns and one biconical urn along with an accessory cup. Fragments from three fine Beakers and at least five Beaker domestic vessels along with a transverse arrowhead and a flake from a polished stone axe are indicative of at least some form of pre-barrow activity, though it's nature could not be determined.

Characteristic secondary use of many of these funerary monuments has also been observed, the ring-ditches at Aston Mill and Huntsman's Quarry in Kemerton (Fig 15.2 and 3) and some of those at Holt being associated with secondary cremation deposits (Dinn and Evans 1990; Jackson and Napthan 1998; Hunt, Shotliff and Woodhouse 1986). The secondary use as a funerary monument of the hengiform at Bredon also provides important evidence for the manner in which monuments could be re-used and adapted according to changing practice throughout the first half of the second millennium BC.

13.2.5 Natural places

The potential of natural features as places of accumulated spiritual and cultural significance should also not be ignored (Bradley 2000). Within Worcestershire, distinct landscape features such as Bredon Hill, the Malverns and the two major rivers, the Severn and the Avon may all therefore have had particular resonance to Neolithic populations either as focal points for activities or even as 'dangerous' places to be avoided or respected in particular ways. Lesser features such as the brine springs around Droitwich or the distinct dome-shaped rise of Crookbarrow Hill may also have held particular significance to local communities; indeed

some evidence exists to suggest that the latter may have been artificially enhanced and have some parallels with monumental mounds like Silbury Hill (HER documentation for WSM 552).

13.2.6 Material culture

Local flint resources are notably limited and are restricted to poor quality gravel derived flint. Higher quality flint is recovered and must have been imported from a considerable distance possibly in the form of pre-prepared cores. As a consequence, flint artefacts and waste are restricted in quantity and often in quality. Further, material was often worked to exhaustion. This has implications for the interpretation of flint scatters and for the correct identification and dating of waste products and tools. In particular, caution should be exercised in assuming that low quantities of material are insignificant. For instance, evaluative fieldwalking of an 8ha area at Huntsman's Quarry, Kemerton produced only 30 worked flints yet subsequent excavation produced widespread and significant evidence for earlier prehistoric and Late Bronze Age activity (Jackson 2005).

Neolithic and Earlier Bronze Age pottery has only been recovered from a limited number of locations within the county. To date no certain Early Neolithic pottery has been identified. Very limited quantities of variants of Middle to Late Neolithic 'impressed' wares (Peterborough Wares) have been found, only three quarry sites in the Carrant Valley having produced such material (Beckford, Aston Mill and Huntsman's Quarry; Fig 15.2, 3 and 7). Similarly, only four locations have produced Late Neolithic Grooved Ware and all bar the sizeable assemblage from Clifton Quarry (Fig 15.1) are restricted to only a few sherds at best.

Beaker pottery is better represented and includes complete or virtually complete fineware mostly deriving from funerary contexts, including for instance at Bredon Hill (Thomas 1965) and at Hill and Moor Quarry (Else 1943). Non-funerary pit deposits have also produced domestic Beaker assemblages, as at Huntsman's Quarry (Jackson and Napthan 1998) and Longmore Hill Farm, Astley (Dinn and Hemingway 1992). Lastly the urn traditions of the Earlier Bronze Age have also been identified, most notably the assemblage of collared urns and other vessels from Holt Quarry which provide the most important ceramic group for this period from the Severn Valley (Hunt, Shotliff and Woodhouse 1986).

Metalwork deposition is also relatively limited in comparison to other areas; for instance dredging of the River Severn has produced surprisingly little material in comparison with other major rivers. However, a range of material has been recovered including flat axes, looped and unlooped palstaves, socketed axes, socketed gouges, spearheads and leaf-shaped swords and armlets of which elements are of Beaker/Earlier Bronze Age date (eg armlets and flat axes). For the future, the reporting of metal detecting finds through the Portable Antiquities Scheme is liable to continue to increase both the quantities and range of material known.

13.3 Environment (Elizabeth Pearson)

13.3.1 Introduction

The Neolithic and Earlier Bronze Age periods witness an important transition from a reliance on collected and hunted food to an increasing use of cereal and livestock farming. The rate of this change is complex, with both sources of food being used in tandem for much of this period. The cultural significance of food from different sources also needs to be considered.

Direct evidence of food consumption is limited, and only slightly more abundant than for the Mesolithic period. Similarly, there is likely to be small quantities of food waste produced by small populations, but also because certain food resources, such as cereals, may have not have been exposed to the preserving effects of fire during processing (parching), as seems to have been the case in later Iron Age and Roman periods (Robinson 2000). Aspects such as taphonomy need to be considered in interpretations. For example, Jones (2000) has pointed

out that the importance of cereal cultivation may be under-represented compared to the use of hazelnuts. Hazelnuts shells are a by-product with few uses, and are more likely to have been discarded on to fires. Residue analysis from pottery samples may also contribute to the (limited) information available on the types of food consumed. The cultural symbolism of food also needs to be considered, as it is likely to have had much ritual significance to Neolithic populations.

Cereals have been considered as food of ritual or special significance for this period. Although cereals are likely to be under-represented, one point of view is that cereal cultivation was not an important part of the economy throughout the Neolithic and Earlier Bronze Age, and that crops were grown for specialist use. Richmond (1999) suggests that cultivated crops were viewed as prestigious foods, traded or grown for use on special occasions, particularly ritual feasts, and were a symbol of economic status.

During latter part of the phase discussed here, the relative importance of cereal and livestock farming becomes more important. There is often scant direct evidence for food consumption and production, and so off-site environmental evidence, is an important source of supporting evidence. Much of the evidence does seem to point to a predominantly pastoral economy, particularly in the West Midlands. However, it should be bourn in mind that several types of environmental evidence (for example pollen, insects, molluscs) tend to provide more information on grassland communities than arable or cultivated land. Interpretations may, therefore over-stress the importance of a pastoral based economy. The use of arable/pastoral indicators in the analysis of data from pollen and insect assemblages, for example as described in Section 11.3 may be useful in addressing this issue.

The symbolic and cultural importance of the landscape is also important. Brown (2000) has considered whether some forest clearings or ‘gaps’ could have had as much symbolic as practical importance, involving the encouragement of game or useful plants for food. The possibility of a clearing having ritual significance is more likely where there are ritual monuments or artefacts in the vicinity, where the location does not seem suitable for pastoral agriculture or encouragement of game.

Lastly, the landscape in which monuments were constructed is of interest. Off-site peat or sediment profiles can be used in interpretation, where present, but if buried soils exist beneath monuments, soil micromorphological analysis of these may be productive (although these may only rarely be relevant to gravel extraction areas).

13.3.2 Neolithic and Earlier Bronze Age environment in Worcestershire

Direct on-site evidence for human activity is limited. Three of these sites are located on Bredon Hill, which has been noted to be of significance for Neolithic activity. At Huntsman’s Quarry, Kemerton, on the south side of Bredon Hill (Fig 15.2), occasional charred barley and grass grains were recovered from a Beaker/early Bronze Age pit (Pearson 2005), and a small, abraded assemblage of animal bone (Pinter-Bellows 2005). Close by, limited environmental evidence from the quarry at Aston Mill Farm, Kemerton (Fig 15.3) included incomplete and slightly under-fired cremations from three contexts of Early Bronze Age and mid-late Bronze Age date (Mays 1990). A small quantity of animal bone was also recovered which included cattle, sheep/goat, wolf and badger (Lovett 1990).

To the south, at Ripple Quarry in the Severn Valley (Fig 15.5), pollen associated with a post-pit (part of a possible pit alignment) dated to 2410 to 2130 cal BC (3809±39 BP; Wk-14296) and indicated regeneration of woodland following clearance. A large, worked timber and other woody fragments also survived. The pollen evidence would be consistent with an interpretation of the pit alignment as a particularly early division of land. Charcoal fragments, indicating human activity, were also found in other undated features in the vicinity, thought to be contemporary with the pit alignment (Miller *et al* 2004).

More comprehensive off-site evidence is available from peat deposits within abandoned watercourses and hollows in floodplain areas and geoarchaeological study. On a broad scale, there appears to be a difference in the rate at which woodland was cleared from the Severn and Avon Valleys. Work by Brown (1982) showed that, in the Severn Valley, primary woodland was cleared in some places on the gravel terraces by the end of the period covered in this section (*c* 1500 BC), but was not cleared on the floodplain until much later, largely in historic times. In the Avon Valley, however, an open, deforested environment was apparent early in the Bronze Age, as demonstrated by sequences at Carrant Brook, Beckford (Fig 15.7; Greig and Colledge 1988) and at Birlingham nearby (Fig 15.11; Bretherton and Pearson 2000). The implications of this have been discussed as part of the West Midlands Regional Archaeological Research Frameworks (Pearson 2001). This emphasises Tony Brown's observation that the difference may partly reflect the proximity of the sites to substantial sized settlement, and the fact that the form of the two valleys is different. Much of the Severn in the region is narrow and gorge like, while the Avon has wider terraces and shallower valley slopes. This may have affected settlement patterns, land use and could have had implications for cultural diversity (Tony Brown pers comm).

More recent work in the Severn valley at Clifton Quarry, Severn Stoke (Head and Pearson 2005) has revealed an extensive peaty channel deposit dating from the Late Mesolithic (4685 to 4458 cal BC; 5712 ±46 BP) to the Late Neolithic/Earlier Bronze Age (2290 to 1910 cal BC; 3698± 67 BP). This compares well with Brown's (1982) earlier work, showing the later part of the sequence as a mosaic of woodland and cleared areas. A further channel was also identified nearby, close to Ashmoor Common, which may be an earlier channel of the River Severn, and also close to a site sampled as part of Brown's work on Severn valley sites (Brown 1982). Radiocarbon dating suggests that this may have silted up around 4,000 BC (Vaughan 2005a; Tarmac Limited 2002).

At Cookley in the Stour valley, the part of the sequence representing the Mesolithic/Neolithic transition is not detailed because sedimentation seems to have been slow. Early Neolithic woodland disturbances are seen from fluctuating tree pollen values and the presence of weeds, cereals and heathers, while the last of the woodland was cleared around the start of the Iron Age (Greig 2004).

13.4 Summary discussion

The evidence for Neolithic and Earlier Bronze Age Worcestershire is thus very restricted, comprising limited flint and other artefact scatter sites; pits containing carefully selected and deposited residues of short-lived periods of non-monumental activity; a limited number of small monuments in the Worcestershire/Warwickshire Avon and Carrant Valleys; and small concentrations of funerary sites in the south of the county, along the Avon and Carrant Valleys, and north of Worcester, around Holt and Grimley.

The concentration of activity within the Carrant and Avon Valleys perhaps suggests that this area was marked out as one with special meaning for local communities from an early date, though other areas with less readily visible archaeology may have been equally important and held their own specific meanings. Within the Carrant and Avon Valleys, it has been observed that the postulated mortuary enclosures, ring-ditches and hengiform monuments appear to occupy the edge of local fan gravel deposits (from Bredon; Dinn and Evans 1990), although in the light of more recent cropmark evidence it seems more probable that their distribution coincides with the limits of the gravel terrace (Jackson 2005). This distribution may reflect the marking of a boundary of some cultural, religious or even economic significance to the local population.

Beyond this concentration, and that identified around Holt and Grimley (another quarrying landscape with a readily visible archaeological record), a key conflict can be observed between the very limited record for settlement, monument construction or other forms of activity and the relatively strong, but indirect, evidence from the palaeoenvironmental record for considerable levels of human intervention. The latter, when considered alongside the

widely dispersed evidence from surface finds, suggests that most areas of the county were in fact utilised in some way by Neolithic and Earlier Bronze Age communities. However, for reasons already discussed, the sites in many areas are less readily detected and have yet to be firmly identified, examined and characterised; a point re-enforced by the recent discoveries of significant Neolithic and Bronze Age deposits buried within alluvium at both Ripple and Clifton.

13.5 Research directions

The following presents a summary of some of the weaknesses and potential strengths of the county for supporting local, regional and national narratives for this period. It echoes many of the ten directions recently identified for the West Midlands (Ray in press) but is focussed at a local level and more specifically towards aggregate extraction landscapes.

13.5.1 General issues

It is clearly the case that both aggregate landscapes and those beyond suffer from similar difficulties of interpretation, enjoy a similar potential for developing narratives and require similar approaches and a cohesive strategy for addressing the gaps in understanding for the period. The latter, as Ray (in press) has observed, requires a regionally cohesive and pro-active approach, perhaps one steered by a small regionally active group but involving local universities, curators, contractors and avocational archaeological groups drawing on a wide range of resources at different scales.

13.5.2 Environment (Elizabeth Pearson)

A brief summary for priorities for environmental archaeology in the West Midlands is outlined in Grieg (in press) as part of the Regional Research Framework for Archaeology. Further recommendations are as follows:

- As for the Mesolithic period– increased sampling intervals on palaeoenvironmental profiles;
- Predictive modelling of areas of potential for palaeoenvironmental analysis;
- More use of anthropological studies as part of an environmental analysis;
- More use of varied techniques such as residue analysis.

13.5.3 Artefact scatters and collections

Given that these provide a major source of evidence for the period and particularly support production of distribution patterns, further survey and use of improved approaches are seen as being highly important.

Overall there has been little systematic survey or consistency of approach to field survey within the county, a problem exacerbated by a lack of tradition of avocational fieldwalking except in limited areas (notably the Avon and Carrant Valleys, a pattern which has exaggerated this area even more in the record).

No targeted surveys have been undertaken to address the apparent gaps in coverage of the region. In the light of this, it is considered highly significant that where surveys or more intense, large-scale programmes of fieldwork have occurred, Neolithic and Earlier Bronze Age finds appear relatively common. Further, where excavation has followed, features have relatively regularly been encountered. This suggests that the county may in many respects reflect the pattern emerging in the East Midlands. There, recent surveys of the claylands have shown that, contrary to the previous impression of limited utilisation of these landscapes,

during the Mesolithic, Neolithic and Earlier Bronze Age they were in fact extensively exploited (Clay 2002).

The methods used for any survey also need to be considered, whether research or development driven. Myers (in press) has suggested that the potentially small size of Mesolithic sites may be a crucial factor in whether they are detected in programmes of prospective fieldwalking, noting that 20m intervals in Leicestershire proved clearly more effective than 30m ones in neighbouring Northamptonshire. Given the similarly restricted size of most Neolithic and Earlier Bronze Age non-monumental sites, and the low levels of flint present in the county, a similar observation can be made for this period. Thus curators need to specify higher than normal sampling levels for fieldwalking in areas of high potential or perhaps require them as a contingency or supplement to normal interval walking if this has produced even very small quantities of flint. Burnt/heat-shattered stone should also be routinely collected and its distribution be recorded as this is a frequently overlooked component of prehistoric sites.

Where fieldwalking and/or excavation produce lithic assemblages, specialist assessment and analysis would undoubtedly allow many flint scatter sites to be more specifically dated and understood than at present. Further, re-assessment of material from both published and unpublished former programmes of fieldwork which has not received specialist analysis would improve the quality of the data for the Neolithic as well as for the Mesolithic and Bronze Age periods, thereby improving the reliability of decision making based around these sites.

Lastly, fieldwalking by community and special interest groups should be supported and where possible directed to try and address some of these shortfalls in coverage. Where undertaken, efforts should be made to ensure that there is a consistency of approach, an improved awareness of the character and appearance of lithics (through provision of training sessions and artefact recognition sheets) and specialist support should be provided.

13.5.4 Survey, evaluation and excavation strategies

The long-term impact of aggregate extraction and other research on selective tracts of river valley landscapes has been observed to have biased the record and produced a focus on specific elements of the Neolithic and Earlier Bronze Age landscape. This is to an extent unavoidable but as noted above, fieldwalking by local groups could be encouraged and supported in specific areas to test their potential.

Targeted research excavation, even small-scale, to test the cropmarks indicative of monuments should be seen as a priority since these are poorly understood, appear to differ in scale to the better known monument complexes of southern England. This would allow more confident dating and assignment of function to these cropmarks which focus on areas with considerable potential to attract future programmes of extraction. In this context, it is of considerable note that the hengiform monument recently investigated at Bredon had a well-preserved sequence. This suggests that some of these sites have a high potential for good preservation and the survival of long sequences of use, and thus have the potential to provide crucial evidence for repeated use and adaptation of a monument or ritual focus over along period.

Similarly targeted research should address the nature of the archaeology which surface scatters represent. As noted above, caution must be exercised within programmes of development-led fieldwork to ensure that fieldwalking samples are adequate to recognise these site types. Some non development-led testing of appropriate methodologies for the investigation of surface scatter sites would also be of considerable benefit. This would not only support more effective future programmes of development-led work but could also support understanding of the character of any buried remains which might be associated with these surface scatters.

Archaeological briefs and/or Written Schemes of Investigation for any subsequent evaluative trenching strategies and excavation of sites of this period (whether identified through cropmark, geophysics or surface scatter) must also recognise the likely dispersed, ephemeral and rather intractable character of many early prehistoric sites (especially occupation sites). Higher levels of sampling than are typically employed are recommended, allied to provision of a period to allow features to weather out and provision of resources to allow careful cleaning of anomalous areas (which may be revealed to be features rather than natural irregularities as can often be assumed). Such approaches are especially important for developments such as aggregate extraction where large areas of early landscape are potentially being revealed and where the cumulative value of widely dispersed, fragmentary, sometimes ephemeral and perhaps diverse activity can provide the greatest potential return (see for instance Yarnton, Oxfordshire; Hey 1997). Further, within alluviated areas, the problems of site prospection noted above (Section 5.3) should be noted and particularly careful consideration given to the evaluation and mitigation strategies recommended and the methods employed (see also Section 13.5.6).

13.5.5 Specialist analysis and dating programmes

The potential of radiocarbon dating and other appropriate scientific analyses for providing detailed information on chronology and site activities represented is increasingly well recognised. Where dating is uncertain or sequences are complex (and thus potentially allow high resolution dating) adequate provision for radiocarbon dating should be made as a matter of course.

Similarly proper specialist provision for analysis of all aspects of material culture is essential, while for well sealed assemblages from discrete and datable contexts it is important that artefact and ecofact distributions are carefully recorded to allow structured deposition to be recognised and further investigated. In the case of such well-sealed assemblages, further scientific analyses (such as usewear analysis on flint or thin sectioning and absorbed residue analysis on pottery) should also be routinely employed.

Lastly, specialist environmental input and routine sampling should be undertaken on any site with potential Neolithic or Earlier Bronze Age deposits since even very small quantities of charred plant remains or animal bone can cumulatively provide significant evidence for the use of, and balance between, domesticated and wild resources. Similarly any sites where pollen, molluscan, coleopteran or other wider palaeoenvironmental indicators are present should be properly sampled and analysed to provide evidence of wider patterns of landscape use, adaptation and change through this period.

13.5.6 Organic remains and alluviated landscapes

In common with the rest of the country, any sites with preserved organic remains, which include artefacts and/or settlement or other activity remains would be of great importance. Although there is only limited potential for the survival of such sites, former marshy areas and watercourses along the floodplains of both the Severn and Avon Valleys such as may be present within aggregate extraction areas have a high potential for survival of trackways, organic artefacts and other organic structures and remains of the type rarely encountered.

This potential has recently been demonstrated at Ripple and Clifton Quarries (as discussed above), but unfortunately it has not proved possible to secure resources to further investigate the former site where ongoing quarrying (resulting from an active and unconditioned pre-PPG16 permission) is liable to remove all elements of any surviving Neolithic landscape.

Given this demonstration of the archaeological potential of such landscapes and the potential problems of alluvial masking of deposits within these landscapes, research to better understand these areas and methods for evaluation and investigating them should be regarded as a high priority.

14. Later prehistory: Middle and Late Bronze Age to Iron Age (Annette Hancocks)

This assessment spans the Middle Bronze Age through to the pre-Roman Iron Age inclusively (*c* 1500BC to 42AD); a period which is sub-divided into that spanning the Middle and Late Bronze Ages through to Early Iron Age and that covering the Middle to Late Iron Ages.

14.1 The Middle and Late Bronze Ages to Early Iron Age

14.1.1 Background and chronology

Profound changes can be identified at the end of the Earlier Bronze Age (in *c* 1500 BC) with new conceptions of territory, land, domesticity and identity being introduced (Parker Pearson 1999; Champion 1999). The subsequent period as discussed within this section runs through to *c* 450 BC and can be separated chronologically into Middle Bronze Age period (*c* 1500-1150 BC) and a Late Bronze Age period (*c* 1150-800 BC), which merges into the Early Iron Age period (through to *c* 450/300 BC). Considerable debate also continues about where to divide the Early and Middle Iron Ages with some such as Hazelgrove (1999) placing it as late as 300 BC but others such as Willis (2006) considering the division to lie earlier at 450 BC.

The period is marked by a number of new technological and social changes reflected in the emergence of metalworking and pottery centres, which both ultimately led to the development of regional ceramic and metalworking traditions that are both functional and decorative. As a direct consequence, centralised production and distribution patterns emerge which are supported by marked changes in social relations leading to the development of differing settlement patterns culminating with permanent defended and undefended settlements within the landscape. From the mid second millennium onwards, within these settlements, roundhouses appear to be constructed more substantially and in larger sizes than previously, and are often interpreted as reflecting the emergence of household groups with domestic rituals and routines.

This chain of events also manifests itself by recognised significant changes in burial traditions and rites, the placing of the dead in the landscape for instance. By the advent of the Middle Bronze Age cremation was universal and grave goods limited to a single Deverel-Rimbury vessel or regional variations of this tradition. Associated metalworking traditions include the Acton (*c* 1500-1400), Taunton (*c* 1400-1275) and Penard/Wallington (*c* 1275-1140) phases and items such as palstaves and swords (chronology based on Needham 1996). Cremation without grave goods in small cemeteries behind settlements prevailed, and flat, apparently unmarked, graves gradually replaced barrows. Middle Bronze Age houses were constructed more substantially than had been the case previously. They also occur in larger sizes and a greater number of settlements and household groups can be identified with established domestic rituals and routines than for earlier periods. Burials represented local markers of a new sense of place fixed on the homestead. Personal identities were defined more by territory and control over land counted as much as control over people. Landscapes became characterised by fixed places of occupation surrounded by defined, bounded blocks of agricultural land.

By the Late Bronze Age human settlement and the division and exploitation of the agricultural landscape was common with more substantial and significant settlement sites, which were often unenclosed. Settlements, their structures, and related finds, such as pottery (post Deverel-Rimbury plainwares) and domestic food waste form one of the two main sources of information about Late Bronze Age societies. Metalwork, especially heavily leaded bronze, is a principal indicator of material culture of this time which is found in the archaeological record. Metalwork is rare on settlement sites, but hoards are more common as is debris from manufacture in the form of ceramic mould fragments. Metalwork phases

include the Wilburton (*c* 1140-1020) and Ewart (*c* 1140-800) traditions and forms include a greater range of items such as socketed axes and horse gear, with regional traditions becoming more apparent. There is a fundamental transformation in the culture of Bronze Age society, with the reorganisation of the physical landscape and introduction of new forms of social interaction.

Contact through trade and exchange with the Continent is recognised archaeologically in form of boats and continental imports. New industries such as salt-making and textiles developed in Europe too, along with changes in the agricultural economy. New crops were cultivated, with greater emphasis on storage, territorial division and field systems seen throughout Europe.

The deposition of artefacts in watery places is both important and significant and appears to be one of the major themes: the conspicuous consumption of wealth through ritual deposition of bronze (Bradley 1990). It is an indication of individual status and control over rare materials and technologies which is shown in several guises such as warfare: slashing swords and armour; a new form of combat and symbol of power; feasting: cauldrons and associated flesh-hooks and buckets ritualised preparation and serving of meat and drink; wheeled vehicles and the control over the production and distribution of food; an important feature of Late Bronze Age society.

The emphasis in the Late Bronze Age/Early Iron Age transition and Early Iron Age periods (through to *c* 450/300 BC) focuses on unenclosed sites and creating linear field boundaries, and it may be of some significance that Late Iron Age enclosures have been observed to have been constructed next to Late Bronze Age and Early Iron Age linear boundaries. The construction of hillforts and the development of a new repertoire of domestic pottery is now firmly associated with the Late Bronze Age (see later discussions). The final bronze metalwork tradition, the Llyn Fawr (*c* 800-650 BC) falls in this period and overlaps the first use of iron.

Champion, amongst others, has recognised the problems of identifying Middle to Late Bronze Age and Early Iron Age settlement sites and field systems (Champion 1999, 97). Many excavated settlement sites lack substantial enclosure ditches, and this type of site is hard to recognise in aerial photographs. There is also the problem of interpreting and ascribing dates to aerial photographs (Bradley 2001, 231). Fieldwalking is not a reliable indicator of settlement of this period, due to the friable nature of pottery of this date. The extensive Late Bronze Age settlement at Huntsman's Quarry, Kemerton, Worcestershire produced little material culture using this methodology (Cook and Hurst 1994, 5). Gridded trial pits, wide evaluation trenches and particularly the use of sample levels of 4% or greater as suggested by Hey and Lacey (2001) probably offer the most reliable means of identifying later Bronze Age and Early Iron Age settlement sites.

14.1.2 Nature of the evidence

The regional pattern has recently been summarised by Dalwood (2002a) and Jackson (2002). This demonstrates that on a regional level, as for the country as a whole, the record for the Middle Bronze Age, Late Bronze Age and Early Iron Age periods is dominated by patterns of distribution, which must be treated with a distinct element of caution. The existing information for this period is rather thin overall, with large blank areas. However, it is apparent that some lowland river valleys were intensively settled and farmed by the later 2nd millennium BC.

The palaeoenvironmental and geoarchaeological evidence in the lower Severn Valley and the Avon Valley points to a trend in widespread clearance for cultivation of the Avon terraces sometime prior to those of the Severn (Shotton 1978; Brown 1982; Greig 2005), although the pattern of clearance across these terrace and floodplain landscapes is liable to be complex.

Within Worcestershire, quantifying the records for this period through the HER is not possible as no distinction is made between Early, Middle and Late Bronze Age or between divisions within the Iron Age. However, it is perhaps indicative that nearly 55% of recorded Bronze Age monuments are from aggregate producing areas, with 45% of recorded Bronze Age activities deriving from the same aggregate areas. This is a substantial proportion and this data comes from purely sand and gravel aggregate areas around the lower Severn Valley and Avon Valley (Fig 17). It has to be noted that this reflects a bias in the archaeological and HER record and is a reflection of the level of archaeological intervention in these areas too. Not surprisingly the level of archaeological preservation is a reflection of the type of aggregate upon which archaeological sites have been recorded, with archaeology appearing to survive better in soft aggregate areas as opposed to hard aggregate.

14.1.3 Middle Bronze Age, Late Bronze Age and Early Iron Age Worcestershire

Landscape organisation and settlement patterns

During this period, Worcestershire, in common with much of southern and eastern England, saw the beginnings of landscapes as fixed places of more permanent occupation than had previously been the case. Ditches and hedges marked out defined blocks of agricultural land and within these both enclosed and unenclosed settlement was situated.

Enclosed settlement, characteristic of the later prehistoric period in England, emerges with occupation areas defined by ditched enclosures (accompanied by hedges and occasionally palisades). These settlements, field systems and droveways have only rarely been identified in Worcestershire but typify a national trend seen as reflecting expressions of an increasing sense of belonging to, and control over, particular areas of the landscape. Open, unenclosed settlement lying within these newly defined landscapes remained important.

Lowland settlement sites, many in river valleys seem to be the focus of attention during this time and Worcestershire is no exception, though by the end of Late Bronze Age some hilltop sites are occupied and possibly defended. However, construction of complex defences and the development of hillforts did not fully take place until the Iron Age.

The largest concentrations of Middle to Late Bronze Age and Early Iron Age activity are located towards the south of the county along the Severn, below Worcester, and in the Lower Avon/Carrant Valley on the major river terraces surrounding Bredon Hill. This latter area includes the most important known site of this period in the county, located at Huntsman's Quarry, Kemerton (Fig 17.1; WSM 21698; Jackson 2005). Here an extensive area has been recorded, covering in excess of 8ha, including numerous roundhouses and other post-built structures forming unenclosed settlement areas set within a series of ditch defined fields and droveways with associated waterholes and stock enclosures. Together with cropmarks (eg WSM 5006, 10265-7, 10284 and 27144), and further limited excavated evidence from sites along the Carrant Valley at Aston Mill, Beckford and Ashton-under-Hill (Fig 17.2, 3 and 4), this provides certain evidence for considerable organisation and enclosure of the landscape into fields dotted with settlements and waterholes and linked by droveways.

To the north of Bredon Hill, in the Avon Valley, as yet unpublished excavations and salvage recording along the route of the Wyre Piddle Bypass and several other sites in the vicinity have identified several sites indicative of an ordered, defined landscape of fields and settlements in this area (Fig 17.5). These include a rectilinear, palisaded enclosure and field boundary of Middle Bronze Age date, the alignments of which persist through to the Iron Age (WSM 30576; Robin Jackson pers comm). Two unmarked isolated cremations associated with fragments of plain bucket urns were also identified during evaluation, while salvage recording identified a probable burnt mound on the Avon floodplain (WSM 23390; Napthan *et al* 1997b; WSM 31598; Goad and Darch 2002).

To the west, in the Severn Valley, recent evidence of a burnt mound and associated features alongside a palaeochannel at Clifton Quarry, Severn Stoke appears likely to reflect Middle to

Late Bronze Age utilisation of the river floodplain (Fig 17.6; WSM 35069; Andy Mann pers comm). This provides a significant and well-preserved example of this important site type and demonstrates that, although only a few other possible examples of burnt mounds have been identified in Worcestershire, there is the potential for burnt mound sites to survive in the county. On the terrace at Clifton Quarry, above the floodplain, a probable shouldered/biconical urn and other ceramic forms associated with pits, ditches and postholes indicate the presence of funerary or settlement activity, elements of which appear to be of Bronze Age or Early Iron Age date (WSM 34498; Vaughan 2005a).

To the north, at Kempsey, as yet an undated pit alignment known through cropmark evidence (Fig 17.7; WSM 30504 and 30509) highlights another type of formal land division potentially dating from this period, though this monument form extends in use from the Neolithic through to the Iron Age.

Moving north, just south of Worcester, two bronze objects were dredged from the Severn near its junction with the Teme (Fig 17.9; WSM 966), at Diglis. Moving north of the city, at the confluence of the River Severn and River Salwarpe in the Holt/Grimley area, major cropmark complexes may include later Bronze Age or Early Iron Age elements (Fig 17.8; eg WSM 4503 4512 29807 and 33401). This has been demonstrated by evaluation of one of these cropmark complexes at Top Barn Farm, Holt in 2004. This identified Middle Bronze Age pottery in an apparently domestic context at this site, pre-dating more extensive Late Iron Age and Romano-British activity (Deeks 2004; WSM 32983).

Elsewhere in the north and west of the County, in the Upper Severn Valley, evidence for this period is minimal, but includes flint finds including potential Bronze Age material, along the River Stour on the sand bedrock geologies around Wolverley and Cookley (Fig 17.10; WSM 12233, 12235 and 12231). One further potentially important site is present on the Severn, above the confluence with the Stour, where evidence indicative of short-lived Bronze Age occupation was identified during excavation in advance of quarrying of an Iron Age enclosure at Blackstone (Fig 17.11; WSM 7261). Further to the east, on the boundary with Warwickshire, a couple of sites have been noted along the River Arrow, including a burnt mound at Major's Green (Fig 17.12; WSM 10651) and a looped palstave from near Rowney Green (Fig 17.13; WSM 33544).

Lastly, on the west side of the county, there is a small but significant quantity of Bronze Age activity represented in the Malvern Hills former hard rock extraction area (Fig 17.14; WSM 3721, 3722, 3750, 3752, 3754, 3814-26, 3873, 22993, 3746, 30058, 30076 and 32983). Here, recent survey of the Iron Age hillfort at Midsummer Hill has provided indications that an earlier earthwork enclosure of potential later Bronze Age date underlies the later monument, while the parts of the linear earthworks known as the Shire ditch, previously understood to date to the medieval period, also appear to pre-date the hillfort suggesting that this may represent a major Late Bronze Age land division running along the crest of the Malvern Hills (WSM 3721, 3722, 3750, 3752, 3814-26, 3873; Bowden 2005, 15-17). Support for this suggestion derives from an evaluation on the east facing slopes of the hills where a boundary ditch running perpendicular to the Shire ditch had been deliberately backfilled with a small but significant dolerite tempered pottery assemblage dating from the Late Bronze Age to Early Iron Age (WSM 30058; Griffin *et al* 2000). This concentration of activity suggests that the Malvern Hills may have seen significant occupation during this period prior to the development of the major later Iron Age hillforts at Midsummer Hill and British Camp.

Funerary activity and other monuments

Bronze Age funerary markers in the landscape comprise initially barrows and later flat cremation cemeteries.

Barrows and ring-ditches, although potentially extending into the period covered here, are more commonly of Middle Neolithic or Early Bronze Age date and have been considered earlier (Section 13). However, as noted previously, extended periods of use often

characterised these monuments, and some ring-ditches and barrows and secondary phases of use (cremations) within earlier monuments may be of Middle Bronze Age date.

More typically, flat unmarked cremation cemeteries are associated with the Middle Bronze Age period and the two cremations associated with simple urn fragments recorded on the Wyre Piddle Bypass are liable to be of this period, though this has still to be confirmed by radiocarbon dating (Fig 17.5; WSM 23390; Napthan *et al* 1997b).

Later Bronze Age burial evidence is typically elusive, though a human vertebra from a Late Bronze Age waterhole at Huntsman's Quarry, Kemerton (Fig 17.1; WSM 21698; Jackson 2005) may reflect the integration of the human remains within settlements as has been noted elsewhere (see Brück 2001).

Other, non-funerary, monuments are not as yet well evidenced in Worcestershire either on or beyond the gravel terraces. A notable and well-investigated exception is the site at Perdiswell, near Worcester where a pennanular ditch and palisaded enclosure of mid 2nd millennium date have been excavated (Fig 17.15; Griffin *et al* 2002). Although only a very small quantity of artefacts were recovered (including fragments of a biconical urn), three radiocarbon determinations from charcoal recovered from the primary fills of the ditch date the monument to the earliest part of the period covered here (Beta-152193, 3240 $\pm$ 50 BP, 1510 to 1440 cal BC; Beta-149926, 3150 $\pm$ 70 BP, 1530 to 1270 cal BC; Beta-149927, 3040 $\pm$ 40 BP, 1400-1190 cal BC). Cropmark evidence suggests that a similar monument may be located near Fladbury (Fig 17.16; WSM 33691).

Material culture

Control over the production and distribution of food and other goods appears to become an increasingly important feature of Middle and especially Late Bronze Age society. This is reflected in the increasing variety and abundance of material culture and exchange of prestige items as well as more formally bounded and defined agricultural landscapes. Centralised production and distribution patterns begin to emerge, along with marked social relationships and rites of passage. All of these are evidenced in Worcestershire, albeit through the evidence of a small number of sites and especially that from Huntsman's Quarry, Kemerton.

Bronze and pottery making industries have left the most evidence in the archaeological record. The Deverel-Rimbury tradition (*c* 1500-1150 BC) demonstrates regional varieties of coarseware bucket urns and fineware globular urns. In Worcestershire these are represented for instance by two bucket urns found on the Wyre Piddle Bypass (Napthan *et* al 1997b) and a probable shouldered/biconical urn from Clifton Quarry (Vaughan 2005a). Within the Midlands as a whole there are few burials with regional variants of Deverel-Rimbury pottery, but little evidence of settlement sites. Regional urn styles and Deverel-Rimbury styles of pottery are recognisable too.

For the subsequent period, the most important ceramic assemblage from the county is the substantial post Deverel-Rimbury plainware assemblage from Huntsman's Quarry, Kemerton. This has been closely dated (by charred residues) on pottery to the end of the 2nd millennium BC (*1140-1010 cal BC and 1050-960 cal BC* @ 95% probability; Bayliss, Jackson and Bronk Ramsey 2005). The ceramic assemblage included just over 4000 sherds of Late Bronze Age pottery, including potentially transitional forms (from Middle Bronze Age traditions) and a substantial proportion of non-local fabrics (especially Palaeozoic limestone) indicating that the well-documented later (Iron Age) Severn Valley tradition of using rocks from specific sources has its origins in the Late Bronze Age (Woodward and Jackson 2005). Small quantities of potentially similarly dated material have been recognised at other sites along the Carrant Brook. In the region as whole, post Deverel-Rimbury plainware (1150-800 BC) coarse jars are undecorated, except for finger-tipping and perforations (the latter probably reflecting the transition from Deverel-Rimbury traditions). Hook rim jars and finer cups are also present. Later dated, post Deverel-Rimbury, decorated wares (800-600 BC) exhibit similar forms, with an increased range of incised and inlaid decoration, which overlap

in style with Early Iron Age traditions but to date have not been certainly identified in Worcestershire.

Middle and Late Bronze Age flint assemblages are poorly understood and tend to be represented by increasingly crude flakes and utilitarian tools, the implied emphasis being on functionality rather than form. Metal objects made out of copper, gold, tin and lead become more widespread nationally but remain rare finds regionally. As noted previously, this is a period that sees regional metalworking forms/styles emerge, including such characteristic items as palstaves, long bronze rapiers and spearheads. From 1000-700 BC onwards, increasingly large quantities of bronze metalwork (typically with a high lead content) appear in the archaeological record (Needham 1996). Whilst nationally the development and sequence of metalworking traditions is well established and dated (see Needham 1996), only very limited quantities of metalwork have been recovered from Worcestershire. These mostly derive from dredging of river channels and surface finds and no Bronze Age metalwork has been recorded to date in any of the county's quarries. However, at Huntsman's Quarry important evidence of metalworking was recorded in the form of mould and wrap fragments deriving in the main from the production of weapons (Doonan 2005).

Other indicators of trade and exchange mechanisms include the shale bracelet industry of Dorset, salt boiling (though not as yet firmly identified at Droitwich), leather-working evidenced by specialist knives and textile production evidenced by spindle whorls and loomweights.

14.1.4 Key issues and sites/assemblages

The key site for the Late Bronze Age in Worcestershire is that at Huntsman's Quarry, Kemerton, where an extensive unenclosed (open) settlement was recovered (WSM 21698; Jackson and Napthan 1998; Jackson 2005). At this site evidence for landscape organisation in the Late Bronze Age includes ditched trackways, waterholes and fields. Further evidence of formal land division in the vicinity derives from a major Mid to Late Bronze Age boundary ditch at Beckford Quarry (Britnell 1974) and of field systems apparently pre-dating the Middle Iron Age hillfort of Conderton Camp (Thomas 2005, 8). Together the evidence suggests that during the Late Bronze Age (or possibly during the Early Iron Age), the landscape along the southern side of Bredon Hill and north of the Carrant Brook was formally divided up and settlement focussed on gravel terraces. The settlement areas at Huntsman's Quarry are unenclosed with a number of groups of roundhouses, together with waterlogged pits, and evidence for bronze casting, clay moulds, and textile production. Grazed grassland and limited cultivation is evidenced by a recognised field system and associated waterholes and trackway/s of this date. Regional and national trading contacts as demonstrated by shale finds, metalworking debris and the ceramic assemblage, allied to the extensive unenclosed character of the settlement provides ready comparison with sites in the Thames Valley (such as Reading Business Park) and are currently unique to Worcestershire.

At Kemerton some of the trackways appear potentially to have been maintained into the Late Iron Age and at Conderton Camp, just north of the sand and gravel terrace, elements of the Middle to late Iron Age hillfort defences align with parts of the pre-hillfort field system. Similar elements of continuity in the structuring of the landscape can be seen at Wyre Piddle and Beckford, where Middle and Late Iron Age enclosures were constructed next to Middle to Late Bronze Age boundary features and trackways. Substantial linear boundaries of this date are known at Childswickham in south Worcestershire, pre-dating similarly aligned Iron Age and Roman field systems (Patrick and Hurst 2004), while the ditched and palisaded enclosed enclosure of Middle Bronze Age date at George Lane, Wyre Piddle is aligned with a field system which is incorporated into a Middle Iron Age field system. At all of these sites, a notable factor is that the Mid to Late Bronze Age settlement and linear land division appears to be maintained or at least reflected in the Middle and later Iron Age landscape, yet certain evidence for Early Iron Age activity remains elusive.

Key issues for this period therefore surround the need to address the apparent Early Iron Age hiatus and also determine whether similar landscapes to those in the Carrant Valley/Bredon area are present in the less well-defined and investigated areas of activity of Middle to Late Bronze Age date such as around Malvern and in the area north of Worcester around Holt and Grimley.

14.2 The Middle to Late Iron Age

14.2.1 Background and chronology

The Iron Age is usually taken as spanning the period from 800 BC until the first century AD. As noted previously, no clear archaeological horizon marks the transition from the Late Bronze Age and considerable overlap exists between the Early Iron Age and that period as well as the transition from Early to Middle Iron Age.

The adoption of iron technology was a lengthy process and overlapped for instance with the latest phase of the long sequence of bronze metalworking traditions, the Llyn Fawr (Needham 1996). Indeed, iron working and use do not seem to have had much impact until the Middle and more notably the Late Iron Age periods when major social and economic changes also occurred. As a result, although no distinction is made within the HER dataset, this section covers the Middle to Late Iron Age period from *c* 450/300 BC through to the middle 1st century AD. As noted previously, debate continues about where to place the transition from Early to Middle Iron Age, though the recent radiocarbon dating programme undertaken for Conderton Camp, Worcestershire (Bayliss *et al* 2005) suggests that Middle Iron Age ceramic phases are likely to commence closer to 450 than 300 BC (reflecting the dating recently outlined for the Middle Bronze Age in the East Midlands; Willis 2006).

The Middle and Late Iron Age is characterised by its plentiful and diverse settlement evidence including upstanding monuments and cropmarks, ranging from individual farmsteads to substantial hillforts (Haselgrove 1999, 113). Important temporal and spatial differences exist with large hillforts on upland areas (as in the Welsh Marches) and lowland areas (as in the Avon Valley) characterised by landscapes including trackways, field systems and linear boundaries which are often difficult to distinguish from their Bronze Age and Roman counterparts. Late Iron Age religious sites are recognised, as well as production centres for salt, iron, pottery, shale and quernstones. Visible burial rites are restricted to a few regions, but usually are rare in the archaeological record.

Most of the surviving Middle and Late Iron Age material culture evidence derives from settlements, although metalwork is recovered as isolated or votive finds from hoards of late date and increasingly has been recorded by metal detectorists operating in the county, indicating a far greater wealth of material than previously suspected. However, ceramic evidence usually forms the basis of settlement chronology. Grain storage pits are a major source of artefactual and environmental data and are common in limestone and chalk areas, but absent in the north and east of Britain.

Based on decorated pottery chronology, the Iron Age is sub-divided into three phases south and east of the line from the Bristol Channel to the Humber, of which the later two are relevant here (the Early Iron Age being covered in Section 14.1):

- Early Iron Age (*c* 800/700 to 450/300 BC)
- Middle Iron Age (*c* 450/300 to 100 BC)
- Late Iron Age (*c* 100 BC to AD 43/84)

Emphasis on the development of the Iron Age in Worcestershire and the surrounding area has shifted in recent times to embrace economic and social questions, prompted by thin-section studies of ceramics by Peacock (1968). The latter identified centralised production centres with distribution networks reflecting regional trade and exchange systems (though see

Section 14.1.3 for discussion of possible earlier origins). This theory has been developed by scientific analysis on the composition and source of metal artefacts. Coupled with the adoption of environmental techniques, cereal cultivation and models concerning mixed agricultural regimes have been put forward based on subsistence economies, altitude and soil types. Pollen diagrams have demonstrated the importance of regional variations and the impact of humans upon the landscape during this period. Another significant development within archaeological interpretation has been the use of radiocarbon dating, although dates are imprecise during the period 800-400 cal BC. Dates are also very imprecise over the period when iron was coming into wider use.

14.2.2 The nature of the evidence

Agriculture and settlement

Settlement sites are characterised by large, circular, timber buildings (roundhouses) and associated ancillary structures such as grain storage pits, working hollows and two- or four-post structures, the latter often interpreted as having an agricultural function for grain storage or as racks for hay.

Cattle and sheep were the principal livestock, with pig playing a lesser role and dog, small horses and domestic fowl present. Fish maybe under represented, although coastal sites depended on shellfish. During the first millennium BC, hulled barley superseded naked barley, and spelt wheat replaced emmer as the main cereal crop. In the Late Iron Age bread wheat was grown more regularly in regions such as the south Midlands. Other plant crops included beans, peas and flax.

Palisaded enclosures are replaced by banked and ditched (probably often accompanied by a hedge) compounds or enclosures, a settlement form commonly encountered during this period. These enclosed farmsteads were probably occupied by single households and were the dominant settlement type in most of Britain, enclosing between 0.2 and 1ha. However, unenclosed settlements should not be overlooked and are almost certainly under-represented in the archaeological record. Double and single post-ring structures form the most common building tradition at this time, often with a surrounding eavesdrip gully. Most would have had domestic or workshop functions but some served as shrines too. Second gravel terraces in many areas were occupied by aggregated settlement, with separately defined areas for domestic occupation, pit storage and other functions. In contrast, on first gravel terraces, reflecting the expansion of pastoral farming during the Late Iron Age, smaller, self-contained ditched or hedged enclosures with funnel entrances are often found. In addition, a scatter of short-lived, seasonally occupied, sites were established on the floodplain to exploit summer grazing (linked to craft-based activity).

The main period for hillfort construction was between 600-500 BC. As noted earlier these hillforts often had a Bronze Age precursor. In the Late Iron Age, the Bronze Age practice of constructing linear earthworks and landscape boundaries resumed. Territorial oppida appeared in many regions of southern England and can be divided into pre-Conquest centres that continued to be used into the Roman period and frontier sites, established on the edges of the established Roman province.

Religion and burial

Before, and well into, the first millennium BC domestic settlements were the focus of ritual activity, including feasting and the sacrifice of domestic animals, household objects and sometimes people. Evidence of Iron Age date reveals a continuity of ritual within the domestic and everyday spheres of activity and includes structured or placed deposits in storage pits and at entrances or boundaries (Hill 1995). Rituals were important in society and influential in the laying out of sites: both roundhouse and enclosure entrances are often oriented directly towards either the equinox or the midwinter solstice.

The Late Iron Age sees the emergence of shrines and sanctuaries, associated with offerings of brooches and coins. Many shrines within settlements probably remain unrecognised. Late Iron Age metalworking finds from lakes and bogs, hoards, square barrow enclosures (Arras culture); cart burials all appear to be evidence of ritual deposition and demonstrate a deliberate and close relationship with springs and other water related features.

Production and exchange

The manufacture and exchange of goods became more complex during the Late Iron Age (Morris 1994). Significant technological advances included the introduction of lathes for wood-turning and shale objects, the potter's wheel and the ability to make glass beads and bracelets. In bronze working the use of lost-wax casting became widespread, as did the development of the rotary quern for grinding grain and the iron-tipped ploughshare for the cultivation of heavier clay soils.

Most Iron Age settlements yield evidence of iron smithing and with time the best ores were exploited for this purpose from areas such as Northamptonshire and the Forest of Dean. By the 3rd century BC good quality iron was exchanged over considerable distances as standardised ingots (currency bars). These were of considerable value, frequently being hoarded or used as offerings.

Regionally, Worcestershire is notable for the evidence from Droitwich where brine tanks, hearths and vast quantities of briquetage show that by the late 1st century BC salt production had become a large-scale industry (Woodiwiss 1992), salt being highly important for food storage and cooking.

At about the same period as salt production emerged on a large scale, the Malvern Hills became the principal production centre for regional Iron Age ceramics. Initially, existing Late Bronze Age finewares had dictated the pattern of Early Iron Age ceramic development with early assemblages containing a significant proportion of decorated forms such as situlate jars with fingertip impressions, or furrowed bowls, often with a glossy haematite coating. However, during the Middle to Late Iron Age the character of pottery production altered significantly with regional traditions dominated by new forms of decorated jars, bowls and 'saucepan pots'.

Woodland management was considerable (to supply fuel for these industries) and, as in the Late Bronze Age, many other craft activities are represented by small numbers of specialised tools. Archaeological evidence of textile, leather and weaving production is common. Carpentry in household construction was noticeable with the advent of iron tools. Other important crafts included quern production and bronze-working. For the latter, the production of bronze luxury goods, likely to be made by a small number of highly skilled metalworkers and categories of decorative metalwork, are seen as reflecting the same social and ritual preoccupations – feasting, warfare and driving vehicles. Metalwork types are indicative of close ties with the continent as in the Late Bronze Age.

Economic and social changes

Climatic and environmental deterioration continued into the Iron Age, with the demand on resources possibly leading to increasing social tension, conflict and the construction of many early hillforts. The prominence of storage facilities confirms the importance of food supplies to such marginal areas. The territorial control needed to support such communities became a means of achieving status and power. In the Late Iron Age the climate improved sufficiently for the heavier, damper soils to be settled and is no doubt related to the increasing population at this time.

14.2.3 Iron Age Worcestershire

Distribution and character of the evidence

Within the Worcestershire HER 47% of Iron Age monuments are located in aggregate producing areas, with *c* 25% of Iron Age activities located in aggregate producing areas too, jointly representing 44% of the total number of recorded sites for this period in the county.

The principal aggregate production area where these sites are located is the sand and gravel terraces of the Severn and Avon Valleys, and to a lesser extent the sand bedrock geologies within the County around the River Teme (Fig 18). It is apparent that the distribution of the Iron Age monuments and activities mirrors that of the Bronze Age period (Fig 17). As previously noted, this is more than likely a reflection of the character and level of archaeological activity and intervention in these areas (especially arising through the ready visibility of cropmark sites), but does indicate the very high importance of aggregate production areas to date in the development of an understanding of Iron Age landscapes in the county. It should be noted as well that further bias may have been introduced into the record as a result of alluviation masking earlier sites and therefore making detection rates low (although evidence exists to suggest that alluviation, especially in the Severn Valley, is liable to mask Late Iron Age and Roman dated sites as well).

Further bias in the record exists in the aerial photographic data for this period, which shows numerous ditched farmstead enclosures, pit clusters and alignments, trackways and fragments of field systems clustered on the aggregates in the Severn, Avon and Carrant Valleys (Fig 18). The majority of these have been assigned an Iron Age date within the HER, despite the fact that dating has rarely been confirmed (see methodology section for restrictions associated with this evidence). As a consequence, cropmark evidence is heavily biased towards the Iron Age with Roman period cropmarks probably under-represented and the Middle and Late Bronze Age and Early Iron Age periods almost entirely absent. In the case of the latter group, although unenclosed settlement forms are more common during these periods (and thus settlements are liable to be under-represented in any case), it is likely that impression of low numbers of sites has been greatly exaggerated by the common tendency to interpret rectilinear enclosures as of Middle to Late Iron Age or Roman date rather than allow the potential for them being of earlier date.

Firmly dated Middle Iron Age evidence in the county is dominated by examples of these settlement enclosures and associated field systems, which are sited on gravel terraces and have been subject to excavation and other forms of investigation (Fig 18). Examples include the key rural settlement site for this period in the county at Beckford Quarry (Wills forthcoming) and a series of other sites stretching along the Carrant and Avon Valleys around Bredon Hill. Extensive Iron Age settlement areas have also been discovered on less well-drained geologies within the county, especially on the margins of gravel terraces as at Throckmorton Airfield (Griffin, Griffin and Jackson 2005) and along the Wyre Piddle Bypass (Robin Jackson pers comm).

These settlements are more visible in the archaeological record than those of earlier periods (especially cropmark enclosures), and coincide with the emergence of the Middle Iron Age ceramic tradition, coins and increasing use of metalwork and the development of new hillfort enclosures, such as at Bredon Camp (Hencken 1938) and the recently published site of Conderton Camp on the south slopes of Bredon Hill (Thomas 2005).

Settlement and landscape

Looking at the aggregate producing regions as whole, in the north of the County the main discrete area of clustering of Iron Age activity and monuments occurs along the Upper Severn Valley, north of Worcester at the confluence with the River Salwarpe. Here, several sites and evidence of material culture have been recognised on the western gravel terrace of the River Severn between Holt and Grimley (Fig 18.1). The data includes evidence ranging

from an isolated find of an Iron Age pin recovered at Holt Lock, Holt Fleet, Ombersley (WSM 2589) through to extensive cropmark complexes subsequently recorded by geophysics, aerial photographic assessment, fieldwalking and evaluation trenching at Top Barn Farm, Holt (WSM 30286, 30123 and 32983; Fig 19). These investigations revealed that the cropmarks represented Middle to Late Iron Age and Romano-British enclosures, settlement areas and an associated trackway. Further archaeological work at Church Farm Quarry, Holt (WSM 29806) covered a further extensive multi-period cropmark complex along the western gravel terrace of the River Severn, which includes a boundary and ditch, plus associated earlier prehistoric activity. There are several find spots (WSM 1182, 4503, 4501, 4516 and 4502) and a further aerial photographic assessment at Retreat Farm Quarry, Grimley (WSM 29605 and 33401) has recorded cropmarks which include features such as trackways, pits, linear earthworks and elements of field systems some of which are likely to be of Iron Age date.

Apart from this concentration of activity around Holt and Grimly, Iron Age occupation evidence is generally scarce in the county north of Worcester. However, important sites are present along the River Salwarpe, a tributary of the Severn, including the single ditched enclosures at Stonebridge Cross (Fig 18.2; WSM 29657; Miller, Griffin and Pearson 2004b), the farmstead enclosure at Stoke Lane, Wychbold (Fig 18.3; WSM 29599; Jones and Evans 2006) and Iron Age pottery recovered at Hanbury (Fig 18.4; WSM 11492). Most important, however, is the major Iron Age salt production industry located at Droitwich (Fig 18.5; Woodiwiss 1992). Here, at Friar Street (WSM 605), deeply stratified archaeological deposits relating to Iron Age salt production were excavated in the 1970s. These included brine tanks and a hearth, whilst later excavations at the Old Bowling Green site (WSM 600) revealed further Late Iron Age brine tanks and briquetage demonstrating that Droitwich formed the focus for an organised, large-scale, salt production and export industry (Morris 1985; Woodiwiss 1992). This industry no doubt relied heavily upon the River Severn and its ability to act as a navigable trade route at this time to distribute salt across the region.

Further north, limited Iron Age activity is evidenced on aggregate deposits lying along the Severn and the Stour (Wyre Forest). Examples include evidence from on and around Drakelow hillfort, one of the smaller hillforts in the region where Iron Age pottery, a Middle Iron Age quernstone and two of the defensive rampart ditches have been identified (Fig 18.6; WSM 30118). Just above the confluence of the Severn and Stour, extensive excavations were undertaken in advance of quarrying of a Middle to Late Iron Age enclosure at Brant Farm, Blackstone (Fig 18.7; WSM 236). Unfortunately this remains unpublished, however, an assessment of the fieldwork archive is currently underway supported by English Heritage through the ALSF and will hopefully lead to analysis and publication of this important site (Derek Hurst pers comm). Below Brinat Farm, at the confluence of the Severn and the Stour, a further site has been salvage recorded in advance of quarrying at Larford Farm, Astley again producing evidence of an Iron Age settlement enclosure (Fig 18.8; WSM 8072; Walker 1958, 1959).

To the west, where the igneous hard rock aggregate of the Malverns has been exploited in the past, recent survey work by English Heritage at British Camp (Fig 18.9) and Berrow Hill, Martley, both in Worcestershire has demonstrated that both sites are densely packed with hut platforms (Bowden 2005). Just over the border in Herefordshire, Midsummer Hill has been surveyed as well and this site has also been extensively excavated (Fig 18.10; Stanford 1981). Two hoards of Iron Age currency bars (WSM 03744) have been recovered in this area as well. During this period, the Malvern Hills area emerged as a major pottery production centre (Fig 18.11), and, along with the previously discussed salt production centre at Droitwich, exploited extensive regional trade and exchange networks extending across much of Worcestershire as well as west into Herefordshire and south into Gloucestershire. These networks are understood to be linked to the known Dobunnic coin distribution during the Middle to Late Iron Age and are often interpreted as evidence for the extents of the social, cultural and political influence of the *Dobunnii*.

Moving across back into the Severn Valley and south of Worcester, metal-detecting finds (coins), desk-based assessment, fieldwalking and geophysical survey at Clifton Quarry,

Seven Stoke and Kempsey (Fig 18.12; WSM 30892-6 and 34498; Miller, Darch and Griffin 2001) has revealed an extensive scatter of Romano-British material along with a hearth, rectilinear enclosures and settlement areas some of which are thought to be of Iron Age date. Subsequent trial-trenching of a separate area to the east of this concentration revealed an unenclosed Middle Iron Age settlement area (Vaughan 2005a; WSM 34498). Other finds in the vicinity include an iron brooch recovered from Kempsey (WSM 30781). To the south, also on the Severn, excavations at Ryall Quarry have identified a potential unenclosed Middle Iron Age occupation site succeeded by a Late Iron Age/Early Roman pit complex associated with large quantities of charred cereal grain but no evident occupation remains (Fig 18.13; Barber and Watts 2006).

In the south of the county, a major clustering of Iron Age sites has been identified, centred on the limestone outcrop of Bredon Hill, occupying the sand and gravel terraces of the River Avon and its tributary the Carrant Brook. Sites in the Carrant Valley include numerous poorly investigated sites such as that at Bredon's Norton (WSM 23029) where metal detector finds included an Iron Age Bronze coin (1/4 stater) and extensive and important complexes of cropmarks (eg WSM 7648, 4637, 7646). However, it is the excavated sites that provide the most important evidence. At Bredon Farm, Bredon a cropmark to the south-east of the farm proved on recent excavation to be a Middle to Late Iron Age ditch system which had survived as an earthwork when a later Iron Age settlement was established (Fig 18.14; WSM 6585 and 33819; Hart, Alexander and Inder 2004). Close by, at Kemerton, excavation and salvage recording has recovered evidence for Middle and Late Iron Age/Early Roman enclosed settlements at several locations (Fig 18.15; WSM 10286-7; Dinn and Evans 1990; Bellamy 2001; Jackson 2005), while further to the east is the nationally important site at Beckford (Fig 18.16; WSM 497, 10268-9). Here, a complex arrangement of smaller enclosures was associated with clusters of storage pits, cobbled yards, numerous roundhouses and a rich array of finds and burials (Wills forthcoming). Another area of complex cropmarks and activity, lies further east along the valley, at Ashton-under-Hill. Here aerial photography has revealed a rectangular cropmark enclosure with internal features, from which a Dobunnic coin has been recovered by metal-detecting. Evaluation of part of the complex adjacent to this enclosure revealed numerous features clearly indicative of Middle to Late Iron Age occupation, but also including some evidence for a Late Bronze Age to Early Iron Age phase of activity (Fig 18.17; WSM 5503, 5509 and 7578; Jackson 1991b). The terraces on which these sites are located lie below Bredon Hill where two excavated hillfort sites are known at Bredon Camp and Conderton Camp (Fig 18.18 and 19; Cruso Hencken 1938; Thomas 2005), as well as possible third hillfort underlying the medieval site of Elmley Castle (Fig 18.20).

North of Bredon Hill, a further group of sites lie along the Avon Valley. In the Pershore area several find spots and cropmarks point to Iron Age settlement activity, including a ditched enclosure and field systems at Defford, Wychavon and, just outside Pershore, the remarkable discovery of 1,500 Dobunnic coins from the flue of a Roman oven (Fig 18.21; WSM 20060; Hurst *et al* 2000; Hurst 2001). Geophysical survey and fieldwalking of the latter site has recovered Middle to Late Iron Age pottery and identified a complex sequence of enclosures spreading to the north of the main find spot. To the east, at Wyre Piddle, on the 2nd Avon Terrace, evaluation and subsequent excavation have recorded a major phase of Iron Age activity including ditch complexes and roundhouses within rectilinear enclosures (Fig 18.22; WSM 22308 and 30576; Robin Jackson pers comm). These were succeeded by Late Iron Age and Romano-British settlement activity in the immediate vicinity, a sequence of occupation repeated just off the terrace at Throckmorton Airfield (WSM 30519 and 30861-2; Griffin, Griffin and Jackson 2005). Locally, further cropmarks are present, while other small-scale activity is also recorded on the HER (WSM 11388, 1392 and 31103). Also, in this area of the Avon Valley, at Fladbury, metal detecting finds including an Iron Age coin and pottery have been observed (WSM 32354) and cropmarks associated with these finds appear to represent a 'camp'. Nearby, at Church Lench, an apparently isolated burial has been recorded representing a rare burial deposits of this period (Fig 18.23; WSM 7307; Griffin *et al* 2006) Within Evesham itself, to the east of Bredon Hill and on the 3rd Avon Terrace, excavation of part of a Middle Iron Age enclosure beneath the modern town recorded pits and a roundhouse

indicative of domestic settlement (Fig 18.24; WSM 26358; Edwards and Hurst 2000). Finally, east of Evesham, Iron Age occupation has been recorded at Broadway (Fig 18.25; WSM 10945).

Evidence for material culture during this period is abundant, but as with excavated remains described above, is concentrated in only a few limited aggregate production areas rather than being evenly distributed across the county. This is liable to partially reflect different socio-economic patterns and traditions of use of material culture across the county, but also in part clearly reflects the bias in distribution of archaeological intervention towards aggregate extraction areas. For example, a single gold coin from Newnham Bridge (Fig 18.26; WSM 8682) is the only Iron Age material recovered in the Teme Valley; while in Bromsgrove area two ritual Iron Age pits recorded at Madeley Heath, Belbroughton (WSM 30021 Fig 18.27; Hurst and Pearson 1996) represent virtually the only evidence for activity of this date.

14.3 Middle and Late Bronze Age and Iron Age environment (Elizabeth Pearson)

14.3.1 Introduction

This was a period of intensification of agriculture associated with more substantial settlement types and significant and increasing formal division of the landscape into defined fields and other enclosures linked by tracks and droves. Increasing evidence for crop storage emerges both on lowland settlements and hillforts during the Iron Age.

Knowledge to date on environmental evidence representing this period in the West Midlands has been summarised as part of the Regional Research Frameworks for Archaeology (Pearson 2001). There is a greater body of direct evidence (largely charred cereal crop remains and animal bone) which can be used to assess the relative importance of cereal and livestock farming than for previous periods, and the combining of several strands of environmental evidence is more common. The way in which food is processed is likely to have affected the evidence that is recovered. For example, it appears that by the Late Iron Age, increased use of parching of crops in the de-husking process, and burning (accidental or deliberate) of stored grain has resulted in enhanced preservation of crop remains.

Off-site environmental evidence (mostly from pollen profiles) tends to show a relatively cleared landscape by this period, and the emphasis in pollen analysis shifts to comparing rates of introduction of cereal pollen, and if possible, the relative importance of arable and pastoral land. As discussed previously (Section 10), there are some problems with detecting flora associated with arable land compared to grassland. This is mirrored in several types of environmental evidence. There is also evidence for increased alluviation in many river valleys from the Late Bronze Age onwards, which may have resulted from more intensive agriculture although other factors such as climate change may have been involved.

Greater densities of charred crop remains have been recovered, particularly on Iron Age sites, on second gravel sites along the Warwickshire Avon and the Thames (Moffett 1994a), which mirrors the location of aggregated settlements, as opposed to the smaller, self-contained enclosed settlements on the first gravel terraces in these areas.

Environmental evidence can contribute towards an understanding of the development of industries such as iron working. Analysis of heavy metals in sediments (frequently alluvial) can provide additional off-site data to that recovered from metal producing or metal working sites (Thorndycraft, Pirrie and Brown 2003). The increasing prominence of these and other industries, such as salt working, are likely to have had an effect on surrounding woodlands. The most direct evidence is likely to come from analysis of charcoal associated with industrial debris, although recovery of fragments sufficiently large for identification is rare. Evidence for this may be detectable from pollen profiles, although this can be difficult, as there may not be large areas of wholesale clearance, as in many areas agricultural exploitation will have already resulted in a largely deforested environment. Rather, the remaining

woodland is likely to have been managed. Management by coppicing, nevertheless, can be reflected in a pollen profile by peaks in pollen from favourable tree species such as hazel (Katie Head pers comm). The coppicing every few years encourages flowering on the re-growth of multiple stems or poles, but sampling intervals often represent decades, so it can be difficult to determine a definite coppicing cycle (P Dark 2000).

Production and exchange become increasingly important during the later prehistoric period. By the end of the Iron Age crops were being traded, perhaps over considerable distances (P Dark 2000), and therefore aspects of production, distribution and consumption of cereal crops (for both human consumption and animal fodder) are important in archaeobotanical analyses. The ability to process and store cereals in quantity requires a large labour force, and this is, therefore, an indication of a highly organised society (Stevens 2003). Consideration of soils, topography, and proximity to good communication routes are all-important in the interpretation of the location of these settlements.

A period of climatic deterioration occurring from around the Late Bronze Age to the Early Iron Age would have had an impact on agriculture and settlement. Some evidence of this may be apparent as episodes of woodland regeneration seen in pollen diagrams resulting from a relaxation of the use of land in some parts of Wales and Southern England (P Dark 2000). The increase in evidence for storage of crops on hillforts discussed earlier may also be a reflection of pressure on land resulting from this change. Formation of blanket peat in upland areas may result from climate deterioration, as well as deterioration of soils (gleying and podsolisation). The latter two characteristics, however, are unlikely to be relevant to the main aggregate producing areas in the West Midlands.

14.3.2 The environmental evidence from Worcestershire

Middle and Late Bronze Age to Early Iron Age

On-site environmental evidence, providing direct evidence of human activity and settlement in the Middle and Late Bronze Age to Early Iron Age periods is rare.

The earliest potentially useful data for this period derives from Aston Mill Farm, Kemerton (Fig 18.15), where occasional animal bone included wolf and badger in association with cattle and sheep/goat (Lovett 1990). Both the wolf and badger were found in the final silting of a barrow ditch, and a further wolf skeleton may have been a ritual deposit. Dating is uncertain but an Early Bronze Age date has been assigned to the main phases of activity and thus these final use stages may potentially fall within the Middle Bronze Age.

Sparse charred plant remains were recovered from a Middle Bronze Age palisaded enclosure at Perdiswell Park and Ride in Worcester (Griffin *et al* 2002). These included wheat (*Triticum* sp) and barley (*Hordeum vulgare*) grains, emmer wheat chaff (*Triticum dicoccum*) and hazelnut shell (*Corylus avellana*). The sparse remains are consistent with other ceremonial sites in the British Isles, with no abundance of waste being expected, for the reasons described above (Section 13.2.1). These scant remains may represent the remains of food gifts associated with cremation burials (van der Veen 1985), although no cremations survived at this site and other ceremonial functions are possible.

The key site for environmental evidence of this period is at Huntsman's Quarry, Kemerton. Here, there was survival of a range of environmental evidence associated with an extensive unenclosed settlement dated to early within the Late Bronze Age period. Charred cereal crop waste was widely spread across the site, but sparsely concentrated, with the exception of one pit. Here, a grain-rich assemblage (mostly emmer wheat and hulled barley) may represent deliberate and selected deposition, as it was associated with the sherds of a single vessel. Emmer wheat and barley grain were dominant in the remaining features and charred hazelnut fragments were also recorded in others (Pearson 2005). The animal bone was dominated by the common domesticates (cattle, sheep/goat and pit, with possibly more cattle), and only occasional wild mammals (red deer and roe deer) supplementing the diet. Dogs were present

in small numbers and may have been used for hunting or working with stock (Pinter-Bellows 2005). Well-preserved organic remains from deep waterholes provided rare on-site information on the surrounding environment. The combination of environmental evidence from these and other features, in association with field boundary patterns and possible droveways indicated a pastoral landscape. The supporting evidence for a landscape relatively cleared of woodland and dominated by grassland comes from pollen, plant macrofossils from the waterholes, and molluscs from other features. There was some pollen evidence of the presence of flax from the waterholes, possibly representing flax retting. This coupled with the find of loomweights suggests textile working on the site.

A small amount of evidence has also been recovered from potentially Late Bronze Age/Early Iron Age deposits at Evesham (Pearson 2000a) and Childswickham (Pearson 2004b).

Middle to Late Iron Age

There is a greater body of environmental evidence of Iron Age date, the key sites being at Beckford Quarry in the Carrant Valley (Fig 18.16; Wills forthcoming), Ryall Quarry on the River Severn (Fig 18.13; Pearson 2006a), and a group of sites in the Avon Valley at Wyre Piddle, Upper Moor and Throckmorton (Fig 18.22; WHEAS ongoing post-fieldwork analysis; Head 2005; Head and Mann 2005). On these sites, evidence for the processing and use of cereal crop remains, in the form of charred plant remains is generally sparsely scattered over settlements, and entirely so at Wyre Piddle, Upper Moor and Throckmorton. At these three settlements, the low level of waste supported the general interpretation of settlements engaged with a largely pastoral economy. Cereal crops may have been imported and only processed in small quantities in a piecemeal fashion.

In contrast, discreet concentrated deposits, suggesting processing or storage in greater quantities is evident on sites at the foot of Bredon Hill as at Beckford (Fig 18.16), and at Aston Mill Farm, Kemerton (Fig 18.15; Ede 1990), and at Ryall Quarry and Clifton Quarry in the Severn Valley (Fig 18.12 and 13; Pearson 2006a; Head and Pearson 2005). At Beckford charred crop waste was more concentrated in three storage pits and postholes of Middle Iron Age date. Detailed sampling of a contemporary roundhouse was also carried out in order to study the distribution of charred plant remains over several phases of occupation (Colledge 1983a and b). The most significant evidence of cereal crops being stored in pits in large quantities comes from Late Iron Age contexts at Saxons Lode Farm at Ryall Quarry on the River Severn between Upton-on-Severn and Tewkesbury (Pearson 2006a). Six pits contained a remarkably high density of relatively clean grain, an unusual characteristic as in other pits, the grain has been mixed with chaff, probably because they have been stored in the husk (in their glumes). These are considered to be of regional and national importance. The location of the settlement on the banks of the river Severn may be significant, providing an ideal location for collecting or distributing clean grain. The ‘Lode’ part of the site name of Saxons Lode Farm implies ferry or river crossing, at least in historical times (Barber and Watts 2006). A further rich assemblage has been recovered from Clifton Quarry nearby, although this was of Late Bronze Age to Early Iron Age date (Head and Pearson 2005). It is notable that the sites at which there was evidence of crop storage are close to hillforts. Beckford and Aston Mill Farm are close to Bredon Hillfort and Conderton Camp on Bredon Hill, while Ryall Quarry and Clifton Quarry are close to Towbury Hillfort. Whether there is any relationship between lowland and hillfort based storage of crops in the region, and distribution elsewhere, is an issue of interest which merits detailed attention.

Only emmer wheat was identified at Clifton Quarry and Aston Mill Farm, while at Beckford and Ryall Quarry, both emmer and spelt wheat were grown. The replacement of emmer wheat by spelt wheat as the dominant crop has not been observed locally, although this has been recorded in southern England (Colledge 1983b).

Animal bone is generally poorly preserved in the soils around Worcestershire and so the database with which to determine trends is small. This was the case at Aston Mill Farm, Beckford, Ryall Quarry, and Wyre Piddle. However, at Throckmorton Airfield, Middle Iron Age bone shows settlement typical of the ‘native type’ as described by King (1978).

Sheep/goat was more common than cattle, horse and pig (Baxter 2005). A small amount of animal bone and red deer antler fragments were also found in a pit containing briquetage pottery at Madeley Heath, Belbroughton on the Fairfield to Frankley Green pipeline (Fig 18.27; Hurst and Pearson 1996).

Off-site environmental studies from peat and alluvial deposits in floodplain areas have shown that woodland had been extensively cleared in the Avon Valley, and in the Severn Valley on the gravel terraces. The floodplain in the Severn Valley was generally not cleared until the Iron Age or later (Brown 1982). Signs of an intensification of agriculture dating to the Iron Age or Roman period may be evident in a pollen profile from Carrant Brook, near Beckford (Greig and Colledge 1988) although this needs further dating. Shotton (1978) attributes an extensive alluvial deposit in the Severn Valley to the Late Bronze Age and Brown (1983) to a period over the last two or three thousand years. This alluviation may have partly been a result of the intensification of settlement and agriculture discussed earlier but as noted previously other factors may be responsible. Combining pollen analyses with geoarchaeological and other studies is important. Brown (1983) points out that palaeohydrological changes may not always be reflected in the physical character of alluvium, and sometimes it is only by looking at molluscs and diatoms that these changes become apparent. Changes in climate may also have contributed to these changes (Brown 1992), and this needs to be considered.

The implications of this have been discussed as part of the West Midlands Regional Archaeological Research Frameworks as follows (Pearson 2001) and in Section 10 of this report.

14.4 Key sites and assemblages in Worcestershire (Middle Bronze Age to Late Iron Age)

The key sites for sand and gravel aggregate producing areas for the Middle and Late Bronze Age and Iron Age periods in the County are at Furzen Farm and George Lane (on the Wyre Piddle Bypass), at Clifton Quarry (Severn Stoke), Huntsman's Quarry (Kemerton) and Beckford Quarry. These lie close to key hillfort sites such as Bredon Hill, Conderton Camp and Towbury Hill and have close economic links to the major salt production centre at Droitwich and the pottery manufacturing sites in the Malvern Hills area.

In general the River Avon and Lower Severn Valley and associated tributaries, such as the Carrant Brook, hold the best evidence identified to date. This ties in with the known archaeology in the Vale of Evesham and adjoining County of Warwickshire. On these lowland floodplain sites the use of palynology, geoarchaeology and radiocarbon dating has increased and it is generally understood that archaeology will be found in these areas if development is allowed. However, the Late Bronze Age/Early Iron Age transition is still poorly represented and understood as is Middle and Late Bronze Age and Early Iron Age settlement and the association between settlement sites and their wider landscape context. Improved approaches to identifying unenclosed settlements, wider use of radiocarbon dating and the investigation of the wider landscape of fields, boundaries and trackways must therefore be considered as priorities for this period.

The emergence of the Malvern Hills as a major pottery production centre, and of Droitwich as a major salt production centre, as well as the origins of the local iron industry (based on exploitation of Forest of Dean ores) are key issues as is the distribution of the products of these industries and Dobunnic coinage, since these in turn reflect trade and exchange networks exploited by the local population. The major rivers of the Severn and Avon undoubtedly played an important role in developing the trade and exchange mechanisms outlined above, however, more synthetic analysis and specialist analysis of the products and organisation of these industries is required as is further consideration of how these may reflect the distribution and spread of Dobunnic tribal/cultural influence. Here, it is noted that increasing use of metal detectors and the reporting mechanisms for metal detectorists

established through Portable Antiquities Scheme has had, and is liable to continue to have, an important impact upon understanding of metalwork and especially coin distributions.

The widely reported traditions of the Thames Valley do, to some degree, cross over into the Severn Valley. Of special interest is the distribution of flint-tempered pottery from Late Iron Age levels at Childswickham, near Broadway (Timby 2004). Equally pottery and salt containers from the Middle Severn Valley area are widely traded and distributed during the Late Iron Age. This reinforces the significance of these traded goods at both regional and national level.

The cropmark evidence is prolific for the Iron Age and not surprisingly is concentrated on the major river valleys where the density is greatest. The regionality of the items used within the established trade and exchange routes are distinctly objects of Middle to Late Iron Age date and from the core area of South Worcestershire. Distinct frontiers emerge at this time, possibly reflecting a cultural and/or economic region based upon political/tribal groupings of the Iron Age (Cunliffe 1991; Hurst 2001), this despite the natural barriers of the River Severn and Avon.

Lastly, beyond the gravel quarry sites around Grimley and Holt just north of Worcester, the period is poorly understood due to limited opportunities for investigation. This situation is not helped by the fact that one of the few sites to have been widely investigated in this area and have produced a substantial artefactual assemblage, that at Brant Farm Quarry, Blackstone has not yet been published.

14.5 Research directions

14.5.1 General

The following research directions can be identified for this period:

- The West Midlands Regional Research Framework identified the need for greater synthesis of data for the current archaeological framework. This particularly reflects the lack of such work on the great body of data derived from development led work over the past 15 years and Middle Bronze Age to Iron Age Worcestershire is no exception;
- HER enhancement – the ongoing three year programme of improvement being undertaken by WHEAS should be encouraged and maintained since HER data typically provides baseline information for both commercial archaeological work and research, and this period is no exception;
- Digitisation of aerial photographic data and dating of cropmark complexes and earthworks through extensive fieldwalking surveys and carefully targeted sample trenching would be of considerable benefit in the overall interpretation and dating of these complexes, many of which are liable to date from this period. This would provide a greater understanding of their chronological development and form as well as supporting the development of an understanding of the relationship between settlement sites and the wider landscape of fields and trackways;
- The use of high percentages of field evaluation (based on samples of 4% or more) recommended for specific period-based archaeology is especially relevant for the detection of unenclosed settlements including those of Middle to Late Iron Age date. This may also increase identification of funerary remains;
- Greater and more systematic, targeted use of scientific dating techniques is required to refine and define chronology, especially at poorly understood transitional phases and for site types producing substantial assemblages from secure contexts. The problems of calibration for parts of this period are noted but chronologies remain poorly developed in this period, especially for the Early and Middle Iron Age. Undated inhumations and cremations should be dated wherever possible;

- Use of new and innovative techniques, such as LIDAR, should be encouraged to support better interpretation, prediction and management of archaeological and palaeoenvironmental deposits which may be masked by alluvium (linking to HER enhancement above);
- Re-working and reappraisal of old archaeological sites and archives should be undertaken, including addressing those from the unpublished enclosed settlement at Brant Farm, Blackstone, excavated by Alan Hunt in the 1970s. The latter site archive has been subject to recent rapid audit and is currently undergoing assessment with the support of English Heritage through the ALSF (Derek Hurst pers comm).

14.5.2 Environment (Elizabeth Pearson)

As discussed in the previous section, where work on pollen profiles is concerned, smaller sampling intervals are needed, but targeted at parts of the profile where a specific change has been identified, for example, the main evidence for extensive woodland clearance. In practice, this tends to need successive phases of work (in association with more than one phase of radiocarbon dating) in order to pinpoint parts of the profile in need of fine interval sampling or other means of refining the interpretation of the data. It may not be possible to acquire funds for all of this work on developer-funded sites, and it may be necessary to refine interpretation of many profiles through other more research orientated projects.

Important information, such as the relative importance of arable and pastoral farming, is often masked in data from palaeochannel deposits by wet-channel flora or fauna species. More use could be made of pastoral/arable indicators, as discussed by Robinson (1983) for interpretation of insect assemblages, and as exists for pollen assemblages (Katie Head pers comm). Further counting, of species (floral and faunal) which omit woodland carr or aquatic species may also help with the use of these indicators.

Further radiocarbon dating is needed on off-site profiles than is commonly undertaken to date, in order to maximise the detail that can be extracted. As discussed above, smaller sampling intervals are needed, and the work is likely to take place over successive phases of work so that suitable parts of the profile can be pinpointed.

Targeted small interval sampling for plant macrofossil remains at specific parts of the profile, following assessment is not possible as the samples are taken in one operation during field work in a column of spits. Intervals of 5cm may be necessary to pick up on short-term changes in environment, yet this can result in a large number of samples being taken from deep deposits.

A range of techniques needs to be used at one location, where possible, to provide ‘thick descriptions’ as discussed in Section 12.5.3. Diatom, insect, chironomid, and mollusc analyses should all be considered more regularly for off-site work, where survival is good.

Possible indicators for climatic change such as diatoms and chronomids should be considered within programmes of analysis and the recovery of this information should be improved. Preliminary investigation could be used in the first instance to determine whether these survive, as a precursor to more extensive sampling and analysis. Analysis of insect remains would also be useful, and since survival is often poor in the county, maximum use must be made of opportunities to study such assemblages if present.

Methods by which the effects of industry on woodland can be determined need further consideration, as there are many problems with this issue. Charcoal from deposits associated with any industry reliant on burning wood should be targeted in future. Where charcoal from relevant samples from existing sites has not been analysed, it would be useful to complete this work as part of a research project. Targeted sampling of pollen profiles within the vicinity of industrial areas (following extra radiocarbon dating) may provide useful information, although sampling intervals would have to be small. Suggested areas are

Feckenham Forest, close to the salt-working town of Droitwich and woodland around the iron-working town of Worcester.

15. Later pre-Roman Iron Age to sub-Roman period (Richard Morton and Neil Holbrook)

15.1 Background

15.1.1 Introduction and chronology

For the purposes of a simple chronology it is possible to define the Roman period as the years between AD 43 and 410. In reality neither date marks any overnight or fundamental change to the way that most people lived their lives in Worcestershire or England as a whole. Patterns of rural production and settlement continued little altered for many decades after the invasion of Britain in AD 43.

In the traditional map of Roman Britain the southern part of Worcestershire lay within the civitas of the *Dobunni*, while the northern part of the county falls within the territory of the *Cornovii*. The boundaries of the civitates are almost entirely modern conjecture, however, and it is debatable how much weight should be ascribed to this apparent political division. Nevertheless there appear to be significant contrasts between the archaeological resources of the north and south of the county reflecting the differences in terms of settlement forms and patterns, economic links, and patterns of social and cultural expression (Roger White pers comm). At the other end of this period, while most commentators accept that the cessation of central imperial government around AD 410, and with it the issuing of coinage, led to a collapse of a market-based economy, important changes in settlement and economy had occurred several decades before this date. For instance many sites in Worcestershire show evidence of decline, or had been entirely abandoned, by the mid 4th century. The nature of, and reasons for, this profound change in the settlement pattern is an important gap in our knowledge. Nor, of course, is this observation solely restricted to Worcestershire. Interpretations also vary for how long into the 5th century a recognisably Romano-British way of life continued. Some scholars consider that all had been wiped away within a generation or so (for instance Esmonde Cleary 1989), while others argue for a continuity of tradition lasting for much longer (eg Dark 1994). Within the Roman period it is often convenient to use the terms early and later Roman. The division between the two occurs in the early 3rd century when rapid inflation led to coinage having a sufficiently small face value to facilitate its use in everyday transactions. The 3rd century was also a time of change in the pattern of rural settlement in parts of western Britain, in some areas typified by increasing numbers of villas.

15.1.2 Sources of evidence

One of the great strengths of Romano-British archaeology compared to the immediately preceding and succeeding periods is the visibility of sites. The ubiquity of artefacts (especially pottery) renders sites susceptible to discovery through structured surface collection and chance discovery. It has also long been recognised that the gravel terraces of, in particular, the Avon Valley and Carrant Brook lend themselves to the production of cropmarks (Webster and Hobley 1964). On morphological grounds many cropmarks can be assigned to a broadly late prehistoric or Romano-British date (and of course quite frequently both – though as noted in Section 14.2, within the Worcestershire HER the majority have been assigned an Iron Age date). The susceptibility of underlying geology to produce cropmarks varies considerably across the county, and consequently a distribution based purely on this source of evidence will be heavily biased. It is the case that much that is known of both Iron Age and Roman rural settlement in Worcestershire is focused on the gravel terraces in the south of the county (Figs 18, 19 and 20). A similar domination of the evidence of the Avon Valley has also been recognised in neighbouring Warwickshire (for the Roman period; Booth 1996, 55).

This bias is further exacerbated by the fact that more archaeological investigation, prompted by mineral extraction, has occurred in the river valleys than elsewhere. Roman monuments

and activities on aggregates constitute 21% of the entries on the HER (221 sites) for the whole of Worcestershire (Tables 2, 3 and 4). On the basis of sites per km^2, the density of such sites is higher in the aggregate areas than for the county as a whole (0.70 compared to 0.61). By comparison it might be noted that intensive survey in the Severn Vale of Gloucestershire and Somerset suggested a density in the order of 1.5 sites per km^2 and in Shropshire 1.7 sites per km^2 (Millett 1990, table 8.3). More recent survey in Shropshire by the Wroxeter Hinterland Project suggests even higher settlement densities close to the Roman town (White and Gaffney 2003) and, unless intensive surveys are undertaken suggesting otherwise, similar settlement densities are likely in parts of Worcestershire such as the environs of Worcester and Droitwich and through the Vale of Evesham.

Despite the archaeological visibility of Romano-British occupation many substantial sites must still await discovery, as has been demonstrated by the chance discovery of a previously unknown villa at Childswickham near Broadway during routine monitoring associated with the laying of a new water pipeline (Patrick and Hurst 2004). This lay in a locality where landuse is predominantly horticultural and thus not conducive to the production of cropmarks or large-scale fieldwalking, two of the principal means of site detection. The current under-representation of Roman settlement on the non-gravel terrace areas in Worcestershire has also emerged into clearer relief in the past 15 years or so since the implementation of PPG16. In particular archaeological monitoring of pipeline and road schemes provides a valuable record of what are effectively random transects across variable geologies and landscapes. Such work has shown that patterns of Roman landuse were highly variable. As a rule, the model for intensive exploitation and settlement on the river terraces has been substantiated, although some areas dominated by heavy clay and clay with gravel soils have also produced dense evidence of settlement. One example, lying just on the margins of the gravel terraces (but partially within a potentially exploitable area), is the group of five sites recently excavated along, and close to, the route of the Wyre Piddle Bypass which appear to have had largely pastoral economies (Griffin, Griffin and Jackson 2005; Vaughan 2005b; Robin Jackson pers comm; Jon Milward pers comm.). Elsewhere on the poorly-drained soils in the county, the relative paucity of Roman find scatters found during fieldwalking and monitoring along pipeline routes is consistent with a settlement pattern based around dispersed farmsteads involved in pastoralism, if it is accepted that low density finds scatters are often an indication of manuring associated with arable (Dinn and Hemingway 1992, Jackson and Hurst 1994; Jackson *et al* 1996b; Dalwood, Buteux and Pearson 1998).

Thus, whilst it remains possible that certain areas were characterised by discrete islands of settlement within relatively 'empty' landscapes (for instance of woodlands), models based upon geologies or existing data should be treated with the utmost caution.

It is with these caveats in mind that the distribution of Roman sites should be viewed. The current emphasis on the gravels (and thus aggregate production areas) in the south of the county is immediately apparent, with a notable concentration of sites in the Avon Valley between Tewkesbury and Evesham. In the Severn Valley a notable grouping of sites occurs to the north of Worcester near the confluence with the river Salwarpe. Once again this is an area which has witnessed considerable levels of aggregate extraction. Both areas show a similar concentration of Iron Age sites as well (see Section 14).

In contrast, relatively few sites are known on the gravels further north in the Severn Valley or in the stretch southwards between Worcester and Upton on Severn, though recent work associated with quarrying at Ryall and Clifton have found Roman sites (Barber and Watts 2006; Miller, Darch and Griffin 2001). Only one cropmark enclosure of probable Roman date at Broadwas (WSM 31081) is currently known in the Teme Valley, though the Teme is an area which has received only very limited archaeological investigation or research and thus remains somewhat of an unknown territory.

15.2 Roman Worcestershire

15.2.1 Small towns and roads

There were no major Roman towns within Worcestershire, although two smaller centres at Worcester and Droitwich existed which were intimately involved in the production of iron and salt respectively (Fig 20). The road system in Worcestershire is still imperfectly known. The precise course of the road leading from Gloucester through Worcester to Droitwich (Margary 180) along the eastern side of the Severn is unclear in many places. Two routes led northwards out of Droitwich, one continuing a north-eastern alignment towards the 1st century AD forts at Metchley and thereafter Wall on Watling Street, the other (Margary 192) branching north-west, seemingly towards the fort at Greensforge and ultimately the legionary fortress and subsequent town at Wroxeter. Much remains to be learnt about the course of this road. There was a ford across the Severn at Worcester, and although no trace of a road leading from this to the west of the river has ever been located, recent excavations in the city have recorded what is almost certainly an approach road to the ford (Robin Jackson pers comm). A road has also been detected in excavation immediately outside of the town defences at Worcester. This might have been a purely local street serving the extra-mural suburbs, although it is also possible that it ran north along the eastern bank of the Severn towards Greensforge (Dalwood and Edwards 2004, 18).

15.2.2 Military sites

Roman military sites are sparse in Worcestershire compared to the neighbouring counties to Herefordshire and Shropshire. The best-excavated example is the 1st century fort (dated AD 60-68) at Dodderhill, Droitwich (Fig 20; Hurst 2006).

In the Severn Valley forts have been postulated at Worcester, although firm evidence is lacking (Dalwood and Edwards 2004, 13) and Grimley, where the interpretation of a triple-ditched enclosure as a fort was first proposed by Webster in 1956 (WSM 04534; Fig 20.1). Pottery recovered from a more recent investigation of the ditch system dated to the 2nd and 3rd centuries AD, while features outside the ditches dated to the 3rd and 4th century (Lockett 2001a, 1-2). This site poses problems of interpretation since the only period in which a fort in this location would obviously make sense is during the 1st century AD, yet the dating evidence so far produced is too late to fit this context (although it is accepted that none of this comes from a primary context and only limited areas have been examined). Its location on the west bank of the Severn could also be seen as anomalous. Further work is required before firm conclusions can be reached on the function of this site, although given that further cropmark enclosures (albeit less regular and only single- or double-ditched examples) have been identified from the air in the Grimley/Holt area (eg WSM 31144, 04512, 04507) an interpretation of all these sites as rural farmsteads is perhaps more plausible. A similar interpretation as farmsteads is, however, certainly to be favoured for two other highly doubtful military sites at Perdiswell Hall (WSM 05465; Fig 20.2) and Kemerton (WSM 05738; Fig 20.3).

15.2.3 Villas

Worcestershire, like neighbouring Warwickshire, has far fewer villas than on the Cotswolds to the south. Nevertheless a small number of villas are known, mostly on gravel terraces to the south of the Avon (as is also the case in Warwickshire; Booth 2001). It has been noted in the Severn Valley in Gloucestershire that the location of villas displays a preference for the islands of sand and gravel that occur within the predominant geology of lias clays (Holbrook 2004). A similar pattern appears to be true of southern Worcestershire where villa-type structures are known on the flanks of Bredon Hill, along the Carrant Brook and through the Vale of Evesham. A probable villa site known only from surface finds was destroyed by quarrying during the 1970s without further investigation at Aston Mill Farm, Kemerton (WSM 2251 and 10287; Fig 20.4; Dinn and Evans 1990, 8). A possible villa is also known

from aerial photography within a large complex of cropmarks at Wormington Farm, Aston Summerville, in the Isbourne valley (Coleman, Hancocks and Watts 2006; WSM 05506; Fig 20.5). In the Avon Valley a villa has recently been discovered at Perrins Farm, Childswickham (Patrick and Hurst 2004; Fig 20.6) occupying an isolated spread of gravel. Others likely examples are known, as at Wickhamford, Nettlebeds (Overbury) and Little Comberton, and further similar sites should be expected to be revealed in the Vale of Evesham.

Further north within the county fewer examples are known, though the urban villa at Bays Meadow, Droitwich (Hurst 2006) and a second probable site at Stonebridge Cross on high ground to the north-west of the town warrant mention (Miller, Griffin and Pearson 2004b; Fig 20.7).

15.2.4 Farmsteads and rural settlement patterns

The predominant form of rural settlement in Worcestershire was the farmstead, that is to say agricultural settlements that were not equipped with villa-type houses. In the valleys of the Avon and Carrant Brook cropmarks reveal extensive articulated landscapes covering many hectares composed of settlement enclosures, paddocks, trackways and fieldsystems, which as noted earlier are liable for the most part to represent late prehistoric and Roman period activity.

In the Carrant Valley, Aston Mill Farm, Kemerton (Dinn and Evans 1990) and a site to the south-west of the village of Kemerton (Bellamy 2001), along with Beckford (Wills forthcoming) are the best-explored sites in these areas, the latter including a rare example of a small rural cemetery (Fig 20.8 and 9). All of these have been excavated in advance of gravel extraction or through related, small-scale research driven projects. In the Avon Valley fewer sites have been investigated on the gravel terraces or through quarrying, although a series of settlement enclosures at Wyre Piddle, Pinvin, Upper Moor and Throckmorton on the terrace margins on the north side of the river have been the subject of recent programmes of excavation and salvage recording (Fig 20.10). Many of these have Middle or Late Iron Age predecessors and, although the focus of settlement areas appears to have shifted, within the complexes continuity of some boundaries and field systems seem to be emerging as a strong theme, as does the presence of occasional inhumations sited either beyond settlement areas or in one case within a small defined area within an enclosure (Robin Jackson pers comm). In areas of predominantly Lias clay and Mercian Mudstone, settlements sites correlate with areas of slightly higher elevation and very localised deposits of gravel, as along the Carrant Brook (Coleman, Hancocks and Watts 2006, 4).

In the Severn Valley, a farmstead has been examined at Ryall Quarry, Ripple (Fig 20.11). Here, during the Late Iron Age/Early Roman period, activity is attested solely by pits but in the 2nd century a rectilinear ditched enclosure was constructed which appears to have contained at least one rectangular building. The enclosure had been abandoned by the mid 3rd century (Barber and Watts 2006). To the north, evaluation associated with a proposed extension to Clifton Quarry, Severn Stoke, recorded extensive surface scatters of late Iron Age and Roman material, including substantial quantities of iron slag (WSM30892; Fig 20.12). Subsequent geophysical survey showed these to be associated with a complex series of enclosures and other features. Although no further work has taken place at the site, it can be suggested that a large rural settlement was located on the banks of the Severn, possibly with a degree of specialisation in iron production, which exploited the river for transportation of both raw materials as well as finished products (Miller, Darch and Griffin 2001).

Moving up the Severn, north of Worcester, there is a concentration of cropmark enclosures in the Grimley/Holt aggregate production area to the west of the river (Fig 20.13; Edwards 1997). Rather than being part of an extensive cropmark landscape like that represented in the Avon Valley and Carrant Brook, the sites represented appear to be more discrete enclosures. It may be the case therefore that while the archaeology of the Avon Valley in Worcestershire (and indeed Warwickshire) finds similarities with landscapes further south such as the Upper Thames Valley in Oxfordshire and Gloucestershire, further north along the Severn Valley the

settlement pattern has closer similarities with the ubiquitous ditched-enclosures of Shropshire and Herefordshire (Whimster 1989, 35-65). These individual enclosures were always of simple plan but occur in a variety of forms and were often surrounded by more than one substantial ditch. Fieldwork in Herefordshire is beginning to confirm the Late Iron Age and Roman date often assumed for these sites (Guest 2001), a pattern apparently reflected in a recent evaluation of a proposed quarry extension at Top Barn Farm, Holt where successive phases of Middle/Late Iron Age and Roman activity have been recorded in five discrete enclosures of which only two appear contemporaneous (Deeks 2004; Fig 20.13). Evaluation of a cropmark enclosure at Holt Heath adjacent to the river Severn indicated that this site was abandoned in the 2nd century (WSM 30286; Miller and Griffin 2002). On the east side of this stretch of the river fewer sites are known, although a similar pattern may be present.

The pattern described here is of different settlement forms prevailing in different parts of Worcestershire, reflecting different farming regimes in the Roman period. The evidence that communities in parts of Worcestershire were practicing different farming regimes has wider implications. The cultural values of pastoral communities may be very different from arable farmers, as has been pointed out by Roger White. In such communities, wealth was based on cattle ownership, and many aspects of cultural exchange and economy are orientated around cattle, as research indicates prevailed in north Holland in the later Iron Age and Roman period (Roymans 1996), and in Ireland in the Roman Iron Age (Wickham 2005, 354-54). The contrast with arable farming communities would be marked, as arable farming would be embedded in the market economy. The differences between pastoral and arable farming may be detectable in the archaeological record, but part of that pattern is likely to be different degrees of archaeological visibility. This was demonstrated clearly by the Wroxeter Hinterland Survey, where outside the immediate environs of the city, only very small quantities of Roman pottery were recovered from fieldwalking across wide areas of the landscape (White and Gaffney 2003). Differences in settlement form, material culture and farming regime are likely to reflect deeply embedded social structures that developed in later prehistory (Roger White pers comm).

The plans of rural buildings in Worcestershire are poorly known. Traces of roundhouses have been recorded occasionally, as at the 2nd to mid 3rd century site at Leylandii House Farm, Norton and Lenchwick, near Evesham (Jackson, Hurst and Pearson 1996; Fig 20.14) but generally structures are very difficult to detect. At Ryall Quarry a drip gully appears to have defined a rectangular building but no structural evidence could be detected (Barber and Watts 2006; Fig 20.11). This may reflect that many buildings were made of cob or turf which leaves little archaeological trace. Lockett (2001b) has suggested that areas of metalling recorded at sites such as Furzen Farm, Throckmorton Airfield and Norton-juxta-Kempsey might represent the internal floors of such structures. This interpretation partly arises due to the relatively insubstantial nature of the surfaces, which suggests that they would not have been suited to use as external yards. Further, large quantities of domestic material are present both on the metalled surfaces and in associated drainage gullies and ditches, while occasional postholes may represent doorposts or roof supports. At Throckmorton roof tile and numerous nails were scattered across an area of metalling suggesting that it either supported a building or had one fronting onto it (Griffin, Griffin and Jackson 2005).

As our knowledge of non-villa rural settlement in the county has expanded over the past 15 or 20 years, some chronological patterns are beginning to emerge which suggest periods of considerable change in the rural landscape. Many settlement areas occupied during the late Iron Age and early Roman period appear to have been abandoned in the early to mid 2nd century. At the same time many new settlement sites were established suggesting that this was a period of settlement dislocation and re-ordering of the landscape rather than abandonment (Griffin, Griffin and Jackson 2005; Alan Jacobs pers comm). The newly established settlements display an apparent peak in prosperity, extent and density in the late 2nd through to mid-3rd century, but most were abandoned by the mid-4th century. For example, excavation of four Romano-British settlement sites in the Carrant Valley revealed similar settlement chronologies, with occupation dating to the 2nd to 3rd century followed by apparent abandonment before the early 4th century (Hancocks *et al* 2006, 92). This later phase

of abandonment coincides with the decline of the urban areas at Droitwich and Worcester, and unlike in the 2nd century there is no obvious pattern of replacement. This is a very significant event, and the full implications cannot yet be assessed. There is evidence that woodland regeneration had occurred in some areas of Worcestershire by the early medieval period, to be followed by gradual clearance of land (Section 16), which implies that some areas of Worcestershire were depopulated in the 4th century. However there is also evidence that indicates continued management of the Roman farming landscape through the early medieval periods in other areas of Worcestershire (Section 16), which implies a population shift in the 3rd to 4th century. The question of where the rural population went remains an open one, and Roger White has suggested two possibilities: a shift to new settlement sites that remained occupied into the medieval period and later (ie 4th century settlements lie beneath modern villages), or a shift into towns to avoid heavy taxation of the rural population (Roger White pers comm). The evidence is too slight at present to offer certain interpretations.

15.3 Material culture and production

Worcestershire provides good evidence for the production of three staples of the Romano-British economy: iron, pottery and salt. The agricultural base of the rural settlements is less clear (though see Section 15.4.2).

Ironmaking played a crucial part in the economy of the small town at Worcester (Dalwood and Edwards 2004, 16-8) and iron smelting and smithing occurred at other sites along the Severn (seemingly unusually high amounts of smithing slag have been recovered from rural sites at Norton-juxta-Kempsey and Linacres Farm, North Claines (Jackson, Hurst and Pearson 1995; Dalwood, Buteux and Pearson 1998; Fig 20.15 and 16). Recent work at Clifton Quarry, Kempsey, has revealed another potential iron-working site on the banks of the Severn (see above; Miller, Darch and Griffin 2001; Jackson 2004, 101-2; Fig 20.12). These ironworking sites form part of a series that are known on the banks of the Severn from Cardiff to Worcester. It is a vexed question whether all these sites utilized ore from the Forest of Dean. Metallurgical analysis of slags from Worcester was not able to conclusively demonstrate this point, and it is conceivable that the ore derived from now totally exhausted outcrops of a narrow band of iron bearing rock known as the Worcester Graben that ran from Kidderminster southwards towards Gloucester (Dalwood and Edwards 2004, 376-8). Some support for an origin outside of the Forest of Dean for the ore smelted in Worcester is suggested by the observation that if Dean ore was transported up the Severn, it is surprising that no evidence of extensive iron making has come from either the suburbs of Gloucester or the settlement at Tewkesbury. Analyses of artefacts from Beckford also demonstrated an increasing use of non-Dean phosphoritic ores (Salter 2000, 56).

The production and distribution of pottery was also an important activity in Worcestershire. The Iron Age Malvernian tradition continued little altered into the Early Roman period, and the distribution of this pottery clearly shows that the Severn Valley was the major axis for its distribution. Equally the Roman Severn Valley Ware tradition displays strong directional marketing, with what appears to be a fairly sharp eastern edge to its distribution close to the current border of Worcestershire and Warwickshire. To the north the distribution extends into Shropshire and southwards as far as parts of Somerset (Evans 2001). Despite the ubiquity of the ware, kiln sites are still poorly known and such sites are to be expected on the lias clays of the Severn valley in Worcestershire and Gloucestershire (the group of kilns around Malvern are the best studied; Evans, Jones and Ellis 2000; Fig 20.17).

The brine springs at Droitwich which had been exploited since the Iron Age continued to be utilised for salt production in the Roman period, quite probably under official supervision (Woodiwiss 1992). There is no evidence that salt making spread beyond Droitwich onto the aggregate producing areas of the Salwarpe.

The focus along the Severn Valley and its tributaries of sites involved in iron, pottery and salt production suggests that river transport was important, while pack animals and other forms of

road transport must also have played an essential part in moving goods around. However, although distribution maps of some key products such as Severn Valley Ware and Malvernian pottery are fairly well developed, other materials (such as querns for instance) have received less study and overall only very limited research has been undertaken on the means of distribution of either raw materials or finished products.

15.4 Environmental archaeology (by Elizabeth Pearson)

15.4.1 Introduction

During the Roman period there was a much greater degree of organisation of the farming landscape, with the processing and storage of goods on a larger scale on some settlements, particularly on villa estates in those areas where these were present.

The evidence for large-scale arable agriculture and distribution is represented by the presence of rich assemblages of charred cereal remains in corn driers (the remains of bulk processing) or in storage in granaries in some areas. Trends in animal husbandry which seem to be consistent with increasing 'Romanisation' are that sheep became less important generally, while larger cattle, and sheep reflect a superior level of organisation, or a more 'Romanised' agriculture (Davis 1987).

Many herb, vegetable and fruit cultivars were introduced to Britain at this time, the most commonly archaeologically encountered species including herbs such as fennel, coriander, black mustard and parsley, vegetables such as brassicas (cabbage and swede etc), carrot and celery, and fruits such as fig, grape, and plums. Where animals are concerned, cats and chickens, of which there are occasional Iron Age records, become increasingly common. Finds of exotic fish species, although rare, imply long-distance trade with the Mediterranean, and in some cases, concentrated small marine fish bones in vessels such as amphorae, have been interpreted as reflecting that these once held *garum*, a Roman fish sauce. There is no direct evidence of imported *garum*, although a locally made equivalent shows a trend towards Roman taste.

Off-site pollen profiles in lowland areas show a largely de-forested landscape over much of the British Isles. The emphasis for research on these profiles needs to be on the relative importance of arable and pastoral agriculture, and on detecting signs of intensification of arable agriculture. The question of whether there was continuation of occupation at many sites towards the end of the Roman occupation can also be researched by some degree by looking for signs of woodland regeneration (or lack of it) in pollen profiles covering this period.

Evidence for the effect of industry on surrounding woodland is important, particularly the salt extraction industry around Droitwich, the pottery-making industries around Malvern and the iron production industry in the small town of Worcester.

15.4.2 Roman Worcestershire

Direct evidence for crop processing and storage and animal husbandry is widespread, though the latter is often poorly preserved. Rich assemblages of charred plant remains have been recovered from rural farmsteads at Norton and Lenchwick (Jackson, Hurst and Pearson 1996; Fig 20.14), Norton-juxta-Kempsey (Jackson *et al* 1996b; Fig 20.15), Strensham (Jackson *et al* 1996b; Fig 20.18), and Throckmorton Airfield (Head and Mann 2005; Fig 20.10), while large dumps of charred crop waste have also been found in a ditch along the Broadway Bypass (Hurst and Pearson 1997), and of probable Roman date, in a palaeochannel at Carrant Brook near Bredon Hill (Greig and Colledge 1988). All these sites are within the Avon Valley and show evidence of crop processing, in relatively large quantities, one of which, at Norton and Lenchwick was directly related to a corndrier. More sparse scatters of charred cereal crop waste have been found on settlements along the Wyre Piddle Bypass, and at

nearby Upper Moor in the Avon Valley (Head 2005; Fig 20.10), and in the Severn Valley at Ryall Quarry (Pearson 2006a; Fig 20.11), along the Astley to Worcester Aqueduct (Dalwood, Buteux and Pearson 1998), and at sites around Holt, for example, at Top Barn Farm, Holt (Pearson 2004a; Fig 20.13).

Although the number of sites for comparison is still small, the evidence for larger scale crop processing appears to be on sites in the middle to the south of the County, and mostly within the Vale of Evesham, Avon Valley and its tributaries around Bredon Hill. Whether there is any significance in the location of this type of evidence has not been considered in detail to date, but it may be significant that this is also the area of the county with the highest concentration of certain and possible villa sites and the greatest spreads of articulated enclosed landscapes of settlement enclosures and surrounding field systems. The importance of topography, soils, culture and communication routes in the location of larger arable settlements would all be important issues to consider, and it is probably no coincidence that this part of the county has some of the best drained and most fertile soils.

Larger quantities of charred cereal crop remains are also found in, or on the fringes of, urban settlements, sometimes because they were collecting points for cereal products as well as other goods, and also because some areas of towns were semi-agricultural in character. It is important to link this evidence to that retrieved from rural farmsteads in the gravel extraction areas in order to understand the relationship between the producers and consumers of agricultural commodities.

In terms of crop regimes, there appears to be no distinct transition from emmer to spelt wheat as the main wheat crop in cultivation, as is apparent in other areas of the country (for example in southern England), and the reasons for this need some consideration. Evidence for the introduction of herbs, fruit and vegetable cultivars associated with the Roman occupation is lacking in Worcestershire. Despite routine sampling of Roman deposits on excavations at Deansway in Worcester (Moffett 2004 a and b), at Dodderhill Fort, Bays Meadow villa (Straker 2006) and Hanbury Road in Droitwich (de Moulins 2006), no other cultivars have been recorded. This is likely to be largely because they are most likely to be found in waterlogged or mineralised deposits where waste from food or cess waste would have accumulated, and only a limited number of these deposits have been encountered. Exotic animals and pests may also be expected on sites of this date, the preservation of which may not be so dependant on waterlogging or mineralisation, although their presence is more likely in urban areas than on farmsteads on gravel terraces and floodplain areas.

In contrast to the evidence from arable agriculture, there is little information on animal husbandry from animal bone as its survival from the rural farmsteads has been poor. However, the recent work at Upper Moor, at Throckmorton and along the Wyre Piddle Bypass (Fig 20.10) has produced small animal bone assemblages and associated molluscan, insect and pollen remains which suggest that pastoralism played an important role in the economies of these sites, which are located on the clay and gravel deposits on the terrace margins north of the River Avon (Vaughan 2005b; Griffin, Griffin and Jackson 2005; Andrew Mann pers comm).

Evidence for the broad nature of landscape derives mostly from pollen profiles (and occasionally analyses of macrofossil remains) from palaeochannel deposits. Woodland clearance was extensive, particularly in the Avon Valley, for example at Carrant Brook near Beckford (Greig and Colledge 1988), though in the Severn Valley, some wetter areas of the floodplain were only cleared of woodland in the post-Roman to medieval period (Brown 1982). High levels of cereal pollen were recovered at Broadway Bypass in association with large dump of charred cereal crop waste.

15.5 Discussion and research directions

15.5.1 Resource identification

Mapping cropmarks

Cropmarks are a major source of evidence for Romano-British rural settlement in Worcestershire, and there has been a strong local tradition of aerial photography. By their very nature, cropmarks are heavily focussed upon aggregate production areas and thus provide a particularly valuable resource in managing and understanding these areas. The systematic transcription of cropmarks through an extension of the National Mapping Programme would therefore be a valuable means of collating and capturing these data sources. The apparent variation in settlement forms between south-east and north Worcestershire, discussed above, should be explored through this more comprehensive dataset in conjunction with consideration of variations in material culture between these two areas. This would lead to a greater understanding of the character of occupation in these areas and thereby strengthen assessment of site significance and methodological approaches during evaluation and mitigation of aggregate extraction sites.

Mapping alluvium

The picture currently generated by the HER is that some areas of the main river valleys were more densely settled than others. Is this a true reflection of the past or a product of the differential visibility of sites in different areas? There is now increasing evidence that some Roman sites may be buried beneath alluvium. In the Carrant Valley accumulation of alluvium in the early Roman period has been demonstrated at Beckford and Aston Mill Farm (Dinn and Evans 1990, 62). A similar picture would also appear to be true of some sectors at least of the Severn valley. An ALSF-funded evaluation at Ripple Quarry strongly suggests that alluviation was on-going here in the Roman period, while Roman deposits associated with ash, cinders and pottery were recorded in the 19th century below 4 feet of alluvium (Allies 1852, 62-4; Deeks and Jackson 2003; Miller *et al* 2004). Deposition of alluvium points to an intensification of agriculture in the late Iron Age and early Roman period.

Settlement sites buried beneath alluvium clearly have very high potential, as good preservation of deposits, artefacts and environmental evidence can be anticipated.

In the Severn Valley, where aggregate extraction has in recent years expanded to incorporate wet working of sand and gravel reserves buried beneath alluvial deposits (as at Ripple Quarry), the mapping and dating of alluvium should be regarded as a high research priority as this will provide an important corollary to the basic HER site distribution, especially as sites covered by alluvium are likely to be well preserved. Techniques for mapping alluvial deposits, palaeochannels and locating sites buried beneath them (such as LiDAR, use of remote sensing and boreholes, specialist geoarchaeological input) require further development and experimentation.

Predictive Modelling

The data accumulated by mapping cropmarks, palaeochannels and alluvium could be integrated into a GIS-based predictive model of later prehistoric and Romano-British rural settlement in the main river valleys. Plotting known settlements against attributes such as drift and solid geology; soil quality, and historic flood risk should allow the identification of locations with high potential for later prehistoric and Romano-British settlement. These areas could then be targeted for more extensive sampling and survey.

15.5.2 Rural settlement

Settlement pattern and economic base

Further investigation of rural settlements, especially in the north and west of the county, should provide further data to test the hypothesis that the pattern and morphology of rural settlement differs in these areas to that found in the Avon Valley and further south. Does the apparent difference in site morphology (isolated ditched enclosures compared to articulated systems of enclosures, fieldsystems and trackways) and cultural material reflect differential agricultural economies and patterns of social organisation? Excavation and morphological analysis needs to be supported by consistent monitoring of all deposit types to test for the presence of environmental remains. A broad landscape framework for the period needs to be developed, and research questions should be explored both through new fieldwork and through re-examination of older museum collections and synthetic analysis of more recent datasets.

Of the areas to the north and west where aggregates are present, the Teme Valley although little exploited by quarrying, is of note since there has been very limited archaeological research in this part of the county. Similarly rural areas of the Severn Valley, north of Stourport and in the north-east of the county around Bromsgrove have been subject to only limited archaeological research in the past and have aggregate resources which are either subject to active exploitation or could potentially be subject to future exploitation. These areas might display different settlement patterns and economic strategies compared to the better-researched areas in the south and east of the county.

Unenclosed settlement is currently poorly represented in the record, yet is likely to be present in some areas. In many ways the detection of such sites is hampered by the same factors as affect the detection of unenclosed sites of other periods, though the durability of many aspects of Roman material culture does produce surface scatters. Improved field evaluation methodologies now routinely employed on large-scale developments should increase the detection rate for such sites. Similarly, rural cemeteries have rarely been identified except where large-scale excavation and/or salvage recording has uncovered extensive areas, a situation which may be improved by increased sample levels used in evaluation.

Lastly, the impact and organisation of the iron, salt and pottery production industries in the county warrants consideration since there is currently little understanding of these. Sourcing and supply of raw materials, distribution of finished products, labour supply and whether production was seasonal are all questions to be considered. Of these the supply of one raw material, fuel (charcoal) may be the most important in terms of impact on the rural landscape and economy. All three of the recognised major regional industries would have demanded large volumes of charcoal and wood to fuel furnaces, kilns and hearths and consequently woodland management, charcoal burning and transportation of the fuels would have been major industries in their own right. Thus sampling and analysis of charcoal deposits from industrial sites and sampling (especially for pollen) for information relating to the wider environment is of especial importance and should be more widely undertaken.

Chronology

There are suggestions that a significant episode of settlement dislocation occurred in the 2nd century, with some sites that had been occupied from the Late Iron Age being abandoned. This sequence has been recognised elsewhere, for instance in Warwickshire and the Upper Thames Valley (Booth 2001). The chronological evidence from Worcestershire is not as strong, however, and synthetic studies of the dating, pattern and character of the large number of Roman rural settlements investigated in recent years across the county would undoubtedly go a long way towards addressing this situation.

Further data collection should not rely entirely on developer-funded projects since these tend to reinforce the bias towards the more economically developed areas of the county. One

potential research direction would be to focus targeted fieldwork, perhaps in conjunction with local heritage groups, on dating cropmark enclosures through fieldwalking and possibly limited evaluation trenching. Such work would be particularly welcome in less well-studied areas such as the Teme Valley. Extensive fieldwalking and rapid geophysics of areas where cropmarks are poorly represented should be encouraged to attempt to identify and date sites away from the more obvious fieldwork targets that cropmarks represent. It would also be of considerable benefit to ensure that surface scatter assemblages are recorded to a consistent standard as far as possible so that inter-site comparisons can be made.

15.5.3 The Severn Valley as a trade route

Sources of iron and importance of the industry to the rural economy

Further work is required to characterise the origin of the iron ore being smelted at Worcester and worked at rural sites along the Severn Valley, most of which lie in aggregate production areas. Just how important was the rural iron industry, and what part did the Severn play in the distribution of ore and worked products?

Pottery

The Severn seems to have played a major role in the distribution of Malvernian and Severn Valley wares but little is known of the infrastructure of the industries and how they were organised. Where were the production sites, workers' villages, and river ports?

15.5.4 Environmental evidence (Elizabeth Pearson)

More use could be made of methods by which the relative importance of arable and pastoral agriculture can be assessed, particularly in order to support information on the distribution of sites showing evidence of crop processing in large quantities, which seem to focus in aggregate producing areas of the county. Small interval sampling of pollen profiles (and macrofossil profiles, where present) may be needed to look for signs of agricultural decline or woodland regeneration towards the end of the Roman period as well as impact on woodland of the supply of charcoal and wood fuel to the pottery, iron and salt industries.

In the light of the poor preservation of animal bone assemblages in general across the county and particularly on the generally acidic soils on the sand and gravel terraces, the identification of sites with substantial and well-preserved animal bone assemblages should be regarded as a priority, while indirect evidence of pastoral regimes through analysis of settlement and field pattern morphology (to reveal stock management features such as waterholes, droves and drafting gates) and through insect, pollen and molluscan analyses to reveal pastoral regimes, evidence of grazed grassland and remains of parasites associated with stock keeping (such as dung beetles).

16. Post-Roman and early medieval period to conquest (Hal Dalwood)

16.1 Background

16.1.1 Chronology and national research frameworks

The focus of this chapter is the archaeology of the early medieval period (including the immediate post-Roman period), and adopts the convention of the date bracket AD 410 to 1066. Study of the early medieval period has specific regional characteristics in Britain, ultimately arising from historical events and processes. Regional research traditions have developed for different parts of Britain that are rooted in the understanding of historical events in the early medieval period, including the collapse of Roman provincial administration and migration into the former province (Hills 1999, 176-181). The research framework for Anglo-Saxon settlement archaeology has become increasingly sophisticated (Arnold 1997). One research theme is the interrelationship between 'post-Roman' or 'British' societies in south-west and western England and areas of southern and eastern England which show evidence for Anglo-Saxon settlement (Dark, K, 1994 & 2000; Snyder 1998). This topic has particular relevance for the study of Worcestershire's early medieval history and archaeology.

The chronology of the period is divided chronologically in a number of ways, but from a local perspective a simple chronology can be used:

The early 5th century to the late 7th century. This includes the 'post-Roman' period and the development of the Anglo-Saxon kingdom of the Hwicce. It is in this period that a contrast can made between an area where 'Anglo-Saxon' evidence is found – broadly south-east Worcestershire - and an area which can be labelled 'British', where the archaeological evidence is negative (west and north Worcestershire). Worcestershire forms part of a regional pattern of contrast and change in these 300 years (Bassett 2000; Dalwood 2002b). In general archaeological and documentary evidence is scarce for the period.

The later Anglo-Saxon period lasts from the late 7th century to the mid-11th century. From the late 7th century, Worcestershire was a territory within a succession of growing Anglo-Saxon kingdoms (Mercia, and then England), fully integrated into early English society in terms of politics, culture, language and religious organisation. Documentary evidence is much more plentiful for the later part of the period, but archaeological evidence is not much more extensive than for the 5th to 7th century.

16.1.2 Regional research frameworks

A *West Midlands Regional Research Framework for Archaeology* seminar in 2002 addressed the archaeological research framework for the early medieval period in the region. The web-published papers focused on a range of topics: the early medieval landscape (Hooke 2002), towns (Baker 2002), ceramics (Vince 2002), and current issues of interpretation (Hines 2002). This exercise has produced a picture of the region that takes into account current knowledge and recent research. The archaeology of early medieval Worcestershire was reviewed and placed in a research context (Dalwood 2002b).

16.2 Post-Roman to early medieval Worcestershire

16.2.1 General

Archaeological evidence for the early medieval period in Worcestershire is not extensive either on aggregates or beyond them, although they are relatively well represented on

aggregates (at 24% of the county total) in comparison to the Roman and medieval periods (at 21% and 18% respectively; Tables 3 and 4; Fig 21).

The recorded settlements and cemeteries of the 5th to 7th centuries have mostly been chance discoveries, and such sites are very difficult to detect other than through intrusive fieldwork. Sunken-featured buildings were excavated at Ryall Quarry, but the features were only detected following weathering of the area that was stripped in advance of excavation of a Romano-British settlement; the evaluation of the site did not detect any evidence for early medieval sunken-featured buildings (Barber and Watts 2006). The recognition of deposits that date to the early medieval period is problematic, due to the generally low use of pottery in the period.

The framework for understanding archaeological sites and monuments depends heavily on documentary research, and in Worcestershire such research has developed along a number of lines, emphasising in particular the history of ecclesiastical organisation and the early medieval rural landscape. It has been argued that there were late Roman churches at Worcester founded in the late Roman period that survived as institutions until the foundation of the diocese of Worcester in the late 7th century (Bassett 1989; 2000). From the 7th and 8th centuries documentary sources indicate the development of monasteries and churches, and detailed research provides a picture of the early medieval landscape (Hooke 1985a; 1990).

16.2.2 Landscape: continuity and change

The rural settlement pattern of Worcestershire was one of dispersed farmsteads and small hamlets for most of the period. Archaeological evidence does not provide much useful evidence for understanding the way in which the landscape was used for this period. The very low use of pottery before the 11th century in Worcestershire means that it is difficult to investigate early medieval arable farming, as is possible in earlier and later periods. Current knowledge of the character of the early medieval landscape depends heavily on research based on documentary sources, studied by Della Hooke (Hooke 1980; Hooke 1985a & b; Hooke 1989; Hooke 1990; Hooke 1998). This research suggests that the early medieval landscape of Worcestershire fell within two zones of different character:

Vale of Evesham

This was an area of intensive arable farming, which was also the case in the Roman period. Although in the 5th to 6th century settlement was very dispersed, there was increasing nucleation around estate centres, probably from the 9th century onwards, associated with grain production. In the later Anglo-Saxon period there were still small settlement sites on the edges of estates, which disappeared as the process of nucleation continued through the medieval period. Some of the extensive open field character of the later medieval landscape developed in the later Anglo-Saxon period (Hooke 1985a, 190-226, fig 49; Hooke 1985b). This part of Worcestershire was recognised as particularly valuable land by the Mercian kings, who granted large estates in the Avon Valley to support the new monastic foundations of the 7th and 8th century.

North and west Worcestershire

In central Worcestershire, Hooke has identified an early medieval landscape of open fields near settlements together with woodland in the later part of this period (Hooke 1985a, 227-47, fig 53). West of the Severn, the early medieval landscape was one of dispersed settlement with little arable cultivation, but with evidence for woodland: settlement nucleation was not a feature of the early medieval landscape (Hooke 1985a, 154-89). Detailed study of Hanbury (Dyer 1991) and Pendock (Dyer 1990) provide case studies for the character of 'woodland' landscapes. However the rarity of archaeological evidence from the period has resulted in reconstructions of the early medieval landscape that are dependent on documentary sources, and working back from later medieval evidence. It has been suggested that in Hanbury there

were localised areas of cultivation and settlement which had been farmed since the Roman period; other areas were regenerated woodland with little clearance in the early medieval period (Dyer 1991, 19-26, fig 5). To what degree the Romano-British agricultural system was totally abandoned or partly maintained through the 5th and 6th century is a long-running area of research question; evidence has been put forward for local continuity in parts of the west midlands, including an area around Droitwich (Bassett 2000, 109-10).

16.2.3 Rural settlements

There are few recorded early medieval settlement sites in Worcestershire. The settlement site at Saxon's Lode Farm, Ryall Quarry, Ripple, is by far the most significant excavated site (Fig 21.1; Barber and Watts 2006). The site lies very close to the east bank of the River Severn, on the edge of a gravel terrace above the floodplain. Excavation in 2001 recorded an unenclosed settlement, consisting of a group of six sunken-featured buildings, a post-built structure, ditches and other features, which together produced a rather limited artefact assemblage. The undecorated pottery was broadly datable to the 5th to 9th century, and three charcoal samples from one sunken-featured building produced radiocarbon dates of the 6th to 7th century. It was suggested that the absence of evidence for rebuilding or modification indicated that settlement was relatively short-lived (Alexander 2006). This settlement is the most significant excavated settlement of the earlier part of this period in Worcestershire, and despite the very low level of artefacts, Saxon's Lode Farm can be compared to early medieval settlements in Southern England and the Midlands. It seems likely that other contemporary settlement sites in Worcestershire were similarly small-scale. Although the excavation also revealed an earlier phase of Romano-British occupation, there was a major hiatus between the periods of occupation. However there was evidence that the northern boundary of the settlement in the Roman period remained in use, continuing as the northern boundary of the early medieval settlement and subsequently surviving as a field boundary until the 20th century (Alexander 2006). This evidence is significant in the context of the wider research question of the continuity of the agricultural landscape from the Roman period through the early medieval period (see above).

Other evidence for rural settlements is limited. At Fladbury, a sunken-featured building containing a large bread oven, and a post-built building, were recorded, together with an artefact assemblage and an uncalibrated radiocarbon date of AD 851 $\pm$ 51 (Fig 21.2; Peacock 1967). In Kemerton, three separate field projects have excavated separate individual sunken-featured buildings (Fig 21.3). Excavations at Aston Mill Farm quarry recorded a single sunken-featured building, with 6th to 7th century pottery (Dinn and Evans 1990, 23-6); elsewhere in the same parish, an evaluation project recorded a sunken-featured building in association with one or more post-built buildings (WSM 20019; Fagan, Hurst and Pearson 1994), and a separate project recorded a further sunken-featured building (Bellamy 2001). The existing evidence suggests that early medieval settlement sites were small, and sometimes dispersed. The material culture associated with these settlements is consistent with that of the cemeteries, comprising 'Anglo-Saxon' material culture. Archaeological fieldwork has contributed nothing to understanding the nature of sub-Roman (or 'British') occupation in Worcestershire.

The process of settlement nucleation was underway in south-east Worcestershire before the mid-11th century, part of the process that led to the distinctive champion landscape of the Vale of Evesham. Therefore 10th or 11th century occupation evidence might be expected within modern villages, although the low usage of pottery will make it hard to detect. An example might be the seventh-century sceat and small group of middle Saxon pottery from Sedgeberrow (Price and Watson 1984).

16.2.4 Towns and their hinterlands

Two settlements in Worcestershire clearly developed unusual characteristics in the early medieval period. At Droitwich, salt production was clearly underway on a large scale in the 6th to 7th century, demonstrated by both documentary sources and archaeological excavation

(Hurst 1997a). Throughout the early medieval period, Droitwich was a specialised industrial centre producing a valuable commodity that was widely traded. Clearly there was a resident workforce specialising in salt production.

Worcester had an early church and was possibly an elite centre in the 6th century located within the Roman defensive circuit; the site was chosen for a new see in *c* 680 (Baker and Holt 2004, 127). A civilian population serviced the needs of the religious and secular authorities. There is some evidence for a developing settlement in the 8th to 9th century, with evidence for trade links with London and an area of the river bank where ships were beached; archaeological evidence is however limited (Hillaby 2000, 140; Baker and Holt 2004, 127-32). In the late 9th century the developing settlement was put on a new basis with the granting of a charter which led to the construction of new fortifications and the reorganisation of the control of the town (Baker and Holt 2004, 133-7). The development of an urban community within the new defences has been revealed through excavation, particularly at Deansway (Dalwood and Edwards 2004).

The development of urban communities through the early medieval period had an impact on the surrounding rural area, though growing demands for food, fuel and other requirements.

16.2.5 Cemeteries

Excavated pagan cemetery sites lie in the Vale of Evesham and south of Bredon Hill, and are characterised by pagan burial rites and Anglo-Saxon material culture: questions of their ethnic origins of the population remain open. The most significant excavation is of the two cemeteries, Beckford A and Beckford B, dating to the late 5th to mid-6th century, investigated in advance of quarrying in the 1950s (Fig 21.4; Evison and Hill 1996). Beckford A comprised 28 inhumation burials, and Beckford B comprised 106 inhumation burials and 3 cremation burials. The artefacts from the graves were typical of the upper Thames Valley. The excavators interpreted the cemeteries as associated with a settlement of Anglo-Saxons, settled in south Worcestershire, and suggested that some individuals were Christians (Evison and Hill 1996, 40). It was suggested that both cemeteries were laid out aligned on prehistoric barrows (Evison and Hill 1996, 38).

Other recorded cemetery sites were probably similar in size or smaller than the Beckford cemeteries. A cemetery was discovered at a limestone quarry on the crest of Broadway Hill, overlooking the Vale of Evesham. Eight inhumations were excavated under salvage conditions, and a range of artefacts was recovered (Fig 21.5; Cook 1958). A single cremation was recorded at Hoarstone Lane, dated to 663-773 cal AD (Fig 21.6; Jackson *et al* 1996a, 119-121). A number of sites have only seen limited investigation, such as the two crouched inhumations with shield bosses beneath the floor of St Anne's Church, Wyre Piddle, recorded in 1888 (Fig 21.7; Meaney 1964), or the three inhumation burials salvage recorded at the Bennett's Hill cemetery, Offenham (Fig 21.8; Dalwood and Ratkai 1998). One of the earliest records of an Anglo-Saxon cemetery was made at Upton Snodsbury in 1866: a sword, spearheads, brooches and other artefacts were recovered by workmen in a small gravel quarry (Fig 21.9; Cook 1958, 78-9; WSM 599). A review of Worcestershire Anglo-Saxon cemeteries concluded that they were rather few and limited in their distribution (Evison and Hill 1996, 37-8).

Most discussion of the material culture from early medieval cemeteries has focused on comparisons with other cemetery sites in southern and eastern England, in order to establish the origins of Anglo-Saxon immigrants to Worcestershire. Current research frameworks for the period have moved to more nuanced interpretations. The model for early medieval Worcestershire suggests that a high proportion of the population were Christian and would have been buried in graves aligned east-west, without grave goods. Two burials recorded at Worcester cathedral are dated to between the 5th and 7th century (Barker *et al* 1974), but other early Christian cemeteries were rural and not necessarily located close to later medieval churches. There was a large cemetery excavation beneath Worcester Cathedral Chapter

House, which recorded 180 burials of the lay cemetery (Guy 2005). So far, no archaeological evidence for early medieval Christian cemeteries has been noted.

16.2.6 Industry, marketing and trade

In the early medieval period, the salt producing site at Droitwich lay at the centre of a network of 'saltways', by which salt was distributed across Worcestershire and Gloucestershire (Fig 21; Hooke 1985a, 122-6, fig 31). Similarly, charter evidence allows the radiating routes to and from the market at Worcester to be mapped (Hooke 1985a, 120, fig 30). More recent research has pointed to evidence for parallel routeways in areas to the west of the Severn (Della Hooke pers comm).

The Severn was of some significance for travel and trade in the early medieval period, but on a much smaller scale than in later centuries. Worcester developed into a locally important trading place at an early date, and documentary sources indicate the existence of coastal trade between Worcester and London from the early 8th century, involving high-status goods, and possibly salt and cloth; such trading links are also reflected in the coin evidence (Hillaby 2000, 140). River boats were probably used to transport raw materials within the region, such as iron from the Forest of Dean, lead possibly from Stoke Bishop (Bristol), and building stone for churches from the Cotswolds (Hooke 1985a, 126-7). Although the Avon was less important for trade, the river was probably used for transporting building stone (Hooke 2002).

The documentary evidence for trade networks is enhanced by the artefactual evidence. At Deansway, Worcester, there was evidence for long-distance trade in the 10th century, including pottery from the Cotswolds, Stafford and Stamford, and whetstones from Yorkshire and grindstones from Shropshire (Bryant and Dalwood 2004, 98-9). The settlement site at Fladbury, dated to the 9th century, produced fragments of Neidermendig lava quernstones from Germany (Peacock 1967).

16.2.7 Monasticism and the church

Documentary evidence identifies eight early minster or monastic sites in Worcestershire, of which those at Worcester, Kempsey, 'Ismere' (Kidderminster), Pershore, Fladbury, Evesham and Bredon lie on aggregates (Fig 21), others being located away from aggregate areas at Inkberrow and Hanbury (Hooke 1985a, fig 24). The estates of these minsters can be established through documentary research. Worcester, Evesham and Pershore developed into substantial monastic centres, and at Pershore excavation has located the foundations of an early church, probably dating to the 10th century (Blockley 2000). The substantial landholdings of Pershore in the late 10th century can be mapped in detail (Bond 2004, fig 6). Fisheries on the Severn (and perhaps the Avon) were an important economic resource of monastic estates, particularly for eels (Hooke 1985a, 131-2, fig 32). The documentary evidence is much less detailed than for the later medieval period, but the later data can help understand the early medieval landscape.

Documentary sources indicate a number of other pre-conquest churches in Worcestershire, and the existence of others can be surmised; no upstanding structures survive (Bond 1988, 120-1). Many of these churches were probably small and stood on the sites of Norman and later medieval churches.

16.3 Material culture (Derek Hurst)

There is a scarcity of sites, and objects of this period are few and far between, which is in extreme contrast with the preceding era. This scarcity of objects is partly explained by a move away from the more durable materials such as stone or ceramic.

Most sites of this period have come to light through quarrying, for instance at Aston Mill Farm, Kemerton and at Beckford (Fig 21.3 and 4). At Beckford two cemeteries were located

which were in use in about the 5th -mid 6th century. The excavators concluded from a study of the associated artefacts that 'connections are almost exclusively with the West Saxons of the upper Thames Valley' with some possible Anglian influence also evident (Evison and Hill 1996, 37). Further up the Avon Valley, such as at 'Baginton and Bideford-on-Avon, … items of Anglian origin were represented' (Evison and Hill 1996, 37). Here the absence of pottery across the site was taken as an indication that little pot was in general use. Only four pots were noted of which three had been used for cremation burials – unfortunately these were not described by fabric. Finds were described as comparable to nearby sites at Broadway, Upton Snodsbury, and Fairfield at Evesham (Fig 21). The small square-headed brooches from Beckford suggested connections with Kent (Evison and Hill 1996, 39), and the etymology of Conderton has sometimes even been suggest to indicate such a Kentish connection though Evison and Hill (1996, 37) dismissed this. Interestingly there are some Roman objects, coins and spoons.

At Aston Mill Farm, Kemerton 27 sherds of pottery and a copper alloy object were recovered from a *grubenhaus* and 23 sherds from elsewhere on the site (Fig 21.3; Dinn and Evans 1990, 39-40). Another similar find of a single *grubenhaus* at Kemerton was associated with few finds (Bellamy 2001), whereas at an adjacent site, an evaluation revealed another *grubenhaus* associated with 26 sherds of pottery and other fragments of domestic objects (Fagan, Hurst and Pearson 1994). A more recent site at Saxon's Lode near Ryall has also produced an important assemblage of ceramics of this period (Fig 21.1; Barber and Watts 2006).

At the heart of the salt-making area of Droitwich and underlying the more substantial medieval remains a well-preserved horizon of post-Roman salt making was identified with its associated hearths (Hurst 1997a). This level was associated with a lot of contemporary ceramics in a variety of different fabrics (Lentowicz 1997). Radiocarbon dating has suggested that this activity was datable to the 5th-mid 7th century, and this so far represents the best stratified remains of this period in the county. The variety of fabrics in itself suggests some pottery trade was in operation, though in the context of the salt trade it is possible that the ceramics were more varied than normal for the region. These remains certainly indicate that the region is not aceramic at this time. The similarity of ceramic fabrics from south Worcestershire sites (see above) may indeed suggest that traded ceramics still formed part the economy of the region. The relatively low incidence of grass tempering in the West Midlands is in keeping with sites north of the Thames Valley signifying a closer potential link to East Anglian culture (Vince 2002).

Apart from these relatively small assemblages from a few sites, finds have otherwise largely been isolated chance discoveries. One of the most unusual has been the Viking-style axe-head (WSM 30763) from the Avon river-bank at Pershore, and even on excavations such discoveries can be apparently isolated such as the 6th century gilded silver mount from Childswickham Roman villa site (WSM 30773; Evans 2004). Metaldetecting is increasingly adding to the picture across the county especially now that the PAS is in place. Though some of these finds are from river valleys it is more likely that any deliberately buried hoards, where recovery was the intention, will be on higher ground (eg a hoard of pennies from Severn Stoke; Hillaby 2000). The most substantial recent find was just such a location on higher ground away from the River Avon at Offenham (unpublished finds, now in Evesham Museum). Mid Saxon finds are even rarer, the pottery that can be definitely assigned to this period so far being only a single sherd from Droitwich (Hurst 1997b, 78-9).

Accordingly the material culture of this period is giving a completely different picture than for the Roman period, where the study of material culture has led to the definition of regional pottery production (Malvernian), and of an iron-working specialisation. The post-Roman era is, therefore, much less easy to characterise in terms of major themes relating to material culture, and the trade in essential commodities. This is to a large extent due to a shortage of material, which in turn reflects a shortage of sites. The recovery of finds also comes to a large extent from funerary contexts, which is bound to lead to a bias in the evidence.

The temptation is to assess post-Roman culture as impoverished and, therefore, to assume that there were few comforts and possessions of any value. However, the likelihood is that this view should be tempered by other considerations such as that much more use was made of natural materials especially wood and bone, which are more prone to decay. Settlement sites seem to have become lower density affairs where structures might be scattered across a wide area rather than being concentrated around an obvious centre. This more diffuse rural existence has severe repercussions for the archaeologist, such as the relatively low level of background finds loss, as well the decreased susceptibility of sites to be identified at all.

There is also a distinct possibility that the Anglo-Saxon objects represent a culture directly imported into the region rather than being a product of the native people. The local fashioning of objects in this new style may have been limited and it is uncertain how long such objects remained in circulation. Some of the objects in the Beckford graves may have been passed down for a generation or so, and the burying of such heirlooms will have rapidly reduced the numbers of such objects in general circulation. The shortage of 7th-8th century objects is a general problem that afflicts archaeology nationwide, and naturally this makes the identification of any sites of this period even more difficult than for the earlier post-Roman period.

From the 10th century onwards there is a revival of economic activity evident at least from the renewed pottery availability. This production of pottery was established at some urban centres, where the main markets were also in place. This pottery has hardly ever been found in a rural context in this region.

The river valleys presumably continued to function as routeways but with fewer material goods being transported it is much more difficult to suggest any specific networks of trade. Much more sourcing of materials was done locally and less durable materials were considered suitable even by the richer members of society in the case of housing for instance. Personal adornment was still in everyday use but it was most likely to be restricted to a few accoutrements such as beads.

The new material culture was, therefore, characterised not only by new decorative styles but also by new materials, and a change in production and distribution patterns. The new style was expressed by peoples who are presumed to be immigrants, though these traits do disappear quite rapidly suggesting that this identity was soon changed as a process of assimilation meant that the native population and immigrants merged – what is curious is that the native population seems to be absent from the archaeological period as a distinctly different entity at this time. This may be a strong argument for contending that the new styles have less to do with immigration than with changing fashions.

16.4 Environment (Elizabeth Pearson)

16.4.1 Introduction

A trend that is particularly noticeable during this period is a change in the types of crops in cultivation. Of particular significance, is the transition in the importance of glume wheats (emmer and spelt wheat) as the main wheat crop in cultivation, to the predominance of free-threshing wheats. The latter include bread wheat (*Triticum aestivum*), club wheat (*Triticum aestivo-compactum*) and rivet wheat (*Triticum turgidum*). Free-threshing wheats, which require a shorter sequence of processing to free the grain from the chaff and are higher yielding, would seem to have an obvious advantage over glume wheats. However, emmer and spelt wheat, although more difficult to process, when stored in the husk, are more effectively protected from damp and spoilage. The reason for the change from one type of wheat to another is still uncertain. Rye, oats, hemp and flax become more common at this time suggesting a diversification in the cultivation of field crops (as opposed to garden crops introduced in the Roman period). An interesting question to consider is the degree to which these changes are a result of the introduction of crops during Anglo-Saxon invasions or

settlement, adoption of new crops by the native British or a change in response to environmental factors.

With the withdrawal of Roman control of Britain in AD 410, it has been assumed that this period would be marked by signs of woodland regeneration in the pollen record, reflecting abandonment or less intensive land use. The pattern of continuity and abandonment of land is, however, is mixed in the Midlands as it is over much of the British Isles (P Dark 2000). Identifying signs of either woodland regeneration or continued occupation related to this period can be difficult, because of the paucity of profiles spanning this period and because of the limited number of radiocarbon dates associated with them. Deposits of this nature, which are of importance for providing information on environmental change, are the type most likely to be recovered from aggregate producing areas.

Signs of abandonment or a change in the use of land can also be seen in urban areas. Deep dark earth deposits reflect this change and have been extensively studied in some areas, for example at Deansway in Worcester and in London (Macphail 2004) using soil micromorphology. However, as urban areas are not generally affected by quarrying, this aspect of change is not discussed further here.

Towards the end of this period there was marked warming of climate, which has been called the 'medieval warm period' occurring roughly between AD 900 and 1200 (Fagan 2000). This was a period of relatively settled and warmer weather compared to today. The type of environmental evidence mostly likely to reflect this trend is the tree-ring record from timber or dendrochronological samples. Climatic warming is unlikely to be directly obvious in pollen or other environmental profiles in the Midlands, except perhaps occasionally in insect assemblages. The indirect affects of warming may, however, be evident. The importance of this phase is that during this time there was less likelihood of dramatic crop failure and problems with livestock husbandry and generally agricultural productivity would have increased (Fagan 2000; P Dark 2000). Towards the end of this period these circumstances were a significant factor in allowing population densities to rise and resulting in marginal land being opened up for agriculture. Petra Dark (2000) points out that there is a dearth of pollen and other environmental sequences which span an important period of agricultural expansion.

16.4.2 Post-Roman and early medieval West Midlands

At Kings Pool, Stafford, a profile through peat deposits infilling a post-glacial lake spans the post-Roman to early medieval period. Here, sampling by augering during the 1970's (Colledge and Greig 1991) provided some indication of woodland regeneration at this time, but subsequent augering provided an incomplete profile from which interpretation of this phase was uncertain (Bartley and Morgan 1990). When the opportunity arose to sample within a deep, shored trench during a watching brief in 1999, a more complete profile was recovered, and from this, evidence of woodland regeneration was found in a single sample which is thought to date to approximately cal AD 300-600 (Pearson, Greig and Jordan 1999). The appearance of hemp and a peak in cereals is recorded in the pollen record at 1370 ±70 BP (WAT –275, cal AD 530-820) by Bartley and Morgan (P Dark 2000), and similarly a peak in cereals and rye at approximately Cal AD 500-800 (Pearson, Greig and Jordan 1999). This corresponds to the recovery of large amounts of charred rye in the adjacent late Saxon town of Stafford (Moffett 1994b).

16.4.3 Post-Roman and early medieval Worcestershire

Evidence for the change in transition from the cultivation of glume wheats to free-threshing wheat in Worcestershire is associated with sunken grubenhaus buildings in south-east Worcestershire at Aston Mill Farm (Ede 1990) and the Time Team excavation (Bellamy 2001), both at Kemerton (Fig 21.3), and further south at Ryall Quarry (Fig 21.1; Pearson 2006a). The evidence is sparse and does not suggest processing of cereals in large quantities.

These sites lie within south-east Worcestershire where 'Anglo-Saxon' evidence is found, and the kingdom of Hwicce developed. As there are no sites to the west, it is not possible to compare 'Anglo-Saxon' and British arable farming cultures. Two of the sites above (Aston Mill Farm and Ryall Quarry) were excavated as a result of quarrying, and in future, similar evidence may be recovered from aggregate producing areas.

Off-site peat deposits within aggregate producing areas have, as with preceding periods, provided information on the changing environment and farming practices. At Cookley, in the Stour Valley just north of Kidderminster, rye and hemp pollen, which are characteristic crops of the Saxon period, appear at approximately AD 610 – 700. At Carrant Brook, at the base of Bredon Hill, a drop in cereal pollen is thought to correspond to a phase of post- Roman abandonment (or movement of cultivation and crop processing elsewhere). Field bean (*Vicia faba*) and hemp (Cannabiacea) pollen are found immediately above and in association with a radiocarbon date of AD 940- ±80 BP (HAR 3624), presumably indicating a resuming of cultivation in the Saxon period. A deep peat deposit nearby at Gwen Finch Nature Reserve, Birlingham (Bretherton and Pearson 2000) also appears to span this period, but only limited work has been carried out on the profile. Further work on these, or any peaty deposits revealed by aggregate extraction, may provide more extensive information on the introduction of new crops characteristic of the period and of the variation in continuation or abandonment of settlement and agriculture over the county.

16.5 Key sites

The cemeteries at Beckford A and B are the key sites for the 5th to 6th century period (Evison and Hill 1996), and the settlement site at Ryall Quarry provides the first detailed study of a potentially contemporary rural settlement site (Barber and Watts 2006). The discovery of activity of this date at three separate locations around Kemerton indicates the potential resource present for this period where large areas are systematically investigated. Some older unpublished sites, such as the settlement site at Fladbury, will be published in due course (David Peacock pers comm).

The urban sites of Worcester and Droitwich have provided evidence for early medieval settlements of a particular character, with extensive evidence for 6th to 7th century industrial-scale saltworking at Droitwich (Hurst 1997a) and for house plots of urban craftsmen at Worcester (Dalwood and Edwards 2004). Knowledge of late Anglo-Saxon Worcester will be immensely enhanced by the future publication of the urban cemetery at the Cathedral Chapter House (Guy 2005). The growth of towns and trade in the early medieval period can only be understood in the context of change in the wider landscape that formed the hinterlands of these new urban centres.

16.6 Discussion and research directions

The available archaeological evidence for these centuries is limited, but where excavations have taken place the potential has been clearly demonstrated. The West Midlands Regional Research Framework for Archaeology provides a wider context for the period; the perspectives and ideas that emerged from that review underlie what follows.

So far, archaeology has made some contributions to the understanding of the early medieval period in Worcestershire, but there remains enormous potential to increase knowledge from what is at present a rather narrow base. The focus of archaeological projects has often been on 'sites', and it is argued here that the full potential of archaeological evidence for the period can only be realised through the development of a research framework that emphasises the wider framework. The early medieval landscape of Worcestershire is particularly well understood in many aspects, due to the extensive research by Della Hooke on documentary sources. Issues of continuity and change between the end of Roman Britain and the 11th century have remained nationally important research topics since the 1950s (J Hunt pers comm). Archaeology offers the potential to explore the interrelated themes of ethnicity, culture, religion, and landscape change.

The following research directions for the early medieval period can be identified:

16.6.1 Early medieval landscapes

A number of local studies have put forward evidence for substantial landscape change between the later Roman period and the early medieval period, for example in Hanbury (Dyer 1991, 59-60) and Pendock (Dyer 1990, 104). Areas of landscape that were extensively farmed and settled in the Roman period saw woodland regeneration and a much lower level of cultivation and settlement in the early medieval period. The process of landscape change may have been less dramatic in south-east Worcestershire, where the intensively farmed arable landscape of the Roman period appears in the early medieval historical record as an arable landscape. There is little evidence for the scale of change, and differences between the two regions can only be dimly discerned. Archaeological evidence has considerable potential to develop and refine understanding of landscape change in this period. The potential of environmental archaeology has not yet been exploited for elucidating local landscape change. Deep waterlogged organic-rich deposits were sampled at Newport Street, Worcester, in the floodplain of the Severn. The sequence spans the early medieval period, and analysis of this data may provide a detailed view of landscape change around Worcester at least (K Head pers comm).

Research by Della Hooke on early medieval landscapes has highlighted extensive evidence for both boundaries and routeways (Hooke 1990). The boundaries of early medieval estates have been mapped and studied, but there remains the important question of when such estates originated; archaeological investigation of such boundaries may provide evidence for the date of origin of estate boundaries. Hooke's research into estates also provided evidence for many early medieval routeways (including those used for transporting salt from Droitwich). There is a need for research to reconstruct the early medieval communication route network, including roads and the rivers, as a basic element of the early medieval landscape.

16.6.2 Settlements and cemeteries

The number of early medieval settlement sites and cemeteries in Worcestershire is small, and any newly discovered sites would be an important addition to knowledge. Archaeological evidence in the form of cemetery sites and settlement sites dating to the 5th to 7th century is focused on south-east Worcestershire, and these sites produce Anglo-Saxon material culture. Further evidence for settlement sites to compare with Saxon's Lode Farm, Ripple (Barber and Watts 2006), would be very significant. The reoccupation of Romano-British settlement sites in the early medieval period was observed at this site, as well as at the site of Bank Farm, Dumbleton (Glos), in the Carrant Valley (Coleman, Hancocks and Watts 2006).

There are two important linked research directions for early medieval cemeteries, which are the question of the ethnicity or ethnicities of cemetery populations, and the cultural identities expressed by 'Anglo-Saxon' material culture in the graves. The character of the inferred aceramic settlement sites of the British population is not yet known, and no cemeteries have been identified. It is likely that the settlements were small.

It is likely that settlement sites of the 5th to 9th centuries were small, and were distributed across the landscape rather than lying beneath modern settlements. The processes of social and economic change that took place in medieval society from the 9th or 10th century onwards were reflected in important changes in settlement form and landscape organisation. The rise of medieval manorial society led to changes in fields, farming systems and settlement locations. Pursuing these key issues depends on the investigation of early medieval settlement sites and the farming landscapes that surrounded them.

16.6.3 Use of scientific dating as a principal dating method

The low incidence of pottery use throughout the period is a real problem for recognising early medieval settlement sites or phases of occupation. The routine use of radiocarbon dating is essential for developing our understanding of the early medieval period, as has been demonstrated by fieldwork projects. At 93-7 High Street, Evesham, radiocarbon dating was important for dating part of the site sequence (Edwards and Hurst 2000, 94), and at Saxon's Lode Farm in Ripple, radiocarbon dating refined the dating of the settlement to the 6th to 7th century (Barber and Watts 2006). Similarly, the extent of early medieval occupation at Bank Farm, Dumbleton (Glos), in the Carrant Valley, was only elucidated through radiocarbon dating (Coleman, Hancocks and Watts 2006, 20). It is impossible to arrive at reliable dates for local sites based on dating by early medieval artefacts alone, and undated occupation deposits, or 'later' phases of Roman sites, should always be considered for radiocarbon dating.

The current research framework also suggests that virtually aceramic early medieval settlement sites exist in Worcestershire, associated with post-Roman/'British' communities, together with unaccompanied Christian cemeteries: absence of artefactual dating evidence should prompt scientific dating.

16.6.4 Research and publication of 'backlog' early medieval sites

The rarity of early medieval settlement sites and cemeteries is such that unpublished sites should be assessed for analysis and publication. The 9th century settlement evidence at Fladbury is programmed for post-excavation by the excavator (Peacock 1967; D Peacock pers comm). The Anglo-Saxon artefacts discovered at a gravel quarry at Upton Snodsbury in 1866 and now in Worcester City Museum deserve more detailed study (Cook 1958, 78-9), as do other cemetery sites such as that at Offenham (Dalwood and Ratkai 1998).

16.6.5 Material culture (Derek Hurst)

Whereas most objects of this period are classified according to classifications developed for other areas, especially to the south, pottery is likely to be much more local in source. Consistent study of this material may be particularly useful for detecting local affiliations and for detecting local production networks. The variation in pottery fabrics has not yet been examined in detail and so it would be useful to survey this material.

16.6.6 Environmental archaeology (Elizabeth Pearson)

The routine use of environmental archaeology in archaeological projects is essential, to fill the large gaps in current knowledge of the period. There is good potential for both site-based sampling, in order to investigate woodland regeneration and clearance, changes in land-use and climate, and the relationship between agriculture and standards of living in rural settlements and towns. There is also very high potential for work orientated at the level of the wider landscape, which can usefully be related to documentary research and local landscape research (Dyer 1990 and 1991). The most useful direction is in detailed studies of long-term change, which can be extracted from peat or alluvium deposits.

The main emphasis for future work is on off-site environmental profiles in conjunction with evidence from landscape history and archaeology. Small interval sampling and radiocarbon dating needs to be targeted at parts of the profile which appear to correspond to the transition between Roman and post-Roman periods. In general the collation of data from sequences covering the early medieval period may contribute to the discussion of agricultural expansion.

Specific detailed information from timber and dendrochronological samples may in turn contribute towards the debate (on a local level) on climate change.

17. Medieval period, mid-11th century to *c* 1540 (Hal Dalwood)

17.1 Background

17.1.1 Chronology and national research frameworks

The focus of this chapter is the archaeology of high and late medieval period, and adopts the convention of the period date-bracket of AD 1066 to 1540. Study of the medieval period has a long pedigree, and the research field has grown to include the disciplines of document-based historical research (including political, economic and social history), art and architectural history, archaeology, historical geography, and folklore. The perspectives of all these disciplines are relevant to understanding the archaeology of medieval Worcestershire. The early medieval period is discussed in the previous chapter.

The chronological framework of the medieval period is well known. The impact of the Norman Conquest was severe on the lay landholding class of Worcestershire, but the landholdings of the church were extensive and remained stable, as is documented in Domesday Book (Thorn and Thorn 1982). Broad chronological sub-divisions can be identified:

> The high medieval period, between the late 11th century and the mid-14th century. The growth of towns and the intensification of settlement and farming through these centuries are important research themes.
>
> The late medieval period, between the mid-14th century and the mid-16th century. The devastating impact of the Black Death (1349) on population and settlement, and the subsequent social and economic changes, are actively researched fields.

Archaeological research has made important contributions to a wide range of topics within these broad themes (Gerrard 2003, Gilchrist 1999; Schofield 1999; Stamper 1999).

17.1.2 Regional research frameworks

A *West Midlands Research Framework for Archaeology* seminar in 2003 addressed the archaeological research framework for the high and late medieval period in the region. The web-published papers focused on a range of topics: larger towns (N Baker 2003), market towns (Dalwood 2003), ecclesiastical archaeology (Atkin 2003a), pottery (Ratkai 2003), industries (Hurst 2003), and current interpretational issues for the period (Hunt 2003). The period-specific research priorities for Worcestershire were reviewed in a paper by Bryant (2003), who noted the lack of synthesis of archaeological evidence for medieval Worcestershire. Medieval archaeological research themes have been discussed in detail for the East Midlands Region, which forms a useful source of comparable evidence (Lewis 2002).

17.1.3 Nature of the evidence

Compared to periods considered in earlier chapters, the archaeological evidence for the medieval period is extremely varied in both character and form. Archaeological sites range from medieval buildings that still serve their original function (the bishop's palace at Hartlebury and numerous medieval parish churches), to medieval bridges which are carry modern traffic (eg Eckington Bridge). Monuments survive as carefully preserved ruins (eg Bordesley Abbey) and extensive earthwork remains of settlements (eg Grafton Flyford), and the archaeological resource includes a large number of earthwork sites, cropmarks, and finds scatters. Moreover extensive physical evidence exists for the medieval rural landscape, in the form of the ridge-and-furrow of former medieval arable fields, field boundaries, woodland banks, and holloways. Excavation has revealed some types of landscape feature, surviving as

buried archaeological deposits, while fieldwalking has revealed the extent of medieval manuring of arable fields. Documentary evidence allows the identification and broad delimitation of medieval landscape elements such as woodland, marshland, and deerparks (which might be represented archaeologically by an absence of field scatters).

The aggregate-producing areas of Worcestershire are rich in medieval archaeological sites and settlements, clearly demonstrated in the dense distribution plot of monuments and activities (Figs 22 and 24). Gravel deposits were preferred locations for settlement in the medieval period, including market towns (for example Worcester, Pershore, and Evesham), moated sites, and villages – both deserted medieval settlements (DMVs) and settlements that survive as contemporary villages. However information from archaeological fieldwork in areas of aggregate production has only made a limited contribution to understanding the rich archaeological landscape of the medieval period. In fact, despite the high density of medieval sites recorded on aggregate producing areas on the HER (748 sites at 2.34/km^2), in comparison with both earlier and later periods (see Table 4), at only 18% of the countywide total they have the lowest percentage for any chronological period (Table 4). This is for a range of reasons, including the fact that the majority of medieval settlements of all sizes are still occupied rather than archaeological sites in fields. The modern farming landscape preserves many elements of the medieval rural landscape, although the agricultural economy has changed radically. Archaeological fieldwork arising from minerals extraction reveals evidence for medieval field systems and farming practice.

17.2 Medieval Worcestershire

17.2.1 Landscape: continuity and change

The historic landscape of Worcestershire broadly falls into two distinct landscape types: a 'planned' countryside of nucleated villages and modern enclosure fields (open fields in the medieval period), and an 'ancient' countryside of dispersed settlements and enclosed field systems that pre-date the medieval period. In the medieval period, the 'champion' (or 'feldon') landscape of the Avon Valley had nucleated villages, open fields, and a farming population heavily engaged in growing corn. In contrast, the 'ancient' or 'woodland' landscapes of north and west Worcestershire had scattered settlements, a mixture of woods, pasture fields, and arable fields, mostly enclosed with thick hedgerows, and a peasant population who practiced a wide variety of occupations in addition to farming (Dyer 1991, 1-2). Detailed historical research into the manors held by the Bishopric of Worcester (Dyer 1980, 91-5) has revealed the contrasts between the dispersed settlement pattern and enclosed landscape of north Worcestershire and the Severn Valley (eg Ripple and Alvechurch) and the nucleated settlements of the Avon Valley manors (eg Fladbury).

It is now recognised that the development of nucleated villages and open field farming occurred between the 9th and the 12th centuries in different parts of England, replacing a pre-existing pattern of dispersed settlement. In Worcestershire, this major change to the landscape is not well dated, although documentary research suggests that the process was certainly underway in the Vale of Evesham before the Norman Conquest (Hooke 2002). A similar case has been made for the East Midlands and in East Anglia (Lewis 2002).

A detailed study of rural settlement in England mapped the differences between zones with difference degrees of settlement dispersal (Roberts and Wrathmell 2000). Worcestershire lies in three zones (Fig 23; Roberts and Wrathmell 2000, figs 17-18). Bryant (2003) has pointed out these zones are a useful starting point for research in the county. For the purposes of this assessment, the landscapes affected by aggregate extraction in Worcester can be divided into the Avon Valley, the Severn Valley and north Worcestershire, and the floodplains of the two rivers.

Champion landscape: Avon Valley

The medieval champion landscapes of Worcestershire lay in the south-east of the county, where a landscape of unenclosed arable fields and nucleated villages was centred on the Avon Valley. The Avon Valley was the most densely populated part of Worcestershire at the time of Domesday Book (Monkhouse 1954, 239-42, figs 78-81), and the least wooded (Monkhouse 1954, 242-7, fig 82). The Bishop of Worcester's estates in the Avon Valley, such as Fladbury, were important for growing cereals in the high medieval period (Dyer 1980, 69, 122-34). The Avon Valley near Evesham was still largely open fields used for growing corn in the early 16th century, as recorded by Leland who called the Vale of Evesham the 'granary of Worcestershire' (Chandler 1993, 507-8). The end of the open-field system in the post-medieval period was a widespread and profound change to the landscape, including enclosed fields, a new farming system, and changes to the settlement pattern. The former open fields of south-east Worcestershire were transformed by post-medieval enclosure, arable farming was replaced by livestock farming, and the pattern of nucleated settlements was modified by the establishment of new dispersed farmsteads. The area has seen further change in the post-war period as arable farming has become dominant again. Despite these changes, many features of the former 'champion' landscape survive. The Avon Valley, Bredon Hill, and the Carrant Valley all fall into this region. This is an area of Worcestershire that has seen considerable aggregate extraction in the last 50 years.

Much of the land was held by the church, including the bishopric and priory of Worcester, Evesham Abbey, Pershore Abbey, and Westminster Abbey. A number of manors in the Avon Valley belonged to the Bishopric of Worcester, and detailed historical research has illuminated the medieval society and economy of these manors, such as Fladbury (Dyer 1980). There are no detailed archaeological surveys of champion parishes or manors in Worcestershire. Local desk-based studies and fieldwalking surveys have been undertaken by archaeological groups, particularly in parts of south-east Worcestershire, but these are mostly unpublished and their potential has not been fully exploited. The survey of the settlement earthworks and surrounding ridge-and-furrow of Grafton Flyford shows the quality of some of the surviving earthwork evidence (Fig 23; Bond 1974, 41-2, figs 11-13).

In south-east Worcestershire there were extensive areas of ridge-and-furrow, much of which no longer survives as earthworks due to changes in farming practice but was recorded in aerial photographs. This well-known type of medieval agricultural landscape has been subjected to extensive research nationally, recently discussed by Williamson (2003). Parish-by-parish field survey of the surviving ridge-and-furrow in Worcestershire is an ongoing volunteer research project (pers comm Deborah Overton). A number of field projects have included the recording and excavation of remains of ridge-and-furrow, most extensively during fieldwork at Huntsman's Quarry, Kemerton (Jackson and Napthan 1998, 63). Medieval arable fields are also indicated by low-intensity pottery distributions, which are interpreted as evidence for manuring with farm middens that incorporated household refuse. Archaeological investigation on a pipeline from Upton-on-Severn to Strensham recovered consistent scatters of medieval pottery which, together with evidence for ridge-and-furrow, allowed the medieval landscape to be reconstructed as extensive open fields with limited areas of common land and waste (Jackson and Hurst 1994, fig 1).

Woodland landscapes: north-east and west Worcestershire, and the Severn Valley

The Severn Valley north of Kidderminster was described by Leland in the 16th century as 'undulating and hilly enclosed country' with 'good corn and grass' and 'a plentiful supply of wood' (Chandler 1993, 509). This is typical of the 'woodland' landscape that characterised north and west Worcestershire (Chandler 1993, 511-5). Although enclosed pasture fields were typical of medieval 'woodland' landscapes, there were also common fields in most parishes in the medieval period, which is reflected by records of both ridge-and-furrow and manuring scatters in central and north Worcestershire.

Two parishes in the 'woodland' region of Worcestershire have been subject to detailed landscape studies, with a particular focus on the medieval period: Pendock in south-west Worcestershire (Dyer 1990) and Hanbury in central Worcestershire (Dyer 1991). Other landscape studies on a narrower scale have been undertaken for Hanley Castle (Toomey 2001) and the Wyre Forest (Mindykowski 1999). Hanbury and Pendock parishes were studied as examples of medieval 'woodland' communities, and are the key case studies for the medieval landscape of the Severn Valley and north-east and west Worcestershire. These have the potential to framework for interpreting medieval archaeological evidence in this landscape area.

Hanbury The Hanbury research project showed that the distinctive character of woodland landscapes cannot simply be projected back into earlier periods (Dyer 1991, 59-60). Roman settlements and associated cultivated land were abundant in Hanbury, and the landscape was largely agrarian. In Hanbury there was extensive woodland regeneration in the period 400-1066, followed by assarting and woodland management which created the distinctive 'woodland' landscape of the medieval period (Dyer 1991, 59). The research project also showed the resilience of woodland landscapes: the disasters of the mid-14th century saw large-scale loss of life among the peasantry, but there was no irreparable damage the social and economic system of the woodland landscape of Hanbury, which renewed itself from the late 14th century onwards (Dyer 1991, 61-2).

One of the main findings of the Hanbury survey was that a third of the parish was occupied and farmed continuously from the prehistoric period and throughout to the medieval period, in another third settlement and farming were discontinuous, and in other areas again woods and pasture land was conserved as uninhabited hunting reserves through the medieval period. Woodland that had regenerated in the post-Roman period was only slowly cleared for farming (assarted) from the 12th century onwards. Between the late 11th and late 13th century the population of Hanbury expanded, through intensified use of existing land and especially the assarting of regenerated woodland (Dyer 1991, 27-9, fig 5, table 1). Dyer noted that the medieval landscape history of Hanbury was not explicable by the quality of soils alone, but that an interplay of social and economic factors was at work (Dyer 1991, 31-2).

Through a combination of methods, Dyer reconstructed the dispersed medieval settlement pattern of Hanbury, which included at least eleven high-status sites, together with individual peasant farmsteads, and farmsteads loosely-grouped into settlements called 'ends' or 'greens'; there were no nucleated villages (Dyer 1991, 32-43, figs 6-11). The survey identified 80 deserted farmsteads in Hanbury, based on archaeological and documentary evidence (Dyer 1991, 52-5, fig 13). Understanding the effects of the early 14th century famines and the Black Death is not straightforward, and it is clear that there was a complex and changing pattern of shifting settlement and amalgamated landholdings from the late 14th century onwards (Dyer 1991, 55-8). Although it is difficult to reconstruct complex historical patterns of changing landscape from utilising archaeological, documentary, cartographic, and ecological sources, it is precisely the richness and complementariness of these different data that offers the possibility of a deeper understanding.

The detailed picture of the dynamic medieval landscape of Hanbury was built up through a combination of historical, archaeological and ecological research methods (Dyer 1991, 3-5). The antiquity of individual farmsteads in Hanbury was sometimes established by the presence of earthworks but in other cases the medieval documentary record was of prime importance. The results clearly have applications elsewhere in north and west Worcestershire, in particular for developing new approaches to the assessment and evaluation of historic landscapes.

Hanley Castle The medieval landscape and settlement pattern of the manor of Hanley, west of the Severn, has been reconstructed along similar lines to Hanbury and Pendock, but without using specifically archaeological methods (Toomey 2001, xi-xxxiv). Hanley lay in the 'woodland' landscape of west Worcestershire, at the time of Domesday Book within the newly established royal forest of Malvern which stretched between the top of the Malvern hills to the Severn, and from the River Teme to the River Leadon in the south (Toomey 2001,

xiii, map I). The documentary evidence shows clearly the dispersed settlement pattern and the mixed nature of the economy, with arable and pasture fields near the river (on sands and gravels), and extensive woodland in the central and western part of the parish, some of which was assarted in the 12th century. There was a large and valuable riverside meadow, and two riverside hamlets and a quay on the Severn (Toomey 2001, xiv-xxvii, Map II). The complexity of the settlement pattern and the interlinking trackways in Hanley reflect the complex economic and social structure of the manor, as seen in other woodland.

Pendock The Pendock research project was undertaken as a further study of medieval woodland landscape, and led to the characterisation of a small but complex medieval landscape (Dyer 1990). Here, as in Hanbury, there is archaeological evidence for occupation of the landscape from the prehistoric period and fairly intensive Romano-British arable farming and dispersed farmsteads. Following extensive woodland regeneration in the post-Roman period, a dispersed settlement pattern gradually developed (Dyer 1990, 116-7). It reached its full extent in the 12th to 13th century, and although there was shrinkage in the 14th century, the agricultural system adapted to change (*ibid*).

Wood pasture. There were extensive areas of managed wood pasture within the 'woodland' landscape of west and north Worcestershire, concentrated within the areas designated as royal forests in the 11th century, comprising Malvern Forest (later Malvern Chase), Feckenham Forest, and the Forest of Wyre (Nisbet 1906). Landscape research has begun to show the potential of extensive landscape survey of medieval wood pasture areas, such as the Wyre Forest (Mindykowski 1999).

Longdon Marsh The southern part of Malvern Chase contained extensive areas of marshland, of which the largest area was Longdon Marsh. The medieval settlement pattern and the agricultural landscape that developed in its vicinity were studied by Bond (1981). These marshlands were progressively drained in the late post-medieval period, but in the medieval period (and in earlier centuries) they were an important economic resource for summer grazing of livestock (Bond 1981, 103). Archaeological fieldwork on the fringes of Longdon Marsh has revealed evidence for medieval manuring of arable fields close to settlements (Miller, Dalwood and Darch 2002).

Other archaeological evidence The nature of settlement and landuse in 'woodland' landscapes gives rise to a distinct archaeological signature. This can best be understood at the level of fairly large-scale survey, as the studies of Pendock and Hanbury showed. The evidence from smaller-scale projects may be harder to interpret within this framework, although the absence of medieval pottery from fields can be interpreted as the former use as pasture fields. Very low levels of pottery from fieldwork on pipeline routes in the Severn Valley in north Worcestershire has been interpreted in this way (Dinn and Hemingway 1992, 108; Jackson *et al* 1996a, 123). Similarly, the Astley to Worcester pipeline project in north Worcestershire produced no medieval pottery from most of the fields examined (Dalwood, Buteux and Pearson 1998). Some fields were recorded with scatters of medieval pottery, and in just one field ridge-and-furrow was recorded, reflecting the fact that woodland manors contained arable fields and some open fields. Further south in the Severn Valley, a pipeline project from Worcester to Strensham produced evidence for manuring scatters in limited areas (Jackson *et al* 1996b, 56-60). Fieldwalking at Clifton Quarry showed that some fields contained no medieval pottery, probably indicating medieval pasture, but one field produced a small quantity of pottery, interpreted as a manuring scatter (Miller, Darch and Griffin 2001). Subsequently evaluation trenching retrieved a moderate quantity of medieval pottery (Vaughan 2005a).

Floodplains.

The alluviated flood plains of the Severn, Avon and Teme are a distinctive landscape element. The extensive use of floodplains as hay meadows from the Anglo-Saxon period onwards is well documented. Meadow was valuable land in the medieval period, as the source of hay to feed cattle. The extent of meadow was carefully recorded in Domesday

Book for each vill, and not surprisingly there was a concentration of meadowland in the wider floodplains of the Severn (south of Worcester), Teme, and Avon (Monkhouse 1954, 247-9, fig 84). Meadowland was not divided by boundaries but was enclosed to keep livestock out. Its fertility was dependent on annual deposits of alluvium. Such areas can be predicted to produce neither evidence for field boundaries nor manuring scatters. Although it is believed that most water meadows were created in the post-medieval period, a rectilinear system of water channels on the Trent at Hoveringham (Notts) was dated to the 13th to 14th century and is interpreted as a potential water meadow system (Elliott, Jones and Howard 2004, 161). It has been suggested that medieval water meadows may also have operated in the Severn and Avon Valleys (V Bartoszuk pers comm).

17.2.2 Settlements: growth and decay

Towns

Medieval towns in Worcestershire have seen constant archaeological fieldwork since the 1990s, and archaeological fieldwork has built up a detailed picture of aspects of medieval society and economy, especially in Worcester (Dalwood and Edwards 2004), Droitwich (Hurst 1997a) and, to a lesser extent, for market towns such as Evesham and Pershore (Dalwood 2000). The development and growth of towns in the 12th to early 14th century led to agricultural intensification in their hinterlands to supply food to growing urban populations, and rural industries developed at the same time as urban industries, in complex interrelationships – most particularly the cloth industry. The interconnections between towns and the countryside were very close in the medieval period, and in the later medieval period in particularly there was considerable variation in local development in England, most clearly indicated by the different trajectories of urban economies. Some medieval small towns eventually lost their urban characteristics and functions, such as Clifton-on-Teme (Dalwood 1996). Archaeological fieldwork associated with redevelopment in towns in Worcestershire is transforming knowledge of medieval towns in Worcestershire, by providing a huge range of information.

Rural settlements

In Worcestershire, medieval settlements are represented by both nucleated villages in 'champion' countryside (eg Grafton Flyford; Bond 1974; Fig 22.1 and 23), and by numerous dispersed farmsteads and hamlets that predominate in 'woodland' areas (such as in Hanbury; Fig 22.2). There have been countywide overviews of deserted medieval settlements (Bond 1974; Bond 1982) and of moated sites (Bond 1978), both of which are numerous (Fig 22). A survey published in 1974 indicated that there were between 50 and 80 deserted medieval settlement sites in the county, concentrated in the south-east of the county (Bond 1974, 36, fig 10). No deserted settlements have been extensively excavated, although limited excavation has taken place on a few sites.

Excavation next to the site of the medieval church at Hallow revealed part of the medieval settlement, including a large ditched enclosure divided into plots containing small houses and plot boundaries (Fig 22.3; Miller, Griffin, and Pearson 2004a). Occupation in this part of Hallow dated between the 11th or early 12th century to the late 14th or early 15th century, and was identified as part of the manorial centre. At Whittington (near Worcester), excavation uncovered part of a small settlement, dating to the 13th to 14th century, with evidence for crop processing. The occupation evidence was overlain by late medieval ridge-and-furrow (Fig 22.4; Hurst 2000).

Limited trenching at Rock, although not on aggregate, demonstrates the high archaeological potential of earthwork sites in the county (Fig 22.5; Fagan 1996), while within an aggregate producing area, at Strensham, part of the periphery of the medieval settlement was excavated (Jackson *et al* 1996b, 6-35).

Medieval settlement sites are very often known and located, and many are occupied. However it is clear that some sites are buried beneath medieval ridge-and-furrow; and in the future fieldwork in the aggregate producing areas may well reveal previously unknown small medieval settlement sites, which will be an important addition to current knowledge.

17.2.3 Monasteries and the church

Much of the land in central and south-east Worcestershire was in the hands of the church: the bishopric and priory of Worcester, Evesham Abbey, Pershore Abbey, and Westminster Abbey were the most important and richest foundations (Fig 22). These religious institutions managed their great estates in order to provide support in the form of raw materials (especially food) and money through the sale of raw materials; market towns were developed as a source of revenue. The estates of Evesham Abbey have been studied in detail by Bond (1973b; 1975; 2004, fig 7), with a focus on the field archaeology relating to estate management, including surviving and former buildings (eg residential buildings, barns, dovecotes, mills) and landscape features (eg vineyards, fisheries, fishponds, parks and rabbit warrens). Such buildings and facilities were constructed to serve the particular needs of large religious institutions and constituted a particular form of economic landscape (Bond 2004). Similarly, Bordesley Abbey was linked in complex ways to its rural estates and the wider region (Fig 22.7; Astill 1993; Astill, Hirst and Wright 2004). A detailed study of the estates of the bishopric of Worcester, by Dyer (1980), has elucidated the economic relationship between the bishopric and the rural landscape across Worcestershire.

Medieval parish churches are one of the most enduring monuments of the medieval period. Numerous examples survive in Worcestershire which have been the subject of historical and archaeological study (Bond 1988; Bridges 2005). Few parish churches have been intensively studied in detail.

17.2.4 Medieval trade and industry

The Severn was certainly an important trading route in the medieval period (Stamper 1994). It is clear that the volume and variety of river trade increased during the medieval period, reflected in the development of new river ports and new quays. Worcester was the most important river port in Worcestershire, at the centre of the local transport network by virtue of its bridge, and an important centre for crafts and industries. Bewdley was a late medieval foundation, developed as a river port in the 15th century (Buteux 1996). Leland, writing *c* 1539, described how at Bewdley Bridge ‘many flat craft come to this bridge carrying all kinds of merchandise up and down the river, to Bewdley and above’ (Chandler 1993, 509). There were a number of minor quays on the Severn, of which the quay at Hanley Castle is reasonably well documented (Fig 24.1; Toomey 2001, xvii). Artefacts have also been recovered from the riverbed, presumably lost overboard from trading vessels.

River transport on the Severn was limited to relatively shallow-drafted boats. Most of the goods transported were bulk goods: wine was certainly the most important imported good, together with olive oil and dyestuffs, transhipped from larger seagoing vessels at Bristol. Goods travelling downriver included wool and cloth, together with timber, firewood, leather and food. The major destinations for goods were Gloucester and Bristol. Building stone for major construction projects (especially churches) was transported by river, including sandstone from quarries at Holt and Ombersley (Fig 24.2 and 3), sandstone from Highley and Alveley (Shropshire), and öolitic limestone from the Cotswolds (Prentice 1994). Although there were difficulties for riverboats using the Severn, the Avon was more difficult for transport due to extensive shallow stretches. It was only in the 17th century that improved navigation made the Avon economically important.

A medieval boat excavated at Magor Pill, Gwent, was a *c* 14m long cargo-vessel which carried a load of iron ore. The vessel had a shallow draft and flat bottom, capable of river voyages and short sea journeys (Nayling 1998). Boats of this type (generally known as

'keels') probably carried most of the goods on the Severn on longer journeys, with smaller vessels being used for short journeys, carrying both goods and passengers.

The Severn and the Avon were crossed by fords, ferries and bridges. Before the navigation improvements in the 19th century, the tidal River Severn could be crossed at numerous fords when the river was low, together with ferries for foot traffic. The most important medieval routeways had bridges: the narrower River Avon was easier to cross, and the medieval bridges at Eckington and Pershore (Fig 24; Hunt 1994) are fine survivals. There were medieval bridges over the Severn at Bewdley, Upton, and Worcester – the latter was the only bridge over the Severn between Gloucester and Bridgnorth before the late medieval period. Although the bridges were strategically and economically critical, the main rivers of Worcester were not major barriers to travel and could be crossed between the major bridging points, at least when the rivers were not in flood.

The rivers themselves were valuable economic resources in the medieval period: the 'fisheries' where salmon and eels were caught were economically important throughout the medieval period and later. In Domesday Book a total of 24 fisheries were recorded for Worcestershire, on the Teme, Severn, and Avon (Monkhouse 1954, 249-51, fig 85). Many of the fisheries were located at mills because they utilised the constructed mill-weirs, which were used to channel the fish and eels into traps. These sites remained important through the medieval and post-medieval period, and have been located through documentary research (Guyatt 1996), but have not seen any detailed archaeological investigation. Fishponds are similarly well-distributed and were also often located close to mills.

Hanley Castle was the location of a dispersed medieval potting industry, which has been studied in some detail (Fig 24.1; Hurst 1994). This industry seems to have been particularly successful by the 13th century, and by the 15th century it had become the major regional producer (Vince 1977; Bryant and Dalwood 2004, 99-100). Other industrial structures are unpredictable and may be represented by very small sites, such as the isolated oven or kiln recorded at Pirton, the function of which is uncertain (Jackson *et al* 1996b, 56).

Quarrying was an important industry in the medieval period. Good quality building stone was required for building parish churches, monasteries, and high status secular buildings. The location of quarries was determined by both the requirements for good-quality stone and the proximity to rivers for transport. Sandstone from Highley and Alveley (on the Severn in Shropshire) has been recognised in the medieval fabric of Worcester Cathedral, together with sandstone from Holt, Ombersley and Hadley, and oolitic limestone from the Cotswolds (Prentice 1994). The same building stones were used in many medieval parish churches in Worcester, together with lias. There is potential to reconstruct the medieval building industry, together with the quarrying industry, and the transport routes, utilising a range of data.

Little archaeological attention has been paid to the importance of market villages and fairs in the distribution of goods. Sites of fairs have been tentatively identified by metal detector finds of coins in fields adjacent to a number of villages but more work on identifying these sites needs to be done (Bryant 2003).

17.3 Material culture (Derek Hurst)

During this period there is no shortage of finds generally from medieval sites across the county, though urban excavation has revealed that they are commonest by far in urban contexts. Though there is relatively little material from rural sites and the quantity is especially thin for the mid-11th to 12th centuries, with few sites producing pottery definitely of this date. Where rural excavation has occurred, as at Whittington (Crookbarrow), near Worcester, this has produced few finds in direct association with medieval peasant houses (Fig 22.4; Hurst 2000). Unfortunately there are several classic types of rural site that have not been excavated, most notably moated houses. This variation in quantities of finds could be at least partially explained by variable rubbish disposal practices, and in the countryside it would be easier to dispose of waste in surrounding fields especially as this would have a

beneficial effect on soil fertility. Consequently much less domestic waste may have accumulated around rural sites.

In aggregates areas medieval finds figure less commonly than those of other periods. Most commonly there might be field boundaries or medieval pottery in general association but at a relatively low density. This would typically be interpreted as a manuring scatter (see for instance Jackson and Hurst 1994).

Though lacking in major sites actually situated on the gravels there are a number of major excavations remain which remain unpublished (Ratkai 2003). The major seigneural centres of Dudley Castle, which lies on the watershed between the Severn and Trent valleys and Stafford Castle, both provide large quantities of finds and, therefore, the opportunity to identify the sources of pottery supplying a major centre. The position of Dudley Castle in particular means it could be a valuable addition to the repertoire of analysed sites, as it sits in between Worcestershire and Staffordshire, and between two of the major river valleys. The former was in decline as a supplier of domestic pottery in the early post-medieval period, while the latter was developing as significant later medieval to post-medieval pottery industry, which was later to achieve international significance.

There is a general trend towards greater industrial activity in the countryside, though in most cases this is situated off the floodplain for obvious reasons. For instance the Malvernian potters were based in the foothills at the base of the Malverns beyond the gravel terraces of the Severn, and there are dense scatters of sherds in the some areas of Hanley Swan (Fig 24.1; Hurst 1994). However, the potters did rely on the river for cheap transport of their heavy products and so the local quayside was a key local facility, which gave contact with the wider world. For instance the distribution of 13th-14th century cooking pots shows that it enjoyed markets up-stream at least as far as Shrewsbury and downstream was able to access the south Wales coast via the Severn estuary trade (Vince 1977). Underwater exploration at this site has recently also revealed intact structural remains, and associated stratified medieval and later finds in the riverbed (Hurst 2004).

In some cases these are industries which would not leave much trace on the ground and so it is historical evidence that provides the best clue to this activity (Hurst 2003). One example of this type of site would be where rural clothworkers worked, as despite the prevalence of this type of livelihood few archaeological remains have been identified.

The role of the river in the success of other local industries is less clear. The Droitwich salt trade seems to have relied on road transport (Fig 24; Hooke 1985a), as it had done in the late Saxon period. However, at least one major route southwards involved reaching the River Severn at Worcester, from where the salt was shipped onwards. The impact on other trade, such as pottery supply, of the trade in such a major commodity as salt has been noted (Hurst 1992), and was probably especially significant for the late Saxon and earlier medieval periods when long distance trade was also evident in higher quality ceramics such as Stamford ware.

By the later 12th–13th centuries local markets came to be generally supplied with more locally made goods of sufficient quality for purpose, and in the absence of shops, the opportunity to buy more exotic goods was restricted to the fairs which continued into the later medieval period though they went into decline with the rise of London (Dyer and Slater 2000, 634). However, the supply of rarer commodities such as salt still ensured that communities maintained contacts with the wider world, and that merchants still played an important role, despite the increasing self-sufficiency of the town in terms of especially more basic goods, such as pottery and no doubt treen vessels, and, of course, more perishable goods.

A feature of the Portable Antiquities Scheme (PAS) is the considerable incidence of finds of medieval date that are recovered by metal detectorists, the next highest after Roman finds reported to the PAS (PAS 2004-5, table 5). These are nearly all casual stray finds rather than hoards of finds buried for later retrieval. The high percentage of dress accessories indicates the increase in metal accoutrements used in everyday life. It is likely that these finds are from

all over the county especially where arable cultivation is carried out, and therefore presumably including from potential aggregates sites a proportion of which are under arable cultivation. It has often been pointed out metal finds from cultivated fields are in poor condition, due physical damage and corrosion (Dobinson and Denison 1995, section 6.3.3). The flow of information from metaldetecting finds should be encouraged.

17.4 Environment (Elizabeth Pearson)

17.4.1 Introduction

The beginning of this period sees the continued expansion of agriculture onto marginal land, and over part of the country, the formation of an arable open field system, replacing a more mixed landscape of pastoral and arable fields and woodland. There is good potential for both site-based sampling, in order to investigate woodland regeneration and clearance, changes in land-use and climate, and the relationship between agriculture and standards of living in rural settlements and towns. There is also very high potential for work orientated at the level of the wider landscape, which can usefully be related to documentary research and local landscape research (Dyer 1990 and 1991), and should help characterise urban hinterlands. Documentary evidence can provide detailed information on these changes, and environmental archaeology may play a complementary role, depending on the richness of the documents available. Specific information can be gained from environmental evidence about a settlement which may not be apparent from documents and maps, such as detail on zones of use for various agricultural or craft activities on a farmstead, or simply the range of crops grown and the livestock in use that may not be documented.

There are, however, limitations and problems with the nature of the evidence. Environmental remains, such as charred cereal crop waste and animal bone, tend to be recovered in low densities from medieval rural settlements. In particular, evidence of cereal cultivation is often less extensive than that recovered from Romano-British sites, probably partly due to changes in the way in which crops were processed. Free-threshing crops were generally used in the medieval period which were simpler to process, and did not need to be parched in order to free the grain from the chaff, thus reducing the chance of accidental burning of grain and chaff. The chaff was also more fragile than that of glume wheats (emmer and spelt wheat) and easily destroyed if exposed to fire. Rich deposits of charred cereal remains seem to survive only on occasions where grain had been either been destroyed by a barn fire, or accidentally burnt when parching grain prior to storage, cooking or milling. The latter is more likely during wet harvesting seasons. Moreover, as discussed above, only limited evidence has been recovered from medieval settlements on gravel terraces as many settlements are still occupied and are therefore not affected by quarrying, and only to a limited degree by development generally. Survival of on-site evidence is therefore patchy.

Survival of off-site evidence from palaeochannels and former low-lying marshy areas on the floodplain is the most likely form of evidence to be affected by quarrying. Evidence from pollen sequences of a diverse range of crops (rye, flax, beans, hemp etc) and peaks in cereal pollen generally are characteristic of this phase. This may compliment similar trends identifiable in documentary evidence. Phases of woodland regeneration, relating to desertion of settlements, are an important trend which may be evident in pollen sequences. Nevertheless, comparison of environmental sequences with detailed documentary narratives may be useful in enhancing the interpretation of either type of evidence.

During this period sheep farming became increasingly important (mainly in hilly areas such as the Cotswolds) with the development of the wool industry. This aspect of the agricultural economy has been recognised in both rural and urban assemblages (Grant 1988), and recording of metrical data is, therefore, important for the recognition of animals used for producing wool.

This period is also an important time for climate change with a continued warming until around the late 1200s. After this time, a more period of more unstable weather conditions

prevailed which marked the beginning of the Little Ice Age (Fagan 2000). The 'great hunger' and dramatic harvest failure in 1315 and 1316 is an important episode during this period. This and other similar episodes may be apparent in environmental evidence. Cereals were badly affected by cold, wet seasons; and deterioration in climate played an important role in the move away from dependence on a predominantly arable agriculture in 'champion' country towards a more mixed farming using fodder crops to support livestock, and reducing the need for fallow land (Fagan 2000). Characteristics of this time include the decline in vineyards. Large quantities of burnt grain may well also reflect an increasing need to parch damp grain prior to storage, milling or cooking cold with the increasing regularity of cold wet summer and autumn months. As described previously, the types of evidence most likely to reflect changes in temperature are, for example, insects, diatoms, and chironomids in peaty floodplain deposits. Survival of these remains is, however, patchy compared to pollen.

Evidence for plagues such as the Black Death may have resulted in phases of woodland regeneration (although this sometimes may have only resulted in a return to pasture) which may be identifiable in pollen sequences. Some evidence for this may be apparent from human burial. For example, plague pits to date have been hinted at from urban areas around cathedrals (such as at Hereford).

17.4.2 Medieval environmental evidence in the region

A phase of woodland regeneration identifiable from Lammascote Road, Stafford, which appeared to date to the 14th century, could have resulted from settlement abandonment following a bout of plague or similar epidemic, or from poor harvests on account of deteriorating weather conditions (Pearson, Greig and Jordan 1999). Rich deposits of charred cereal grain at Wellington Quarry (Herefordshire) were found in an oven, raising the question whether this crop was parched, and then accidentally burnt, during a wet harvesting season (Pearson 2006b). A similar deposit has been recognised in a medieval oven at Ludlow (Pearson 2000b).

17.4.3 Medieval environmental evidence from Worcestershire

There is scant direct evidence of the agricultural economy from rural medieval settlements in Worcestershire. At best there are small assemblages of animal bone and charred grain with associated weed seeds in pit and ditch fills. At Hallow to the west of Worcester, however, rye is notable in the assemblages, most probably reflecting that this crop was best suited to the poor sandy soils around the settlement. Therefore, except in circumstances where good preservation or atypical assemblages are identified on rural sites, the indirect evidence for the agricultural economy derived from the wealthier assemblages encountered on urban sites may be of more value.

Comparison of environmental sequences from peaty or organic deposits would be useful within the areas that have been subject to detailed landscape surveys, such as at Hanbury, Grafton Flyford, Hanley Castle and Pendock. If deposits of a suitable date can be compared, it may be possible to determine if there are any characteristics in environmental sequences that are indicative of a champion or dispersed settlement landscape. Near Hanbury there appears to be good potential for such deposits surviving in the valley of the River Salwarpe, although none of medieval date are yet known. Pollen profiles exist at Callow End on the River Severn near to Hanley (Brown 1982), and peat deposits infilling the palaeolake at Longdon Marsh, are close to Pendock and surrounded by dispersed settlement. The upper level of peat deposits evaluated at Gwen Finch Nature Reserve on the River Avon (Bretherton and Pearson 2000) appeared to date to the medieval period or later. This site is situated in the heart of champion country.

Geoarchaeological evidence in this area consists of a sediment layer at Carrant Brook overlying peat deposit thought to have resulted from medieval cultivation on the slopes of Bredon Hill (Greig and Colledge 1988).

17.5 Key sites

The key sites for understanding the aggregate landscapes of Worcestershire in the medieval period are towns and monasteries. Although these sites themselves will not be affected by aggregate extraction in the future, their hinterlands encompass the aggregate areas of Worcestershire. Monastic institutions owned and managed large areas of productive agricultural land in the river valleys throughout the medieval period. There is a complex relationship between the medieval farming landscapes affected by aggregate extraction and medieval towns and monasteries, which can be characterised as consumption sites from an archaeological perspective. The towns of Worcester and Droitwich as consumption sites have produced extensive direct evidence for the products of rural industries (especially pottery production) and the products of the local farming economy (food). Production industries (such as clothmaking and salt boiling) in these towns linked towns and their hinterlands into wider regional and national economic networks. The excavations at Deansway (Dalwood and Edwards 2004), Sidbury (Carver 1980), together with more recent excavations such as at Newport Street, have produced extensive information on Worcester as a consumer of food (cereals and meat) and goods (notably pottery) produced in its hinterland. Bordesley Abbey is the key monastic site, due to the extant of excavation there, and has produced important artefact assemblages together with information on medieval technology and estate management (Astill 1993).

17.6 Discussion and research directions

The value of a landscape archaeology framework for the medieval period has long been advocated. There is a need to relate archaeological evidence from the aggregate-producing areas of Worcestershire to the broader medieval landscape of the county, through multi-disciplinary research. Charting and understanding the processes of settlement nucleation and creation of the open fields system, such as constitute the champion landscape of south-east Worcestershire, remains a major theme of landscape research for the medieval period (Lewis, Mitchell-Fox, and Dyer 2001). The difference between champion and woodland landscapes is a broad research topic (Williamson 2003), and in Worcestershire local studies have been particularly informative (Dyer 1991). The sometimes well-defined boundary between champion and woodland landscapes runs across Worcestershire, and there is clearly potential for future comparative research. Manuring scatters have been used for reconstructing medieval farming landscape in Worcestershire. Recent work in the east midlands has pushed forward the potential of this type of data, and shown that analysis of pottery assemblages can produce considerable detailed information on the organisation of farming systems and change through the medieval period (Jones 2004).

By the 14th century, new urban societies had emerged across England, enmeshed in a complex social and economic network that linked Britain to Europe and the Mediterranean. The rural landscape was heavily exploited and intensively settled. The impact of the Black Death in 1348-9 was a catastrophic event, involving the loss of up to 50 per cent of the population. It was followed by complex changes in society and economy, which archaeology is only beginning to illuminate (Schofield 1999; Stamper 1999). There are dangers in applying a simplified model of change to archaeological evidence, and Dyer has shown that complex social and economic changes lie behind reduction in settlement numbers between the 13th and 15th centuries (Dyer 1991, 52-8). However, it is important to note that archaeological evidence, even in the form of mundane evidence such as datable ridge-and-furrow, can contribute to ongoing research into the reordering of the landscape through the medieval period.

The following research directions can be identified:

17.6.1 Rural settlement sites

The locations of numerous medieval rural settlements have been recorded in Worcestershire, but very few sites have been investigated. Many known settlements are either protected sites, such as the many earthworks sites that are scheduled ancient monuments, or form the historic core of contemporary villages. However, it is probable that a number of small settlements exist only as buried archaeological sites, and are not yet located. Such sites have high potential. Archaeological evidence has the potential to contribute to longstanding research themes, including settlement expansion and demographic growth in the 12th to 13th century, and changes in settlement and population in the mid-14th century. There remains a real question about the long-term impact of the Black Death on rural populations in the region, as documentary evidence across the west midlands does not demonstrate major population downturns at this period (John Hunt pers comm)

17.6.2 Medieval landscapes

Medieval evidence needs to be placed in appropriate landscape context, as well as a social and economic context. In Worcestershire, medieval tenurial history can be established with some certainty, and areas of land can be determined to have been within a particular estate, whether held by a minor secular landholder, or part of a great monastic estate. The individual manor or holding is the best framework for multi-disciplinary research, integrating archaeological and documentary evidence in order to gain a greater understanding of the ways in which the medieval countryside worked. Both the Avon Valley and the Severn Valley have good potential for integrating archaeological evidence with a wide range of documentary evidence. The understanding of these differing medieval landscapes would be advanced through comparative research between woodland and champion landscapes, and Dyer has noted the importance of understanding these marked differences (Dyer 1991, 60).

The growing research focus on urban hinterlands offers another, broader, framework for interpreting the range of archaeological evidence from the countryside. During the medieval period the growth of urbanism, driven by the increasing commercialisation of society, led to the development of a network of small towns which had a direct affect on their surrounding landscapes. The requirements for raw materials for markets and crafts, and fuel and food for growing urban populations, had measurable effects. The economic relationships between urban and rural communities are important, and some research directions for urban hinterlands using archaeological evidence have been discussed by Perring (2002). It is also recognised that medieval towns had social, administrative and cultural impacts on their rural hinterlands, and these aspects have been the focus of recent research (Giles and Dyer 2005). The definition of the hinterlands of the small towns of Worcestershire would provide a strong geographical framework for the interpretation of archaeological evidence (John Hunt pers comm). This approach could be used to explore hinterlands that included diverse landscapes and farming systems.

Archaeological evidence for fields, whether in the form of dateable ridge-and-furrow, manuring scatters (*cf* Jones 2004), or negative evidence indicating pasture fields, offers the possibility for developing our understanding of the farming landscapes of medieval Worcestershire.

17.6.3 Material culture

Material culture studies would particularly benefit from:

- The survey and prospection of smaller quays along the rivers, especially the River Severn.

- Excavation of artefact assemblages from rural settlement sites such as moated houses.

- Systematic metaldetecting, which should be encouraged in areas where more intensive arable cultivation is carried out and a high use of fertiliser is associated.

- Large artefact assemblages from major excavated sites remain unpublished for instance from Stafford and Dudley Castles – these are likely to give a good indication of the extents of trade across the region which would have heavily involved river trade.

17.6.4 Environment

The potential of environmental archaeology for the study of medieval landscapes in Worcestershire has not yet been realised. Evidence from towns has provided evidence for consumption of meat and grain. Detailed local studies of rich sequences of well-dated environmental data are needed, to investigate the variation in medieval farming landscapes and the processes of change. The potential of locations such as palaeochannels is discussed above, but so far it has not been possible to fully exploit this resource. Such locations are a high priority for detailed research, which needs to be related to broader landscape research at the level of the medieval estate and urban hinterlands. It is important that future research in environmental archaeology develops stronger links between evidence from towns as consumption sites and evidence from farming landscapes.

18. Earlier post-medieval period, *c* 1540 to *c* 1750 (Gail Stoten)

18.1 Background

18.1.1 Introduction and chronology

For this assessment the earlier post-medieval period has been defined as commencing at 1540, with the end of the dissolution of the Monasteries, and finishing at 1750, with the commencement of the Industrial Revolution. This period includes the Civil Wars 1642-1651.

Although this period is defined as preceding the Industrial Revolution, large changes took place in industrial production, urbanisation and the organisation of the countryside, and it was these slower, more evolutionary, changes which allowed the revolution to occur afterwards.

18.1.2 Nature of the evidence

Evidence for the earlier post-medieval period comprises a broad range of sites and evidence (Fig 25). Recent excavations at Deansway and Newport Street, Worcester have attested to the survival of archaeological deposits of earlier post-medieval date in urban areas. However, it is only relatively recently that the recording and analysis of deposits from this period has been a priority during archaeological investigations, having previously been viewed as less important than earlier periods in deeply stratified excavations, and few excavations have been directed at post-medieval sites of intrinsic value.

As well as the below ground archaeological resource, significant numbers of standing buildings date to this period, including domestic, ecclesiastical and industrial structures. Some visible landscapes in Worcestershire are early post-medieval in origin or have elements of that date, such as formal landscapes around great houses, water meadows and early examples of enclosure. The material culture and environment of this period is considered in separate sections (Sections 20 and 21).

The information gained from the above sources is often fragmentary, and is interpreted through reference to the historical framework for the county. Detailed historic resources, such as tenement histories and early estate maps are both valuable resources themselves, and allow the interpretation and assessment of the excavated archaeological resource (Atkin 2003b).

A major consideration in looking at the distribution of the earlier post-medieval entries on the Historic Environment Record is that these entries, of course, reflect a small percentage of the known post-medieval resource. Due to the frequency of their occurrence, entries do not exist for all buildings, transport links and findspots, as they would perhaps for earlier periods. The city of Worcester, which has a separate database of archaeological sites, is not included within the dataset. Further, the dataset does not allow for a simple division of the post-medieval period into an earlier and later phase and thus the distribution plots for this period (as well as the later post-medieval to modern period; Figs 25, 26 and 27) show all post-medieval monuments and activities recorded on the Historic Environment Record with sites mentioned in the text highlighted.

Naturally, earlier post-medieval sites recorded on the HER show some clustering in urban areas, such as Evesham, which have continued in occupation since that time, and are areas in which archaeological investigations most frequently occur through new development and the planning process. These settlements are generally located on riverine sands and gravels and so are included in the aggregate areas. However, the Historic Environment Record entries show a generally evenly dispersed distribution across the aggregate areas. Most lie on riverine sands and gravels, with a few lying on glacial sands and gravels, igneous rocks and sandbrash. Whilst some sites have purposely been located in close proximity to the rivers or

on the good agricultural land of this geology type, this must partially be a reflection of the far greater area of riverine sands and gravels. There are no major differences in distribution between the valleys of the major rivers.

This assessment focuses on the rural evidence, as these areas are most likely to be affected by the future extraction of aggregates. Likewise, the potential for below ground archaeology and extant landscapes had been considered in greater depth than extant buildings.

18.2 Earlier post-medieval Worcestershire

18.2.1 Rural landscapes

Enclosure

The beginning of the earlier post-medieval period saw a continuation of the landscape of the medieval period (WMRRF 2002). One of the greatest influences on the rural landscape during the earlier post-medieval period was the enclosure of some areas of common land and open fields and pastures, which started during the middle of the 17th century. This was precipitated by increased population growth and urbanisation, as it was seen as a way to achieve increased agricultural output (Newman 2001, 108). In the earlier post-medieval period, this comprised piecemeal enclosure by agreement of landowners, with larger schemes of Parliamentary enclosure taking place in the second half of the 18th century (Newman 2001, 109; Atkin 2003b). Some of the field pattern within the county reflects the boundaries established during enclosure to some degree, with areas of piecemeal enclosure typified by a rather irregular field pattern with curved boundaries sometimes following the former strips within open fields (Taylor 1975, 122). Residences were moved out of villages onto newly-consolidated land holding, resulting in the decline of some rural settlements.

Watermeadow

The post-medieval period saw a general increase in the land used for pasture (Atkin 2003b), resulting in an increased need for hay, for the over-wintering of stock. Areas of lowland pasture were improved by the creation of water meadow between the 17th and 19th centuries (Stamper 2003). This was a system of irrigation that seasonally flooded meadow, protecting it from winter frosts, which could produce a fourfold increase in hay yield (Newman 2001, 114, Rackham 1986, 339). Until recently the region was considered to have been unsuitable for the construction of extensive systems of water meadow, such as those constructed in other parts of the country, although some investments in meadows had been identified (Stamper 2003). However, ongoing work in Worcestershire is challenging this perception with research on the floodplains of the Avon and Severn identifying at least six bedwork systems covering in total some 800 acres (Vanda Bartoszuk pers comm). Of these the earliest documented system appears to be that between Clifton and Severn Stoke (WSM 34925; Fig 25.1) dating from 1576, which was recently partly recorded during fieldwork prior to establishment of a new quarry extension. Other previously known examples of meadow improvement include Chaddesley Corbett (Fig 25.2), where new water works were constructed in the 1690s (Atkin 2003b) and at Heathy Mill Farm (on the former Dunclent Estate), Kidderminster (WSM 33415; Fig 25.3) where a water meadow system dating from *c* 1655 survives as a multitude of individual channels which would have watered up to 300 acres of land.

Marginal land

The earlier post-medieval period also saw an expansion of agricultural cultivation into marginal land such heaths, uncultivated uplands, and alluviated areas. This mainly occurred between the 17th and 19th centuries due to rising population levels (Stamper 2003). Evidence of the management of land in these areas may be visible as ridge-and-furrow earthworks and abandoned field boundaries, as following the abandonment of cultivation areas, they were

often undisturbed by later cultivation. No such systems are currently recorded on the Historic Environment Record, but this remains a possible topic of further research.

Rural settlements

As mentioned above, rural settlements experienced some erosion during this period as farms were moved out to consolidated holdings following enclosure. Entries on the Historic Environment Record within rural settlements usually comprise dwellings and chapels. No deserted villages of earlier post-medieval date are recorded on the Historic Environment Record on mapped aggregate, although where currently undated these may have been included in earlier datasets.

18.2.2 Dissolution of the monasteries, Great Houses and surrounding landscapes

The dissolution of the monasteries affected the rural landscape as it led to the redistribution of much land and wealth. Some individuals used their newly acquired affluence to construct Great Houses or convert former monasteries to residences (Newman 2001, 102). Many of these large homes were sited in Worcestershire in the early post-medieval period (Atkin 2003b, eg Beckford Hall, which is a partially 17th century structure and succeeded a house of Augustinian Friars WSM 28994, Fig 25.4; and The Court House, Feckenham WSM 28946, Fig 25.5). The creation of large landed estates was also encouraged by changes in inheritance law in the mid 17th century (Newman 2001, 132).

These Great Houses were often set in estates, the fashions for the forms of which changed in the earlier post-medieval period (Currie and Locock 1993). Gardens had previously been small, and parks had been enclosed exclusively for housing game (Whyte 1999, 272). Formal, often geometric, gardens were created on a larger scale from the 16th century onwards and landscaped parks were laid out (*ibid*, 272). Fourteen parks and gardens of earlier post-medieval date are recorded on the Historic Environment Record, including the park at Ripple Hall (WSM 28928; Fig 25.6) and the garden at Beckford Hall (WSM 28944). Estates surrounding the great houses had their own individual stylistic palate for buildings, fences, gates and stiles, some of which are visible beyond the current extent of estates (Milln 2003, Stamper 2003).

18.2.3 Industry, production and transport

Although the earlier post-medieval period ended with the commencement of the Industrial Revolution, industrial production changed greatly over the period, laying the foundations for the faster rate of change ahead.

The main type of earlier post-medieval period industrial site recorded on the aggregate areas is the water mill. Such sites are commonly located on sands and gravels, due to their proximity to watercourses. The 16th century saw a great expansion in the use of waterpower for a variety of industries and every stream in Worcestershire that could be used drove water wheels (Atkin 2003b). Ten such mills are recorded on the Historic Environment Record on the aggregates, such as Beechcote Mill, Wolverley (WSM 8162; Fig 25.7) and Washford Mill, Redditch (WSM 48; Fig 25.8). These often changed purpose over their lifetime, being used for such purposes as the processing of corn, straw, cider, paper and, in Redditch, needle manufacture.

Several of these mills were forge mills related to the iron industry (eg the Old Forge, Ipsley WSM 40, Fig 25.9; and the Old Forge Wolverley WSM 12651, Fig 25.10). The iron industry was centred on the Weald in the early 16th century, but as charcoal resources there became inadequate the industry moved to more remote areas including the West Midlands (Whyte 1999, 272). The 16th century saw the landscape of north Worcestershire being transformed by the development of the coal and iron working industries (Atkin 2003b) and from late in that

century blast furnaces began to replace small-scale smelting works**.** The Foley works on the Stour in the late 17th century were an extremely important concern at the time (*ibid*).

The pottery industry collapsed during the earlier post-medieval period in Worcestershire, after which potters may have diversified into clay pipes and roof tiles (Atkin 2003b). No evidence of the ceramic industry dating to the earlier post-medieval period is recorded on the Historic Environment Record, except for the possible location of a sunken barge in the River Severn, which is thought to have been carrying clay pipes (WSM 33851; Fig 25.11).

There was a large increase in extraction, mining and quarrying in the earlier post-medieval period (WMRRF 2002). In the 16th and 17th centuries quarrying had been a small-scale activity but urban growth led to a demand in specialised buildings materials and the industry became larger and more specialised (Whyte 1999, 274). There may be some potential for evidence of quarrying for buildings material in the areas of limestone and evidence of brick making sites in areas of alluvial clay and sand, such as on the banks of the Severn in the Worcester area.

Another form of industrial site present on areas of aggregate is the limekiln. One such site has been excavated on the banks of the River Severn, at Fladbury (WSM 26481; Fig 25.12).

These industrial developments led to improvements in watercourses so that they might be used for the transportation of goods. By 1665 the River Stour had been made navigable from Stourport to Stourbridge in order to serve the iron industry (Atkin 2003b). A lock was constructed at Wyre Piddle between 1636 and 1640 (WSM 20428; Fig 25.13) and five locks were constructed along the River Salwarpe between Ombersley and Droitwich before 1771, when a canal replaced them.

River crossings are frequently present on areas of riverine aggregate, such as the possible ferry point at Ombersley suggested by the fieldname Boat Meadow on the Enclosure Award (WSM 23047; Fig 25.14), a ford at Worcester (WSM 23047) and bridges either constructed or rebuilt during this period (eg at Pershore WSM 5574; and Stanford WSM 8085, Fig 25.15).

18.2.4 Urban settlements

At the end of the medieval period, towns were still suffering from the decline they had experienced during the late medieval period and remained small (Whyte 1999, 276). The earlier post-medieval period saw an increased rate of urbanisation, precipitated by sustained growth in population and the continuation and intensification of the movement of population from the countryside. Older settlements showed large growth, such as Worcester, the population of which grew from 4,250 in 1563 to 7,000 in 1646 as it developed into a regional market centre with an important manufacturing industry (Atkin 2003b, Dalwood and Edwards 2004, 25). Newly established industrial centres showed even greater growth (WMRRF 2002), such as Bewdley which developed as an inland port (Atkin 2003b).

The increased urbanisation was reflected in townscapes, with much infilling of land within town walls left vacant following the medieval decay, and the construction of suburbs. This increase in population density led to improvements in sanitation and fireproofing, following outbreaks of disease and fire. Roof tiles replaced thatch, brick fireplaces replaced open hearths and rubbish was collected and disposed of in pits (Atkin 2003b).

Although unaffected by modern quarrying, a consideration of these urban areas is important for this period since they provided expanding markets for the rural economy to supply with food, fuel and other raw materials (wood, stone, bricks, etc). This is reflected by increases in monument types such as water meadows and quarries within aggregate producing areas as discussed above (Section 18.2.1 – *Rural Landscapes*).

18.2.5 The Civil Wars

Much evidence of the Civil Wars (1642-51) is present in the county of Worcestershire, and while the majority comprises the fortifications of, and modifications to, towns and the defences of manor houses, some evidence is present on areas of rural aggregate. Detailed study of documentary and archaeological evidence has led to a new understanding of the impact of campaigns in Worcestershire (Atkin 1995).

The site of the first skirmish of the first Civil War (in 1642) lies to the south-west of Worcester, at Powick (WSM 1595; Fig 25.16) and the site of the battle of Ripple in 1643 (WSM 27218) and the skirmish at Upton-on-Severn in 1651 (WSM 27004; Fig 25.17), as well as the 1651 Battle of Worcester, are all on aggregate landscapes. The sites are visible in the archaeological record as find scatters; small canon shot, musket balls and a powder flask keg were found at Ripple by metal detecting and lead musket balls were recovered during an archaeological metal detecting survey at Upton-on-Severn (WSM 27004). The accurate recording of findspots of these types has the potential to illustrate how battles developed (Atkin 2003c).

Military action regularly took place around bridges, which are commonly located on aggregates. Pershore Great Bridge (WSM 29948), Bewdley Bridge (WSM 10691) and The Old Bridge at Upton on Severn (WSM 12309) were all partially destroyed during the Civil Wars and there may be potential around them for contemporary finds, demonstrated by those recovered at Upton-on-Severn (WSM 27004).

There may be potential for outlying defensive works to be present around strategic points, such as bridges, and other garrison sites. No such sites are currently recorded on the Historic Environments Record, on aggregate areas, but these works are commonly mistaken for other features such as boundary ditches (Atkin 2003c).

18.3 Research directions

18.3.1 Rural landscape

There is great potential for the expansion of the dataset for the earlier post-medieval period through the inclusion of data on the rural landscape. The interpretation of this resource through historic landscape characterisation is currently in the final planning stages (Adam Mindykowski pers comm) and, when completed, will allow the identification of areas of landscape which show evidence of earlier post-medieval activity, such as piecemeal enclosure.

Areas of future research on the rural landscape might include:

- The effect the dissolution of the monasteries had on land ownership through the redistribution of lands (Atkin 2003b);
- The establishment of Great Houses in the county;
- The extent of former areas of meadow improvement and their survival (Stamper 2003);
- How woodland was managed as a crop, in order to provide fuel for industry (Atkin 2003b);
- Areas of marginal land (including alluviated floodplain) which were brought into agricultural cultivation (Stamper 2003).

Since aggregate extraction is restricted to rural areas these research directions are key ones in terms of the aims of the project. In particular, historic landscape characterisation, when completed, will refine understanding of the rural landscape of the county including that of the aggregate extraction landscapes. As a result, the undertaking and subsequent implementation

and use of the output of this project should be seen as of considerable importance in supporting management of future aggregate extraction.

18.3.2 Industry

Information on the iron industry comes mainly from historic sources rather than archaeological investigations. Survey works and the excavation of smelting sites would provide valuable evidence (Atkin 2003b).

The clay pipe industry has been identified as a possible rural industrial occupation, which may be worthy of further research (Atkin 2003b). Archaeological and documentary research may elucidate this, as would the excavation of any possible kiln sites identified.

Rurally based industries, for instance quarrying for sand and gravel, stone (for building and for lime kilns) and clay (for brick and tile manufacture), are poorly researched in the county for this period, yet were expanding during the earlier post-medieval period to supply (or support the supply of other goods) to the growing urban market. HER enhancement would again be of considerable benefit, for instance through the consistent mapping of documented quarries, limekilns and clay pits of this period.

18.3.3 Civil War

The recording and study of Civil War battlefields should be a priority, as the archaeological record in these areas is under threat from the indiscriminate collection of artefacts by metal detectorists (Atkin 2003c). The survey of these areas should take place at scale of whole battlefield or skirmish site, rather than from fragmented planning conditions, which only investigate small areas. An effective methodology for field evaluation of battlefields should be established, as the current methods of evaluation trenching and limited survey are unlikely to provide much new information (Atkin 2003c).

In order to identify other currently unrecorded Civil War sites and features, a list of historical Civil War events and garrison sites should be added to the Historic Environments Record, and special consideration given to the potential for features in their vicinity during planning applications (Atkin 2003c).

18.3.4 Material culture

No firm pottery chronology exists for the earlier post-medieval period, but a framework for a fabric series has been set up for its development at the University of Worcester Ceramic Research Centre (Victoria Bryant pers comm). It is hoped that this resource, once established, will be available online. The establishment of a local ceramic type fabric series would facilitate the accurate dating of deposits and finds of earlier post-medieval date, providing a greater data set (Atkin 2003b). This would also lead to a better understanding of the ceramic industry in its own right (*ibid*).

19. Later post-medieval and modern period (Gail Stoten)

19.1 Background

19.1.1 Introduction and chronology

For this assessment the later post-medieval and modern period has been defined the period after 1750, a date generally taken to be the commencement of the Industrial Revolution. This date was a watershed for much of the archaeological resource, which was mainly precipitated by increased industrialisation and urbanisation. This period includes the Napoleonic wars of 1796-1815 and the First (1914-18) and Second (1939-45) World Wars and the Cold War (1947-1991), evidence of which is present in the archaeological record. Transport systems were revolutionised during this period, first with the construction of the turnpike roads and canals, and the improvement of rivers for navigation, then the construction mainline railways. Urbanisation caused changes in the organisation of the countryside including Parliamentary enclosure. All of these changes had roots in the earlier post-medieval period, but the beginning of the later post-medieval period saw an increase in the rate of change which reflects a genuine watershed in people's way of life.

The period around 1750 also saw a change in country estates with the creation of more informal landscapes for the enjoyment of their owners. Great changes also occurred to these estates as entities, culminating in the modern period with the break-up of many large land holdings between 1930 and 1950.

19.1.2 Nature of the evidence

Many types of evidence contribute to the resource for the later post-medieval period. Documentary sources provide a wealth of evidence on all aspects of the period including individuals, industry and land organisation. The first cartographic sources with widespread, accurate coverage of the countryside, those accompanying the Enclosure Awards and Tithe Apportionments, were produced in the later 18th century and early to mid 19th century, followed by mapping of the entirety of the county by the Ordnance Survey from the late 19th century onwards. Aerial photographs of the 20th century cover the entire county. Evidence for the whole of this period can also be gained through the analysis of standing buildings and the visible landscape.

Below ground archaeological deposits from this period are usually incidental discoveries in excavations to record earlier activity, although they can provide valuable evidence for this period, including that relating to the development of urban areas, the evolution of industry, former landscape organisation and the more ephemeral features relating to the defence of Britain during the Second World War. Deposits of this period are rarely given priority in archaeological recording for their intrinsic value as part of the archaeological resource. As with the earlier post-medieval period, the information from the archaeological resource is fragmentary and is often used to illustrate the historical record rather than vice versa.

The entries for this period on the Historic Environment Record naturally reflect a small percentage of the known resource, due to the frequency of standing buildings, landscape features and findspots (Figs 26 and 27). This may also reflect the importance assigned to resources of this date, as they are often only mentioned in report summaries when deposits of other dates were not encountered. Although the survival of resources of the later post-medieval period is far greater, more HER entries exist for resources of later prehistoric, Roman and medieval dates on the areas of aggregate this study covers. Furthermore, the dataset does not allow for a simple division of the post-medieval period into an earlier and later phase and thus the distribution plots for this period show all post-medieval and modern monuments and activities recorded on the HER with sites mentioned in the text highlighted.

The HER entries on the aggregate show strong clusters around the urban areas which, as they were sited on rivers, are often located on riverine sand and gravel. Other clusters are present along river valleys due to the lines of communication that followed them for topographical reasons, and the siting of industry close to these links.

This assessment focuses those areas most likely to be affected by future aggregate extraction: rural areas. Likewise, the potential for below ground archaeology and agricultural landscapes had been considered in greater depth than extant buildings and formal landscapes with statutory protection.

19.2 Later post-medieval and modern Worcestershire

19.2.1 Industry

The industrial revolution is generally considered as commencing in the mid 18th century and lasting until the second quarter of the 19th century (Clark 1999), although, as mentioned above, many industrial developments took place in the earlier post-medieval period (Section 18.2.3). The opening up of overseas markets precipitated growth in industry and the improvement of transport links, and the urban factory system led to the growth of towns and cities and the movement of population from the countryside (Dinn 2003; Clark 1999). Great technical advances were made and the scale of industry grew (Dinn 2003). See Section 20, *Material Culture*, for a discussion of the material culture and manufacturing output during this period.

Manufacturing was typically specialised by location in urban areas, especially in the north of the county, such as the Worcester porcelain industry and carpet weaving at Kidderminster (WSM 9901, 12900, 12904, 29162, 33917-29, 33932-5, 33937-8, 33940-2, 33944, 33946-7, 33950; Dinn 2003).

Although the period saw the acceleration of centralised production in urban areas at the cost of rural industries, such as the pottery industry, evidence of industrial production in more rural areas is present, including the continuation in use and conversion of mills on watercourses. Examples of rural mills include the site of Parsonage Mill, Alvechurch, on the River Arrow (WSM 1741; Fig 26.1) which was constructed in the earlier post-medieval period, but was converted to a scouring and pointing mill by 1855 and Astley Forge on a tributary of the River Severn which was an earlier post-medieval fulling mill which was later converted to a forge (WSM 238; Fig 26.2).

Industrial activity in rural areas often produced products which where further processed elsewhere. Accommodation for seasonal hop-pickers has been recorded at Church Farm, Grimley (WSM 26896; Fig 26.3) and hop kilns are recorded at Callow End (WSM 27223; Fig 26.4), showing evidence of activities supporting other industries. Other examples of such rural activities which may show in the archaeological record of rural areas are tanning at Alvechurch (WSM 30061; Fig 27.5) and lime production close to transport links (WSM00678; Fig 26.6).

Evidence of modern extraction is also present on the areas of aggregate, as there was a massive increase in the demand for raw materials during this period, for industrial purposes and also for construction (Clark 1999, Dinn 2003). A gravel pit is recorded on Ordnance Survey mapping at Hartlebury Common (WSM 32705; Fig 26.7), modern sandpits were recorded at Bromsgrove (WSM 15476; Fig 26.8) and it was the extraction of minerals from a number of quarries across the county during the 19th and 20th centuries which led to many antiquarian and subsequent archaeological discoveries. Although the focus of these has always been on the earlier materials present, these quarries also form part of the archaeological record in their own right. However, many of these quarries (both hard rock and sand and gravel) as well as clay pits are not included on the HER, yet are often documented through secondary sources as well as more comprehensively through Tithe and early Ordnance Survey map editions.

19.2.2 Urban development

With the increased industrialisation, towns in the north such as Kidderminster, Droitwich and Redditch towns expanded as people moved from the countryside. Population expansion was also experienced due to falling death rates (Clark 1999). This led to higher density occupation of settlements (Dinn 2003). HER entries for urban areas include non-conformist chapels and workhouses as well as residences. Later trends within urban areas included post-war slum clearance and the growth of suburbs (*ibid*). Evidence of this urban growth also includes sites such as Evesham's Victorian and Edwardian rubbish dump (WSM 26409), reflecting the need to collect rubbish in growing towns.

19.2.3 Transport

The growth of industry is also reflected in more rural areas by the transport links which crossed them. The later post-medieval period saw a revolution in transport systems including the construction of turnpike roads, canals, railways and improvements in river navigation.

Roads

The road system remained essentially medieval in character until the later 17th century, with few roads having metalled surfaces. The system was greatly improved by the construction of turnpikes roads in the later 18th century and early 19th century, many of which continue in use today (Clark 1999). Examples in Worcestershire include the Kidderminster to Worcester Road (WSM 32710). Features associated with Turnpike roads include tollhouses (WSM 19732; Fig 26.9), milestones (WSM32348, Fig 26.10; WSM 32947, Fig 26.11) and bridges. The sources which provide evidence for many aspects of turnpike travel in Worcestershire have been surveyed (Gwilliam 1987).

Rivers

The River Severn was the most important transport artery in the county until the early 20th century, and increased in importance from the mid 18th century when the river was linked to growing canal system (Underdown 1984; Dinn 2003). The principal river ports were Bewdley and Worcester (Trinder 2003). Navigation of this watercourse was improved in the mid 19th century by the construction of locks (as at Lincomb WSM 22565, Fig 26.12; Dinn 2003). The documentation of these works is poor, due to the lack of bureaucratic control during their planning and construction (Trinder 2003). Works were also carried out to improve the navigation of the tributaries of the Severn, including the Avon, Teme and Dick Brook (*ibid*).

Evidence of the use of the rivers for transport may include isolated settlements with pubs, owners' houses and boat building yards (Trinder 2003). The site of a boathouse is present at Evesham (WSM 33910). The area in which the Engine Basin at Stourport was constructed was previously used for the repair of Severn trows (WSM 17447). Towing paths were built between 1796 and 1810 in order to aid transport (*ibid*), and one such path is recorded on the HER at Stourport (WSM 32512).

River crossings

River crossings are common site types on the areas of aggregate. The documentary and pictorial material has been comprehensively surveyed (Gwilliam 1976; 1982). Bridges were frequently built or rebuilt during the later post-medieval period, many replacing earlier structures (eg Holt Fleet Bridge WSM 02581, Fig 26.13; Eastham Bridge WSM 8091, Fig 26.14; Stanford Bridge WSM 8085, Fig 26.15). The points at which ferries crossed are also recorded (eg that at Stourport WSM 23822), as are the locations of fords.

Canals

The canal network in Worcestershire, which was constructed in the later 18th century, included the Staffordshire and Worcestershire canal, the Droitwich Barge Canal and the Birmingham and Worcester Canal (Fig 26). Stourport was a major inland canal port (Dinn 2003) and retains many canal features, such as basins (WSM 12856, 17447 and 19651); wharf areas (WSM 32841), sluices (WSM 32843), and walls (WSM 32862). The sites of other features, such as warehouses (WSM 32856) are also recorded. Evidence of canal basins has been uncovered during archaeological excavations (WSM 24809 and 30152). These features tend to be clustered around the ports. They were originally more numerous in these areas but this clustering also reflects the detailed recording carried out at Stourport prior to the formation of a Conservation plan. Worcester did not have as many canal connections as Stourport, but did have some canal features (WSM 23250).

Other features associated with canals include the routes of the canals themselves, locks (eg those on the Droitwich Barge Canal WSM 32232-3), bridges (eg Clay House Bridge on the Staffordshire and Worcestershire Canal WSM 32529), possible leats (such as that at the Dick Brook WSM 22312) and aqueducts (such as the Rea Aqueduct WSM 8713). There may be potential for other associated sites to be present in close proximity to the canals, such as granaries, timber yards, limekilns and brickyards (Trinder 2003).

Railways

Railways had antecedents dating to as far back as beginning of canals in localised tramways, but the introduction of effective steam locomotives in the 1820s and 1830s encouraged the construction of the first true railways (Whyte 1999, 275). The basic infrastructure of the railways was begun in the 1830s and experienced rapid expansion in the 1840s (Morriss 1999, 26). However, railways were late to arrive in Worcestershire (Dinn 2003). The Birmingham to Gloucester line crossed the county but bypassed Worcester, which was not connected to the railway network until 1850 (*ibid*; Fig 26). Evidence of the camps of those who constructed the railways may be present in the vicinity of the lines (Trinder 2003). Many industrial works were connected to the railway network by small branch lines, such as the salt works (WSM 10574) and clay pits (WSM 10576) at Droitwich. Following the recommendations by Beeching in the early 1960s, many branch lines to settlements and duplicate routes were closed (Morriss 1999, 33). Dismantled lines recorded on the HER include the Teme Valley Line (WSM 15050), the Malvern to Tewkesbury Line (WSM 17504) and the Harvington, Norton and Lenchwick Line (WSM 15447). These lines and others have the potential for railway related features along their route and cross past, present and potential future aggregate extraction landscapes.

Aviation

Evidence of early flying fields is generally sparse, unless they were later converted to RAF bases (Trinder 2003). The airfield at Perdiswell, Worcester was established in the 1930s (WSM 12534). Military airfields are discussed below.

19.2.4 Rural landscape

The later post-medieval period has seen great changes in the rural landscape. Some of these were in reaction to the increase in demand for agricultural output due to continuing urbanisation and the reduction of death rates leading to population growth.

Parliamentary enclosure took place in Worcestershire during the later 18th century, during which open fields were divided into clearly bounded enclosures and areas of previously uncultivated land were divided into holdings (Newman 2001, 106, Atkin 2003b). Enclosure was seen as a step towards improved agricultural production, by allowing greater individuality and flexibility, whether there was a direct link or merely a perceived one (Newman 2001, 108). This resulted in the “Enclosure landscapes” visible in the county, with

large redbrick farmhouses set in the middle of rectilinear fieldscapes (Dinn 2003). Newly laid out boundaries were often straight and bounded by hawthorn hedges (Newman 2001, 110). The relocation of farms to newly consolidated land holdings resulted in the erosion of some rural settlements. Evidence for these changes mainly lies in the maps which accompanied the Enclosure Awards, but the visible landscape contains many boundaries established during this period. This major landscape reorganisation was particularly important in south-east of county, where the reorganisation was accompanied by change from arable cultivation to livestock farming, rather than the north-eastern and western areas, which retained some woodland and pasture enclosures dating from the medieval period and earlier (See Section 17: Medieval).

Some areas of communal grazing, known as *Lammas meadows*, survived following enclosure. Worcestershire had a high number of post-enclosure survivals of this type (Newman 2001, 107).

The consolidation of land holdings allowed agricultural improvements to be adopted. Model farms (eg at Callow End, WSM 27223; Fig 26.16) and new machinery revolutionised agricultural practices and increased output (Milln 2003). This has been a continuing process, which has been reflected in the enlargement of fields in the 19th and 20th centuries. Specialist agricultural areas are present in the county, such as the Vale of Evesham, which has a history of market gardening (Dinn 2003).

The demand for increased agricultural output also resulted in the expansion of cultivation into areas of more marginal land. The early 19th century saw the encroachment of cultivation into such areas, due to expanding population levels and an increase in grain price precipitated by the Napoleonic Wars (Stamper 2003).

Other later post-medieval sites which may be present on aggregates in more rural areas include flood control systems, such as that at Eckington (WSM 5915; Fig 26.17) where an earthen bank, causeway and sluice prevent waters from the River Avon flooding 80ha of low lying ground.

19.2.5 Estates

Worcestershire contains many Great Houses, and the parks surrounding them are particularly well represented on the HER, and subject of a general survey (Lockett 1997). Many of these parks were established in the earlier post-medieval period or before, but were modernised during the later post-medieval period (Dinn 2003). The middle of the 18th century saw park styles change, from formal landscapes to more informal, naturalistic settings with less of a divide between the garden around the house and any larger park (Newman 2001, 104, Milln 2003). These landscapes included eye catchers on land beyond the limits of the park (Dinn 2003). The 19th century saw a partial return to more formal styles (Milln 2003).

The estates often included far more than the Great Houses and parks, with extensive tenanted lands commonly including farms, villages, and woodlands. Land within these estates was united by common elements such as vernacular architecture, fencing types, stile construction or gate types. Estates of this kind dominated the structure of the countryside until the 1930s-50s, when punitive taxation, war requisition, labour shortage and changing fashion led to the break up of many large holdings (Milln 2003). Smaller estates, sometimes only comprising a large house and small park, were created by wealthy industrialists with newly acquired prosperity (*ibid*). Many estates survive today in a reduced form, and there may be potential for characteristic features, such as cottages in a particular architectural style or distinctive stiles, to be present in the vicinity.

19.2.6 Military

The record of military structures in Worcestershire is outstanding, due to the Defence of Worcestershire Project, which has been incorporated in the HER. The majority of the HER entries are for sites relating to the Second World War, although evidence of other episodes, including the Napoleonic War and the Cold War, is also present in the archaeological record, as well as that of general military activity during peacetime (Fig 27).

The French revolutionary and Napoleonic Wars (1793-1815) caused the price of grain to rise. As mentioned above, this resulted in land being brought into cultivation in areas where this had never been attempted before or since (Stamper 2003). Evidence for this expansion may include areas of straight ridge-and-furrow (distinct for curving earlier examples) and now-abandoned barns in upland locations (*ibid*).

A rifle range was recorded at Hartlebury Common (WSM 32725-9, 32680, 32685, 32693 and 32697; Fig 27.1) in the late 19th century. This may have been used by a group of Rifle Volunteers (predecessors of the Territorial Army). Other evidence of such groups comprises Drill Halls in towns (Dinn 2003).

As mentioned above, the structures relating to the Second World War are the most numerous military sites on areas of aggregates within the county, and most of these were anti-invasion in purpose. The original plan for the defence of Britain was to hold the beaches, but this was replaced from June 1940 by a plan for the defence of static lines across the country using stop lines (Atkin 2003d). Stop lines present in the county of Worcestershire included the River Avon, as well as the Shropshire Union Canal, and so naturally many defensive features are present on areas of aggregate. The fortification of the stop lines continued until 1942 (*ibid*). Defensive features are also found around road, rail and river crossings, factories and airfields (*ibid*).

Anti-invasion features commonly found in these strategic locations included anti-tank defences (eg Shrawley WSM 17143, Fig 27.2; Upton-on-Severn WSM 17080, Fig 27.3; Whittington WSM 17125), pillboxes (eg Hartlebury WSM 17126, Fig 27.5; Eastham WSM 17083, Fig 27.6; Stanford Old Bridge WSM 22786, Fig 27.7) and spigot mortar emplacements (eg Pershore Bridge WSM17234, Fig 27.8; and Bredon telephone exchange WSM 17241, Fig 27.9; Atkin 2003d). These features usually occurred in groups (*ibid*). Another type of feature which occurs on aggregates is the anti-glider trench. These were often located on flat floodplains which had the potential to be utilised by enemy aircraft. These features and can be seen on historic aerial photographs, where they show as grids, sometimes with distinctive spoil heaps neatly positioned either side of the trench cuts.

Should the stop lines have been broken, resistance was to be carried out by Auxiliary Units. A possible hide used by such a group has been recorded at Claines, Worcester (WSM 17202; Fig 27.10).

Other Second World War related features include public air raid shelters (eg Worcester WSM 17091, Bewdley WSM 17096, Kidderminster WSM 17229), air raid sirens (eg Claines WSM 17132; Fig 27.10), air raid warden posts (eg Worcester WSM 17192), search light batteries (eg Bredon WSM 24712; Fig 27.11), observation posts (as at Whittington WSM 27728; Fig 27.4), RAF billets (eg Claines WSM 17145; Fig 27.10), re-fuelling points (eg Claines WSM 17158) anti-aircraft gun emplacements (eg Stourport WSM 17086) and petrol tanks, some of which were have been found in rural locations, such as at Ryall (Martin Watts pers comm). Two airfields are also recorded on areas of aggregate, at Wick (WSM 12536; Fig 27.12) and Perdiswell (WSM 12534; Fig 27.13), which have the potential for other related features in their vicinity.

One feature relating to the Cold War Era is recorded on aggregate areas within Worcestershire. This is a nuclear bunker constructed in 1954 at Powick (WSM 17196; Fig 27.14).

19.3 Discussion and research directions

19.3.1 General

As with the earlier post-medieval period, no firm pottery chronology exists for the later post-medieval period. Again, the University of Worcester Ceramic Research Centre hopes to establish a fabric series (Victoria Bryant pers comm), which would facilitate dating of later post-medieval deposits and provide information on the pottery industry itself.

19.3.2 Landscape

Much information on the later post-medieval period is present in the visible landscape. The interpretation of this resource through historic landscape characterisation is currently in the final planning stages (Adam Mindykowski pers comm) and, when completed, will allow the identification of areas of landscape which show evidence of changes of later post-medieval date. The completion of this will be of considerable benefit to the understanding of the later post-medieval and modern landscape and will support decisions relating to future aggregate extraction proposals as well as inform any associated mitigation responses developed.

19.3.3 Transport

Records relating to surviving features of the later post-medieval transport network are skewed towards listed structures and urban areas in which detailed studies have taken place, such the canal features of Stourport. There is great potential for the assessment of the survival of associated features along the whole of the transport routes rather than just their urban hubs. Features may include rural railway halts; canal footbridges, leats, milestones and mooring posts and wharves and industrial works sited close to navigable watercourses.

Other general themes for further studies include:

- The network of pre-turnpike roads (Trinder 2003);
- The study of the chronological development of the canals (*ibid*);
- The location of camps used in the construction of railways, through aerial photography (*ibid*).

19.3.4 Industry

Areas of aggregate may have the potential to provide information on how more rural industries, supplying products that were processed elsewhere such as lime production and tanning, evolved over this period. These industries may be an area of potential further study.

The industry of quarrying itself has received little attention in Worcestershire and, as noted above, mapping of documentary evidence (especially cartographic) onto the HER has considerable potential to reveal the development and distribution of hard rock and sand and gravel quarries as well as clay and marl pits, all of which form important elements of the later post-medieval and modern landscape.

19.3.5 Estates

The HER entries relating to estates mainly comprise the formal landscapes surrounding great houses. Former tenanted farmlands retain generic characteristics long after the break up of the estate to which they belonged. Identifying what these features were for each estate (Milln 2003) and mapping these features where they survive beyond the formal landscapes surrounding the houses, where they are particularly vulnerable to change, would be provide valuable information on the later post-medieval landscape.

19.3.6 Military sites

The Defence of Worcestershire database provides an outstanding record of military sites in Worcestershire. There may be some potential for the identification of further sites, such as anti-glider trenches, through analysis of aerial photographs.

It may be possible to identify areas of land brought into cultivation during the Napoleonic War using aerial photographs to identify zones of straight ridge-and-furrow in upland areas. The reports of the Board of Agriculture could also be reviewed for references areas of new cultivation (Stamper 2003).

20. Post-medieval material culture (Derek Hurst)

20.1 Background

The material culture of this period is generally poorly represented in the archaeological period in this region, as few sites have been excavated, whereas, in contrast, this period was, of course, a period characterised by a huge increase in the manufacture and consumption of material goods. Fortunately there are numerous documentary sources, and many buildings still surviving from the 16th century onwards, which, taken together, serve to reflect the life-style and aspirations of the people of this period. These, in themselves, readily convey a strong impression of increasing wealth, as they reveal the widespread use of new or improved materials often involving long-distance trade in the course of sourcing, processing and manufacture, thereby signifying new technological advances and improvements in transportation. The latter were necessary in order that such complex production and supply chains could still achieve an affordable product.

Initially, however, the post-medieval period saw the continuation of medieval styles of objects and production methods, and a post-medieval signature only developed gradually. It can be identified with, for instance, the move towards brick and glass in buildings, and in domestic household terms by a move towards, for example greater use of pewter rather than ceramic vessels by the emerging middle classes, and by changes in eating habits, such as the use of the fork, which made plates generally more useful at table. The latter would have encouraged the production of cheap ceramic examples, as well as boosting the production of pewterers. There is also an increase in households that have silver, often to be noted in the inventories of wills, and this is another sign of increasing middle class aspirations. The greater use of metal objects in the household, especially pewter vessels, is another sign of the desirability of shiny durable metal in preference to ceramic.

The upper Severn navigation was open by 1660 allowing long distance carrying on water over a distance of over 100 miles (Trinder 2005), and there was also continuing pressure to make the major tributaries as navigable as possible (Willan 1937). Some have considered the Severn and its tributaries in the early modern period as the second most important navigation system in Europe in the volume of goods carried (Wanklyn 1996).

It might seem there is little reason to consider that the material culture *per se* of the area of aggregates (main navigable river valley) would differ from anywhere else in the region. But there may be some themes where the aggregates resources and the river play a more significant role. The Port Books of Gloucester are an important source of information about the use of the river in the 17th to early 18th century, where goods were either being imported or were leaving the river system; however, much of the trade was also internal and so was not registered in the Port Books (Trinder 2005). The following is an attempt to develop some of the possible themes that reflect especially the social and commercial importance of the river, and where distinctive developments occurred.

20.2 Discussion

20.2.1 Trade

One distinctive aspect of the river was the presence of carriers who could be engaged to move goods over long distances by boat (Trinder 2005, 72). Many of these only operated on a local basis but some regularly carried goods imported by sea to local markets along the river system.

Ceramics

Ceramics are often the best indicator of material culture in the archaeological record and it is clear that the river was having a large influence on this industry and the distribution of its products as in earlier periods. Broadly there was a transformation of ceramic trade patterns as 'country' potters, some of which were large-scale producers such as at Hanley (Worcestershire), made way for factory-based production (eg Staffordshire). The Staffordshire industry was emerging in the 17th century (Barker 2003) but was to reach new levels when it was connected to the port of Liverpool and to the Severn valley via the Staffordshire and Worcestershire Canal (opened 1772). Before this there was large numbers of wagons and packhorses bringing the Staffordshire wares to Bridgnorth (Trinder 2005, 81).

Other production centres also emerged in this period along the banks of the River Severn, for instance at Bristol and at Broseley, clearly demonstrating the impact of cheap transport whether of raw materials or of the new products themselves. This expansion of industry was usually accompanied by a downturn of similar industries that did not enjoy such a favourable location, the pottery manufactories of Wednesbury for instance. The concomitant trend, however, towards common styles which became uniform through greater mechanisation has led to greater difficulty in the study of these industries through archaeological finds, as the material from different centres often looks much the same.

If, as seems likely, incoming goods from other parts of the country and beyond are entering the West Midlands along the River Severn then it may be possible to trace the distribution of goods into the hinterland through a series of markets or other *foci*. The trade of German small stoneware 16th century drinking jugs may be a case in point, as this type of ware is infrequently found in the rural hinterland of Welsh Borderland or West Midlands, except perhaps at sites where higher status consumption is suspected (eg adjacent the manor house of Edvin Loach in Herefordshire; Hurst 1998, 16). This suggests that entrepôt sites like Worcester would have a higher percentage of such high quality wares, but insufficient data has yet come to light to confirm this.

One sidelight on this trade has come from Hanley Quay to the south of Worcester. That such pottery was also unloaded at other wharves along the way is demonstrated here by a diving find where a sherd of this ware was found in association with a large quantity of other local pottery (WSM33770/1; Fig 25.18). This seems to indicate that the quay was the site of both incoming and outgoing trade as the local pottery was presumably being exported at the time of its breakage.

In some cases, the production of pottery concentrated in the ports themselves so as to get maximum commercial advantage of cheap transport costs. Examples would be the Barnstaple and Bideford potteries producing the gravel-tempered wares of the 17th –18th centuries, often in very heavy forms such as ovens. The Hanley potters had long taken advantage of water transport though they were based about 2km from the riverside. The emergence of new higher-status wares such as Bristol delftware probably also had similar advantages from their location in Bristol. However, the Staffordshire potters long excluded form the Midlands due to their poor transport connections in that direction, had to wait till the construction of new artificial waterways when the Trent and Mersey Canal was completed in 1777. This allowed their wares to be exported in quantity via Liverpool and their home market to also be expanded.

Pottery, therefore, provides a good example of how material culture was fundamentally influenced by the navigable river in eras where material goods were increasing in availability through increasing production at key sites where cheap raw materials could be exploited.

Other goods

On a wider material culture level, bulk goods were also carried by river and this had implications for the ability of other production centres such as Droitwich to take advantage of the new trading opportunities available through the opening up of the New World and of

other markets overseas. Initially in the post-medieval period the Cheshire salt makers made good use of the Severn by sending large quantities of salt south to Shrewsbury and then loading it onto river craft; however in the early 18th century the Worcestershire salt makers were dominating the trade in salt along the Severn, and this made for the efficient return carrying of coal from the Forest of Dean (Trinder 2005, 80). In this case Worcester acted as the main entrepôt for Droitwich salt, the salt being initially carried by road this far (Hussey 2000).

The access to cheap raw materials (at least relatively cheaper than they would have costed further away from the river) was a major competitive advantage to manufacturers that set up in the riverside towns, and this had the broad impact of promoting jobs at these locations and boosting the economies of these towns. Major ports such as Bristol had the biggest advantage as, before transhipment, raw materials could be processed before being sold on, as in the case of soap manufacture (Trinder 2005, 79). Many other industries gained from their proximity to the river, for instance pipe makers had access to the north Devon white clay (Trinder 2005, 81), and the metal trades which could move raw materials such as lead downstream from Welsh sources very cheaply (Trinder 2005, 84). Agricultural producers also used this cheap means for moving their less perishable products such as cheeses (Trinder 2005, 84). Access to such goods also potentially made the ports and riverside towns the cheapest places to live for everyday, as well as luxury, goods. It enhanced the trade of these places because prospective purchasers could confidently send their orders to these places, and this perpetuated the tendency towards long distance trade, which characterised the medieval tendency for most classes to patronise their regional fairs.

In some cases, for instance textiles from the north-west, the goods were just passing through before being exported (Trinder 2005, 80), in which case the main gain was just business for the major carriers. Again Bridgnorth and Bewdley were the main beneficiaries of this through trade.

The availability of cheap coal for brewing and heating was also an important contribution on the domestic front, and so made living in towns located on navigable rivers much cheaper. Such considerations no doubt affected the choice of Worcester as the centre of the Worcester porcelain enterprise in the mid 18th century, but had presumably affected decisions about other industries for many years previously.

Exotic goods from far afield such as stockfish from Newfoundland and tobacco from the New World, were given easy access to Midlands markets through the Severn, and as a result people understood that they were reliant on Bristol for certain goods (Trinder 2005, 79).

The river acted as cheap means of moving very heavy goods such as timber as it could be floated down the river, though the unwieldy nature of this method often meant that bridges were damaged (Trinder 2005, 76). Other forest and woodland products were also exported from their local region by water such as Wyre Forest goods from Bewdley.

The exploitation of raw materials took off in this period as more scientific study led to better understanding of the location of resources and to their more efficient use (Dawson and Bone nd). As a result material goods became much more widespread and cheaper with the rivers playing an important role in their distribution.

General

This evidence may also point to a much wider phenomenon, where the main trade route (being the navigable river and its associated trading points) channelled trade in certain ways, in much the same manner as has been claimed for Bristol in the post-medieval period. Here, the historical evidence is viewed as supporting the idea that the port became the dominant regional centre for commerce and culture, influencing the trade in both its own and in imported goods across a wide region reaching into the Midlands, as well as in other directions through internal trade (Hussey 2000).

Waterways opened up at Bristol into the coastal trade along the coastlines of south Wales and south-west England, and ultimately to the trans-Atlantic routes to the Caribbean and the New World. Both incoming goods such as sugar and tobacco and the quickening in outgoing trade in manufactured goods depended on the river to link with consumer sites inland – the river therefore led to the transformation of material life across the whole of the wider region. This in turn could lead to the decline of the vernacular, for instance in building, as now products come be brought in from greater distances especially for more prestigious schemes sponsored by the newly wealthy industrialists (Alfrey and Clark 1993). Improvements in the river navigations themselves led to the construction of weirs and the introduction of dredging (Palmer and Neaverson 1994, 153) which drastically changed the character of some rivers. More market towns were brought within the orbit of the coasting trade and this allowed farmers as well as manufacturers to develop more distant and extensive markets. One potentially important aspect of this process for future research is that where later transport developments in canals and railways have bypassed such local centres, there is a higher chance that worthwhile remains still survive rather than in the large towns which have continued to develop at every opportunity (Crossley 1990, 90)

20.2.2 Other aspects

It is important to identify the small quays along the navigable rivers, as it is possible to find submerged structural remains of the earlier quaysides. One particular example with high research potential is the site at Hanley Quay (WSM33770/1; Fig 25.18; Hurst 2004), though so far these remains have not been dated. However, underwater exploration has shown that medieval pottery including almost complete pots such as a rare chafing dish of the 15-16th century have survived. It is uncertain how rare a survival this is as there have clearly been destructive forces at work within the river system, specifically dredging, though the current work at Hanley has shown this to be a localised effect. So far this type of site has only been identified in the current channel but such sites, most likely in other periods, could now be marooned in cut-offs, etc away from the main channel. Their identification would provide evidence for the physical network of how material culture was disseminated across the region.

More ephemeral, but no less important, are the contacts that the local mercers had with the river trade, which made them an efficient supplier of goods. Though their dependence on river trade should not be overestimated, as they also had road connections with major cities. It is surprising, for instance, how little imported wine was apparently conveyed by river (Trinder 2005, 78).

The exploitation of aggregates was integral to the pursuit of some of these new industries. For instance brick and tile making had moved by the end of the medieval period out of the city of Worcester and spread along the riverside both to the north and south of the city, for instance just north of Severn End House in House in Hanley Castle parish. Here the alluvial clays and sands were fashioned into brick which was to become the preferred building medium when timber framed construction lost its pre-eminent position. Such early post-medieval industrial sites have so far not attracted much attention. Equally they do not show up in the Port Book evidence as the bricks would usually have been used fairly locally (Trinder 2005, 77), and so other local documentary sources need to be searched in this case.

The success of the Severn navigation brought pressure to expand the system, so that others could benefit both through easier trade and higher profits, giving rise eventually to the canals being proposed that would, for instance, improve links with the Black Country, where metal goods were being manufactured. The creation of Stourport and its new canal meant that the whole process of manufacturing from the raw materials to the finished product could now be carried out with the benefit of cheap transport. The new canals expanded this system building on the existing foundation of river navigation, the latter often receiving little recognition in the rush to build the new canals. The emergence of fast overland transport by rail in the 19th century eventually led to the demise of commercial water transport, and the decline was well under way by the later 19th century.

20.3 Recommendations

Two areas of importance are highlighted:

- Underwater exploration of the quaysides that were attested in the post-medieval period, as preliminary survey at Hanley Quay in Hanley Castle has revealed significant structural remains as well as 16th –17th century finds from the Severn riverbed (Hurst 2004).

- Identification of sites associated with the manufacture of ceramic building materials which the historical evidence suggests were a feature of the riverbank in this period.

21. The post-medieval environment (Elizabeth Pearson)

Despite this being a period of radical reorganisation of the field system as a result of the parliamentary inclosures, there is very little evidence of this from environmental archaeology studies to date.

As well as the changes in the way land was owned, tenured and enclosed, there was a major change in emphasis on arable farming to a more mixed farming system over a large area of the Midlands where the production of fodder crops, and hay was important. As fodder crops, such as turnips, clover and others tend not to be exposed to fire, their potential for survival in the archaeobotanical record is limited to waterlogged and mineralised deposits. Deposits of this nature, dating to the early post-medieval period, tend to be found in or at the edges of urban areas which are not under threat of aggregate extraction. Even in off-site peat deposits, changes that occurred at this time are less likely to be commented on as these sequences (or the relevant upper elements of the sequences) are rarely dated by artefactual remains while and radiocarbon dates for this period become unreliable. It is possible, however, that evidence for these shifts in agricultural practice may be identifiable simply by the presence of indicators of such change in the relevant parts of sequences even where not specifically dated, and this is especially the case where supporting documentary evidence is available. For example, it is well documented that the Vale of Evesham became an important area for market gardening at this time, and should crops such as tobacco or asparagus be identified, they would provide a marker for the early post-medieval period.

Improved domestic livestock breeds were bred during this time, and may be identifiable in animal bone assemblages from rural sites (where metrical data is analysed), although there are likely to be few of rural sites within aggregate producing areas. Introduction of animals such as the turkey from the New World may also be evident in animal bone assemblages of this date, although their occurrence is likely to be rare.

Industrialisation of the metalworking industries, particularly those of the Black Country and around Ironbridge in Shropshire, may be detectable in Severn Valley sediment profiles by mineral analysis of sediments. Detection of metalworking and mining has been demonstrated in much earlier deposits (Thorndycraft, Pirrie and Brown 2003), but this could be applied to deposits of this date. Mineral debris from the ironworking industries in south Wales have been picked in sediments within an artificial pool of post-medieval date (dated by documentary evidence) at Kyre Pool, Worcestershire. This was discussed by Nathan Pittam (University of Coventry) at the early post-medieval seminar for the West Midlands Research Frameworks for Archaeology held at the Ironbridge Museum, but is presently unpublished. Given the importance of the region during this period in terms of development of the Industrial Revolution and given the likely impact on the environment that these had, the development of such analytical approaches should perhaps be encouraged.

Landscaped gardens with new exotic planting became more common at this time. Environmental archaeology has been used in the interpretation of these sites, but there are practical problems in the recovery of this information, mostly concerning preservation of organic remains in well aerated and rotivated soils. This has been discussed as part of the West Midlands Research Frameworks for Archaeology (for the early post-medieval period; Pearson 2001). At Castle Bromwich gardens (Chambers 1993), however, ash, holly, ivy, walnut and privet and geranium pollen was identified in the plant bedding areas, demonstrating that relevant information can survive. Organic deposits from ornamental ponds, fishponds and moats would also be of value in this context.

Part 4: Research agenda

22. An initial research agenda for the mineral resource producing areas in Worcestershire

22.1 Introduction

Part 4 of this report presents a research agenda for the aggregate-producing areas of Worcestershire. For the purposes of this report, a research agenda is defined as a list of gaps in knowledge and of work that could be done, together with consideration of the potential for the resource to answer questions (Olivier 1996,). It is developed from the chronologically based 'Resource Assessment' that forms Part 3 of this report (Sections 11-21). The resource assessment and research agenda for the aggregate-producing areas of Worcestershire is a problem-orientated exercise, focusing on the criteria for ALSF projects (Section 1).

It is clear that in Worcestershire, any discussion of research frameworks in relation to aggregate extraction will focus on the sands and gravels of the river valleys (see Section 6). The archaeology of Worcestershire's river valleys dominates current knowledge of prehistoric archaeology, as in many other Midlands counties. The importance of the aggregate-producing areas, principally the river valleys, for the advancement of archaeological knowledge in Britain was recognised from the late 1940s due to on aerial photography. As the evidence for extensive prehistoric and Roman settlement of the river valleys mounted, so did the scale of gravel extraction for construction; the rising demand for aggregates and the development of archaeological knowledge have been interlinked ever since. Mineral extraction has been one of the major impacts on the archaeological resource in England since the 1970s, although it was the development of a more rigorous regulatory framework in the early 1990s that led to consistent investigation of new quarries (Darvill and Fulton 1998, 135-7). The enormous contribution to knowledge flowing from archaeological fieldwork associated with mineral extraction has long been acknowledged, with the caveat that the evidence base for some periods is in danger of being distorted (Fulford and Nichols 1992).

The development stronger planning mechanisms have led to a great advance in knowledge since the 1980s. The focus has widened from discrete sites recognisable from aerial photographs (particularly prehistoric and Roman settlements) to broader concern with landscapes. The range of evidence recorded is very extensive, and detailed research frameworks for entire river valleys can now be produced in some areas such as the Trent Valley (Knight and Howard 2004). The quarrying of aggregates (especially sand and gravel) has made a major and unique contribution to archaeological research in England, and it is clear that the pressures of the economy mean that this will probably continue to be the case for decades to come (Brown forthcoming).

Consideration of the above chapters suggests an initial research agenda for the aggregate-producing areas of Worcestershire can be outlined, including period-specific aims and a number of general cross-period and strategically driven research goals.

22.2 Cross-period and strategic research goals

A number of research goals can be identified that would address gaps in knowledge across a number of periods and contribute to strategic planning:

22.2.1 Aerial photography and LiDAR

Cropmarks, earthworks and soilmarks recorded through aerial photography are a major source of information for the prehistoric and Romano-British periods in Worcestershire. The

significance and potential of this data is high in areas where the geology is sand and gravel, and which has been recognised for decades (Webster and Hobley 1964; Hunt 1982). The evidence is sufficiently extensive for variations in the nature of settlements to be detected, such as between the individual ditched enclosures in the Severn Valley and the more complex networks of settlement and field enclosures detected in the Avon Valley and along the Carrant Brook; there seems no doubt that this represents a real difference in settlement pattern in the Roman period, and variation in settlement and monument types are also apparent through prehistory.

This project has included the development of a GIS theme in the Worcestershire Historic Environment Record that comprised the digitisation of aerial photograph plots produced by RCHME in the 1980s. This digitisation has made a large body of data available for direct comparison with other GIS data within the framework of the Worcestershire HER. The data provides an overview of the character of the buried archaeological resource for large parts of Worcestershire, and has already been used in the context of professional consultations and public outreach by HER staff (Victoria Bryant pers comm). This data has also already proved valuable both for planning consultations (Mike Glyde pers comm) as well as for countryside management consultations (Adam Mindykowski pers comm) and will be available during forthcoming consultation for the new Minerals and Waste Development Scheme being developed for the county.

It must be acknowledged that this baseline data is now rather incomplete for some parts of the county, and the transcription and interpretation of air photo data as part of the National Mapping Programme remains a particularly high priority. The availability of comprehensive mapping of aerial photographs is a gap in current knowledge of the range and character of prehistoric and Romano-British landscapes. There is tremendous potential for more extensive utilisation of this resource both for the protection of those surviving as well as the assessment and understanding of those already lost to large-scale developments, such as aggregate extraction. The rich resource of aerial photographs of prehistoric monuments and settlement sites in the Avon Valley and Carrant Brook, informed by recent flying, is the subject of an ongoing research project that will lead to a new appreciation of prehistoric and Roman landscapes in south-east Worcestershire (Mike Glyde pers comm).

Lastly, many comparable areas of potential to those identified for aerial photographs can now also be addressed through the use LiDAR data. This relatively new technological development allows accurate and rapid mapping of the microtopography of large areas, thus revealing archaeological features as well as floodplain and terrace features (Challis 2004; Brown *et al* 2005, 2007). The geomorphological application of this technique is considered in the following section but is noted here for its considerable potential for identification and mapping of a wide range of other archaeological features (earthworks) not readily visible or recordable from the ground.

22.2.2 Environmental archaeology and geoarchaeology: understanding landscape change and river valley formation

The potential for detailed investigations of settlement sites, which often include localised waterlogged deposits, as well as studies of alluvial sequences and palaeochannels have long been identified as research goals for archaeology in river valleys (Robinson 1992).

Although considerable work has been undertaken in Worcestershire, the present state of palaeoenvironmental knowledge derives largely from contract archaeology, mostly undertaken in association with aggregate extraction as at Ripple Quarry and Clifton Quarry. Opportunities have arisen for detailed studies of waterlogged and desiccated deposits on settlement sites, as well as of alluvial sequences, and of peaty deposits in infilled watercourses (palaeochannels) in the floodplains. The contribution of this evidence for understanding past economies and landscapes has been detailed in the chapters above, where it is clear that knowledge is developing rapidly. However, this work has been largely undertaken in response to commercial development and, despite the clear importance of

Severn Valley, has not been supported by targeted research such as has been undertaken in other major river valleys such as the Trent or Nene which now benefit from informed frameworks within which future research and commercial work can be considered (Knight and Howard 2004).

Ongoing research in Worcestershire does, however, demonstrate the high potential of environmental archaeology and geomorphological studies in the aggregate landscapes of the county; for instance in understanding long-term landscape change and valley floor development along the Worcestershire Severn. Indeed, Holocene alluvial deposits and terrace formation form an element of the archaeological resource in their own right and warrant research to enable mapping, dating and understanding of these deposits and the agencies (both natural and human) which have contributed to their development.

The high research potential of these deposits, allied to the need for a comparably robust research framework as exists for other major river valleys, shows that environmental archaeology and geoarchaeology must continue to be integrated into future archaeological research and programmes of commercially-driven work in aggregate producing areas. For instance, it is a priority to obtain high-resolution pollen diagrams for all periods, from the Mesolithic to post-medieval, and across the landscape. There is potential for drawing on a range of documentary sources to identify peat-filled palaeochannels in the floodplains, where such pollen sequences (and other environmental indicators) can be recovered. The high potential of these organic palaeochannel fills to contain important and high-resolution palaeoenvironmental evidence has recently been demonstrated in the Severn Valley at Clifton Quarry (Katie Head pers comm). Similarly, it is essential that firm chronologies are established for the development of the alluvial units and terrace formations as well as associated palaeochannels (see also 22.2.4). These will date the processes and deposits which have formed the valley floor and that provided the environments utilised by past human populations. They also have the potential to support understanding of the likely relationship between remains reflecting specific periods of human activity (sites) and the depositional environments within which they are liable to be encountered, thus supporting design and implementation of prospection and mitigation strategies.

New avenues for the investigation and identification of palaeochannels and other riverine floodplain and terrace features have emerged in recent years as a result of new technologies and research in other river catchments (notably the Trent Valley). Many of these are applicable within the Severn and Avon Valleys and should be used wherever opportunities arise (though the potential of the efficacy of some techniques in the Severn requires research and testing). One tool with particularly high potential is LiDAR (Light Detection and Ranging; see for instance Challis 2004; Brown *et al* 2005; 2007). As noted above, LiDAR can rapidly provide accurate microtopographical detail across large areas and therefore has the potential to identify and map river floodplain and terrace features even in regularly cultivated areas. Another technique with similar potential output, IFSAR (Inteferometric Synthetic Aperture Radar), has also recently been tested in the Trent Valley but does not produce the same subtle microtopographical detail as LiDAR and which is required to map and understand floodplain and terrace geomorphology (Brown *et al* 2005; 2007).

These new techniques can in turn be supported by more ‘traditional’ approaches such as the mapping of former channels and terrace features from aerial photographs and historic mapping (S Baker 2003). Raising awareness of the importance of terrace deposits and alluvial and palaeochannel sediments as sources of information in their own right is also important. Areas of potential include improved techniques for the sourcing and dating (using Optically Stimulated Luminescence dating) of sediments to investigate erosion patterns and support the development of terrace chronologies (Hudson-Edwards, Havelock and Howard 2002; Brown *et al* 2007). Using borehole data and ground-based remote sensing techniques (such as Ground Penetrating Radar and Electrical Resistivity) allied to surface topography, methods for modelling alluvial deposits, channels and their fills, buried landscapes and gravel surfaces and islands are becoming increasingly sophisticated (Brown *et al* 2005; 2007),

thereby supporting greater understanding of the overall resource and better-informed and targeted programmes of evaluation and mitigation.

22.2.3 Trade and transport on the River Severn

The River Severn has long been studied as an important transport route, from the perspective of different research disciplines. The Bristol Channel, the Severn Estuary and the River Severn have been important for travel and for transporting goods and people for millennia. Other rivers such as the Avon and the Teme were shallow, but could be used by riverboats at some times of the year. It is clear that from the Roman period, if not before, that the Severn was an important trade artery and that this determined the location and long histories of some settlements.

A range of imported raw materials and manufactured goods appear at different periods in the archaeological record, and trade in other materials and goods can be demonstrated from documentary sources, or can be inferred. For example there is archaeological evidence for regional trade in iron ore, building stone, quernstones, and ceramics in the Roman period, which together with salt probably constituted the main elements of cargoes on the Severn. Goods and raw materials that were transported on the Severn in the later historic period included salt, leather, wool, cloth, timber, firewood, bark (for tanning), wine, preserved fish, grain, and other foodstuffs.

Artefactual and environmental evidence from settlement sites reflects long-distance and regional trade on the river. Work on individual classes of archaeological material has demonstrated the potential of the excavated evidence, for example the changing sources of whetstones and quernstones used in different periods at Worcester (Roe 2004). The evidence for regional and long distance trade has tended to be studied in terms of individual sites and for particular classes of material. There is potential for a more wide-ranging synthetic study, to place the available archaeological evidence into a broader framework of a trade route that persisted and changed over millennia. A study of the archaeological evidence for trade on the Severn from prehistory to the early post-medieval period would strengthen the local research framework. Such a study should also look beyond trade, to consider, for example, the river as part of a long-distance communication route for people and ideas, and the military and strategic role of the river.

22.2.4 Developing chronologies

The major contribution made by excavated assemblages from aggregates sites is noted, however, for many chronological periods dating frameworks remain poorly developed. Where substantial assemblages or site sequences have enabled these frameworks to be refined, the value of scientific dating techniques has been considerable and continues to grow as techniques and accuracy improve. One area of note is in the use of Baysian modelling of large sets of radiocarbon dates from secure contexts within stratigraphic sequences. This allows considerable refinement of the radiocarbon dates acquired. Along with the continued development of the accuracy of AMS dating (which enables dating of very small samples such as individual charred seeds or charred residues on pottery), this has allowed considerable advances to be made in the dating of prehistoric sites, as at Kemerton, Worcestershire (Bayliss, Jackson and Bronk Ramsey 2005). The regular use of AMS dating and where possible Baysian modelling should therefore be encouraged, especially where chronological frameworks are weak.

The chronologies for terrace and alluvial formation are also poorly established. The potential for radiocarbon dating of organic palaeochannel deposits has been demonstrated and should continue to be used wherever possible while the potential for using Optically Stimulated Luminescence dating (OSL) for silts, clays and sand/gravel deposits has been noted above (Section 22.2.2) and should be explored.

22.2.5 Re-appraising and realising the potential of existing data

Many sources of information are available or are being accumulated which are poorly understood, collated and/or disseminated yet are of potential considerable value to the investigation and research of aggregate producing areas.

Re-appraisal, assessment and, where applicable, analysis and dissemination of such sources of information should be encouraged allowing their potential to be realised. The resultant information should be integrated into the research frameworks established here and incorporated on the HER, which underpins development control and archaeological understanding in the county.

Sources of potentially important information which require better dissemination and/or assessment and analysis leading to dissemination include:

- Portable Antiquities Scheme – the importance of metal detecting finds is becoming increasingly recognised (for the Bronze Age onwards) and efforts to more effectively integrate data collected through the PAS onto the HER should be supported;

- Unstudied collections in museums and held by local groups – the potential of collections from aggregate producing areas of Worcestershire and held by Birmingham City Museum and Art Gallery, by the Almonry Museum in Evesham and by the South Worcestershire Archaeological Group has been assessed as part of an ongoing ALSF project (Unlocking the Past: Collections and HER Enhancement – PNUM 4776). The Updated Project Design has recently been approved by English Heritage for further ALSF support and the resultant analyses will considerably enhance the data held within the HER within the south-east of the county, most notably for Roman period sites around Bredon Hill. However, potentially important collections held by the Worcestershire County Museum and the Worcester City Museum and Art Gallery were not available to this project due to ongoing re-organisation. Further potentially important collections remain in private hands and may also become available over time. All those from aggregate producing areas which have not been examined in detail or have not been studied to modern standards warrant assessment and, where appropriate, proper analysis;

- Fieldwork archives – many archaeological archives incorporate information which was collected for the purposes of specific site investigation and recording but which has other potential applications. Some have also never been examined or disseminated due to non-archaeological factors (eg withdrawal of application). Examples include details of deposit depths on sites which proved archaeologically sterile yet which included data on depths to natural and of overburden deposits including alluvium; stored palaeoenvironmental samples (including potential dating material) which were not analysed or only partly analysed due to lack of resources; and borehole data which dealt with material not considered ‘archaeological’ and thus was consigned to archive. The potential value of these should be considered when developing future project designs;

- Grey literature – the large volumes of unpublished archaeological data presented in commercial reports (commonly referred to as grey literature) are often poorly accessible and not widely disseminated. However, most grey literature reports held by Worcestershire Historic Environment and Archaeology Service have been made available online to allow wider access to this valuable resource (http://www.worcestershire.gov.uk/home/wccindex/archeo_dr_index htm).
  Extensive use has been made of these reports during the current project and the continued use and development of this resource should be encouraged;

- Aerial photographs (see above Section 22.2.1);

- LiDAR – The potential importance of LiDAR has been discussed above and it is noted here that coverage is available for much of the Severn Valley from the Environment Agency. Although there is a charge for commercial use, limited areas are available without charge for research purposes. In the light of the high costs of commissioning bespoke surveys in comparison with purchasing existing coverage, this has the potential to be a valuable resource;

- Former quarried areas and backlog sites (see below Section 22.2.6).

Lastly, it is noted that the Worcestershire HER, like most HERs and SMRs, suffers from problems of data quality and inconsistency and thus requires a programme of cleaning enhancement as well as subsequent development as a GIS based tool which can both inform and support research. This has been acknowledged within the West Midlands Regional Framework draft documentation (Bryant and Shaw 2004) and is emphasised here as an area to be addressed.

22.2.6 Pre-PPG16 quarry permissions, unpublished sites (backlogs) and the impact and extent of former quarrying

Pre-PPG16 quarry permissions

The ALSF has enabled retrospective programmes of evaluation to be undertaken at two operational quarries at Retreat Farm and Ripple, both of which had been granted planning permission prior to the implementation of PPG16. As a result neither had been the subject of pre-determination evaluation or planning conditions requiring archaeological mitigation. At Retreat Farm desk-based assessment of the entire permitted area and evaluation of the small area remaining for extraction has been successfully completed and the site is now fully worked (Deeks, Jackson and Steinmetzer 2004). At Ripple, however, potentially nationally and regionally significant, but rather enigmatic and poorly defined (in extent), deposits of Late Neolithic and Iron Age date were identified during a programme of evaluation (Miller *et al* 2004). These included a Late Neolithic pit containing a preserved and *in situ* timber upright (interpreted as an element of a ceremonial monument of indeterminate form) and a causeway or track running across the floodplain towards the Iron Age hillfort at Towbury. Quarry operations had not significantly commenced at the time of evaluation (2004) but the site is now fully operational and no archaeological provision exists for further evaluation to refine understanding of the character and extent of these deposits or for any mitigation as may be warranted. In the absence of any further work, progress of the current extraction programme will result in their destruction without record over the next couple of years. The problems raised by this particular site therefore are a matter of considerable concern and warrant due consideration.

Unpublished (backlog) sites

The problem of unpublished archaeological investigations and collections (backlog sites) resulting from work undertaken prior to the regular implementation of archaeological planning constraints is widely recognised. Apart from examples such as at Ripple where the quarry remains active, these include many fully worked out quarries where excavation and recording was undertaken through government support which did not extend to cover the costs (or full costs) of analysis and dissemination. These contain much valuable information and have a high potential for analysis to support research aims and objectives. Within Worcestershire the ALSF has enabled the major backlog excavation of the Iron Age and Roman site at Beckford Quarry to be addressed (Wills forthcoming), while the other outstanding backlog quarry site is the Iron Age settlement excavated at Blackstone in the 1970s, which is currently being assessed with ALSF support. Should analysis be approved, this site will make a significant contribution towards understanding of Iron Age activity in the Severn Valley in the north of the county.

Impact and extent of former quarrying

The treatment of the excavations at Beckford and Blackstone is addressing the issue of sites where detailed archaeological recording was undertaken, while the Collections and HER Enhancement Project described above is including a number of quarry sites where less formal programmes of investigation have been undertaken by both local groups and amateur archaeologists during the pre-WW2 and immediate post-war era (22.2.5). However, although this document has briefly considered the history of quarrying in the county, the wider impact of quarrying on the archaeological resource and as an archaeological resource in its own right has not been addressed in any detail. Formal mapping of aerial photographs (Section 22.2.1), allied to the mapped quarrying presented in this document (covering quarrying since 1947) and identification and mapping of pre-1947 quarries would provide an important contribution within the HER (as an element of the county's archaeological resource and basis for studies of the history of quarrying in the county). Further this would enable assessment of the impact on former landscapes of intensive quarrying such as that in the Carrant Brook or around Holt and Grimley and thereby support better understanding of the relative 'value' of surviving fragments within those landscapes should future applications for extraction affect them.

22.2.7 Communication and funding

The better integration of the archaeological community (university departments, county council archaeology services, archaeological contractors and avocational archaeologists) is an important goal. The conference held as part of this project in November 2006 saw a number of calls for better communication and the development of stronger links between all sectors of the archaeological community and exploration of the potential of a wider range of funding opportunities in order to achieve some of the research goals identified (Edwards 2006).

Similarly, better communication with the minerals industry and understanding of their requirements, has the potential to result in better targeting and use of funds as well as potentially providing reduced costs for the industry. One particular area within which this might be achieved is the field of deposit modelling (see above, Section 22.2.2) where there are potential overlaps between the requirements of the industry and archaeology. For example, during evaluation and planning for floodplain sites the mapping of alluvial deposits and the gravel surface can support modelling of potential buried former landscapes and identification of palaeochannels for archaeologists but could also support estimating of potential overburden and mineral volumes for the industry.

22.2.8 Strategic planning

During the course of the project and especially during the conference, it became evident that archaeological management at a strategic level (including for aggregates) is a particular issue requiring attention. Whilst PPG16-related work and minerals planning have robust mechanisms to address archaeological matters on a case-by-case basis, there is little capacity for developing responses for long-term issues. Problems raised include:

- The fact that consistent methodologies and standards are not applied within archaeological practice;
- The difficulties of balancing and monitoring the different demands of archaeology with those of development and agriculture (including the long-term threats the latter poses);
- The difficulties of ensuring good communication between stakeholders and the minerals industry (Section 22.2.8); and
- The limitations of current approaches to evaluation and prospection within alluviated landscapes. These affect the ability of planning archaeologists to make informed decisions and effectively apply the principal of preservation *in situ* to certain areas, site types and/or landscapes.

Within Worcestershire, particular strategic management issues can be identified. The absence of a recent MLP or a Minerals and Waste Development Scheme poses some problems in the immediate future since insufficient preferred areas remain to be allocated from the 'saved' 1997 MLP to enable the county to readily meet its regional apportionment. In the longer term strategic planning will be provided by the Minerals and Waste Development Scheme but this is not likely to be in place for some time.

The completion of this resource assessment will support provision of archaeological advice to the MLP during the preparation of the new Minerals and Waste Development Scheme, however, a number of the problems and research directions identified are of particular immediate concern in ensuring the delivery of appropriate and well-informed advice in the light of the anticipated pressure on reserves in the Severn Valley, Stour Valley and Avon and Carrant Valley (Section 9.4).

These comprise:

- The alluviated areas of the Severn Valley south of Worcester, which are understood to be liable to increasingly become a focus for aggregate extraction in the short to medium term, yet pose particular problems in understanding of the resource and approaches to effective evaluation and mitigation. This area also includes the substantial pre-PPG16 permitted site at Ripple for which no archaeological provision exists;

- The unexploited areas of mineral deposit in the south and south-east of the county, especially along the River Avon, which are liable to provide a renewed focus for aggregate extraction in the short to medium term. These have already been heavily affected by past aggregate exploitation and yet for certain periods and site types remain poorly understood (eg Neolithic and Earlier Bronze Age monuments) while the overall impact of quarrying has not been formally assessed and therefore the relative 'value' of surviving fragments of heavily quarried areas remains difficult to assess;

- The poorly understood archaeological resource of the Stour Valley which may form a focus for aggregate exploitation in the short to medium term; and

- The poorly understood archaeological resource of the Teme Valley which may form a focus for aggregate exploitation in the longer term.

The ALSF and other research and management projects (such as the development of regional research frameworks) have supported a range of initiatives which have gone a long way in addressing some of these issues, however, it is important to ensure that their application, implementation and continuing development are secured in the longer term. This will enable the research frameworks established within many areas to be maintained (ie produce a proper cycle of research and re-appraisal). Further projects and initiatives which address the remaining weaknesses and omissions should be identified and supported where possible.

22.3 Period-specific research goals

22.3.1 Palaeolithic.

A new, clearer understanding of the research framework for Palaeolithic archaeology in Worcestershire has been achieved through recent work, summarised in Section 11.2. The varied potential of different areas of Worcestershire's gravel terraces can now be understood in broad outline, with the importance of the area of the Carrant Brook coming into sharp focus. The varied potential of sand and gravel terraces for Palaeolithic archaeology has been assessed, mapped, and integrated into the HER, with the result that there is a good framework for archaeological resource management. The aggregate-producing areas of Worcestershire will be key in the future development of the research framework for the period.

However the nature of the Palaeolithic archaeological resource is not capable of being readily assessed through conventional evaluation methodologies, and is not well served by the PPG-16 framework (Section 11.3). It is clear that new approaches are needed to meet the challenge of Palaeolithic archaeology, and this is one focus of the National Ice Age Network (www.iceage.bham.ac.uk/home).

22.3.2 Mesolithic

The Mesolithic archaeology of Worcestershire is represented by a small number of key sites, scatters of lithics that are not well understood, and extensive gaps in the evidence (Section 12.4). It is suspected that the extent of Mesolithic utilisation of the river valleys was much greater than existing evidence indicates. Palaeoenvironmental evidence for the period, although based on a very small number of investigated locations, is promising (Section 12.3). Floodplain peat deposits have produced palaeoenvironmental evidence for reconstructing Mesolithic environments as well as for investigating human impacts on those environments. The broad framework for the Mesolithic period in Worcestershire is not well developed at present, but it is certain that the aggregate-producing areas will be key in the future development of the research framework. There is a need for a broader framework for Mesolithic archaeology, which could be addressed through fieldwalking surveys and re-examination of old collections of lithics (Section 12.5).

The potential of the aggregate-producing area of Worcestershire for Mesolithic archaeology has been assessed in this report for the first time. The framework of archaeological resource management will take this assessment into account. The approach to assessment and evaluation of aggregate extraction sites with respect to this period is not straightforward. Approaches need to be fine-tuned to ensure that Mesolithic evidence is not overlooked. Small surface lithic scatters of the period can be identified through fieldwalking when sufficiently intensive (Section 12.5.1). There is potential for the survival of buried occupation deposits in favourable locations, and also for perhaps quite extensive palaeoenvironmental evidence from infilled channels in floodplains.

22.3.3 Neolithic and Earlier Bronze Age

The Neolithic and Earlier Bronze Age archaeology of Worcestershire is represented by a limited number of monuments, very few excavated sites, and generally poorly-understood scatters of lithics (Section 13.2). However the research framework for the period is undergoing rapid change. The discovery of an extensive focus of ceremonial monuments, including five cursus monuments, at Fladbury, the excavation of Neolithic sites in the Severn floodplain at Clifton Quarry and at Bredon's Norton, are important developments as is the potential of the site at Ripple (though see Section 22.2.6: *Pre-PPG16 quarry permissions*).

Palaeoenvironmental evidence indicates a mosaic of woodland and cleared areas across the landscape, and evidence is accumulating to allow the reconstruction of farming economies (Section 13.3). It is now clear that there was Neolithic utilisation of the river floodplains. The Carrant Brook and the Avon Valleys appear to have been the focus of monument building and other activity in this period. The local Neolithic landscape appears to have differed in character from the rest of Worcestershire, including the Severn Valley, and from the Cotswolds (Section 13.4). There seems little doubt that the river valleys were the focus of Neolithic and Earlier Bronze Age inhabitation, and therefore the aggregate-producing areas will be at the forefront of future development of the research framework for the period.

There is a need for a broader framework and understanding for Neolithic and Earlier Bronze Age archaeology in the county to allow the development of a regional narrative for the period. This could partially be addressed through fieldwalking surveys and the re-examination of old collections of lithics, as for the Mesolithic period (Section 13.4). Further, the Neolithic and Earlier Bronze Age monuments of the Carrant Brook and Avon Valleys are elements of a poorly understood prehistoric landscape with considerable research potential as demonstrated by recent research undertaken by a team from the University of Worcester at

Bredon (Jodie Lewis pers comm.). In particular further research is required to allow a greater degree of confidence in assigning date and function to the full range of these monuments and support assessment of their potential significance where they are threatened by future proposals for aggregate extraction.

The potential of the aggregate-producing area of Worcestershire for Neolithic and Earlier Bronze Age archaeology has been assessed in this report for the first time. The framework of archaeological resource management will take this assessment into account. An increasing degree of confidence can be expressed in the assessment and evaluation of potential aggregate extraction sites, in respect to the archaeology of this period, where sites are located away from river floodplains. However, there is the potential for fine-tuning approaches and developing a reliable basis for site interpretation while, as for all chronological periods, considerable problems remain with prospection, evaluation and mitigation within alluviated areas (Section 5). These are particularly an issue for Neolithic and Earlier Bronze Age sites due to the often ephemeral and dispersed character of deposits (Section 13).

22.3.4 Middle Bronze Age to Iron Age

The Middle Bronze Age to Iron Age archaeology of Worcestershire is characterised by fairly extensive recorded evidence for settlement. The research framework for the period is undergoing rapid change, through the results of recent fieldwork, the publication of unpublished key sites, and the re-examination of some much older excavated archives (Section 14). The number of excavated sites is rapidly increasing, but post-excavation work on older sites is likely to have major impact on knowledge. The consistent use of absolute dating techniques has allowed sites to be related to a detailed chronological framework, within which changes in settlement form, local economies and landscapes can be detected. The potential for dating using charred residues on pottery is particularly notable. There is a robust body of palaeoenvironmental evidence for local late prehistoric landscapes and for varied farming systems (Section 14.3). The broader framework for late prehistoric archaeology could be addressed through fieldwalking surveys and carefully targeted sample trenching and morphological analysis of cropmark complexes (Section 14.5).

The rapidly accumulating evidence for the later prehistoric period in the Severn Valley and the Avon Valley underlines the fact that the sand and gravel terraces of the river valleys were intensively settled and utilised during this period. There is no doubt that the evidence base will continue to grow in the future, and that the aggregate-producing areas of Worcestershire will continue to dominate understanding of the period. This framework will be greatly strengthened by the forthcoming publication of larger excavations, such as Beckford and Huntsman's Quarry. The one remaining unpublished larger excavation for this period, that at Blackstone, has similar potential and is of particular note since it is located in the north of the county which is considerably less well understood at this period than the south. Unenclosed settlement remains poorly represented in the archaeological record for this period and warrants greater consideration.

The potential of the aggregate-producing areas of Worcestershire for later prehistoric archaeology has been assessed in detail in this report for the first time. The framework of archaeological resource management will take this assessment into account. An increasing degree of confidence can be expressed in the framework for assessment and evaluation of aggregate extraction sites, in respect to the archaeology of this period, although there is potential for fine-tuning approaches and, as for other periods, alluviated areas continue to pose considerable problems (Section 5).

22.3.5 Late pre-Roman Iron Age to sub-Roman period

The Romano-British archaeology of Worcestershire is characterised by extensive evidence for settlement and landscape organisation. Although numerous small rural settlements are recorded, very few have seen any level of excavation until recently. However the research framework for the period is seeing rapid change with the excavation of a number of rural

settlement sites, including a villa (Section 15). Differences in settlement and landscape character across Worcestershire are emerging, with an extensive landscape of fields and settlements in the Avon Valley and Carrant Brook, while the Severn Valley appears to be characterised by ditched enclosures with little evidence for fields. Palaeoenvironmental evidence has demonstrated the importance of arable farming in the Avon Valley and along the Carrant Brook, where there is also evidence for extensive woodland clearance for arable fields. The evidence from the Severn Valley is less clear-cut, but seems to indicate mixed farming (Section 15.4).

The small towns of Worcester and Droitwich have produced extensive evidence for ironworking and saltmaking respectively. These two 'industrial' sites were strongly tied into the provincial economy, and these industries had a significant local impact in terms of requirements of fuel, labour, food supply, and transport (of raw materials and products), which was also reflected in the Malvernian pottery industry.

One aspect of settlement archaeology that has come into focus is periods of comprehensive change. Settlement sites occupied during the late Iron Age and 1st century AD were abandoned in the first half of the 2nd century, succeeded by sites in new locations. In the late 2nd and 3rd centuries these settlements flourished, but most were in turn abandoned by the mid 4th century. There is a need to ensure that reliable chronologies are established for all excavated sites, through full analysis of the artefact assemblage and the use of absolute dating methods where appropriate. Settlement sites which have evidence for occupation into the late 4th or early 5th century are rare and are a major gap in knowledge.

There is no doubt that in the Romano-British period the sand and gravel terraces of the river valleys were relatively intensively settled and farmed. The evidence base will grow in the future. The broader framework for Romano-British archaeology could be strengthened through fieldwalking surveys, and carefully targeted sample trenching and morphological analysis of cropmark complexes, as for the later prehistoric period. Synthetic analyses of the large quantities of artefact data available from contract archaeology and resulting from ongoing re-assessment and analysis of earlier museum and local group collections has the considerable potential to strengthen chronological frameworks and improve understanding of patterns of supply and consumption within the region.

The potential of the aggregate-producing areas of Worcestershire for Romano-British archaeology has been assessed in detail in this report for the first time. The framework of archaeological resource management will take this assessment into account. A high degree of confidence has been expressed in the framework for assessment and evaluation of aggregate extraction sites, in respect to the archaeology of this period, although there is potential for fine-tuning approaches (Section 5).

22.3.6 Early medieval period

The early medieval archaeology of Worcestershire is characterised by limited evidence for settlement and burial. Settlement sites and cemeteries dating from the 5th to late 7th century are principally known through chance archaeological discoveries; archaeological evidence for the 8th to 11th century is very limited indeed. The research framework for the period has seen some recent development, with the excavation of a small settlement site at Ryall Quarry (Section 16). There are a small number of unpublished sites in the aggregate-producing areas: the rarity of evidence of the period makes analysis and publication a priority, including the settlement site at Fladbury (Peacock 1967) and the cemetery at Upton Snodsbury (Cook 1958, 78-9).

The difficulty of recognising unenclosed early medieval settlement sites and cemeteries from aerial photographs, even where located on gravel terraces, has long been recognised (Hamerow 1992). The present review suggests that recognition will remain a problem for a range of reasons (Section 16). It is essential to establish accurate chronologies for excavated

settlement sites and cemeteries, which requires full analysis of the artefact assemblages and use of absolute dating methods.

Palaeoenvironmental evidence provides evidence that the landscape and the farming system of the early medieval period had seen substantial change since the Romano-British period, although the scale and nature of change is not yet apparent (Section 16.4). Peat deposits from infilled channels in the floodplains have high potential for revealing landscape change in this period.

The aggregate-producing areas of Worcestershire have produced important evidence for the early medieval period, and archaeological evidence for the period is uncommon outside the river valleys. However the research framework for early medieval Worcestershire draws on research in a number of disciplines, which have developed hypotheses about early medieval landscape and settlement which can be tested using archaeological data.

The potential of the aggregate-producing areas of Worcestershire for early medieval archaeology has been assessed in detail in this report for the first time. The framework of archaeological resource management will take this assessment into account. The approach to assessment and evaluation of aggregate extraction sites with respect to this period is not straightforward due to difficulties in recognising sites. Approaches need to be fine-tuned to ensure that early medieval evidence is not overlooked. The current model of settlement history indicates that most settlement sites dating between the 5th and the 11th century were largely or entirely aceramic. Therefore occupation deposits that lack datable artefact deserve particular attention.

22.3.7 Medieval period

The medieval archaeology of Worcestershire is characterised by an extensive range of archaeological evidence. The rural settlement pattern is fairly well understood and most settlements are coincident with contemporary villages and hamlets. Archaeological research has been important in medieval towns, with very little fieldwork in rural settlements. The research framework for the medieval period draws on research in a number of disciplines, which provide a basis for the interpretation of archaeological evidence from the aggregate-producing areas of Worcestershire (Section 17). The themes of the expansion of settlement and the intensification of farming up to the 14th century, and the subsequent changes to the rural landscape brought about by famine and the Black Death are capable of archaeological investigation, based on a strong basis of local historical research.

Archaeological fieldwork in aggregate-producing areas has produced evidence for medieval agriculture, particularly for arable farming in the form of ridge-and-furrow and manuring scatters. There is potential for developing a more sophisticated approach to this data (Section 17.6).

This evidence has potential for contributing to understanding the medieval farming regime in Worcestershire, in combination with environmental evidence. The potential for palaeoenvironmental evidence for understanding long-term change in landscape and farming has been identified, but peat deposits in river floodplains have so far not provided detailed evidence from this period (Section 17.4).

The potential of the aggregate-producing areas of Worcestershire for high/late medieval archaeology has been assessed in detail in this report for the first time. The framework of archaeological resource management will take this assessment into account. The approach to assessment and evaluation of aggregate extraction sites with respect to this period needs to be fine-tuned to ensure that ephemeral non-settlement evidence is not overlooked. The identification and mapping of the rural hinterlands of small towns in Worcestershire would provide a framework for interpreting and comparing medieval archaeological data from a series of locations.

22.3.8 Earlier post-medieval period

The earlier post-medieval archaeology of Worcestershire is characterised by an extensive range of archaeological evidence, which has seen very little detailed research or synthesis. In comparison to the medieval period, the broad research framework for post-medieval Worcestershire is poorly developed. Some topics, such as the impact of the Civil War, have seen detailed research, and it is possible to identify archaeological research aims (Section 18.3). Two other areas for future research are riverside quays and production sites for brick and tile (Section 20).

The changes in the landscape that followed the dissolution of the monasteries and subsequent change of land-use and management are not well understood, and the contribution of archaeological evidence to understanding changes to local post-medieval landscapes have not yet been fully exploited. One aspect of change is the development of water meadows in the floodplains of the river valleys, for which cartographic evidence has been identified but which have not so far been investigated archaeologically.

22.3.9 Later post-medieval period

The later post-medieval rural landscape saw further change and the processes of change have not been studied closely in Worcestershire. Many features of the late post-medieval rural landscape are in active use today, and this can obscure their historical depth. The Historic Landscape Characterisation project will provide a countywide framework that will offer the potential for testing through local studies, as for earlier periods.

The period after 1750 saw the transformation of transportation systems, including roads, canals, river navigations, and railways. These elements of the historic environment deserve to be considered and the surviving evidence merits consideration within the framework of long-term change in the landscape.

23. Bibliography

Alexander, M, 2006 Anglo-Saxon settlement, in A Barber and M Watts 2006, 69-74

Alfrey, J, and Clark, C, 1993 The landscape of industry: patterns of change in the Ironbridge Gorge

Allies, J, 1852 *Antiquities and Folklore of Worcestershire*

Archaeological Investigations Limited, 1998 *Dark Lane, Grimley, Worcestershire: an archaeological watching brief*, Hereford Archaeology Series, **362**

Archaeophysica, 2002 *Geophysical survey at Clifton, Worcestershire. Evaluation in advance of an expansion of Clifton Quarry*, Archaeophysica Ltd, Project **CLQ20011**

Arnold, C J, 1997 *An Archaeology of the Early Anglo-Saxon Kingdoms*, 2nd edition, London: Routledge

Astill, G, 1993 *A Medieval Industrial Complex and its Landscape: the Metalworking Watermills and Workshops of Bordesley Abbey*, CBA Research Report, **92**, York: Council for British Archaeology

Astill, G, Hirst, S, and Wright, S M, 2004 The Bordesley Abbey Project reviewed, *Arch J*, **161**, 106-58

Atkin, M, 1995 *The Civil War in Worcestershire*, Stroud: Sutton

Atkin, M, 2003a Ecclesiastical archaeology in the West Midlands, *West Midlands Regional Research Framework for Archaeology. Seminar 5: the medieval period*, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/Malcolm%20Atkin-ecclesiastical.doc (accessed 2 December 2005)

Atkin, M, 2003b Archaeology in Worcestershire 1500-1750, *West Midlands Regional Research Framework for Archaeology. Seminar 6: the earlier post-medieval period*, http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, accessed on 12/12/05

Atkin, M, 2003c Civil War Archaeology in the Midlands, *West Midlands Regional Research Framework for Archaeology. Seminar 6: the earlier post-medieval period*, http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, accessed on 12/12/05

Atkin, M, 2003d The Archaeology of World War II, *West Midlands Regional Research Framework for Archaeology. Seminar 7: the later post-medieval period*, http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, accessed on 12/12/05

Baker, N, 2002 The archaeology of pre-conquest towns, *West Midlands Regional Research Framework .for Archaeology. Seminar 4: Post-Roman to Conquest*, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar4/SAXON%20TOWNS%20Nigel%20Baker.doc (accessed 16 November 2005)

Baker, N, 2003 The archaeology of the larger medieval towns, *West Midlands Regional Research Framework for Archaeology. Seminar 5: the medieval period*, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/Nigel%20Baker%20-%20ADD.doc (accessed 2 December 2005)

Baker, N, and Holt, R, 1996 The city of Worcester in the tenth century, in N Brooks and C Cubitt (eds), 1996 *St Oswald of Worcester: Life and Influence*, London: Leicester University Press, 129-146

Baker, N, and Holt, R, 2004 *Urban Growth and the Medieval Church: Gloucester and Worcester*, Aldershot: Ashgate

Baker, S, 2003 *Trent Valley 2002. Component 2a: Palaeochannel mapping from aerial photographs*, Trent and Peak Archaeological Unit

Baker, W A, 1992 Air archaeology in the valley of the river Severn, PhD thesis, University of Southampton

Bapty, I, 2007 *Lower Lugg Archaeology and Aggregates Resource Assessment*, (draft dated March 2007), Herefordshire Archaeology Report, **226**

Barber, A, and Holbrook, N, 2000 A Roman iron-smelting site at Blakeney, Gloucestershire: excavations at Millend Lane 1997, *Trans Bristol and Gloucestershire Archaeol Soc*, **118**, 33-60

Barber, A, and Watts, M, 2006 *Excavations at Saxon's Lode Farm, Ryall Quarry, Ripple, 2001-2: Romano-British and Anglo-Saxon rural settlement in the Severn Valley*, Cotswold Archaeology report, **0623**

Barclay, G J, 1996 Neolithic buildings in Scotland, in T Darvill and J Thomas (eds), 1996, 61-76

Barfield, L, 2006 Bays Meadow villa, Droitwich: excavations 1967-77, in D Hurst 2006, 86

Barfield, L, in press Later lithics in the West Midlands counties, in P Garwood (ed), in press

Barker, D, 2003 Ceramic Industries, *West Midlands Regional Research Framework for Archaeology. Seminar 6: the post-medieval period*, http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar6/David%20Barker.doc (accessed 27th April 2006)

Barker, P, 1994 Geophysical Survey carried out at Kemerton pit, unpublished client report, Stratascan

Barker, P, Cubberley, A L, Crowfoot, E, and Ralegh Radford, C A, 1974 Two burials under the refrectory of Worcester Cathedral, *Medieval Archaeology*, **18**, 146-51

Barrett, J, 1994 *Fragments from Antiquity: an archaeology of social life in Britain, 2900-1200 BC*, Oxford: Blackwell

Bartley, D D and Morgan, A V, 1990 The palynological record of the King's Pool, Stafford, England, *New Phytologist*, **116**, 177-194

Barton, N, 1997 *Stone Age Britain*, English Heritage, London: Batsford

Bassett, S R, 1989 Churches in Worcester before and after the conversion of the Anglo-Saxons, *Antiq J*, **69**(2), 225-256

Bassett, S, 2000 How the west was won: the Anglo-Saxon takeover of the West Midlands, *Anglo-Saxon Studies in Archaeol and History*, **11**, 107-118

Baxter, I, 2005 The mammal and amphibian bones, in Griffin, Griffin and Jackson 2005, 47

Bayliss, A, Jackson, R, and Bronk Ramsey, C, 2005 Radiocarbon dating, in R Jackson, 2005, 12-14

Bayliss, A, Thomas, N, Bronk Ramsey, C, and McCormac, G, 2005 Interpreting chronology, in N Thomas 2005

Bell, M, and Limbrey, S (eds), 1982 *Archaeological Aspects of Woodland ecology*, BAR (Brit Ser), **S146**, Oxford

Bellamy, P, 2001 *Kemerton, Worcestershire: Investigations by Time Team, September/October 1998*, Terrain Archaeology report, **5032.1**

Bellamy, P, 2005 Worked flint, in R Jackson, 2005, 71-6

Blockley, K, 2000 Pershore Abbey: excavations in the choir, crossing, and transepts, 1996, *Trans Worcestershire Archaeol Soc*, 3 ser, **17**, 1-52

Bloodworth, A J, Cameron, D G, Harrison, D J, Highley, D E, Linley, K A and Warrington, G, 1999 *Mineral resource information for development plans: Phase 1. Herefordshire and Worcestershire: Resources and constraints*, British Geological survey, Technical report, **WF/99/4** (Mineral Resources Series)

Boismier, W A, Schreve, D C, White, M J, Robertson, D A, Stuart, A J, Etienne, S, Andrews, J, Coope, G R, Field, M H, Green, F M L, Keen, D H, Lewis, S G, French, C A I, Rodes, E, Schwenninger, J-L, Tovey, K, Donahue, R E, Richards, M P, and O'Connor, S, 2003 A Middle Palaeolithic Site at Lynford Quarry, Mundford, Norfolk: Interim Statement, *Proc Prehist Soc*, **69**, 315-24

Bond, C J, 1973a Crop marks near Holt, Worcs, *West Midlands Archaeological Newsheet*, **16**

Bond, C J, 1973b The estates of Evesham Abbey: a preliminary survey of their medieval topography, *Vale of Evesham Histor Soc Res Pap*, **4,** 1-61

Bond, C J, 1974 Deserted villages in Worcestershire, in B H Adlam (ed), 1974 *Worcester and its Region: Field Studies in the former County of Worcestershire*, Worcester: Geographical Association, 36-45

Bond, C J, 1975 The medieval topography of the Evesham Abbey estates: a supplement, *Vale of Evesham Histor Soc Res Pap*, **5**, 51-79

Bond, C J, 1978 Moated sites in Worcestershire, in F A Aberg (ed), 1978 *Medieval Moated Sites*, CBA Research Rep, **17**, 71-7

Bond, C J, 1981 The marshlands of Malvern Chase, in T Rowley (ed), 1981 *The Evolution of Marshland Landscapes*, Oxford: Oxford University Dept External Studies, 95-112

Bond, C J, 1982 Deserted medieval settlements in Warwickshire and Worcestershire, in T R Slater and P J Jarvis (eds), 1982 *Field and Forest*, Norwich, 147-171

Bond, C J, 1988 Church and parish in Norman Worcestershire, in J Blair (ed), 1988 *Minsters and Parish Churches: the Local Church in Transition, 950-1200*. Oxford University Committee for Archaeology Monogr **17**, 119-58

Bond, C J, 2004 *Monastic Landscapes*, Stroud: Tempus

Booth, P, 1996 Warwickshire in the Roman period: a review of recent work, *Trans Birmingham Warwickshire Archaeol Soc*, **100**, 25-57

Booth, P, 2001 Warwickshire in the Roman period, *West Midlands Regional Research Framework .for Archaeology. Seminar 3: The Roman period* www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa (accessed 2005)

Bowden, M, 2005 *The Malvern Hills: an Ancient Landscape*, London: English Heritage

Bowen, D Q (ed), 1999 *A Revised Correlation of Quaternary Deposits in the British Isles*, Geological Society of London Special Report, **23**

Bradley, P, 1989 Bays Meadow, Droitwich: the Flint, unpublished typescript held in archive (WSM 3956)

Bradley, R, 1990 *The Passage of Arms: an archaeological analysis of prehistoric hoards and votive deposits*, Cambridge: Cambridge University Press

Bradley, R, 2000 *The archaeology of natural places*, Routledge

Bradley, R, 2001 Afterword: Back to the Bronze Age, in J Brück (ed), 2001, 229-31

Bretherton, J, and Pearson, E, 2000 *Evaluation at Gwen Finch Nature Reserve, Birlingham, Worcestershire*, Archaeological Service, Worcestershire County Council report, **893**

Bridgeland, D R, Keen, D H, and Maddy, D, 1989 The Avon Terraces: Cropthorne, Ailstone and Eckington, in D H Keen (ed), 1989 *The Quaternary of the West Midlands: field guide*, Cambridge: Quaternary Research Association, 51-67

Bridges, T, 2005 *Churches of Worcestershire*, 2nd edn, Almeley: Logaston

Briggs D J, Coope, G R, and Gilbertson, D, 1975 Late pleistocene terrace deposits at Beckford, Worcestershire, *Geol J*, **10**, 1-16

Britnell, W J, 1975 An interim report upon excavations at Beckford, *Vale of Evesham Hist Soc Res Papers*, **5**, 1-12

Britnell, W J, 1974 Beckford *Current Archaeology*, **4**, 293-7

Brown, A G, 1982 Human impact on the former floodplain woodlands of the Severn, in M Bell, and S Limbrey (eds), 1982 *Archaeological aspects of woodland ecology*, BAR (Int Ser), **S146**, 93-104

Brown, A G, 1983 Floodplain deposits and accelerated sedimentation in the lower Severn basin, *Background to Palaeohydrology*. John Wiley and Sons

Brown, A G, 1992 Holocene floodplain metamorphosis in the Midlands, United Kingdom, *Geomorphology*, **4**, 433-45

Brown, A G, 1997 *Alluvial geoarchaeology. Floodplain archaeology and environmental change*, Cambridge: Cambridge University Press

Brown, A G, 2000 Floodplain vegetation history: clearings as potential ritual spaces? In A S Fairburn (ed), 2000, 49-63

Brown, A G, forthcoming *The Achievements, Status and Future of Aggregate Extraction Related Archaeology in England (PNUM 3350): a report*

Brown, A G, Carey, C, Challis, K, Howard, A, and Cooper, L, 2005 *Predictive modeling of multi-period geoarchaeological resources at a river confluence. Phase I report (PNUM 3357)*, Report for English Heritage, Universities of Exeter and Birmingham

Brown, A G, Carey, C, Challis, K, Howard, A, Kincey, M, Tetlow, E, and Cooper, L, 2007 *Predictive modeling of multi-period geoarchaeological resources at a river confluence. Phase II report (PNUM 3357)*, Report for English Heritage, Universities of Exeter and Birmingham

Brück, J (ed), 2001 *Bronze Age landscapes. Tradition and transformation*, Oxford: Oxbow

Brück, J, 2001 Body metaphors and technologies of transformation in the English Middle and Late Bronze Age, in J Brück (ed), 2001, 149-60

Bryant, V, 2003 Medieval Worcestershire: priorities and potential, *West Midlands Regional Research Framework for Archaeology. Seminar 5: the medieval period*, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/victoria%20bryant.doc (accessed 2 December 2005)

Bryant, V, and Dalwood, H, 2004 Consumption: goods, in H Dalwood and R Edwards 2004, 96-100

Bryant, V, and Shaw, M, 2004 A common vision: priorities for Historic Environment Records (HERs) within the West Midlands Region, unpublished paper prepared for the West Midlands Regional Framework

Buteux, S T E, and Lang, A T O, in press Lost but not forgotten: the Lower and Middle Palaeolithic occupation of the West Midlands, in P Garwood (ed), in press

Buteux, S T E, and Hughes, G, 1995 Excavations at Moele Brace and Bromfield 1981-1991. Reclaiming a wilderness: the prehistory of lowland Shropshire, in *Trans Shropshire Archaeological and Historical Soc*, **LXX**, 157-70

Buteux, S T E, Keen, D H, and Lang, A T O, 2005 *The Shotton Project. Resource Assessment*, University of Birmingham: Birmingham Archaeology

Buteux, V, 1996 *Archaeological Assessment of Bewdley and Wribbenhall, Hereford and Worcester*. Hereford and Worcester County Archaeological Service, report **298**

Carver, M O H, 1980 The excavation of three craftsman's tenements in Sidbury, 1976, in M O H Carver (ed), 1980 Medieval Worcester: an archaeological framework. Reports, surveys, texts and essays, *Trans Worcestershire Archaeol Soc*, 3 ser, **7**, 155-219

Challis, K, 2004 *Trent Valley GeoArchaeology 2002. Component 2b: LiDAR Terrain Modelling*, York Archaeological Trust

Chambers, F C, 1993 Pollen analysis, in C K Currie and M Lockock , 1993 Excavations at Castle Bromwich Hall Gardens 1989-91, *Post-medieval Archaeology*, 27, 111-199

Champion, T, 1999 The Later Bronze Age, in J Hunter and I Ralston (eds), 1999, 95-112

Chandler, J, 1993 *John Leland's Itinerary: Travels in Tudor England*, Stroud: Sutton

Clark, K, 1999 The Workshop of the World: The Industrial Revolution, in J Hunter and I Ralston (eds), 1999, 280-96

Clay, P, 2002 *The prehistory of the East Midlands Claylands. Aspects of settlement and landuse from the Mesolithic to the Iron Age in central England*, Leicester Archaeology Monograph, **9**

Clay, P, 2006 The Neolithic and Early to Middle Bronze Age, in N J Cooper (ed), 2006, 69-88

Coleman, L, Hancocks, A, and Watts, M, 2006 *Excavations on the Wormington to Tirley pipeline, 2000. Four sites by the Carrant Brook and River Isbourne, Worcestershire and Gloucestershire*, Cotswold Archaeology Monograph, **3**

Colledge, S, 1983a Sampling and human activities: a study of the charred plant remains from the Beckford roundhouse, unpublished typescript, revised for publication by L C Moffett in 1990

Colledge, S, 1983b Botanical remains from contexts other than the roundhouse, unpublished typescript

Colledge, S, and Greig, J, 1991 Stafford, King's Pool pollen results, unpublished typescript

Cook, J M, 1958 An Anglo-Saxon cemetery at Broadway Hill, Broadway, Worcs, *Antiq J*, **38**, 58-84

Cook, M, 1999 Watching brief at Riverdale, Grimley, Worcestershire (WSM 27204)

Cook, M, and Hurst, D, 1994 *Evaluation (fieldwalking) at Huntsman's Quarry, Kemerton*, Archaeological Service, Worcestershire County Council, internal report, **274**

Cooper, L J, (ed) 2006 *The archaeology of the East Midlands. An archaeological resource assessment and research agenda*, Leicester Archaeological monograph, **13**, Leicester: University of Leicester and English Heritage

Cox, C, 1997 Aerial photographic assessment report, in Edwards 1997, 50-56 & figs 8 & 9

Cox, C, 2003 Aerial photographic assessment report, in A Deeks, R Jackson and M Steinmetzer, 2004, appendix 3

Cox, C, 2003 Aerial photographic assessment, in D Miller *et al*, 2004

Cox, D C, 1975 The vale estates of the Church of Evesham, *c* 700–1086, *Vale of Evesham Histor Soc Res Pap*, **5**, 25-50

Crossley, D, 1990 *Post-medieval archaeology in Britain*, Leicester

Cruso Hencken, T, 1938 The excavation of the Iron Age camp on Bredon Hill, Gloucestershire (1935-7), *Arch J*, **95**, 1-111

Cunliffe, B, 1991 *Iron Age communities in Britain*, (3rd edn), London: Routledge

Currie, C K, and Locock, M, 1993 Excavations at Castle Bromwich Hall Gardens, *Post Medieval Archaeol*, **27**, 111-99

Dalwood, H, 1996 *Archaeological assessment of Clifton-upon-Teme*, Archaeological Service, Hereford and Worcester County Council, internal report, **310**

Dalwood, H, 2000 The archaeology of small towns in Worcestershire, *Trans Worcestershire Archaeological Soc*, 3 ser, **17**, 215-221

Dalwood, H, 2002a The Bronze Age has lagged behind… Bronze Age settlement and landscape in the West Midlands, *West Midlands Regional Research Framework for Archaeology 2002. Seminar 2: the Middle Bronze Age to Iron Age* http://www.archant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar2/Hal%20Dalwood.doc

Dalwood, H, 2002b The archaeology of post-Roman and early medieval Worcestershire, *West Midlands Regional Research Framework .for Archaeology. Seminar 4: Post-Roman to Conquest*, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar4/Hal%20Dalwood.doc (accessed 11 November 2005)

Dalwood. H, 2003 The archaeology of medieval small towns in the West Midlands, *West Midlands Regional Research Framework for Archaeology. Seminar 5: the medieval period.* http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/Hal%20Dalwood.doc (accessed 2 December 2005)

Dalwood, H, 2004 Resource assessment of aggregate archaeology in Worcestershire:Project Outline (PNUM 3966), Historic Environment and Archaeology Service, Worcestershire County Council, unpublished project design

Dalwood, H, Buteux, V, and Pearson, E, 1996 *Salvage recording on the Astley to Worcester Aqueduct: Archive report*, Archaeological Service, Hereford and Worcester County Council, internal report, **382**

Dalwood, H, Buteux, V, and Pearson, E, 1998 Archaeology of the Astley to Worcester Aqueduct, *Trans Worcestershire Archaeol Soc*, 3 ser, **16**, 1-35

Dalwood, H, and Ratkai, S, 1998 *Salvage Recording at Bennett's Hill Anglo-Saxon Cemetery, Offenham: Interim Report*, Archaeological Service, Hereford and Worcester County Council, internal report, **539**

Dalwood, H, and Edwards, R, 2004 *Excavations at Deansway, Worcester, 1988-89: Romano-British Small Town to Late Medieval City*, CBA Res Rep, **139**, CBA: York

Dalwood, H, Hancocks, A, and Jackson, R, 2005 Archaeology and Aggregates in Worcestershire. Project Design for a resource assessment of aggregate archaeology in Worcestershire (EH PNUM 3966), Historic Environment and Archaeology Service, Worcestershire County Council and Cotswold Archaeology, unpublished project design

Dark, K, 1994 *Civitas to Kingdom. British Political Continuity 300-800*, London: Leicester University Press

Dark, K, 2000 *Britain and the End of the Roman Empire*, Stroud: Tempus

Dark, P, 2000 *The Environment of Britain in the First Millennium AD*, London: Duckworth

Dark, P, 2004 Plant remains as indicators of seasonality of site-use in the Mesolithic period, *Environmental Archaeology*, **9/1**, 39-47

Darvill, T, and Fulton, A K, 1998 *MARS: the Monuments at Risk Survey of England, 1995*, London and Bournemouth: English Heritage and Bournemouth University

Darvill, T, and Thomas, J, (eds) 1996 *Neolithic Houses in Northwest Europe and beyond*, Neolithic Studies Group Seminar papers, 1, Oxbow Monograph, **57**

Davis, S J M, 1987 *The archaeology of animals*, Batsford, London

Dawson, D, and Bone, M, nd, The post-medieval, industrial and modern periods, SWARF resource assessment, http://www.somerset.gov.uk/media/933/63/pm_mod.pdf (accessed 27th April 2006)

de Moulins, D, 2006 Charred plant remains, in D Hurst, 2006, 69-75

de Rouffignac, C, Bowen, D Q, Coope, G R, Keen, D H, Lister, A M, Maddy, D, Robinson, J E, Sykes, G A, and Walker, M J C, 1995 Late Middle Pleistocene interglacial deposits at Upper Strensham, Worcestershire, England, *Journal of Quaternary Sci*, **10 (1)**, 15-31

Deeks, A, 2004 *Evaluation at Top Barn Farm, Holt, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1199**

Deeks, A, and Jackson, R, 2003 *Desk-based Assessment and Updated Project Design: Ripple Quarry, Ripple, Worcestershire (PNUM 3369)*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1245**

Deeks, A, Jackson, R, and Steinmetzer, M, 2004 *Evaluation of land at Retreat Farm Quarry, Grimley, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1206**

Dinn, J, 2003 Worcestershire from 1750, *West Midlands Regional Research Framework for Archaeology. Seminar **7**: the later post-medieval period*, http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, accessed on 12/12/05

Dinn, J, and Evans, J, 1990 Aston Mill Farm, Kemerton: excavation of a ring-ditch, Middle Iron Age enclosures, and a Grubenhaus, *Trans Worcestershire Archaeol Soc*, 3 Ser, **12**, 46-48

Dinn, J, and Hemingway, J A, 1992 Archaeology on the Blackstone to Astley aqueduct, *Trans Worcestershire Archaeol Soc*, 3 ser, **13**, 105-19

Dobinson, C, and Denison, S, 1995 *Metal detecting and archaeology in England*, CBA and English Heritage

Doonan, R C P, 2005 The mould fragments and slag, in R Jackson, 2005, 69-70

Dyer, C, 1980 *Lords and Peasants in a Changing Society: the Estates of the Bishopric of Worcester, 680-1540*, Cambridge: Cambridge University Press

Dyer, C, 1990 Dispersed settlements in medieval England: a case study of Pendock, Worcestershire, *Medieval Archaeol*, **34**, 97-121

Dyer, C, 1991 *Hanbury: Settlement and Society in a Woodland Landscape*, Department of English Local History, Occasional Papers, 4th series, **4**, Leicester: Leicester University Press

Dyer, C, 1994 *Everyday Life in Medieval England*, Hambledon and London

Dyer, C, and Slater, T R, 2000 The Midlands, in D M Palliser (ed), 2000 *The Cambridge urban history of Britain, vol 1, 600-1540*, Cambridge

Ede, J, 1990 Carbonised seeds, in J Dinn and J Evans, 1990, 46-8

Edmonds, M, 1995 *Stone tools and society. Working stone in Neolithic and Bronze Age Britain*, Batsford

Edmonds, M, 1999 *Ancestral geographies of the Neolithic*, Routledge

Edwards, R, 1989 *Archaeological prospection at Top Barns Quarry, Holt*, Archaeological Service, Hereford and Worcester County Council, internal report, **17**

Edwards, R, 1991 *Salvage recording at Church Farm Quarry, Holt*, Archaeological Service, Hereford and Worcester County Council, internal report, **75**

Edwards, R, 1997 *Desk-based assessment of enclosures south of Top Barn Farm, Holt*, Archaeological Service, Hereford and Worcester County Council, internal report, **605**

Edwards, R, 2006 *Aggregate Quarrying and Archaeology in Gloucestershire and Worcestershire: Conference and Peer Review Report* (report dated December 2006), Arboretum Archaeological Consultancy

Edwards, R, and Hurst, D, 2000 Iron Age settlement, and a medieval and later farmstead: excavation at 93-97 High Street, Evesham, *Trans Worcestershire Archaeol Soc*, 3 ser, **17**, 73-110

Elliott, L, Jones, H, and Howard, A J, 2004 The medieval landscape, in D Knight and A Howard, 2004, 153-91

Else, W J, 1943 Bronze Age pottery at Moor, near Fladbury, *Trans Worcestershire Naturalists Club (1932-41)*, **IX**, 53-6

English Heritage, 2003 *Implementation Plan for Exploring our Past (External version)*, London: English Heritage

English Heritage, 2004a River and estuary of the Severn – proposals for grant-funded historic environment research, English Heritage, unpublished typescript

English Heritage, 2004b *Geoarchaeology. Using earth sciences to understand the archaeological record*, London: English Heritage

English Heritage, 2005 *One of the largest Neolithic settlements found in Britain*, http://www.english-heritage.org.uk/server/show/ConWebDoc.5819, accessed 1 December 2005, English Heritage website

Esmonde-Cleary, S, 1989 *The Ending of Roman Britain*, London: Routledge

Evans, A, 2004 A gilded silver roundel, in C Patrick and J D Hurst, 2004, 50

Evans, C J, Jones, L, and Ellis, P, 2000 *Severn Valley Ware Production at Newland Hopfields*, BAR (Brit Ser), **313**

Evans, J, 2001 Joined up thinking: reconstructing the Roman west midlands from ceramic evidence, *West Midlands Regional Research Framework .for Archaeology. Seminar 3: The Roman period*, available at www.iaa.bham.ac.uk/research/fieldwork_research_thmes/projects/wmrrfa (accessed 2005)

Evison, V I, and Hill, P, 1996 *Two Anglo-Saxon Cemeteries at Beckford, Hereford and Worcester*. CBA Research Rep, **103**

Fagan, B, 2000 *The Little Ice Age: How climate made history 1300 – 1850*, Basic Books

Fagan, L, 1992 *Evaluation at Church Farm East, Grimley*, Archaeological Service, Hereford and Worcester County Council, internal report, **153**

Fagan, L, 1996 An evaluation at Rock Farm, Rock, *Trans Worcestershire Archaeol Soc*, 3rd ser, **15**, 343-5

Fagan, L, Hurst, D, and Pearson, E, 1994 *Evaluation at Kemerton WRW*, Archaeological Service, Hereford and Worcester County Council, internal rep, **225**

Fairburn, A S (ed), 2000 *Plants in Neolithic Britain and beyond*, Neolithic Studies Group Seminar Papers, **5**, Oxbow Books

Fairweather, A D, and Ralston, I B M, 1993 The Neolithic timber hall at Balbridie, Grampion Region, Scotland. A preliminary note on dating and plant macrofossils, *Antiquity*, **67**, 313-23

Ford, W J, 1976 Settlement patterns in the central region of the Warwickshire Avon, in P Sawyer (ed), 1976 *Medieval Settlement: Continuity and Change*, 274-94

Fulford, M, 1992 Introduction, in M Fulford and E Nichols (eds), 1992, xi-xiii

Fulford, M, and Nichols, E (eds), 1992 Developing Landscapes of Lowland Britain. The Archaeology of the British Gravels: a Review, *Soc Antiquaries London Occasional Pap*, **14**

Gamble, C S, and Lawson, A J (eds), 1996 *The English Palaeolithic Reviewed*, Salisbury: Trust for Wessex Archaeology

Garton, D, 1991 Neolithic settlement in the Peak District. Perspective and prospective, in R Hodges and K Smith (eds), *Recent developments in the archaeology of the Peak District*, Sheffield: Department of Archaeology and Prehistory, Sheffield Univesity, 3-22

Garwood, P, (ed), in press *The undiscovered country: The earlier prehistory of the West Midlands*, The Making of the West Midlands, **1**, Oxbow

Gerrard, C, 2003 *Medieval Archaeology: Understanding Traditions and Contemporary Approaches*, London: Routledge

Gibson, A, (ed), 1989 *Midlands Prehistory*, BAR (Brit Ser), **204**

Gilchrist, R, 1999 *Landscapes of the middle ages: churches, castles, and monasteries*, in J Hunter and I Ralston (eds), 1999, 228-46

Giles, K, and Dyer, C (eds), 2005 *Town and Country in the Middle Ages: Contrasts, Contacts and Interconnections, 1100-1500*, Society for Medieval Archaeology Monograph, **22**

Glyde, M, 1999 Mapping and interpretation of grass marks north of Riverdale, Grimley, Worcestershire, unpublished typescript

Goad, J, and Darch, E, 2002 *Archaeological watching brief on the Hill and Moor pipeline, Wyre Piddle, Worcestershire*, Archaeological Service, Worcestershire County Council, internal report, **972**

Gold, J T, and Gathercole, P W, 1956 Flint implements from Bourne Pool, Aldridge, *Trans Proc Birmingham Archaeol Soc*, **74**

Grant, A, 1988 Animal resources, in G Astill and A Grant, 1988 *The countryside of medieval England*, Blackwell, Oxford, 149-187

Green, C, 1962 A round barrow at Astley, Worcestershire, *Trans Worcestershire Archaeol Soc*, 2 Ser, **38**, 1-8

Greig, J, 2001 Priorities in Neolithic and Bronze Age Environmental Archaeology in the West Midlands Region, *West Midlands Regional Research Framework .for Archaeology. Seminar 1*: *the Palaeolithic to the Early Bronze Age*, available at http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/docs/Greig%20txt.doc, (accessed 5/7/06)

Greig, J, 2004 Comparison of the events from the Wellington and Cookley pollen results (Table 8), in R Jackson and D Miller, 2004 *Wellington Quarry, Herefordshire (1986-96):*

investigations of a landscape in the Lower Lugg Valley, Worcestershire County Council, Historic Environment and Archaeology Service, internal report, **1230**

Greig, J, 2005 The pollen, in R Jackson, 2005, 86-9

Greig, J, and Colledge, S, 1988 *The prehistoric and early medieval waterlogged plant remains from multiperiod Beckford sites HWCM 5006 and 5007 (Worcestershire), and what they show of the surroundings then*, English Heritage Ancient Monuments Laboratory Report, **54/88**

Griffin, S, Jackson, R, Jones, L, and Pearson, E, 2000 *Evaluation of land at DERA, Malvern, Worcestershire*, Archaeological Service, Worcestershire County Council, internal report, **859**

Griffin, S, Dalwood, H, Hurst, D, and Pearson, E, 2002 Excavation at Perdiswell Park and Ride, Droitwich Road, Worcester, *Trans Worcestershire Arch Soc*, 3rd Ser, **18**, 1-24

Griffin, S, and Jackson, R, 2003 *Archaeological evaluation at Moreton-on-Lugg, Herefordshire*, Archaeological Service, Worcestershire County Council, internal report, **1142**

Griffin, S, Griffin, L, and Jackson, R, 2005 *Salvage recording and evaluation at Throckmorton Airfield, Throckmorton, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal rep, **917**

Griffin, S, Western, G, Mann, A, and Dalwood, H, 2006 A late Iron Age burial at Old Yew Hill Wood, Church Lench, Worcestershire, *Trans Worcestershire Archaeol Soc*, 3 ser, **20**, 1-10

Grogan, E, 1996 Neolithic Houses in Ireland, in T Darvill and J Thomas (eds), 1996, 41-60

GSB, 2003 *Ripple quarry, Worcestershire*, GSB Prospection Ltd, report **2003/88**

Guest, P, 2001 The Iron Age/Roman interface in the West Midlands, *West Midlands Regional Research Framework .for Archaeology. Seminar 3: The Roman period*, available at www.iaa.bham.ac.uk/research/fieldwork_research_thmes/projects/wmrrfa (accessed 2005)

Guy, C, 2005 Archaeological work carried out in 2003/4, Archaeology at Worcester Cathedral, *Report of the 14th Annual Symposium, March 2004*, 1-4

Guyatt, D, 1996 *The Fisheries of the Worcestershire Severn (with Notes on the Fords and Ferries)*, Archaeological Service, Hereford and Worcester County Council, internal report, **439**

Gwilliam, H W, 1987 *Coach Travel and Turnpike Roads in Worcestershire*, unpublished typescript

Gwilliam, H W, 1976 *Worcestershire's Historic Bridges*, unpublished typescript

Gwilliam, H W, 1982 *Severn Fords and Ferries in Worcestershire*, unpublished typescript

Hamerow, H, 1992 Settlement on the gravels in the Anglo-Saxon period, in M Fulford and E Nichols (eds), 1992, 39-46

Hancocks, A, Holbrook, N, Watts, M, and Coleman, L, 2006 Discussion, in L Coleman, A Hancocks and M Watts, 2006, 88-95

Hart, J, Alexander, M, and Inder, S, 2004 *Bredon Farm, Bredon, Worcester. Post-excavation assessment and Updated Project Design*, Cotswold Archaeology (draft) report, **04134**

Haselgrove, C, 1999 The Iron Age, in J Hunter and I Ralston (eds), 1999, 113-34

Haselgrove, C, and Moore, T, 2006 *The Later Iron Age in Britain and Beyond*, Oxford: Oxbow

Havelock, G M, Carrot, J, Geary, B R, Howard, A J, Hall, A, Kenward, H, and Marshall, P, 2002 *Trent Valley GeoArchaeology 2002. Component 11a: Extending and protecting palaeoenvironmental data: deposit sampling*, Trent Valley GeoArchaeology 2002

Hawkes, C, 1935 A new handled Beaker, with spiral ornament, from Kempsey, Worcestershire, *Antiq J*, **15**, 275-83

Hazzledine, Warren, S, 1936 Archaeology of the submerged land-surface of the Essex Coast, *Proc Prehist Soc*, New Ser, **2**

Head, K, 2005 The environmental remains, in T Vaughan, 2005b, 28-30

Head, K, and Mann, A, 2005 The environmental remains, in S Griffin, L Griffin and R Jackson, 2005, 38-47

Head, K, and Pearson, E, 2005 Environmental analysis, in T Vaughan, 2005a, 12-3

Hemingway, J, and Buteux, V, 1992 *A site at Dunley Road, Areley Kings*, Archaeology Service, Hereford and Worcester County Council, internal report, **91**

Hencken, T, 1938 The excavation of the Iron Age camp on Bredon Hill, *Arch J*, **95**, 1-111

Hereford and Worcester County Council, 1997 *The County of Hereford and Worcester. Minerals Local Plan*, Environmental Services Department, Hereford and Worcester County Council

Hey, G, 1997 Neolithic settlement at Yarnton, Oxfordshire, in P Topping (ed), 1997, 99-111

Hey, G, and Lacey, M, with Linford, N, David, A, and Shepherd, N, 2001 *Evaluation of Archaeological Decision-making Processes and Sampling Strategies*, Oxford Archaeological Unit

Hill, J D, 1995 *Ritual and rubbish in the Iron Age of Wessex*, BAR (Brit Ser), **242**, Oxford: BAR

Hillaby, J, 2000 King Burgred, the Severn Stoke coin hoard and the demise of the kingdom of Mercia, *Trans Worcestershire Archaeological Soc*, 3 ser, **17**, 125-48

Hills, C, 1999 Early historic Britain, in Hunter and Ralston (eds), 1999, 176-93

Hillson, S, 1975 Aston Mill Farm, Kemerton, Worcestershire, *West Midlands Archaeol News Sheet*, **17** (1974), 46-8

Hines, J, 2002 The West Midlands Region: towards a research framework for the post-Roman to conquest period, *West Midlands Regional Research Framework for Archaeology. Seminar 4: Post-Roman to Conquest*, available at http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar4/John%20Hines.doc (accessed 16 November 2005)

Hingley, R, 1996 Prehistoric Warwickshire: a review of the evidence, *Trans Birmingham and Warwickshire Archaeol Soc*, **100**, 1-24

Hirst, S M, Walsh, D A, and Wright, S M, 1983 *Bordesley Abbey II. Second report on excavations at Bordesley Abbey, Redditch, Hereford-Worcestershire*, BAR (Brit Ser), **111**

Hodder, M, 2004 *Birmingham: the hidden history*, Stroud: Tempus

Holbrook, N, 2004 Romano-British, in G Walker, A Thomas and C M Bateman, 2004, 29-94

Hooke, D, 1980 The hinterland and routeways of Anglo-Saxon Worcester: the charter evidence, in M Carver (ed), Medieval Worcester, an Archaeological Framework, *Trans Worcestershire Archaeol Soc*, 3 ser, **7**, 39-52

Hooke, D, 1985a *The Anglo-Saxon Landscape. The Kingdom of the Hwicce*, Manchester: Manchester University Press

Hooke, D, 1985b Village development in the West Midlands, in D Hooke (ed), 1985 *Medieval Villages, a Review of Current Work*, Oxford Univ Comm Archaeol Monograph, ***5***, 125-54

Hooke, D, 1989 Early medieval estate and settlement patterns: the documentary evidence, in M Aston, D Austin and C Dyer (eds), 1989 *The Rural Settlements of Medieval England*, Oxford: Blackwell, 9-30

Hooke, D, 1990 *Worcestershire Anglo-Saxon Charter Bounds*, Woodbridge: Boydell Press

Hooke, D, 1998 *The Landscape of Anglo-Saxon England*, Leicester University Press

Hooke, D, 2002 The early medieval landscape, *West Midlands Regional Research Framework for Archaeology. Seminar 4: Post-Roman to Conquest*, available at http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar4/Della%20Hooke.doc (accessed 11 November 2005)

Hudson-Edwards, K A, Havelock, G, and Howard, A J, 2002 *Trent Valley GeoArchaeology 2002. Component 11c: Extending and protecting palaeoenvironmental data: the sourcing of alluvial sediment within the Trent Valley*, Trent Valley GeoArchaeology 2002

Hughes, G, and Crawford, G, 1995 Excavations at Wasperton 1980-1985. Introduction and Part1: the Neolithic and Early Bronze Age, *Trans Birmingham and Warwickshire Archaeol Soc*, **99**, 9-46

Hunt, A M, 1972 Blackstone (Brant Farm), Bewdley, *Worcestershire Archaeology Newsletter*, **11**, 2-3

Hunt, A M, 1973 Blackstone, Bewdley, *Worcestershire Archaeology Newsletter*, **13**, 1

Hunt, A M, 1977 Excavations at Blackstone, Bewdley, Worcs, unpublished typescript

Hunt, A M, 1982 Archaeology in the Avon and Severn Valleys - a review, *West Midlands Archaeology*, **25**, 1-24

Hunt, A, Shotliff, A, and Woodhouse, J, 1986 A Bronze Age barrow cemetery and Iron Age enclosure at Holt, *Trans Worcestershire Archaeol Soc*, 3 ser, **3**, 7-46

Hunt, C, 1994 Pershore Bridge, *Trans Worcestershire Archaeol Soc*, 3rd ser, **14**, 185-92

Hunt, J, 2003 Whose handmaiden? Historical and archaeological approaches to the Middle Ages, *West Midlands Regional Research Framework for Archaeology. Seminar 5: the medieval period*, available at, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/John%20Hunt%20paper%202.doc (accessed 2 December 2005)

Hunter, J, and Ralston, I (eds), 1999 *The Archaeology of Britain: an Introduction from the Upper Palaeolithic to the Industrial Revolution*, London: Routledge

Hurst, D, 1984 Weights from Beckford, Worcestershire, unpublished typescript

Hurst, D, 1987 Archaeological site evaluation at the proposed gypsy site, Bays Meadow, Droitwich (HWCM 3956): interim report, Archaeology Section, Hereford and Worcester County Council, typescript

Hurst, D, 1992 Friar Street, pottery, in S G Woodiwiss (ed), 1992, 132-54

Hurst, D, 1994 A medieval ceramic production site and other medieval sites in the parish of Hanley Castle: results of fieldwork in 1987-1992, *Trans Worcestershire Archaeological Soc*, 3rd ser, **14**, 115-28

Hurst, D, 1995 *Salvage Recording at the Wagon Wheel, Grimley*, Archaeological Service, Hereford and Worcester County Council, internal report, **380**

Hurst, D (ed), 1997a *A multi-period salt production site at Droitwich: excavations at Upwich 1983-84*, CBA Res Rep, **107**, York

Hurst, D, 1997b Comment on Oxford shelly ware, in J D Hurst (ed), 1997a, 78-9

Hurst, D, 1998 Fieldwork at Edvin Loach, Herefordshire, *J Bromyard and District Local History Soc*, **20**, 15-8

Hurst, D, 2000 Excavation of a medieval site at Whittington, *Trans Worcestershire Archaeol Soc*, 3rd ser, **17**, 161-86

Hurst, D, 2001 Dobunnic tribal centres, commodities and trade: the South Worcestershire Hoard, salt and pottery, *West Midlands Archaeology*, **44**, 84-93

Hurst, D, 2002 Middle Bronze Age to late Iron Age Worcestershire, *West Midlands Regional Research Framework for Archaeology. Seminar 2: Later Prehistory. The Middle Bronze Age and Iron Age*, available at http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar2/Derek%20Hurst.doc, (accessed 10 October 2005)

Hurst, D, 2003 Medieval industry in the west midlands, *West Midlands Regional Research Framework for Archaeology. Seminar 5: the medieval period*, available at, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/Derek%20Hurst.doc, (accessed 2 December 2005)

Hurst, D, 2004 Medieval quay found, *British Archaeology*, **77**, 8

Hurst, D, 2006 *Roman Droitwich. Dodderhill fort, Bays Meadow villa, and roadside settlement*, CBA Res Rep, **146**, York: CBA

Hurst, J, Pearson, E A, and Ratkai, S, 1995 *Salvage Recording at the Wagon Wheel, Grimley*, Archaeological Service, Hereford and Worcester County Council, internal report, **380**

Hurst, J, and Pearson, E A, 1996 An Iron Age site at Madeley Heath, Belbroughton, and other sites on the Fairfield to Frankley Green gas pipeline, *Trans Worcestershire Arch Soc*, 3rd Ser, **15**, 127-34

Hurst, J, and Pearson, E A, 1997 *Broadway Bypass: assessment and post-fieldwork proposal*, Archaeological Service, Hereford and Worcester County Council, internal report, **631**

Hurst, J, Burnett, A, Buteux, V A, Dalwood, H, Pacitto, A, and Payne, A, 2000 *The South Worcestershire hoards. Archaeological survey at Allesborough, Pershore, Worcestershire: Stage 1*, Archaeological Service, Worcestershire County Council, internal report, **812**

Hussey, D, 2000 *Coastal and river trade in pre-industrial England: Bristol and its region 1680-1730*, Exeter: University of Exeter Press

IGMTAU (Ironbridge Gorge Museum Trust Archaeology Unit), nd *Grimley fishponds, Grimley, Worcestershire: watching brief for National Rivers Authority*, Ironbridge Archaeological Series, **52**

Jackson, R, 1991a *Salvage recording at Retreat Farm, Grimley*, Archaeology Section, Hereford and Worcester County Council, internal report, **82**

Jackson, R, 1991b *Evaluation at Carrant Brook Farm, Ashton-under-Hill*, Archaeology Section, Hereford and Worcester County Council, internal report, **85**

Jackson, R, 1993 *Salvage recording on the Upton to Strensham Raw Water Main*, Archaeological Service, Hereford and Worcester County Council, internal report, **175**

Jackson, R, 2002 Production and trade, paper prepared for West Midlands Regional Research Framework for Archaeology: Middle Bronze Age to Iron Age

Jackson, R, 2004 Production: Roman ironworking, in H Dalwood and R Edwards, 1999, 100-5

Jackson, R, 2005 *Huntsman's Quarry, Kemerton, Worcestershire: Late Bronze Age settlement and landscape*, Draft publication report (WHEAS report **1302)**, Historic Environment and Archaeology Service, Worcestershire County Council and English Heritage

Jackson, R, Bevan, B, Hurst, D and de Rouffignac, C, 1994 *Salvage recording of a Mesolithic site at Lightmarsh Farm, Kidderminster Foreign*, Archaeological Service, Hereford and Worcester County Council, internal report, **199**

Jackson, R, and Hurst, D, 1994 Archaeology on the Upton to Strensham Raw Water Main, *Trans Worcestershire Archaeol Soc*, 3rd ser, **14**, 181-4

Jackson, R, Hurst, D, and Pearson, E, 1995 *Salvage recording of a Romano-British settlement near Crookbarrow Hill, Norton-juxta-Kempsey*, Archaeological Service, Hereford and Worcester County Council, internal report, **398**

Jackson, R, Bevan, L, Hurst, D, and de Rouffignac, C, 1996a Archaeology on the Trimpley to Blackstone Aqueduct, *Trans Worcestershire Archaeol Soc*, 3 ser, **15**, 93-126

Jackson, R, Hurst D, Pearson, E, and Ratkai, S, 1996b Archaeology on the Strensham to Worcester Aqueduct, *Trans Worcestershire Archaeol Soc*, 3rd Ser, **15,** 1-62

Jackson, R, Hurst, D, and Pearson, E, 1996 A Romano-British settlement at Leylandii House Farm, Norton and Lenchwick, *Trans Worcestershire Archaeol Soc*, 3rd Ser, **15**, 63-72

Jackson, R, and Napthan, M, 1998 Interim report on salvage recording of a Neolithic/Beaker and Bronze Age settlement and landscape at Huntsman's Quarry, Kemerton 1994-6, *Trans Worcestershire Archaeol Soc*, 3rd ser, **16**, 57-68

Jackson, R, and Miller, D, 2006 *Wellington Quarry, Herefordshire (1986-96): Investigations of a landscape in the Lower Lugg Valley*, (PNUM 2590; draft publication text, dated 21 March 2006), Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1230**

Jacobi, R M, and Pettitt, P B, 2000 An Aurignacian point from Uphill Quarry (Somerset) and the earliest settlement of Britain by *Homo sapiens sapiens*, *Antiqity*, **74** (285), 513-8

Jones, G, 2000 Evaluating the importance of cultivation and collecting in Neolithic Britain, in A S Fairbairn, 2000, 79-85

Jones, L, and Evans, J, 2006 The excavation of an Iron Age and Romano-British site at Stoke Lane, Wychbold, *Trans Worcestershire Archaeol Soc*, 3 ser, **20**, 11-36

Jones, R, 2004 Signatures in the soil: the use of pottery in manure scatters in the identification of medieval arable farming regimes, *Arch J*, **161**, 159-88

Kelly, J H, 1976 *The excavation of Wetton Mill rock shelter, Manifold Valley, Staffordshire*, City of Stoke-on-Trent Museum Archaeol Rep, **9**

Kenyon, D, 1998a *Ryall Quarry, Ripple, Worcestershire: Evaluation (part 1)*, Cotswold Archaeological Trust, report, **98858**

Kenyon, D, 1998b *Ryall Quarry, Ripple, Worcestershire: Evaluation (part 2)*, Cotswold Archaeological Trust, report, **98940**

King, A, 1978 A comparative survey of bone assemblages from Roman sites in Britain, *Institute of Archaeology Bulletin*, **15**, University of London, 207-32

Knight, D, and Howard, A J, 2004 From Neolithic to Early Bronze Age: the first agricultural landscapes, in D Knight and A J Howard (eds), 2004, 47-78

Knight, D, and Howard, A J, 2004 *Trent Valley Landscapes: the Archaeology of 500,000 Years of Change*, King's Lynn: Heritage Marketing and Publications

Lang, A T O, and Keen, D H, 2005 Homonid colonisation and the Lower and Middle Palaeolithic of the West Midlands, *Proc Prehist Soc*, **71**, 63-83

Lang, A T O, Lockett, N J, Bryant, V, and Hancox, E, 2006 Bringing the Quaternary into focus: a model for providing specialist information to non-specialist users, typescript submitted to Journal of Quaternary Science

Lentowicz, I J, 1997 Pottery, in J D Hurst (ed), 1997, 68-89

Lewis, C, 2002 Archaeological resource assessment and research agenda for the medieval period in the East Midlands (850-1500), http://www.le.ac.uk/archaeology/research/projects/eastmidsfw/pdfs/emidmed.pdf (accessed 13 February 2006)

Lewis, C, Mitchell-Fox, P, and Dyer, C, 2001 *Village, Hamlet, and Field. Changing Medieval Settlements in Central England.* Macclesfield: Windgather Press

Limbrey, S, and Evans, J G (eds), 1978 *The effect of man on the landscape in the lowland zone*, CBA Res Rep, **21**, York: Council for British Archaeology

Lockett, N, 2001a *Archaeological evaluation at Church Farm, Grimley, Worcestershire*, Archaeological Service, Worcestershire County Council, internal report, **883**

Lockett, N, 2001b Worcestershire in the Roman period, *West Midlands Regional Research Framework .for Archaeology. Seminar 3: The Roman period*, available at www.iaa.bham.ac.uk/research/fieldwork_research_thmes/projects/wmrrfa (accessed 2005)

Lockett, N, and Jones, L, 2001 *Watching brief at Grimley Sewage Treatment Works, Worcestershire*, Archaeological Service, Worcestershire County Council, internal report, **870**

Lockett, R, 1997 *A Survey of Historic Parks and Gardens in Worcestershire*, Hereford and Worcester Gardens Trust

Loveday, R, 1989 The Barford ritual complex: further excavations (1972) and a regional perspective, in A Gibson (ed) *Midlands Prehistory*, BAR (Brit ser), **204**, 51-84

Loveday, R, 2006 *Inscribed Across the Landscape. The Cursus Enigma*, Tempus

Lovett, J, 1990 Animal bone, in J Dinn and J Evans, 1990, 48-54

Lynch, F, 2000 The Earlier Neolithic, in F Lynch, S Aldhouse-Green, and J L Davies, 2000 *Prehistoric Wales*, Stroud: Sutton Publishing, 42-78

Macphail, R, 2004 Soils and land-use history: results and potential of soil micromorphology, in H Dalwood and R Edwards, 2004, 77-9, 558-67

Mawer, A, and Stenton, F M, 1927, *The Place-names of Worcestershire*

Mays, S, 1990 Human bone, in J Dinn and J Evans, 1990, 46-8

Meaney, A L, 1964 *A Gazetteer of Early Anglo-Saxon Burial Sites*, London: Allen and Unwin

Mellars, P A, and Reinhardt, S C, 1978 Patterns of Mesolithic landuse in southern England: a geological perspective, in P A Mellars (ed), 1978 *The early postglacial settlement of northern Europe*, Duckworth

Metcalf, D M, 1977 Monetary affairs in Mercia at the time of Aethelbald, in A Dornier (ed), 1977 *Mercian Studies*, Leicester: Leicester University Press, 87-106

Miller, D, 2003 *Archaeological evaluation (Stage 1.2) of land south of Top Barn Farm, Holt, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1165**

Miller, D, Darch, E, and Griffin, L, 2001 *Evaluation (stage 2) at land north of Clifton Quarry, Severn Stoke and Kempsey*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **945**

Miller, D, and Griffin, L, 2002 *Archaeological evaluation at Holt Heath, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **966**

Miller, D, Dalwood, H, and Darch, E, 2002 *Archaeological evaluation at Hill Court Farm, Longdon, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **999**

Miller, D, Griffin, L, and Pearson, E, 2004a *Archaeological Investigations at Church Lane, Hallow, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1174**

Miller, D, Griffin, L, and Pearson, E, 2004b Excavations at Stonebridge Cross, Worcestershire: an Iron Age and Romano-British settlement, *Trans Worcestershire Archaeol Soc*, 3 ser, **19**, 1-44

Miller, D, Pearson, E, Head, K, and Crawford, A, 2004 *Archaeological evaluation (Stage 3) at Ripple, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1231**

Millett, M, 1990 *The Romanisation of Britain*, Cambridge: Cambridge University Press

Milln, J, 2003 Estate landscapes in the West Midlands, *West Midlands Regional Research Framework for Archaeology. Seminar 7: the later post-medieval period*, available online at http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem7 htm, (accessed on 12/12/05)

Mithen, S, 1999 Hunter-gatherers of the Mesolithic, in J Hunter and I Ralston (eds), 1999, 35-57

Mindykowski, A, 1999 The Forest of Wyre, Worcestershire/Shropshire Borders. An Evaluation and Reconstruction of a Late Medieval Woodland Landscape, BA Dissertation, University of York Dept of Archaeology

Moffett, L, 1994a Charred plant remains, in S Cracknell and R Hingley, 1994 Park Farm, Barford. Excavation of a prehistoric settlement site, 1988, *Trans Birmingham and Warwickshire Archaeol Soc (1993-4)*, **98**, 22-3

Moffett, L, 1994b Charred cereals from some ovens/kilns in late-Saxon Stafford and the botanical evidence for the pre-burh economy in J Rackham (ed), 1994 *Environmnet and economy in Anglo-Saxon England: a review of recent work on the environmental archaeology of rural and urban proceedings of a conference held at the Museum of London, 9-10 April 1990*, CBA Res Rep, **89**, 55-64

Moffett, L, 2004a Botanical remains, in H Dalwood and R Edwards, 2004, 537-56

Moffett, L, 2004b Cultivation and site environment, in H Dalwood and R Edwards, 2004, 91-4

Monkhouse, F J, 1954 Worcestershire, in H C Darby and I B Terrett (eds), 1954 *The Domesday Geography of Midland England*, Cambridge: Cambridge University Press, 215-69

Moray Williams, A, 1954 Socketed axe and spearhead from Bredon Hill, *Trans Worcestershire Archaeol Soc*, **XXXI**, 49-50

Morris, E L, 1985 Prehistoric salt distributions: two case studies from western Britain, *Bull Board Celtic Stud*, **32**, 15-25

Morris, E L, 1994 Production and distribution of pottery and salt in Iron Age Britain: a review, *Proc Prehist Soc*, **60**, 371-94

Morriss, R K, 1999 *The Archaeology of Railways*, Stroud: Tempus

Mullin, D, 2005 The aggregate landscape of Gloucestershire. Predicting the archaeological resource (PNUM 3346), Archaeology Service, Gloucestershire County Council, unpublished typescript

Myers, A M, 2001 An Archaeological Resource Assessment and Research Agenda for the Mesolithic in the East Midlands, http://www.le.ac.uk/archaeology/research/projects/eastmidsfw/index.html

Myers, A M, 2006 The Mesolithic, in N J Cooper (ed), 2006, 51-68

Myers, A M, in press, *The Upper Palaeolithic and Mesolithic Archaeology of the West Midlands Region*, in P Garwood (ed), in press

Napthan, M, Hancocks, A, and Pearson, E, 1996 *Evaluation at the Northwick Arms Hotel, Bengeworth, Evesham*, Archaeological Service, Hereford and Worcester County Council, internal report, **475**

Napthan, M, Jackson, R, Pearson, E, and Ratkai, S, with contributions by Bayley, J, Greig, J, and Woodward, A, 1997a *Salvage Recording at Huntmans Quarry Kemerton 1994-6: Post-Excavation Assessment and Updated Project Design*, Archaeology Service, Hereford and Worcester County Council, internal report, **449**

Napthan, M, Hancocks, A, Pearson, E, and Rátkai, S, 1997b *Evaluation of the proposed Wyre Piddle Bypass*, Archaeological Service, Hereford and Worcester County Council, internal report, **1170**

Nayling, N, 1998 *The Magor Pill medieval wreck*, CBA Res Rep, **108**, York: Council for British Archaeology

Needham, S P, 1996 Chronology and periodisation in the British Bronze Age, *Acta Archaeologica*, **67**, 121-40

Needham, S, 2000 *The passage of the Thames. Holocene environment and settlement at Runnymede Bridge*, Runnymede Bridge Research Excavations, **1**, London: British Museum Press

Needham, S, and Macklin, M G (eds), 1992 *Archaeology under alluvium*, Oxford: Oxbow Books

Newman, R, 2001 *The Historical Archaeology of Britain* c *1540-1900*, Stroud: Sutton

Nisbet, J, 1906 Forestry, in J W Willis-Bund and W Page (eds), *Victoria History of the County of Worcestershire*, **2**, 315-21

Olivier, A, 1996 *Frameworks for our Past. A review of research frameworks, strategies and perceptions*, London: English Heritage

Oswald, A, 1974 Excavations at Beckford, *Trans Worcestershire Archaeol Soc*, 3rd Ser, **3**, 7-54

Oxford Archaeological Unit, 2000 Horse Stone. A Neolithic longhouse, *Current Archaeology*, **168**, 450-52

Palmer, M, and Neaverson, P, 1994 *Industry in the landscape 1700-1900*

Palmer, S, 2006 *Neolithic, Bronze Age, Iron Age, Romano-British and Anglo-Saxon excavations on the Transco Churchover to Newbold Pacey gas pipeline in 1999*, Warwickshire Museum Field Services, report, **0611**

Parfitt, S A, Barendregt, R W, Breda, M, Candy, I, Collins, M J, Coope, G R, Durbidge, P, Field, M H, Lee, J R, Adrian M. Lister, A M, Mutch, R, Penkman, K E H, Preece, R C, Rose,

J, Stringer, C B, Symmons, R, Whittaker, J E, Wymer, J J, and Stuart, A J, 2005 The earliest record of human activity in northern Europe, *Nature*, **438**, 1008-12

Palmer, S, 1992 Polesworth, Kisses' Barn Farm (SK276023), *West Midlands Archaeology*, **33**, 57-8

Palmer, S, in press Recent work on the Neolithic and Bronze Age in Warwickshire: a structured landscape straddling Church Lawford and King's Newnham, in P Garwood (ed), in press

Parker Pearson, M, 1999 The Earlier Bronze Age, in J Hunter and I Ralston (eds), 1999, 77-94

PAS, 2004-5 *Portable Antiquities Annual Report 2004-5*, http://www.finds.org.uk/documents/PAS_2004_05.pdf (accessed 7 July 2006)

Patrick, C, and Hurst, D, 2004 *Archaeological survey and excavation along the Cotswold spring supply trunk main: archive report*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1140**

Peacock, D, 1967 Fladbury, *Current Archaeology*, **1**(5), 123-4

Peacock, D, 1968 A petrological study of certain Iron Age pottery from western England, *Proc Prehist Soc*, **34**, 414-26

Pearson, E, 2000a Environmental remains, in R Edwards and D Hurst, 2000, 93 & 102-3

Pearson, E, 2000b *Environmental remains from an excavation at Corve Street, Ludlow*, Archaeological Service, Worcestershire County Council, internal report, **816**

Pearson, E, 2001 Cows, beans and view: Landscape and farming of the West Midlands in later prehistory, *West Midlands Regional Research Framework for Archaeology. Seminar 2*: *the Middle Bronze Age to Iron Age periods*, available at *http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar2/Liz%20Pearson.doc*, (accessed 3/07/06)

Pearson, E, 2002 Environmental archaeology in the West-Midlands in the early post-medieval period. Do we really need environmental archaeology? *West Midlands Regional Research Framework .for Archaeology. Seminar 6*: *the early post-medieval period*, available at http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar6/Liz%20Pearson.doc, (accessed 6/10/06)

Pearson, E, 2004a The environmental remains, in A Deeks, 2004, 25-8

Pearson, E, 2004b The environmental evidence, in C Patrick and D Hurst, 2004, 56-7

Pearson, E, 2005 The plant macrofossils, in R Jackson, 2005, 83-6

Pearson, E, 2006a The charred plant remains in A Barber and M Watts, 2006, 50-4

Pearson, E, 2006b Medieval and post-medieval activity. Environmental remains, in R Jackson and D Miller, 2006, 113-5

Pearson, E, Greig, J, and Jordan, D, 1999 *Environmental remains from a watching brief at Lammascote Road, Stafford*, Archaeological Service, Worcestershire County Council, internal report, **767**

Peltenburg, E J, 1967 Excavations at Grimley, Worcestershire, *Trans Worcestershire Archaeol Soc (1965-7)*, 3 ser, **1**, 11-14

Perring, D, 2002 *Town and Country in England: Frameworks for Archaeological Research*, CBA Res Rep, **134**, York: CBA

Pinter-Bellows, S, 2005 Animal bone in R Jackson, 2005, 80-3

Pitts, M, and Roberts, M, 1997 *Fairweather Eden. Life in Britain half a million years ago as revealed by the excavations at Boxgrove*, London: Century

Prentice, J, 1994 The building stones used in the cathedral, in P Barker, *A Short Architectural History of Worcester Cathedral*. Worcester Cathedral Publications, **2**, Worcester

Price, E A, and Watson, B, 1984 A Romano-British and Anglo-Saxon site at Sedgeberrow (Hereford and Worcester), *West Midlands Archaeology*, **27**, 88-95

Rackham, O, 1986 *The History of the Countryside London*, J M Dent and Sons Ltd

Ratkai, S, 2003 That earthen lot: ceramics in the west midlands, *West Midlands Regional Research Framework for Archaeology: Seminar 5: the medieval period*, available at http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar5/Stephanie%20Ratkai.doc (accessed 2 December 2005)

Ray, K, in press The Neolithic in the West Midlands: an overview, in P Garwood (ed), in press

Richmond, A 1999 *Preferred economies: the nature of the subsistence base throughout mainland Britain during prehistory*, BAR (Brit Ser), **290**

Roberts, M B, and Parfitt, S A, 1999 *Boxgrove. A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex*, London: English Heritage Archaeological Report, **17**

Roberts, B, and Wrathmell, S, 2000 *An Atlas of Rural Settlement in England*, London: English Heritage

Roberts, B, and Wrathmell, S, 2002 *Region and Place: A study of English Rural Settllement*, London: English Heritage

Robinson, M A, 1983 Arable/pastoral ratios from insects?, in M Jones, 1983 *Integrating the subsistence economy*, BAR (Brit Ser), **181**, 19-43

Robinson, M A, 1992 Environmental archaeology of the river gravels: past achievements and future directions, in M Fulford and E Nichols (eds), 1992, 47-62

Robinson, M A, 2000 Further consideration of Neolithic charred cereals, fruits and nuts, in A S Fairburn (ed), 2000, 85-91

Roe, D A, 1968 *A gazetteer of British Lower and Middle Palaeolithic sites*, CBA Res Rep, **8**, London: Council for British Archaeology

Roe, F, 2004 Worked stone, in H Dalwood and R Edwards, 2004, 466-90

Roymans, N, 1996 From the sword to the plough. Regional dynamics in the romanisation of Belgic Gaul and the Rhineland area, in N Roymans (ed), *From the Sword to the Plough*, *Amsterdam Archaeological Studies*, **1**, 9-126

Sachse, K H, nd History of Kemerton, unpublished typescript

Salter, C, 2000 The metalworking debris, in A Barber and N Holbrook, 2000, 54-7

Saville, A, 1981 Mesolithic Industries In Central England: an exploratory investigation using microlith typology, *Arch J*, **138**, 49-71

Saville, A, 1986 The lithic assemblage, in Cane, J, and Cane, C, *The excavation of a Mesolithic cave site near Rugely, Staffordshire*, City of Stoke-on-Trent Museum archaeological report, **3**

Schofield, J, 1999 Landscapes of the middle ages: towns 1050-1500, in J Hunter and I Ralston (eds), 1999, 210-27

Shelley, D, 1989 *Evaluation at Top Barns Quarry, Holt,* Archaeological Service, Hereford and Worcester County Council, internal report, **29**

Shotton, F W, 1978 Archaeological inferences from the study of alluvium in the lower Severn - Avon valleys, in S Limbrey and J G Evans (eds), 1978 *The effect of man on the landscape*, CBA Res Rep, **21**, 27-32

Smith, C N S, 1943 Broadway: a prehistoric loom weight, in Miscellenea, *Trans Worcestershire Archaeol Soc*, New Ser, **20**, 49

Smith, C N S, 1944 Broadway Gravel Pit: An early Romano-British site, in Miscellenea, *Trans Worcestershire Archaeol Soc*, New Ser, **21**, 77-8

Smith, C N S, 1946 A prehistoric and Roman site at Broadway, *Trans Worcestershire Archaeol Soc*, New Ser, **23**, 57-8

Smith, C N S, 1958 Catalogue of prehistoric finds from Worcestershire, *Trans Worcestershire Archaeol Soc*, New Ser, **34**, 1-27

Snyder, C A, 1998 *An Age of Tyrants. Britain and the Britons AD 400 – 600*, Stroud: Sutton

Stamper, P, 1994 The medieval river, in R K Morriss (ed), 1994 *The Shropshire Severn*, Shrewsbury: Shropshire Books, 63-73

Stamper, P, 1999 Landscapes of the middle ages: rural settlement and manors, in J Hunter and I Ralston (eds), 1999, 247-63

Stamper, P, 2003 The post-medieval countryside, *West Midlands Regional Research Framework for Archaeology. Seminar 6: the earlier post-medieval period*, available at http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, (accessed on 12/12/05)

Stanford, S, 1981 *Midsummer Hill: an Iron Age hillfort on the Malverns*, Hereford: privately printed

Stevens, C, 2003 An investigation of agricultural consumption and production models fro prehistoric and Roman Britain, *Environmental Archaeology*, **8/1**, 51-61

Straker, V, 2006 Macroscopic plant remains, in D Hurst, 2006, 221-3

Stratascan, 1997 A report on a geophysical survey carried out at Saxon's Lode, Ripple, Worcestershire, unpublished client report

Tarmac Limited, 2002 Proposed extension to Clifton Quarry, **6**: Geology, unpublished typescript

Taylor, C, 1975 *Fields in the English Landscape*, Stroud: Sutton

Thomas, J, 1991 *Rethinking the Neolithic*, Cambridge University Press

Thomas, J, 1999 *Understanding the Neolithic*, Routledge

Thomas, J, 2003 Thoughts on the 'Repacked' Neolithic revolution, *Antiquity*, **77** (295), 67-74

Thomas, N, 1967 A double Beaker burial on Bredon Hill Worcs, *Trans Birmingham Archaeol Soc (1965)*, **82**, 58-76

Thomas, N, 2005 *Conderton Camp, Worcestershire: a middle Iron Age hillfort on Bredon Hill*, CBA Res Rep, **143**

Thorn, F, and Thorn, C, 1982 *Domesday Book: Worcestershire*, Chichester: Philimore

Thorndycraft, V, Pirrie, D, and Brown, A G, 2003 An environmental approach to the archaeology of tin mining on Dartmoor, in P Murphy and P E J Wiltshire (eds), 2003 The environmental archaeology of industry, *Symposia of the Association for Environmental Archaeology*, **20**, 19-28

Timby, J, 2004 Later prehistoric and Romano-British pottery from Childswickham, Worcestershire, in Patrick and Hurst 2004, 16-38

Toomey, J P, 2001 *Records of Hanley Castle, Worcestershire, c 1147-1547*, Worcestershire Historical Society, New Ser, **18**

Topping, P (ed), 1997 *Neolithic landscapes*, Neolithic Studies Group Seminar Papers, **2**, Oxbow

Trinder, B, 2003 'Issues Relating to Transport', West Midlands Regional Research Framework for Archaeology **7**: the Later post-medieval period, available online at http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, accessed on 12/12/05

Trinder, B, 2005 *Barges & bargemen: social history of the upper Severn navigation 1660-1900*, Chichester

Underdown, P T, 1984 The navigation of the River Severn, 1750-1950, *Trans Worcestershire Archaeol Soc*, 3 Ser, **9**, 95-100

van der Veen, M, 1985 Plant remains, in R Miket, Ritual enclosures at Whitton Hill, Northumberland, *Proc Prehist Soc*, **51**, 137-48

Vaughan, T, 2005a *Archaeological evaluation at Clifton Quarry, Severn Stoke, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1369**

Vaughan, T, 2005b *Archaeological recording of land off Evesham Road, Upper Moor, Pershore, Worcestershire: Archive report*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **1309**

Vince, A, 1977 The medieval and post-medieval ceramic industry of the Malvern region: the study of a ware and its distribution, in D P S Peacock (ed), 1977 *Pottery and Early Commerce, Characterisation and Trade in Roman and Later Ceramics*, Academic Press, 257-305

Vince, A, 2002 Post-Roman ceramics in the west midlands, *West Midlands Regional Research Framework for Archaeology. Seminar 4: Post-Roman to Conquest*, accessible at, http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/seminar4/Alan%20Vince-ADD.doc (accessed 16 November 2005)

Walker, G, Thomas, A, and Bateman, C M, 2004 Bronze Age and Romano-British sites south-east of Tewkesbury: evaluations and excavations 1991-7, *Trans Bristol Gloucestershire Archaeol Soc*, **122**, 29-94

Walker, I, 1958 Excavations on a Romano-British site at Astley, *Trans Worcestershire Archaeol Soc*, 2 Ser, **35**, 29-58

Walker, I, 1959 Excavations on a second Romano-British site at Astley, *Trans Worcestershire Archaeol Soc*, 2 Ser, **36**, 52-60

Wanklyn, M, 1996 The impact of water transport facilities on the economies of English river ports, *c* 1660-1760, *Economic Hist Rev*, NS, **49.1**, 20-34

Webster, G, 1956 Roman Britain in 1955, *Journal of Roman Studies*, **46**, 129-30

Webster, G, and Hobley, B, 1964 Aerial reconnaissance over the Warwickshire Avon, *Arch J*, **121**, 1-22

West Midlands Regional Aggregate Working Party, 2006 *Annual report 2004*, WMRAWP

Whimster, R, 1989 *The Emerging Past: Air Photography and the Buried Landscape*, London: RCHME

White, R, and Gaffney, V, 2003 Resolving the paradox: the work of the Wroxeter hinterland project, in P Wilson (ed) 2003, 221-32

Whitehead, P, 1988 Lower Palaeolithic artefacts from the lower valley of the Warwickshire Avon, in R J MacRae and N Maloney (eds), *Non-flint stone tools and the palaeolithic occupation of Britain*, BAR (Brit Ser), **189**, 103-21

Whittaker, A, 1972 Geology of Bredon Hill, *Bulletin of the geological survey of Great Britain*, **42**, 1-49

Whittle, A, 1997 Moving on and moving around: Neolithic settlement mobility, in P Topping (ed), 1997, 15-22

Whittle, A, 1999 The Neolithic period *c* 4000-2500/2200 BC, in J Hunter and I Ralston (eds), 1999, 58-76

Whyte, I, 1999 The historical geography of Britain from AD 1500, in J Hunter and I Ralston (eds), 1999, 265-79

Wichbold, D, nd *Watching brief at Grimley and Holt Primary School, Grimley (HWCM 12978)*, Hereford and Worcester County Council, internal report, **194**

Wickham, C, 2005 *Framing the Early Middle Ages. Europe and the Mediterranean, 400-800*, Oxford

Willan, T S, 1937 The river navigation and trade of the Severn Valley, 1600-1750, *Economic Hist Rev*, **8.1**, 68-79

Williams, P, Hurst, D, Pearson, E, and Greig, J, 2005 *Archaeological watching brief and building recording at Impney Farm, Dodderhill, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, internal report, **991**

Williamson, T, 2003 *Shaping Medieval Landscapes: Settlement, Society, Environment*, Macclesfield: Windgather Press

Willis, S, 2006 The Later Bronze Age and Iron Age, in N J Cooper (ed), 2006, 89-136

Wills, J, forthcoming *Excavations at Beckford, Worcester 1972-9*, CBA Res Rep

Wilson, P, 2003 *The Archaeology of Roman Towns: studies in honour of John S Wacher* Oxford: Oxbow

WMRRF, 2002 Aims of the early post-medieval period seminar, *West Midlands Regional Research Framework. Seminar 6: the post-medieval (pre-industrial) period*, available online at http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/wmrrfa/sem6 htm, (accessed on 12/12/05)

Woodiwiss, S (ed), 1992 *Iron Age and Roman salt production and the medieval town of Droitwich. Excavations at the Old Bowling Green and Friar Street*, CBA Res Rep, **81**, York: CBA

Woodward, A, and Jackson, R, 2005 Prehistoric pottery, in R Jackson, 2005, 47-63

Woodward, A, undated Typescript in Beckford archive

Worcester City Council, November 2006 Worcester Urban Archaeological Strategy: an outline research framework for the archaeology of Worcester, Worcester City Council

Worcestershire County Council, April 2006 *Worcestershire County Council Minerals and Waste Development Scheme*, Worcestershire County Council

Wymer, J J, 1977 *Gazetteer of Mesolithic sites in England and Wales*, CBA Res Rep, **20**, London: Council for British Archaeology

Wymer, J J, 1996 *The English Rivers Palaeolithic Project, Report 1, The Thames Valley and The Warwickshire Avon*, Salisbury: Wessex Archaeology and English Heritage

Wymer, J J, 1999 *The Lower Palaeolithic occupation of Britain*, Salisbury: Wessex Archaeology and English Heritage

Young, R, 2000 *Mesolithic lifeways. Current research from Britain and Ireland*, Leicester Archaeology monographs, **7**

Appendix 1: Quarry summaries

1. Sand and gravel

1.1 Active/permitted sites

1.1.1 Ball Mill: Church Farm East, Grimley (383700 261250)

This forms part of the wider Holt/Grimley complex of quarries. It covers an area with an extant permission (Tarmac Ltd) lying to the south of the Grimley Brook (permission granted in 1991) and east of the worked out Church Farm South Quarry. Up to 23ha of reserve with up to 6m depth was originally estimated (Hereford and Worcester County Council 1997). This is the currently active part of Ball Mill Quarry.

An archaeological evaluation was undertaken of this area in 1992 but identified no significant deposits (Fagan 1992). No further archaeological works are required.

There is the potential for extension into a narrow area to the north identified in the Minerals Local Plan but due to the proximity of the village of Grimley no extension to the south is likely (Hereford and Worcester County Council 1997).

1.1.2 Ball Mill: Church Farm West, Grimley (NGR 383000 261350)

This forms part of the wider Holt/Grimley complex of quarries based at Ball Mill. The current operator, Tarmac Limited, has recently been granted planning permission for extraction within this area covering some 17.5ha and the current intention is to work this following completion of Church Farm East (Section 1.1.1).

The site contains a Scheduled Ancient Monument but following a detailed programme of evaluation (Deeks 2004), English Heritage has indicated that Scheduled Monument Consent will be granted for a programme of excavation (subject to approval of an appropriate project design and satisfactory completion of that design). This will lead to de-scheduling of the site allowing extraction to proceed.

1.1.3 Bow Farm, Ripple (NGR 387000 236800)

This covers a large area of *c* 52ha which has been permitted for extraction since 1988 (permission granted to RMC Aggregates Western Limited). Operation has recently commenced by Cemex UK (now owners of RMC) with sand and gravel being shipped up the River Severn on barges to Ryall (Appendix 1: Section 1.1.5). An estimated 1,950,000 tonnes of sand and gravel are identified with a working life of 13 years.

This is a pre-PPG16 application. Consultation in 1987 led to concerns being raised about archaeology but only an access condition was placed on the permission by the MPA. This was despite a request from the County Archaeology Officer for a condition requiring the operator to notify the County Archaeology Officer of any features of archaeological interest identified and to not undertake any further work in the area of any such features until a scheme for their treatment could be agreed. RMC undertook to follow CBI Code of Practice but have now been taken over by Cemex UK and no agreement is understood to be in place. The potential of the site has however been highlighted by a DBA, geophysics and targeted trenching undertaken through ALSF provision in 2003-4 (Deeks and Jackson 2003; Miller *et al* 2004). However, although significant deposits were identified, no mitigation startegy has been established and extraction is ongoing.

The Minerals Local Plan also identifies a further 16ha preferred area of extraction (estimated yield 480,000 tonnes) to the south of the currently permitted area (Hereford and Worcester County Council 1997).

1.1.4 Chadwick Lane/Madeley Quarry, Wildmoor (NGR 395400 276800)

Granted permission in 1980. A 7.5ha site, currently operated by Salop Sand and Gravel Supply. This lies adjacent to earlier workings (to the north and east) and was extended in 1983 to provide a projected 112,000 tonnes over 10-12 years. This extension has now largely been worked out and is used as landfill. A small extension is currently proposed to the west.

Original areas were pre-PPG16 applications with no archaeological provision conditioned. The proposed extension is small and is subject to an agreed programme of archaeological works.

1.1.5 Chadwick Mill Farm, Bromsgrove (NGR 396590 277000)

This small site covers some 10ha and has been extended under the names Pinches 1, 2 and 3 of which the latter is the current operational area. The site was owned initially by Pinches Ltd (later Leigh Interests Ltd), but is now operated by Brian Hill Haulage and Plant Hire. In 1985, an extension to provide a further 450,000 tonnes over 8-10 years was permitted (Pinches 2). A further extension was permitted in 1990 (Pinches 3). The Quarry is listed as active in the 2006 list supplied by the MPA. The site has produced both silica sand and sand and gravel in the past but is now understood to produce sand primarily used in construction

Both the originally permitted area and the 1985 extension applications pre-dated PPG16 and no archaeological consultation or provision made. The 1990 extension was subject to consultation but no conditions were recommended.

1.1.6 Clifton (NGR 384400 246000)

This site was granted permission in 1980 and was left inactive for many years. In 1997 it remained a committed area (Hereford and Worcester County Council 1997), becoming active the following year. The site covered 86.7ha with *c* 66ha of extraction permitted and an estimated 2,750,000 tonnes of reserve. Since this application pre-dated PPG16, no archaeological constraints were placed on this area which is now worked out.

In 2001, Tarmac Limited explored the possibility of a major extension (*c* 32ha) to the north. A pre-determination archaeological evaluation comprising DBA, geophysics and fieldwalking (Miller, Darch and Griffin 2001) identified a high potential for significant Iron Age and Romano-British settlement and ironworking deposits associated with a series of enclosures along the terrace and adjacent to the Severn. Although never evaluated through trenching, the implications of the archaeological mitigation liable to be required were sufficiently problematic in conjunction with other considerations to contribute to a decision to shelve the proposed extension.

Subsequently in 2005, a much-reduced extension was evaluated, comprising a further 14.25ha to the north-east of the permitted area and a further 2.50ha within the original quarry boundary. This revealed areas of Middle Bronze Age and Early to Middle Iron Age (settlement) activity and a palaeochannel containing peat deposits dating from the Later Mesolithic/Early Neolithic through to the Early Bronze Age (Vaughan 2005a).

These additional areas have now been permitted with a mitigation requirement for detailed analysis of the palaeochannel deposits, excavation of the Iron Age settlement area and maintenance of a watching brief across the remainder. The palaeochannel analysis is now underway and a large area has been stripped under the watching brief provision. Results from the latter have considerably exceeded anticipated levels of activity and include significant

Late Neolithic (Grooved Ware pits), Bronze Age (burnt mound) and Romano-British (waterlogged pits) deposits situated on the east side of the palaeochannel (Andy Mann pers comm). In the light of the unexpected and significant nature of these results, an assessment has been completed for the watching brief fieldwork archive and an Updated Project Design submitted to EH for consideration for ALSF support (under PPG16 Assistance) for analysis and dissemination.

1.1.7 Ryall House Farm/Saxon's Lode Farm (NGR 386650 239250)

The original quarry area, Ryall House Farm, was granted permission in 1989. It comprised *c* 29ha and was fully worked out by RMC Aggregates Western Limited. A preferred area for extraction to the south, Saxon's Lode Farm) was identified in the 1997 Minerals Local Plan (Hereford and Worcester County Council 1997) and covered an additional *c* 18ha. This was subsequently permitted for extraction.

Although permitted reserves are now worked out and the site largely restored, the plant site remains in active use processing materials from Bow Farm, Ripple (Section 1.1.3). A further area Ryall North was identified in the 1997 MLP as a preferred area for extraction and some archaeological evaluation has been completed on behalf of Cemex UK (Section 1.2.2).

No archaeological provision was conditioned for Ryall House Farm which was a pre-PPG16 application. However, the Saxon's Lode extension to the south was subject to evaluation and subsequent excavation prior to extraction leading to the recording of significant Romano-British and early medieval period deposits relating primarily to settlement (Stratascan 1997; Kenyon 1998a; Kenyon 1998b; Barber and Watts 2006).

1.1.8 Sandy Lane, Wildmoor (Cinetic Sands; NGR 395100 275900)

Quarrying has been undertaken here since the 1930's. The first planning permission documented dates from 1951. An extension was permitted in 1971 but in 1989 a further proposed extension was deferred due to impending construction of a bypass. This 12ha site remains active and was until recently been operated by John Williams (Cinetic Sand Limited). A *c* 10ha extension is currently being sought by Jack Allen Holdings Limited.

Until the recent application, permissions pre-date PPG16 and no archaeological conditions were required. The currently proposed extension is subject to predetermination evaluation.

1.2 Preferred areas and/or those in planning

1.2.1 Aston Mill, Kemerton (NGR 395400 235500)

A large area (c 47ha) to the north-west of the worked out area at Aston Mill was identified as a preferred area for extraction in the Minerals Local Plan (Hereford and Worcester County Council 1997, 32-3). However, the quality of aggregate has been deemed too poor to warrant working and no further extraction is likely.

1.2.2 Ball Mill: Church Farm South (NGR 383300 260300)

An application has been submitted by Tarmac Limited for a new area at Church Farm South, lying south of the area worked in the 1960s (see 1.3.2) and north of the recently worked out site at Retreat Farm (see 1.3.4). The application has recently been refused but the decision may be subject to an appeal.

An evaluation undertaken in 1991 prior to construction of a conveyor across this area recorded earlier prehistoric and Romano-British features indicating the potential of this area (Jackson 1991) which also supports a range of cropmarks including a ring-ditch (Cox 2003).

A programme of archaeological evaluation is required for this proposed extension should the appeal be successful.

1.2.3 Ryall House Farm North (NGR 385150 242100)

This is a preferred area for extraction identified in Minerals Local Plan (Hereford and Worcester County Council 1997). It comprises *c* 30ha of reserve (with an estimated yield of 600,000 tonnes) along with an additional *c* 10 ha to the immediate south. Preliminary enquiries have been made within the planning process by RMC Aggregates Western Limited (now Cemex UK) but the site is currently understood to not be a priority.

Any formal application will be subject to a programme of pre-determination archaeological evaluation which it is understood has been commenced but not completed.

1.2.4 Strensham Quarry, Mill Lane (NGR 391600 239100)

This is a preferred area for extraction identified in the Minerals Local Plan (Hereford and Worcester County Council 1997). This covers *c* 21ha area and contains an estimated 1,100,000 tonnes of reserve (MLP 1997). A preliminary application has been made by Cemex UK. The quarry proposal is subject to a programme of pre-determination archaeological evaluation. The application is understood to be currently on hold.

1.3 Worked out/inactive sites

1.3.1 Aston Mill, Kemerton (NGR 395400 235500)

Extensive quarry operated by Gloucestershire Sand and Gravel Company Ltd from the 1970s. In 1983, an extension to provide a further 180,000 tonnes over 12 years was granted and the quarry remained active until 1997 but is now fully worked out. Some 155ha was extracted.

A further large area is identified as a preferred area for extraction to the north-west (see 1.2.1 above) but the quality of aggregate has been deemed too poor to warrant working and no further extraction is likely.

This was a pre-PPG16 application but with an access condition applied. However, salvage recording and limited excavation of selected areas was completed in 1984-5 in advance of quarrying and identified significant early prehistoric, Iron Age, Romano-British and Anglo-Saxon period deposits (Dinn and Evans 1990).

1.3.2 Ball Mill: Church Farm South and North, Holt and Grimley (NGR 383480 261220)

A 50ha area within the wider Holt/Grimley complex. Records show that Church Farm South, Grimley was operated in the 1960's by Ball Mill Gravel Company. Church Farm North, Holt was permitted in 1980 with an estimated 130,000-200,000 tonnes of reserve to be worked over 9-10 years. The latter area was subsequently operated by Tilcon Limited and then Nash Rocks during the 1990's and is also now worked out. The worked out northern site is now known as Ball Mill Quarry and supports the plant for the Holt/Grimley complex operations.

These were pre-PPG16 applications. No archaeological provision was therefore made for the mineral extraction at either Church Farm North or South. However, records of finds made during quarrying in this immediate area date from the 19th century when the discovery of an axe hammer was a reported at Ball Mill Gravel Pit (Smith 1958). More recently, salvage recording/watching brief was undertaken of an area within Church Farm South (E J Peltenburg 1965-7) while the insertion of an access road to Church Farm North was subject to salvage recording in 1991 (Edwards 1991). Both recorded archaeological deposits.

1.3.3 Ball Mill: Top Barn Farm/Holt Castle Farm, Holt (NGR 382500 262700)

Part of the Holt/Grimley complex. Worked out quarry covering some 96ha. The quarry dates back to 1964 and was operated by the Ball Mill Gravel Company. Top Barn Farm was worked first from south to north through to the early 1970's and then from 1974/5 onwards the area of Holt Castle Farm was worked. In 1980 (under the name Top Barn Farm) an additional area was permitted to provide a further estimated 350,000 tonnes over 5-6 years. A new area permitted in 1984 allocated an estimated 780,000 tonnes over 2.5-3 years and in 1988 a further area to provide 887,000 tonnes over 4.5 years was permitted. This was worked in the late 1980's and then early 1990's when the far north-west corner of this area was worked by the same company.

The quarry also included the original Ball Mill Quarry mapped on the BGS. This was a further 45ha area to the south-west of the main quarry and west of the main road. This was operated before 1964 by the same company.

This was a pre-PPG16 application and consequently no archaeological provision was conditioned until towards the end of the quarry's life when two small-scale evaluations were undertaken in the north-west extension in the late 1980's (Edwards 1989; Shelley 1989). However, rescue excavation was undertaken of a number of sites in 1970-72 and 1974/5 (Hunt *et al* 1986) revealing a significant group of Bronze Age ring-ditches and Late Iron Age and Romano-British activity.

1.3.4 Ball Mill: Retreat Farm, Grimley (NGR 383205 259810)

This forms part of the Holt/Grimley complex. An area comprising *c* 54ha and including an estimated 3,000,000 tonnes of reserve was granted on appeal in 1989 and worked from 1995 by Tilcon Western, then by Nash Rocks and most recently by Tarmac Limited. This has now been worked out (completed in 2006).

This was a pre-PPG16 permission with no archaeological planning constraint except access condition on original application. However, the construction of a conveyor leading to plant to the north at Church Farm South (now referred to as Ball Mill) resulted in narrow corridor of salvage recording (Jackson 1991). Subsequently and largely retrospectively, ALSF funding supported completion of a DBA including aerial photographic mapping of the whole area (including a large already quarried portion of this quarry). This was followed by geophysical survey and trenching of a small extant area (c 6.5ha), also through ALSF provision. The evaluation revealed no deposits of note in the area remaining to be worked, however, aerial photographic coverage suggests that areas of potential importance were quarried here without record (Deeks, Jackson and Steinmetzer 2004).

1.3.5 Barnet Hill, Nr Blakedown (NGR 389000 276900)

This small quarry is marked on the BGS mapping but no additional information is available.

No known archaeological provision.

1.3.6 Beckford (NGR 398000 236100)

This quarry covered about 25ha and was worked through much of the 1970s. An extension granted in 1980 was estimated to provide 150,000 tonnes over 5-6 years. The quarry is now worked out.

No archaeological provision was made through planning, however, salvage excavations were undertaken through much of the 1970's, with seven seasons of excavation from 1972-9, first by the Rescue Archaeology Group and then by the Avon-Severn Valleys Research Group and the County Council under funding from the Department of the Environment. Approximately

7.28ha were recorded with interims were published during the course of the fieldwork (Oswald 1974; Britnell 1975). Although considerable progress was made with analysis and reporting in subsequent years, it was not until the advent of the ALSF that sufficient funds became available to complete the process of taking this to publication. The nationally important Iron Age and Romano-British settlement and cemetery deposits recorded are therefore currently subject to analysis and are due to be published in the near future (Wills forthcoming).

1.3.7 Belbroughton 1, 2 and 3 (NGR 395430 277310)

This comprised three adjacent small quarries which are marked on the BGS mapping. No additional information has been identified though aerial photographs show a string of pools at the site.

No known archaeological provision.

1.3.8 Belle Vue (NGR 397300 274690)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.9 Brant Farm/Lickhill, Stourport (NGR 379100 273600 and 379300 272700)

The original permitted area, Lickhill Quarry was a *c* 40ha site worked from 1948 onwards. An extension to provide a further 105,000 tonnes over 3 years was permitted in 1983 and a further 23 ha was permitted in 1986 to provide 1,350,000 tonnes over 10-12 years. Brant Farm, to the north, was a smaller area of some 12.5ha. This was granted permission in 1970 and worked initially by the Birmingham Sand And Gravel Company. During the 1990's the two sites Brant Farm and Lickhill were operated in parallel by R Constant and Co Limited. In 1996/7 an application (407410) was made for an additional 7.45 ha of excavation with an estimated output of 350,000 tonnes, while in 1999 an application (407476) was made for an additional 1.6ha area by Hills Minerals and Waste Ltd (formerly Roger Constant and Co) with an estimated output of 100,000 tonnes over 1 year (2000/1). The site is now fully worked out.

Of these, the 1997 extension application was subject to an archaeological evaluation undertaken by Wessex Archaeology (1998; Report 43856.02). Latterly, in 1999 an application relating to a silt lagoon and extraction was subject to a Watching Brief condition. Neither of these archaeological responses is understood to have produced any deposits of note.

However, although no archaeological conditions were placed on the earlier operations, during the 1970s extensive rescue excavation was undertaken at Brant Farm by Alan Hunt (Hunt 1972; 1973; undated interims). This was never formally published due to lack of funds but significant Iron Age and Romano-British deposits were recorded along with some evidence of earlier prehistoric activity (Bronze Age). ALSF support is currently allowing assessment of the 1970s excavation archive and will hopefully lead to analysis and publication of this important site.

1.3.10 Carrant Brook, Overbury and Conderton (NGR 396700 235600)

Quarry of some 70ha worked through much of the 1950's by the Gloucestershire Sand and Gravel Company.

This was a pre-PPG16 application and no formal archaeological provision was made through the planning process. However, rescue excavation of two Anglo-Saxon cemeteries was

undertaken through the Vale of Evesham Historical Society and later the Inspectorate of Ancient Monuments. Beckford A was excavated in 1954 and Beckford B in 1959/9 (Evison and Hill11996).

1.3.11 Cattespool Farm (NGR 400175 271080)

Small quarry marked on British Geological Survey. No details are recorded but aerial photographs show large pools, which presumably reflect the quarry's location.

No known archaeological provision.

1.3.12 Copcut Farm, (NGR 388400 261000)

Quarry recorded by the British Geological Survey. No details recorded.

No known archaeological provision.

1.3.13 Gellester's Farm, Bredon's Hardwick, Bredon (NGR 390600 235400)

Site operated by Western Aggregates Ltd under permission granted in 1975 for 21ha area. A southern extension of 25ha was granted in 1984 to provide a further estimated 667,000 tonnes over 8-10 years. This was operational in 1990 but by 1994 was fully worked out.

This was a pre-PPG16 application with no archaeological provision. Flint finds are reported on the HER (privately collected).

1.3.14 Grime's Hill (NGR 408875 275780)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.15 Holly Green 1 (NGR 385800 240800))

Small quarry marked on British Geological Survey. No details recorded. One of three.

No known archaeological provision.

1.3.16 Holly Green 2 (NGR 385900 241300)

Small quarry marked on British Geological Survey. No details recorded. One of three.

No known archaeological provision.

1.3.17 Holly Green 3 (NGR 385400 240500)

Small quarry marked on British Geological Survey. No details recorded. One of three.

No known archaeological provision.

1.3.18 Houndsfield Lane, Wythall (NGR 409500 276500)

Quarry operated by Wythall Sand and Gravel Company in 1980 when an extension (into field 3263) was permitted providing an estimated 60,000 tonnes over 3-4 years. Fully worked out.

No known archaeological provision.

1.3.19 Huntsman's Quarry, Kemerton (NGR 393750 236300)

Planning permission for this site was granted in 1988. The initial workings covered *c* 11.5ha and were estimate to include 400-500,000 tonnes of reserve. This was worked through to 1993/4 when an application was submitted and passed for a northern extension covering a further *c* 8ha. The quarry remained active until 1997 but now the whole *c* 19.5ha worked out and restored by Huntman's Quarries. Further extension is unlikely to be permitted (Hereford and Worcester County Council 1997).

The original quarry area was a pre-PPG16 application and was subject to only an access condition. The northern extension was subject to geophysical survey, fieldwalking, evaluation trenching and subsequent salvage recording. These were undertaken through a planning condition requiring implementation of an agreed programme of works prior to extraction (Stratascan 1994; Cook and Hurst 1994; Napthan *et al* 1997; Jackson 2005)

1.3.20 Marlbrook (NGR 398000 274700)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.21 Milestone Ground, Broadway (NGR 408600 237900)

Small quarry marked on the British Geological Survey and now fully worked out. Tithe and Ordnance Survey mapping suggests that this is of considerable antiquity.

No formal archaeological provision was made but local archaeologists recorded significant Late Neolithic and Roman activity during the late 1930s and 1940s (Smith 1943, 1944 and 1946).

1.3.22 Larford Farm, Astley (NGR 381300 269200)

Large, worked out quarry area covering in excess of 100ha. Operated in the 1950's by the Severn Valley Sand and Gravel Company.

No archaeological conditions were made but rapid salvage recording was undertaken of a barrow, and Iron Age and Romano-British remains from 1956-58 by the Ministry of Works and later by Kidderminster and District Archaeological and Historical Society (Walker 1959; 1960; Green 1962).

1.3.23 Linehouse Lane (NGR 398060 274090)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.24 Lowan's Hill Farm (NGR 403535 268770)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.25 Salters Lane, Lower Moor (NGR 399000 246500)

A 23ha site worked through a series of permissions granted since 1947, although quarrying there dates from at least the 1920s. An extension was permitted in 1979 to Avon Gravels Limited making provision for an estimated 12-20,000 tonnes over a 5-10 year period. A further extension was granted in 1989 and a final small extension permitted in 1995. The site remained operational until the mid/late 1990s but it is now fully worked.

This was largely operated with no archaeological provisions since for the most part applications pre-dated PPG16. However, in the 1940s significant early prehistoric finds including accompanied crouched inhumations were recorded by local archaeologists (Else 1943). An access provision was applied to the 1989 and 1995 extensions. Nothing was revealed though brief visits were made.

1.3.26 Shirley (NGR 409750 277780)

Large quarry recorded by British Geological Survey. This was first permitted in 1951 and extended in 1966 and 1967.

No known archaeological provision.

1.3.27 Offenham (NGR 405200 245700)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.28 Puxton, Kidderminster (NGR 382405 278270)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

1.3.29 Shepley, Lickey End (NGR 398400 273200)

This quarry has a long history with operations dating back to pre-1947. It has been operated under a series of consents for mostly relatively small areas and covers some 16ha in total. The quarry is operated by Cemex UK (and previously by RMC Western Ltd). A 1978 extension was estimated to provide 120,000 tonnes over 8 years. This is now worked out.

This was a pre-PPG16 application and no archaeological provision was made.

1.3.30 Shut Mill, (NGR 394500 278100)

Small quarry marked on British Geological Survey. No details are recorded but aerial photographic evidence shows a pond in this location presumambly reflecting the quarry site.

No known archaeological provision.

1.3.31 Stourhill/Hoo Farm, Wilden Lane (NGR 383000 273500)

Pair of small quarries marked on British Geological Survey. No details are recorded but aerial photographic evidence shows pools in this location presumambly reflecting the quarry site.

No known archaeological provision.

1.3.32 Titton, Stourport (NGR 382190 270000)

Small quarry marked on British Geological Survey. No details are recorded but aerial photographic evidence shows pools in this location presumambly reflecting the quarry site.

No known archaeological provision.

1.3.33 Upper Moor (NGR 397200 247300)

Small quarry marked on British Geological Survey. No details are recorded but aerial photographic mapping shows pools at this location presumably marking the quarry site.

No known archaeological provision.

1.3.34 Wolverley, Court Farm (NGR 382300 268700)

An 8ha site granted permission in 1966 and worked by R & D Aggregates. A 12ha extension was permitted in 1987 to provide an additional 500,000 tonnes over 6-7 years and was worked between through to the mid 1990s. The site is now fully worked out.

This was a pre-PPG16 application and no archaeological provision was made.

2. Silica Sand

2.1.1 Sandy Lane (Harbour Hill/Hilltop Farm), Wildmoor (NGR 395200 276200)

A 24ha site immediately north of the Sandy Lane (Cinetic Sands) sand and gravel quarry (Section 1.1.8). This was extended in 1979 with an estimated 112,500 tonnes for extraction over a period of 6-8 years. This was operated by Stanley N Evans Limited for many years but is now owned by Cleanaway Limited. The site is mainly used for landfill but remains active at a small-scale.

Pre-PPG16 application. No archaeological provision conditioned.

2.2 Worked out/inactive

2.2.1 Bonemill (NGR 382250 272985)

Small quarry marked on British Geological Survey. No details are recorded.

No known archaeological provision.

2.2.2 Highfield (NGR 383435 275000)

Small quarry marked on British Geological Survey. No details are recorded.

No known archaeological provision.

2.2.3 Hoo Road (NGR 383395 275410)

Small quarry marked on British Geological Survey. No details are recorded.

No known archaeological provision.

2.2.4 Zenith (NGR 283280 275535)

Small quarry marked on British Geological Survey. No details are recorded.

No known archaeological provision.

3. Limestone

3.1 Active/permitted

3.1.1 Fish Hill, Broadway (NGR 411600 236650)

This long-standing quarry operated through the 1950s and 1960s and then lay largely dormant for a period up to 1987. However, the current owners have increased production and the quarry remains active covering some 8.5ha. It is operated by Smith & Sons (Bletchington) Limited. The quarry produces crushed stone for a variety of purposes and also limited quantities of cut stone for building.

An additional 2ha extraction area has been identified to the south-east as a preferred area and would provide an additional 3-400,000 tonnes (Hereford & Worcester County Council 1997).

No formal archaeological provision was required in the early years but in 1954 the discovery and recording of a skeleton led to the recording the following year of an Anglo-Saxon cemetery. Work was completed by the Vale of Evesham Histroical Society and the Ministry of Works and published in 1958 (Cook 1958). More recently in 1997, evaluation of an extension area produced no evidence of deposits of any note and no archaeological conditions are presently applicable.

3.2 Worked out/inactive

3.2.1 Woodbury, Shelsley Beauchamp, Abberley Hills (NGR 374300 263700)

Last listed (1997) as being owned by Lafarge with a projected working life to 2008. This 0.7ha site has been closed. No resumption of extraction is likely due to be permitted due to location within a SSSI and Abberley Hills Quarrying Policy Area.

No known archaeological provision.

3.2.2 Shavers End, Great Witley (NGR 377000 267700)

This 13ha site is situated to the north end of the Abberley Hills. Permission was first granted in 1951 with an extension added in 1986. Last worked by ECC Quarries Ltd and latterly owned by Aggregates Industries Limited, Although some reserves survive, planning consent has lapsed and no further extraction deemed likely due to location within Abberley Hills Quarrying Policy Area.

No known archaeological provision.

3.2.3 Penny Hill, Abberley Hills (NGR 375200 261300)

Situated to south end of Abberley Hills. A 5ha site where production had ceased by 1990. No further extraction is deemed likely with any future extensions unlikely to be permitted due to location within Abberley Hills Quarrying Policy Area.

No known archaeological provision.

3.2.4 Nash Rock

Listed in MLP as part of Abberley Hills group of quarries but not located on BGS mapping or in MLP. Dormant but with some 10 years reserves at intended output. Permission is now lapsed and location within Abberley Hills Quarrying Policy Area means further extraction is unlikely to be permitted.

No known archaeological provision.

3.2.5 Rodge Hill, Abberley Hills (NGR 375375 262420)

Worked out quarry situated just to east of Abberley Hills Quarrying Policy Area. No further extraction deemed likely with any future extensions unlikely to be permitted due to location immediately adjacent to Abberley Hills Quarrying Policy Area.

No known archaeological provision.

4. Igneous

4.1 Active sites

There are no active igneous rock quarries in the county.

4.2 Worked out

4.2.1 Gullet (NGR 376250 237815)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

4.2.2 Holly Bush (NGR 376150 236690)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

4.2.3 Tank (NGR 376750 246670)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

4.2.4 North Malvern Scar (NGR 376960 246240)

Small quarry marked on British Geological Survey. No details recorded.

No known archaeological provision.

Appendix 2: Mineral operators currently active in the county

Brian Hill Haulage and Plant Hire, Brymar House, Moor Street, Brierley Hill, West Midlands DY5 4SN

Cemex UK Materials Limited, Cemex House, Coldharbour Lane, Thorpe, Egham, Surrey TW20 8TD (West Midlands Region Office, Western Equinox North, Great Park Road, Patchway, Bristol BS32 4QL)

Cleanaway Limited, Warley Hill Business Park, The Drive, Warley, Brentwood, Essex CM13 3BE

Jack Allen Holdings Limited, Beecham Business Park, Aldridge, Walsall, West Midlands WS9 8TZ

Tarmac Limited, PO Box 1, Kington, Herefordshire, HR5 3LQ

Salop Sand and Gravel Supply Co Ltd, The Oaklands, Admaston, Telford, Shropshire TF5 0AN

Smith & Sons (Bletchington) Limited, Enslow, Kidlington, Oxfordshire OX5 3AY

J Williams (Cinetic Sands) Limited, Cinetic Quarries, Sandy Lane, Wildmoor, Bromsgrove, Worcestershire B61 0QR

Appendix 3: Standards and Guidelines for Archaeological Projects in Worcestershire

Note

The following document is regularly revised and updated. Please contact the Planning Advisory Section or consult our website www.worcestershire.gov.uk/archaeology for updated versions

STANDARDS AND GUIDELINES FOR ARCHAEOLOGICAL PROJECTS IN WORCESTERSHIRE.

November 2007

Find out more online at
www.worcestershire.gov.uk/archaeology

worcestershire countycouncil

STANDARDS AND GUIDELINES FOR ARCHAEOLOGICAL PROJECTS IN WORCESTERSHIRE

Prepared by the Planning Advisory Section
of the
Worcestershire Historic Environment and Archaeology Service
Worcestershire County Council

Revision November 2007
(Note This document is regularly revised and updated. Please contact the Planning Advisory Section or consult our website www.worcestershire.gov.uk/archaeology for updated versions)

Worcestershire Historic Environment and Archaeology Service
Worcestershire County Council
Woodbury
University College Worcester
Henwick Grove
Worcester WR2 6AJ

Report 604

CONTENTS

STANDARDS AND GUIDELINES FOR ARCHAEOLOGICAL PROJECTS IN WORCESTERSHIRE.

Scope

This document is primarily for archaeological contractors undertaking projects as part of the planning process, but it is also relevant as guidance to good practice for anyone undertaking archaeological projects within the county. It specifies the standards required of archaeological projects by the County Historic Environment and Archaeology Service in its role as archaeological advisor to the local authority and as curator of archaeology in the county. It should be read in conjunction with any brief that is prepared as part of the planning process and also with the Code of Conduct of the Institute of Field Archaeologists. It is important that both the planning brief and this supplementary guidance are adhered to in order that a planning condition may be judged to have been discharged satisfactorily. Different requirements apply to projects within the City of Worcester.

Foreword

The modern landscape of Worcestershire is the product of human activity extending over thousands of years. This has contributed greatly to the character, economic base and attractions of the area. But although many generations have contributed to the multi-layered tapestry of remains, the scale of modern redevelopment has now brought an unparalleled power to sweep this heritage away. Once gone, it can never be replaced.

Archaeological remains should be seen as a finite, and non-renewable resource, in many cases highly fragile and vulnerable to damage and destruction. Appropriate management is therefore essential to ensure that they survive in good condition. In particular, care must be taken to ensure that archaeological remains are not needlessly or thoughtlessly destroyed. They can contain irreplaceable information about our past and the potential for an increase in future knowledge. They are part of our sense of national identity and are valuable both for their own sake and for their role in education, leisure and tourism (Department of the Environment Planning Policy Guidance 16, Nov. 1990).

The need to preserve significant archaeological remains where they exist on the ground is now recognised by both national and local government as an integral part of planning policy. Where present, archaeological remains can be a 'material consideration' in determining whether a local authority decides to accept or reject a planning application. Developers, working in partnership with archaeologists now play a key role in helping to preserve this heritage.

Archaeological projects undertaken outside the planning process, e.g. for research, contribute to the overall understanding and vision of the county's past. It is vital, therefore, that the results of such work are also made available, so that they may inform future work.

1 Requirements for an archaeological project

The following requirements are considered by the County Archaeological Officer to be necessary for successfully achieving the aims of an archaeological project. Failure to meet any of these requirements may not provide the necessary level of information as required in the planning process. In the case of an *Evaluation* this may result in a refusal of (or refusal to determine) a planning application or may not result in a satisfactory discharge of a *Programme of Works* or *Watching Brief* condition. These requirements apply as guidelines to best practice for work undertaken outside the planning process, to encourage consistent standards for all archaeological projects.

- The Code of Conduct of the Institute of Field Archaeologists must be observed. This represents a basic measure of the professionalism of any archaeologist, whether or not they are members of the Institute. This ensures a high standard of archaeological work and professional ethics amongst all archaeologists undertaking archaeological work in the County.

- Archaeological projects will also be expected to adopt the advice of the *Standard and Guidance* leaflets issued by the Institute of Field Archaeologists.

- As verification of the above. contracting organisations that have been formally assessed as Registered Archaeological Organisations (RAO) of the IFA are preferred.

- All projects undertaken in the County must abide by current legislation, with regard to:

- Ancient Monuments
- Treasure
- Burials and Human Remains
- Health and Safety
- Environmental and ecological protection
- Any other, as appropriate to the project
  (see annex 2 for summary list)

- **It will be the responsibility of the contractor to ensure that the developer/applicant has secured appropriate consents for all archaeological groundwork's prior to commencement of fieldwork. Advice may be sought from the Historic Environment and Archaeology Service, English Heritage or the County Ecologist.**

- The guidelines below (sections 2-14) should be followed in all projects undertaken as part of the planning process and are advised as good practice in all other circumstances. Project Managers should ensure that **all** staff (including external specialists) engaged on a project are fully aware of its purpose and scope, and of all requirements set forth in the Brief.

2 Research Frameworks

Archaeological projects undertaken through the planning process are tailored to the specific threats of individual developments. Nevertheless, such work should be undertaken in the context of local and national research frameworks. It is therefore important that archaeological contractors are fully aware of the purpose behind the particular type and scale of recording.

The Planning Advisory Section takes account of a wide range of research frameworks in framing the Brief. This includes an assessment of archaeological research needs in the context of a detailed knowledge of the County Historic Environment Record.

Research frameworks which are relevant to the county include national research frameworks (eg *Exploring Our Past*, English Heritage 1993), local research frameworks (eg *Regional Research Strategy, 2004*, in preparation – http://www.arch-ant.bham.ac.uk/wmrrfa), period based research strategies (eg *Saving Our Prehistoric Heritage, Landscapes Under Threat* The Prehistoric Society, 1988) and specialist research strategies (e.g. Medieval Settlement Research Group 1990s).

The results of any piece of fieldwork should inform the research cycle and should take into account local, regional and national research frameworks. In particular, archaeological projects carried out within historic towns should be designed and carried out to test and further the understanding of these towns as published by the Central Marches Historic Towns Survey (reports on-line via www.worcestershire.gov.uk/archaeology/library), and by subsequent projects designed to test the hypotheses that were raised.

3 Methods Statement

Any specification, project design or Written Scheme of Investigation (WSI) prepared in advance of an archaeological project must include a methods statement. Where a brief has been issued, the methods statement demonstrates to the Applicant and the Planning Advisory Section of the County Historic Environment and Archaeology Service how all the requirements will be met and how the Archaeological Contractor intends to supply the required level of information.

- The Planning Advisory Section will advise on the suitability of methods statements in the Written Scheme of Investigation in addressing the aims of a desk-based assessment, evaluation, watching brief or other programme of works.
- Where the Applicant is seeking competitive quotations the Section can advise on the relative merits and suitability of each proposal (the lowest quote may not provide the required information and may therefore not give the best value for money).
- The Planning Advisory Section cannot, however, take any responsibility for any archaeological contractor successfully achieving (or otherwise) the requirements of the Brief.
- The Written Scheme of Investigation should identify the range of general techniques that will be used. These will include one or more of the following, augmented by other specialist techniques as appropriate.

- Desk-based study

Collation and assessment of existing sources (eg HER search, other documentary sources, aerial photographs)

A desk-based assessment should also include a site visit

- Non-intrusive survey

Observation and recording
Fieldwalking
Geophysical survey
Earthwork survey
Building survey

- Intrusive investigation

Observation and recording
Excavation
Watching brief
Auger survey
Intrusive building recording

- The methods statement should specify the methods to be used for each of these fieldwork techniques, and will also include statements on the following (as appropriate):

- Artefact and environmental recovery strategy,
- Geophysical survey methods
- Site clearance method,
- Excavation methods,
- Recording format,
- Data analysis,
- Artefact conservation and deposition,

- Environmental analysis,
- Report structure
- Archive format (digital / paper) and deposition.

- Where considering sampling strategy, archaeological contractors must specify the factors to be used (such as the nature of the potential archaeological site, the proportion of the application area to be affected, the use of a variety of prospecting techniques). Sample ratios will be site specific. The final trench locations must be approved before the commencement of fieldwork, subject to factors beyond control (e.g. unexpected services).
- Many projects will comprise a number of stages, as identified in the methods statement. It is essential that sufficient time be built into the work programme to allow the results of each stage of work to be incorporated into the next stage (i.e. geophysical survey leading to final trench layout). The Planning Advisory Section welcomes the opportunity to participate in the assessment of each stage so as to help ensure that the final report fulfils the archaeological planning condition.

Costings

The role of the Historic Environment and Archaeology Service in respect of providing advice is to ensure that the proposed work is of sufficient scope and quality to meet the terms of any planning condition. It does not normally comment on cost unless specifically asked to by the developer. In which case, this information is treated in strictest confidence between the Historic Environment Planning Advisor and the County Archaeology Officer.

It is, however, strongly advised that the developer and prospective contractor have reached a complete understanding (in writing) what any costing actually comprises before work commences. Archaeological contractors should make it clear if a quotation covers the whole project to the completion of the final report, or not. This is especially true of any tendering situation.

When submitting a proposal or Written Scheme of Investigation it is essential that as well as the above, the following facts and information are included

- Correct Site Name
- Correct Fieldwork Type
- Traceable Source for WSI (contractors reference no. - site code etc)

- Correct planning application for which the work is being undertaken.
- Correct applicant and or agent for which the work is being undertaken.
- Correct planning authority for which the work is being undertaken.
- Correct HER references (not activity number for the work the WSI is for).

- Correct reference to the brief.
- Correct aims as detailed in the brief.

- Details of the resources to be applied for field and post excavation work (staff and time).
- Clear explanation of any contingencies.
- Named specialist provision.

- Details of methodology and standards proposed to fulfill the brief.
- Details of the Report structure and content.
- Heath & Safety requirements.

4 The County Historic Environment Record

The County Historic Environment Record (formerly Sites and Monuments Record) is a record of all known archaeological sites in the county and is a readily accessible source of information. Unless otherwise agreed with the Planning Advisory Section, the HER must be consulted before fieldwork commences, in particular where the final details of an evaluation are to be decided (for example in the precise location of sample trenches). Consultation should include discussion of the range of potential sources with the staff of the HER. Other relevant HERs must also be consulted for sites bordering other counties or the City of Worcester.

The HER currently consists of records of 17,000 archaeological sites, recorded on:

- a GIS map base of the whole county linked to:-
- a computerised database
- site files including plans, photographic and documentary material
- a collection of aerial photographs of the county
- a specialist reference library
- a collection of additional material stored by parish or subject area

A copy of the basic HER record will be provided to a contractor as part of the required HER search. This should be regarded as an index to current knowledge rather than an end in itself. Contractors should ensure that they consult any supporting documentation (i.e. the collection of aerial photographs in the HER) and also take advantage of any specialist local knowledge of HER staff.

The Historic Environment Record manages the ceramic database and its on-line version (www.worcestershireceramics.org), and is seeking to improve the quality of finds and environmental indices contained within the HER. The cooperation of all those engaged in fieldwork in the county is sought to ensure that finds information is recorded in a systematic fashion so that its value to other researchers can be maximised. External specialists must use the county type fabric and form series.

The Historic Environment Record is not currently seeking to put the full Record on-line. Instead a number of thematic on-modules are being developed. These include the on-line archaeology library and all contractors are encouraged to provide copies of reports in PDF format so that they can be included. The HER can arrange for PDFs to be produced at cost price (subject to copyright).

4.1 Access and charging policy

- A leaflet outlining the Access and Charging Policy of the HER is available separately.
- Users of the HER will normally be asked to agree in writing to abide by these guidelines using the user's declaration form. Regular contributors may be asked to complete a single annular form.
- Access to the HER is by appointment during office hours.
- Access to information held on the HER may be refused in certain cases.
- A charge will normally be made for consulting the HER for commercial purposes, or where the costs of a search could have been reasonably included within a grant application.
  Charges will depend on the nature of the enquiry and the use to which the information will be put.
  Fees may be waived in certain circumstances.
  The basic fee and a range of costs can be supplied for guidance.
- The County Historic Environment and Archaeology Service reserves all rights of Copyright on behalf of the HER and all other originators of material held within the HER.
- Users are required to inform the HER of new sites or information which may come to light as a result of their researches.
- While the County Historic Environment and Archaeology Service attempts to ensure the accuracy of the information, it cannot take responsibility for inaccuracies or omissions.
- Most of the sites included on the record are on private property and no automatic right of access should be assumed.

5 Documentary sources

Documentary sources are of vital importance to any archaeological project and must be consulted as part of a Desk-Based Assessment. The level of the documentary research must be stated. Where further documents are likely to exist the type of source and location must be stated, with the reason why these were not consulted.

Sources

As a minimum consultation of the following will normally be expected (where available):

- All sources indexed through the relevant entries in the HER
- Relevant cartographic sources e.g. Ordnance Survey First Edition County Series, Tithe and early estate maps (as available). Some tithe maps are available on-line at www.worcestershiremaps.org.uk with a wider range of analysis possible via the HER office.
- Aerial photographs
- Historic documents (e.g. Charters, registers, estate papers)
- Place-name evidence
- Secondary and analytical sources (including local studies and any reports on previous archaeological investigations)

Repositories

As well as the HER, the following should be consulted:

- County Record Office
- National Library of Air Photos, Swindon (where appropriate)

In addition, the following should be considered where appropriate:

- National Monuments Record (English Heritage, Swindon)
- Local study libraries
- The National Archive (formerly Public Record Office)
- Satellite and LIDAR imagery (where available)

6 Buried Remains

The location, extent and nature of buried remains are of fundamental importance in many archaeological projects. An adequate record and full interpretation is therefore essential.

- Excavation or other investigation must be sufficient to determine the nature of buried remains.
- A written stratigraphic record must be made of all archaeological deposits and underlying natural deposits revealed.
- A drawn and photographic record must be made. (Digital photography is acceptable – minimum resolution should be **6** mega pixel, presented as an archivally-recommended TIFF file)
- Recording of significant remains will need to be of sufficient accuracy to allow the identification of their location in three dimensions, and their interpretation, by any other archaeologist.
- Archaeological deposits must be dated as closely as possible and placed in a chronological sequence.
- Any limitations to recording must be identified.
- An assessment must be made of the extent and significance of buried remains.
- The results of finds analysis and ecofactual analysis should be integrated with the interpretation of the stratigraphic sequence.
- An ordered archive must be compiled, consisting of all information recorded on site and all post-excavation interpretative information, appropriately listed and cross-referenced.

7 Building Recording

Historic buildings or other structures may be recorded in their own right, or as part of an investigation of buried remains. Historic buildings take many forms, from medieval timber framed barns to Cold War bunkers.

The archaeological analytical survey of the building required will need to be undertaken by a suitably qualified individual with a proven track record in archaeological building recording, in order to meet these standards and conforming to Institute of Field Archaeology & English Heritage guidance.

Recording, whether as evaluation or conditional will aim to: -

- Define the history, character, date, function and techniques of construction, phasing and significance of the structure(s).

- Assess and reference primary and secondary documentary sources and photographs relating to the building (and where appropriate its occupants).

- Document the structure photographically using 35mm (or larger format) black & white and colour print photographs or high-resolution digital images (minimum resolution should be **6** mega pixel), all with suitable scales, of the following.

- Where appropriate, all archaeological contractors must provide in their quote a contingency for a limited level of dendrochronlogical survey. Should primary phase timbers be suitable and not reused from earlier structures then this absolute dating method will be applied. Dendrochronological survey must follow '*Dendrochronology: Guidelines on Producing and Interpreting Dendrochronological Dates*' **(**English Heritage**)**

- Provide a detailed measured survey at an appropriate scale, or the collation and annotation of existing survey drawings (plans and elevations).

- Phased plans of the building, with photo locations clearly marked, and a location plan related to the national grid. *This may be based on an existing survey plan.*

All recording works shall be in line with methods detailed in 'Understanding Historic Buildings – A guide to good recording practice. English Heritage, February 2006

8 Non-Intrusive Survey

Non-intrusive survey techniques should be suitable to the ground conditions and expected nature of deposits. They should only be undertaken by appropriately qualified persons or organisations. Excavation may be necessary to test the results of non-intrusive survey techniques.
Techniques to be considered include:

- Geophysics
  A methods statement must be produced by the geophysical survey contractor, detailing the method(s) to be applied and suitability for its us on the specific site (geology & soil type)
  A critical appraisal of the techniques used must be undertaken.

- Earthwork survey
  Plans must be produced to an appropriate scale and with accuracy.
  The scales of survey and reproduction must be clearly stated.

- Field Walking (find scatters)
  Collection, sampling and plotting methodologies must be clearly stated.

- Auger Survey
  Collection, sampling and plotting methodologies must be clearly stated.

- Metal Detector Survey:
  The defined area shall be surveyed / scanned with a metal detector, (of appropriate technical specification and operated by an experienced and responsible user). All artefacts other than non-diagnostic or of recent date shall be recovered from the topsoil only. All finds shall be spatially recorded at an appropriate scale. Finds shall be cleaned and conserved in the appropriate manner.

9 Artefactual Material

Artefacts are of prime importance for dating and characterising archaeological remains and are very important indicators of past social and economic organisation.

Assessment will need to be undertaken by a suitably qualified individual with a proven track record in artefact analysis, in order to meet these standards and conforming to Institute of Field Archaeology & English Heritage guidance.

- The *Institute of Field Archaeologists Guidelines for Finds Work* must be adhered to.
- Collection and discard policies must be included in the methods statement and report.
- A blank statement 'there were no finds', or similar, will not be acceptable. Reasons for the absence of anticipated finds should be given.
- Where possible, the identification of artefacts should be based on recognised local, regional and national typologies.
- The *Worcestershire Type Fabric Series* must be used as the basis of ceramic reporting. This is to maintain consistent standards of ceramic analysis within the county, make data sets from all fieldwork accessible to all users and facilitate synthesis..
- Individual artefacts must be dated where possible, and a *terminus post quem* should be recorded for each context.
- Finds assessments and reports must include identification, dating and quantification of all artefacts by count and weight.
- Records of all artefacts by context should be available in the site archive.
- The significance and date of residual material must be considered. Finds from topsoil and from unstratified contexts may also be significant and should be recorded.
- The results of finds analysis should be integrated into the report.
- Finds indices are now included in the HER record. To help the HER staff achieve a consistent record we request that all finds reports include a short summary table (see Annex 4).
- The potential of artefacts as indicators of site formation processes should be considered.
- Material with potential for further study in its own right should be highlighted.

10 Environmental Material

Archaeological deposits contain environmental information. These are vital to the understanding of the past environment, diet, living conditions, and agricultural or industrial economy.

The analysis required will need to be undertaken by a suitably qualified individual with a proven track record in environmental archaeology, in order to meet these standards and conforming to Institute of Field Archaeology & English Heritage guidance.

- The environmental potential of a site must be assessed by one or more specialists, and provision should be made for site visits, specialist sampling and specialist analysis if appropriate.
- The methods statement must include consideration of sampling and flotation of selected stratified and datable deposits in order to recover environmental remains, in conjunction with hand collection of large animal bones. Where environmental sampling is not included in the project then the reasons must be stated in the report.
- Selection of deposits for sampling would normally be on the basis of professional judgement. Deposits formed *in situ* are of primary importance. The following are significant environmental indicators: animal bones, charred or mineralised plant macrofossils, molluscs, insects and pollen. The significance of waterlogged organic material, alluvium and buried soils associated with archaeological deposits must also be considered.
- Assessment of the environmental remains must include, for each sample, a record of the types of material present and their abundance. These records should be available in the site archive.
- The results of environmental analysis must be integrated into the report.
- Environmental indices are now included in the HER record. To help the HER staff achieve a consistent record we request that all environmental reports include a short summary table (see Annex 5).
- Environmental sampling policies must be stated in the report.
- The potential of environmental material to identify site formation processes should be considered.
- Material with potential for further study in its own right should be highlighted.

11 Significance of Archaeological Deposits

The significance of the archaeological deposits is crucial in determining future archaeological strategies and in making recommendations within the planning process.

- An assessment of the state of deposit preservation and significance must be undertaken. Physical, artefactual and environmental aspects must all be considered.
- In all cases, local significance, in the context of current models of development, typology and survival must also be considered.
- Where appropriate the non-statutory criteria for the scheduling of ancient monuments used by the Department of the Environment may be employed as a guide in assessing the significance of deposits (*PPG16 Annex 4*). English Heritage also produced a number of manuals on monument assessment for the Monuments Protection Programme (these may be consulted through the HER).

12 Recommendations

The Institute of Field Archaeologists identifies that it is reasonable for a client to seek an opinion of the significance of discoveries from their archaeological contractor, and this view is supported by the Planning Advisory Section. Where recommendations are made by a contractor it must be clearly expressed that the recommendations are those of the contractor and may differ from those ultimately provided to the planning authority by the Planning Advisory Section. This should be made clear to a client. The Planning Advisory Section is pleased to discuss any recommendations at report draft stage.

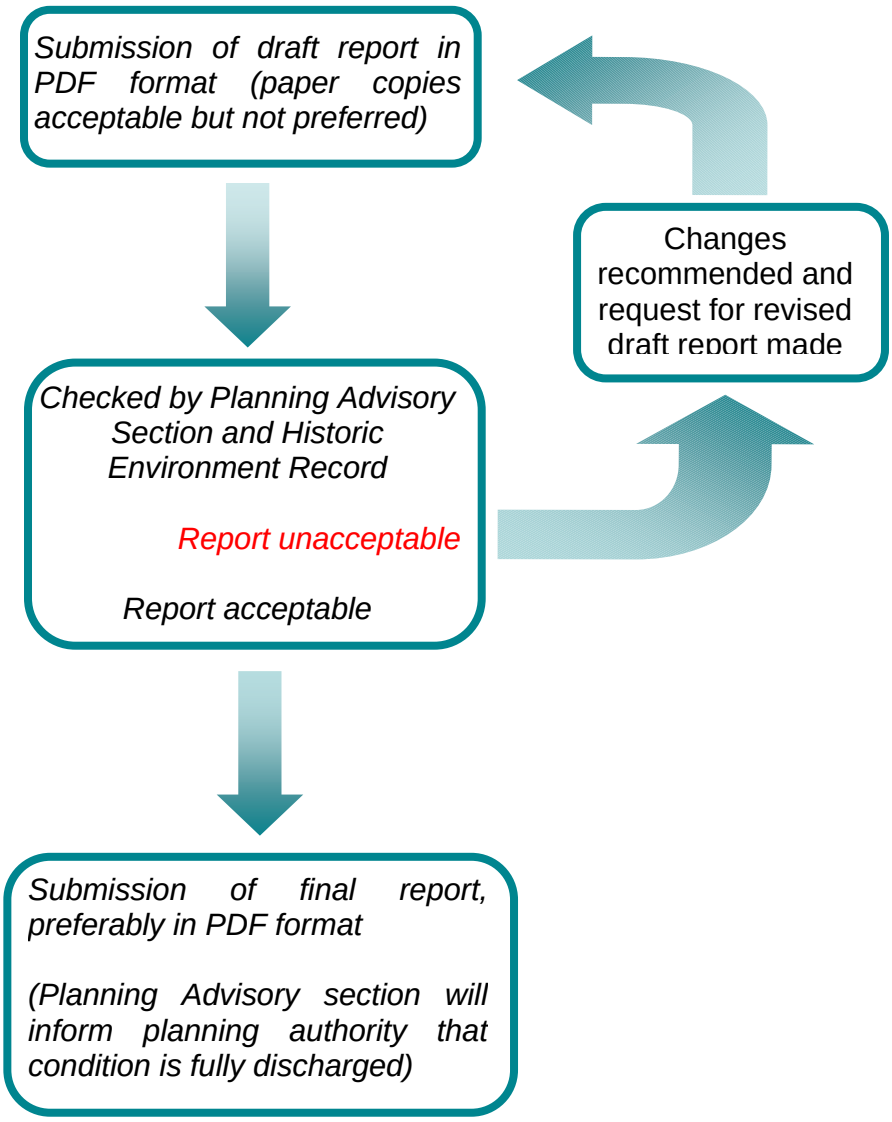
13 The Report

The Planning Advisory Section welcomes the opportunity to comment on draft reports. There is the possibility, otherwise, that further information may be requested after the production of the report.

- The report must consist of the following:

  non-technical summary
  background to the site derived from documentary sources
  aims including any additional requirements made by the client
  methods, as outlined in the methods statement and as amended in the field
  location and size of archive
  discussion of the results (see below)
  assessment of significance (see above)
  geophysical or other specialist reports must be included as appendices

- The location of archaeological fieldwork must be clearly indicated on a location plan, which should be readily related to the Ordnance Survey National Grid.
- The location of significant archaeological remains must be clearly graphically represented at an appropriate scale. This information may be required by architects and engineers when considering the design of developments.
- A plan must be provided at a scale of 1:100 or greater, sufficient to allow the work to be tied into any subsequent archaeological operations on the site.
- Identifiable heights related to the OD must be provided, unless previously agreed.
- The depth from the ground surface to the top of significant archaeological deposits, and the thickness (or depth to base of features) of those deposits must be clearly presented both in the conclusions and in graphical format.
- All plans, sections, elevations and maps must include a scale and north arrow
- The report must be explicit about the basis for dating contexts and phases of activity.
- All reports should include summary tables of the finds and environmental results (see Annexes 4 and 5) as well as the specialist reports themselves.
- The discussion of the results must consider documentary evidence, deposit analysis, artefactual evidence, environmental evidence and significance. Even if the results are negative a reasoned statement to this effect must be included.
- Where appropriate, research, management and presentation opportunities must be considered within the report. Additionally, a critical appraisal of the evaluation strategy may be included.


Submission of draft report in PDF format (paper copies acceptable but not preferred)
Changes recommended and request for revised draft report made
Checked by Planning Advisory Section and Historic Environment Record
Report unacceptable
Report acceptable
Submission of final report, preferably in PDF format
(Planning Advisory section will inform planning authority that condition is fully discharged)

It is preferred that a draft copy of the report be submitted to the planning advisory section prior to submission of the final report. This should preferably be in PDF format. Although there may be concerns about client confidentiality at this stage, this procedure does avoid the embarrassment of the Planning Advisory Section having to report to the client that a particular piece of work is unacceptable.

Upon approval of the draft report.

- ONE hard copy of the report must be sent to the Planning Advisory Section of the County Archaeological Service. After approval, this will be passed to the HER, the planning authority, the clients and their agents will each have their own requirements for copies of the report.
- Contractors are encouraged to also provide reports in PDF format. These can be held in two locations 1) within the HER (i.e. within an electronic filing cabinet as opposed to a physical filing cabinet and 2) on the Worcestershire on-line archaeology library (effectively the same level of access as with a conventional report but with the added convenience of not having to access via the office).

All reports that are produced via the development control process are considered to be within the public domain. However, copyright restrictions (particularly with regard to Ordnance Survey mapping) or the inclusion of confidential or commercially-sensitive information means that not all reports can be made freely available over the internet. Other reports have been excluded by request of the copyright holder. The development of an on-line library can only be achieved if the organisations that supply data can be assured that their own rights are protected. Consequently, use of the on-line library is covered by a variety of legal instruments to protect us, our users and those who supply data to us. (See Annex 6)

The contractor should obtain all necessary copyright clearances for publishing on the internet. The ability to provide on-line PDF reports will be indicated on the list of contractors supplied to prospective developers

- For pre-determination evaluation reports, the report must be submitted to the County Archaeological Service's Planning Advisory Section at least **ten working days** in advance of the relevant planning officer deadlines, unless otherwise agreed.
- Other reports must normally be submitted to the Planning Advisory Section within three months of completion of fieldwork.

- Most full reports will remain as archive / technical reports (‘grey literature’) with limited circulation. These may be published electronically as they stand as PDF files. The project must, however, also be published through an appropriate permanent medium. In many cases this form of publication may consist of a summary including location, reasons for the evaluation, and outline of results. This may be published through the appropriate county journal (*Transactions of the Worcestershire Archaeological Society*) or *West Midlands Archaeology* (Council for British Archaeology, West Midlands).

14 The Archive

Archaeologists have a duty to present the results of their work in a public archive and to disseminate a report on them.

- Any archival material should be deposited with an appropriate museum which has Museum and Galleries Commission approved archaeological storage facilities. For Worcestershire, these are Worcester City Museum (for sites within the city council boundaries), or the County Museum (all other areas). There is now a joint archaeology store between the City and County Museums.
- Samples of any new ceramic fabric or forms discovered in a project should be deposited with the County Type Fabric and Form Series (held within the Historic Environment Record at the offices of the Historic Environment and Archaeology Service).
- Depositors must accept the financial responsibility for finds storage. The current (2006) rate is a one off payment of £13.79 + VAT per box. The quantity of finds requiring storage will need to be considered at the assessment stage, following completion of fieldwork. Contact the County Museum (Keeper of Archaeology) for further advice.
- The selected museum must be approached in advance and a copy of their collections policy obtained (including requirements for archives).
- Worcestershire County Museum has a draft document on the conditions for acceptance of archaeological archives and artefacts. For further information contact the Keeper of Archaeology.

- Wherever possible archives should be prepared in digital format. This allows security copies to be easily made and for the archive to be made accessible via the HER, museum catalogues and the internet. Digital archives should follow accepted national standards (guidance may be obtained from ADS).

- For further guidance see ‘archaeological Archives – A guide to best practice in creation, compilation, transfer and curation by Duncan H Brown, 2007.

15 Monitoring

The Planning Advisory Section encourages active dialogue between contractor and curator to enable the best possible outcome for both the archaeology and the client.

- Access must be provided to staff of the Planning Advisory Section, to allow for fieldwork to be monitored.
- A minimum of five working days notice is required prior to any fieldwork commencing, unless otherwise agreed.
- Archaeological trenches should not be backfilled without first consulting the Planning Advisory Section.

Annex 1
Useful addresses and phone numbers

Planning Advisory Section
County Historic Environment and
Archaeology Service
Worcestershire County Council
Woodbury
University of Worcester
Henwick Grove
Worcester, WR2 6AJ

Tel: 01905 855454

Inspector of Ancient Monuments
English Heritage West Midlands
112 Colmore Row
Birmingham
B3 3AG

Tel: 0121 625 6820

County Records Office (Head Office)
Worcestershire County Council
County Hall
Spetchley Road
Worcester

Tel: 01905 763612

Coroner's Officer
Worcester Police

Tel: 01905 723888

County Ecology Officer
County Hall
Spetchley Road
Worcester
WR5 2NP

Tel: 01905 766477

Historic Environment Record
County Historic Environment and
Archaeology Service
Worcestershire County Council
Woodbury
University of Worcester
Henwick Grove
Worcester, WR2 6AJ

Tel: 01905 855494

Institute of Field Archaeologists
University of Reading
2 Earley Gate
PO Box 239
Reading
RG6 6AU

Tel: 0118 9316446

County Museums Officer
Worcestershire County Museum
Hartlebury Castle
Hartlebury
Kidderminster, DY11 7XZ

Tel: 01299 250416

Keeper of Archaeology
Worcester City Museum
Foregate Street
Worcester
WR1 1DT

Tel: 01905 25371

Annex 2
Legislation relevant to archaeological heritage management

The range of legislation affecting archaeological sites and discoveries should be familiar to an archaeological contractor or consultant. Attention is, however, also drawn to the potential hazard of commencing fieldwork without consulting equivalent environmental protection legislation. Even accidental damage to wildlife habitats or protected ecology can result in severe penalties to a developer and/or their contractor.

The following lists the legislation that refers to archaeology (excluding maritime law)

1. Primary Legislation

- Agriculture Act 1986
- Ancient Monuments and Archaeological Areas Act 1979
- Burial Act 1857
- Capital Transfer Tax Act 1984 (renamed the Inheritance Tax Act 1984)
- Countryside Act 1968
- Disused Burial Grounds (Amendment) Act 1985
- Electricity Act 1989
- Environment Act 1995
- Environmental Protection Act 1990
- Forestry Act 1967
- Land Drainage Act 1991
- National Heritage Act 1983
- Planning (Consequential Provisions) Act 1990
- Planning (Hazardous Substances) Act 1990
- Planning (Listed Buildings and Conservation Areas) Act 1990
- Planning and Compensation Act 1991
- Protection of Military Remains Act 1986
- Town and Country Planning Act 1990
- Treasure Act 1996 and Code of Practice 1997
- Water Act 1989
- Water Industry Act 1991
- Water Resources Act 1991
- Wildlife and Countryside (Amendment) Act 1985
- Wildlife and Countryside Act 1981

2. Secondary legislation and guidance

- Ancient Monuments (Claims for Compensation)(England) Regulations, S.I.1991 No.2512
- Ancient Monuments (Class Consents) Order, S.I.1981 No.1302
- Ancient Monuments (Class Consents) Order, S.I.1984 No.222
- Ancient Monuments (Class Consents) Order, S.I.1994 No.1381
- DOE/DNH: PPG15 Planning and the Historic Environment 1994
- DOE: Circular 1/85 The use of conditions in planning permissions
- DOE: Circular 15/88 Environmental assessment
- DOE: Circular 8/87 Historic buildings and conservation areas - policies and procedures
- DOE: MPG1 General Considerations and the Development Plan System 1988
- DOE: MPG10 Provision of raw material for the cement industry 1991
- DOE: MPG5 Minerals Planning and the General Development Order 1988
- DOE: MPG6 Guidelines for Aggregates Provision in England and Wales 1994
- DOE: PPG1 General Policy and Principles 1992
- DOE: PPG12 Development Plans and Regional Planning Advice 1992
- DOE: PPG16 Archaeology and Planning 1990
- DOE: PPG7 The Countryside and the Rural Economy 1992
- Operations in Areas of Archaeological Importance (Forms of Notice, etc) Regulations, S.I.1984 No.1285
- The Transport and Works Applications (Listed Buildings, Conservation Areas and Ancient Monuments Procedure) Regulations S.I.1992 No.3138
- Town and Country Planning (Applications) Regulations, S.I.1988 No.1812
- Town and Country Planning (Assessment of Environmental Effects) Regulations, S.I.1988 No.1199
- Town and Country Planning (General Development Procedure) Order S.I.1995 No.419
- Town and Country Planning (General Permitted Development) Order S.I.1995 No.418
- Town and Country Planning General Development Order, S.I.1988 No.1813
- DOE: MPG13 Guidelines for peat provision in England 1995

Annex 3:
Historic Environment Record - User's Declaration

I, the undersigned, in using the County Historic Environment Record understand and accept the conditions set out in Worcestershire Historic Environment and Archaeology Service leaflet *Access & Charging Policy Guidance & Conditions* dated April 2003.

- ☐ I agree to pay HER charges and any associated costs.
- ☐ I expect these charges to be a minimum of £50.00 plus VAT (from September 2006).
- ☐ I am a student or bona fide researcher.
- ☐ I am exempted from payment by prior agreement with the County Historic Environment and Archaeology Service.
- ☐ I undertake that the information will only be used for the purpose as declared below
- ☐ I undertake that the HER will be fully acknowledged in any publication of the research

Name _____ Organisation _____

Signed _____ Date _____

To assist with answering your enquiry please fill in any or all of the following, as appropriate:

Search type: Location

* Site address or coverage (eg parish name) _____

* Grid reference (centre of search area) _____

* Radius or area of search from central point _____

* Range of search from boundary/route indicated on attached map _____

Continued over

Search type: Period/Site type

* Period(s) of interest _____

* Site types of interest _____

Search type: Other

* Please define the nature of your search _____

_____

Annex 4

Information for finds specialists and post-excavation managers working in the county.

The Worcestershire HER has now completed a project to record all artefacts produced by archaeological activities in the county, irrespective of date or type. We now enter all new information as reports are submitted and this document is intended to provide a guide as to how we would like information submitted to the HER. The aim of this is to enable us to provide you with a complete and consistent data set. If you have any concerns about this please contact Victoria Bryant via vbryant@worcestershire.gov.uk

Worcestershire had no consistent record of artefacts within the HER so creating such a dataset has involved considerable resources. Given the scale of the task, the record for each site does not detail individual finds but provides a general, consistent index which will allow you to identify those sites which are likely to be most productive for your research. The creation of these indices is the first step towards transforming the HER into a useful tool for finds research. For example, you will be able to search for all sites within a certain area (or the whole county) which produced Roman bronze objects and then possibly refine the search to include only those with specialist reports on Roman bronze objects. Using the HER GIS the results can be plotted onto a range of map bases and can be used with other artefact or monument searches. For example all the Roman bronze objects from rural sites which have produced Roman coins.

To help us achieve a consistent record we would like all finds reports to include a short summary table. This is not intended to determine the type of analysis undertaken nor the structure of the report as these need to be suitable for the relevant material and research questions. The function of this table is to allow us to enter correct, consistent data as quickly as possible.

A similar index system is being used for environmental remains. **This will include unworked bone, wood, horn etc. Worked bone, wood or horn will be entered in the artefact index.**

Please remember that **all artefacts** must be included not just those from stratified contexts. This is particularly important for the earlier periods where often the only evidence of activity may come from, for example, Roman pottery found in a post-medieval context.

The following are examples of tables compiled from recent field projects

Example 1 Evaluation of late Iron Age and Roman site

Date (see note 1)	Artefact type (see note 2)	Count	Weight (g)	Specialist report? (see note 3)	Key assemblage? (see note 4)
3rd century BC to 1st century AD	pottery	192	2533	Y	Y
1st century to 2nd century AD	pottery	90	200	Y	N
Roman	pottery	1456	17040	Y	N
Roman	ceramic roof tile	280	457	Y	N
Roman	brick	9	109	N	N
Roman	plaster	2	45	N	N
Roman	stone roof tiles	20	8903	N	N
Roman	iron objects	42	305	N	N
Roman	bronze object	1	40	Y	N
Roman	lead object	2	100	Y	N
Roman	Iron slag	20	164	N	N
Roman	stone object	1	3600	Y	N
Roman	vessel glass	4	10	N	N
Roman	window glass	6	12	N	N
Roman	worked bone	3	24	Y	N
18th to 19th century	pottery	10	34	N	N
Post-medieval	iron objects	5	106	N	N
Undated	iron objects	6	110	N	N

Example 2 Finds from Field walking

Date (Note 1)	Artefact type (Note 2)	Count	Weight (g)	Specialist report? (Note 3)	Key assemblage? (Note 4)
Later Mesolithic to later Neolithic	flaked stone object	12	78	Y	N
Roman	pottery	5	27	Y	N
Medieval	pottery	44	429	Y	N
1540 to 1750	pottery	43	605	Y	N
1750 to present	pottery	2998	17271	N	N
17th century	clay pipe	1	8	N	N
Late medieval to early post-medieval	ceramic roof tile	35	1025	N	N
18th to 19th century	clay pipe	803	2611	N	N
19th to 20th century	vessel glass	176	2174	N	N
19th to 20th century	window glass	24	47	N	N
18th to 19th century	Industrial kiln waste	50	543	N	N
Post-medieval	Stone roof tile	10	97	N	N
Post-medieval	ceramic roof tile	164	6086	N	N
Post-medieval	iron objects	32	1204	N	N
Post-medieval	CU alloy object	1	33	N	N
Undated	slag	15	176	N	N

Notes

1. In some cases the date will be "Undated". In most cases, especially if there is not a specialist report, the information entered in the *Date* field will be a general period such as Neolithic, Roman, medieval etc (see Appendix 1 for a list of general periods used in the Worcestershire HER). Very broad date ranges such as *late Medieval to Post-medieval* are occasionally acceptable for artefacts which can be hard to date for example roof tiles **but if you have more specific dates, such as *13th to 14th century*, use these instead.** Specific date ranges which cross general period boundaries can also be used, for example *15th to 17th century*.

2. *Artefact type* is a broad general category (for thesaurus see Appendix 2). Remember that the table will be used to create a summary of the finds information and is not a substitute for the more detailed definitions which are needed in the main finds report, tables and archive. The table includes very general headings such as “glass” which allowed us to enter the often very vague information found in early reports. In modern reports we would expect the most detailed term available to be used for example “Vessel Glass”

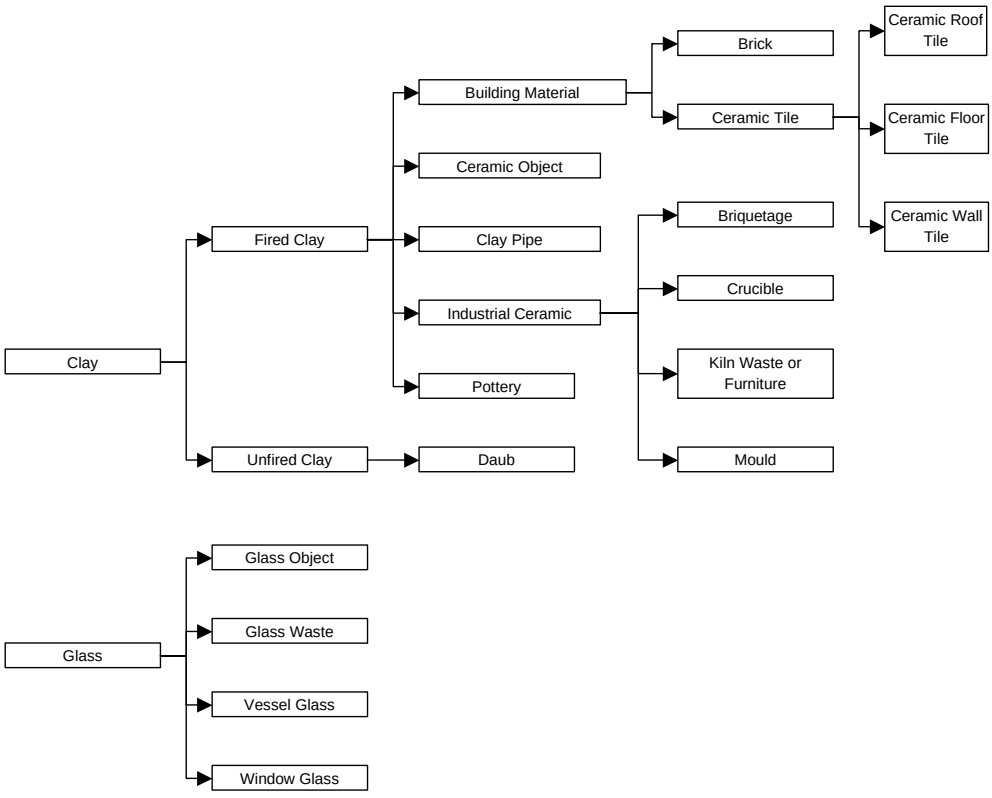
3. Not all evaluations of small excavation assemblages have specialist reports on all classes of objects. An identification (eg clay pipe) and a quantification is not a specialist report. A short discussion or a more detailed record identifying types and dates is a specialist report. This field is designed to point researchers to reports where they will find out more than merely the presence or absence of material of a particular type and date.

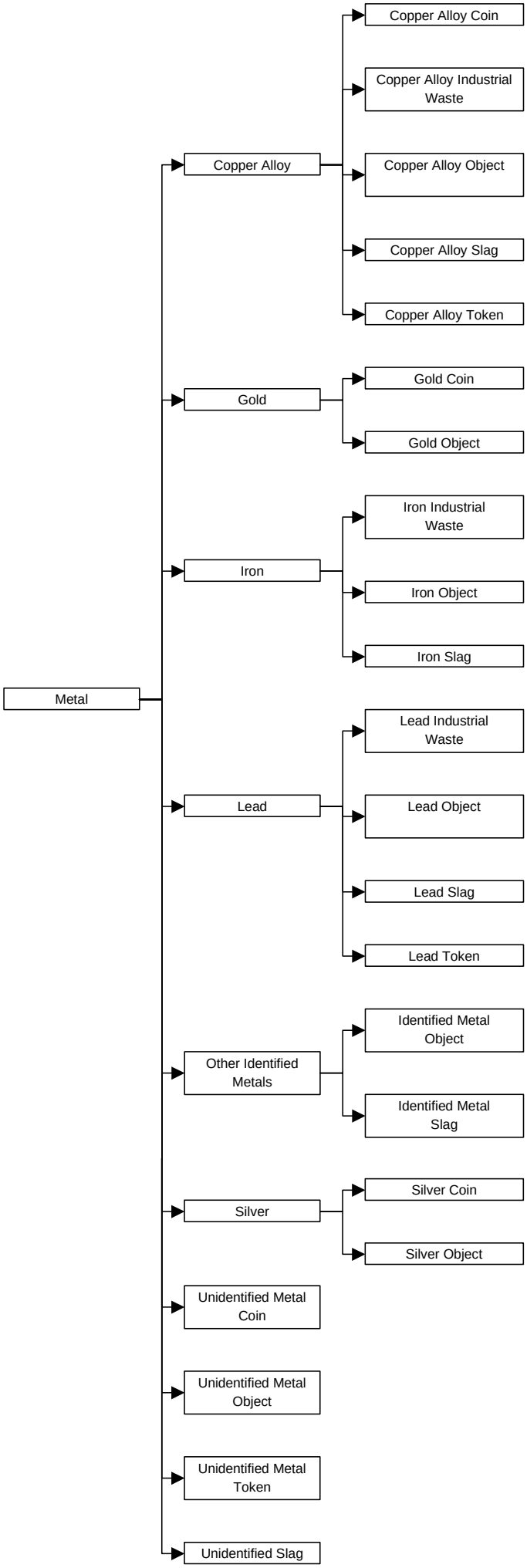
4. This field should be used with care. It is designed to point researchers to reports where they will be able to locate the most important assemblages for any given material for any given date.

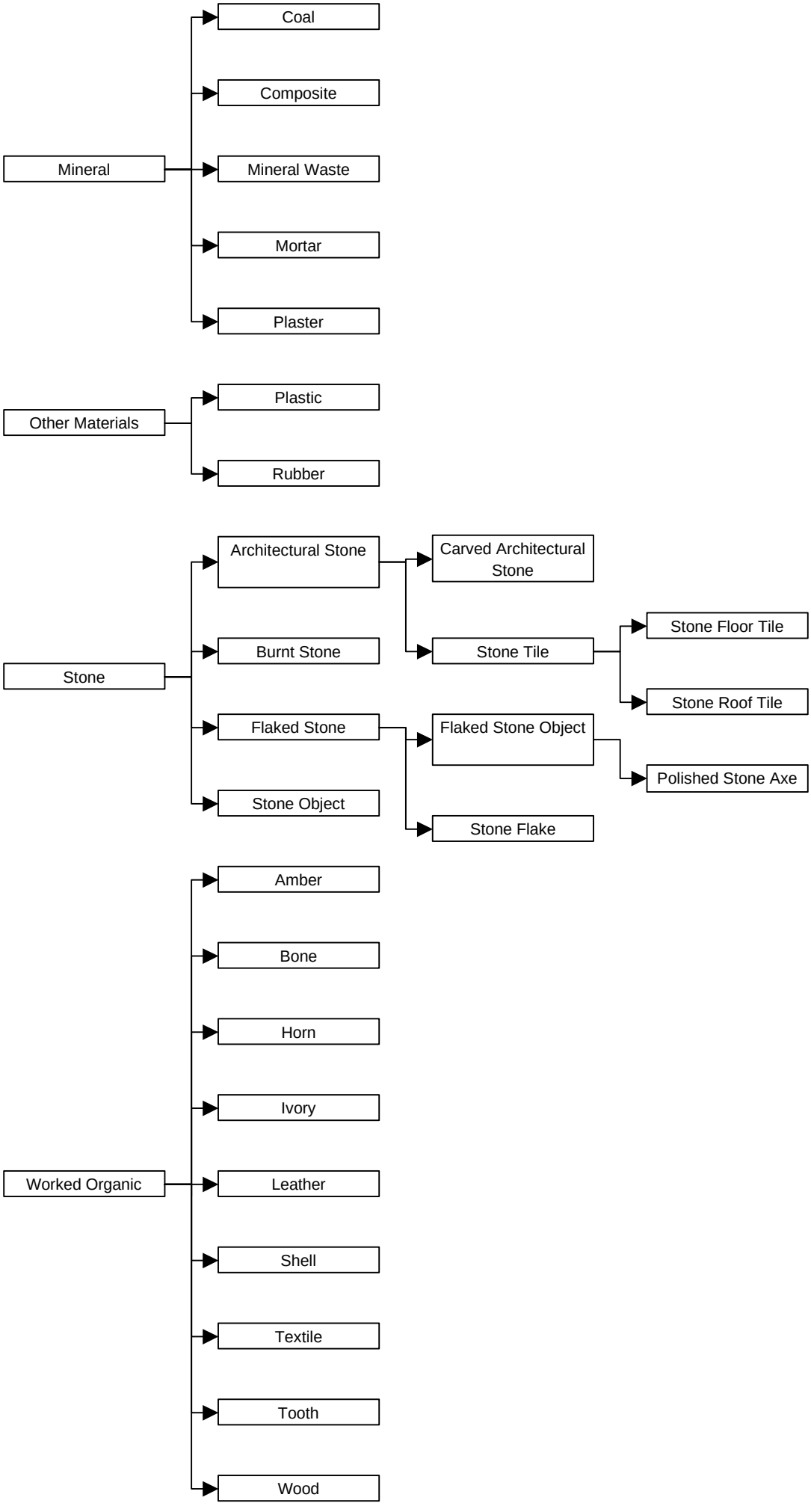
Appendix 1 - Main Period date ranges used in the Worcestershire HER

Palaeolithic	-500000	-10001
Mesolithic	-10000	-4001
Neolithic	-4000	-2351
Bronze Age	-2350	-801
Iron Age	-800	42
Roman	43	410
Post Roman	411	1065
Medieval	1066	1539
Post medieval	1540	1899
Modern	1900	2050

Appendix 2 – Thesaurus of Artefact Types




Metal
Copper Alloy
Copper Alloy Coin
Copper Alloy Industrial Waste
Copper Alloy Object
Copper Alloy Slag
Copper Alloy Token
Gold
Gold Coin
Gold Object
Iron
Iron Industrial Waste
Iron Object
Iron Slag
Lead
Lead Industrial Waste
Lead Object
Lead Slag
Lead Token
Other Identified Metals
Identified Metal Object
Identified Metal Slag
Silver
Silver Coin
Silver Object
Unidentified Metal Coin
Unidentified Metal Object
Unidentified Metal Token
Unidentified Slag


Coal
Composite
Mineral
Mineral Waste
Mortar
Plaster
Plastic
Other Materials
Rubber
Architectural Stone
Carved Architectural Stone
Stone Floor Tile
Stone Tile
Burnt Stone
Stone
Stone Roof Tile
Flaked Stone
Flaked Stone Object
Polished Stone Axe
Stone Object
Stone Flake
Amber
Bone
Horn
Ivory
Worked Organic
Leather
Shell
Textile
Tooth
Wood

Annex 5

Information for environmental specialists, finds managers and post-excavation managers working in the county.

The Worcestershire HER has now completed a project to record all environmental material produced by archaeological activities in the county, irrespective of date or type. We now enter all new information as reports are submitted and this document is intended to provide a guide as to how we would like information submitted to the HER. The aim of this is to enable us to provide you with a complete and consistent data set. If you have any concerns about this please contact Victoria Bryant via vbryant@worcestershire.gov.uk

Worcestershire had no consistent record of environmental material within the HER so creating such a dataset has involved considerable resources. Given the scale of the task, the record for each site does not detail species but provides a general, consistent index which will allow you to identify those sites which are likely to be most productive for your research. The creation of these indices is the first step towards transforming the HER into a useful tool for environmental research. For example you will not be able to find every site where, for example, a particular type of mollusc has been found but you will be able to discover which sites of a particular period have produced molluscs and which of these sites have detailed reports. You will be able to search for all sites within a certain area (or the whole county) which produced, for example, molluscs from Roman contexts and then possibly refine the search to include only those with specialist mollusc reports. Using the HER GIS the results can be plotted onto a range of map bases and can be used with other environmental, artefactual or monument searches. For example all the Roman rural sites excavated after 1950 which have produced molluscs.

A similar index system is being used for artefacts. This will include worked bone, wood, horn etc. Unworked bone, wood or horn will be entered in the environmental index. **Finds managers should ensure that unworked bone, wood, horn which is not sent to a specialist is still entered in the table.**

To help us achieve a consistent record we would like all environmental reports to include two pieces of information

1) A clear statement of the retrieval methods.

This might be best constructed as a simple table

Method of retrieval	Yes/No
Hand retrieval	Y
Bulk sample	Y
Spot sample	N
Auger	N
Monolith	N
Observed	N

The *Observed* box is for fieldwork such as watching briefs on bore holes where environmental remains may have been observed but not hand retrieved or sampled.

2. Short summary table of the results.

This is not intended to determine the type of analysis undertaken nor the structure of the report as it is expected that these will reflect the potential of the material and the research questions. The function of this table is merely to allow us to rapidly enter correct, consistent data. The table should contain the following fields.

2.1 Type

This is a broad general category (for thesaurus see Appendix 3). Remember that the table will be used to create a summary of the environmental information and is not a substitute for the more detailed definitions which are needed in the main environmental reports, tables and archive.

2.2 Preservation

This needs to be completed for each material type. There are two broad categories

- Not decayed (for example bone or teeth)
- Modified (i.e. preserved by some process or set of conditions) Please indicate whether preservation is due to desiccation, charring, mineralisation or anaerobic/anoxic conditions. For a thesaurus see Appendix 1.

2.3 Quantity

At this basic level of recording it has been decided that a quantification is not helpful given the variety of methods of quantification needed for different types of material. The database does include tables for quantity, however, as it is hoped that in the future more detailed information will be entered on at least some specific types of environmental material for example seeds or pollen.

2.4 Specialist report?

Not all evaluations of small excavation assemblages have specialist reports on all classes of environmental evidence. An identification (e.g. large mammal bone) and an assessment of quantity or a quantification is not a specialist report. This field is designed to point researchers to reports where they will find out more detail about material of a particular type and date. In many cases this will be a species list and discussion.

2.5 Key assemblage?

This field should be used with care. It is designed to point researchers to reports where they will be able to locate the most important assemblages for any given material for any given period. Most assemblages will not, on their own, be important research resources.

2.6 Date

In some cases the *Date* will be "Undated". In most cases the information entered in the *Date* field will be a general period such as Neolithic, Roman, medieval etc (see Appendix 2 for a list of periods used in the Worcestershire HER). Very broad date ranges such as *Iron Age to Roman* are acceptable if the date is not known but if there are Iron Age **and** Roman remains these should be entered as two records. If specific dates are available, such as *13th to 14th century*, please use these instead. Specific date ranges which cross general period boundaries can also be used, for example *15th to 17th century*.

2.7 Example of a summary table

Type (see 2.1)	Preservation (see 2.2)	Specialist report? (see 2.4)	Key assemblage? (see 2.5)	Date (see 2.6)
Human bone	Not decayed	Y	N	Medieval
Human teeth	Not decayed	Y	N	Medieval
Large mammal bone	Not decayed	N	N	Undated
Small mammal bone	Not decayed	N	N	Undated
Large mammal bone	Not decayed	Y	N	9th to 16th century
Small mammal bone	Not decayed	Y	N	9th to 16th century
Fish bone	Not decayed	Y	N	9th to 16th century
Large mammal teeth	Not decayed	Y	N	9th to 16th century
Small mammal teeth	Not decayed	Y	N	9th to 16th century
Plant macrofossils	Mineralisation	Y	Y	14th - 15th century
Pollen	Not decayed	Y	N	9th to 16th century
Wood	Waterlogged	N	N	18th century
Mollusc shell	Not decayed	Y	N	9th to 16th century
Food remains	Charring	Y	N	14th to 15th century

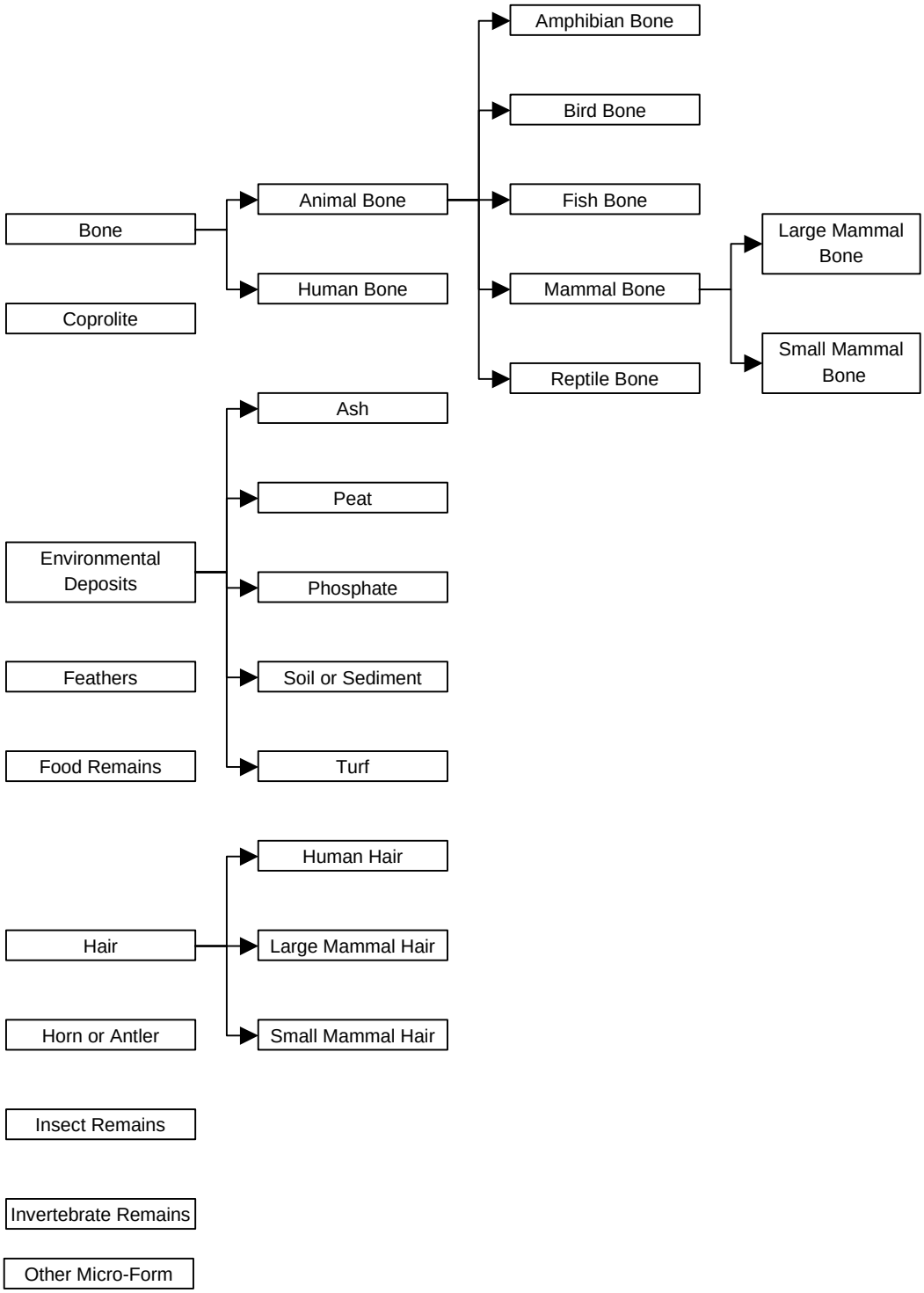
Appendix 1 – Preservation

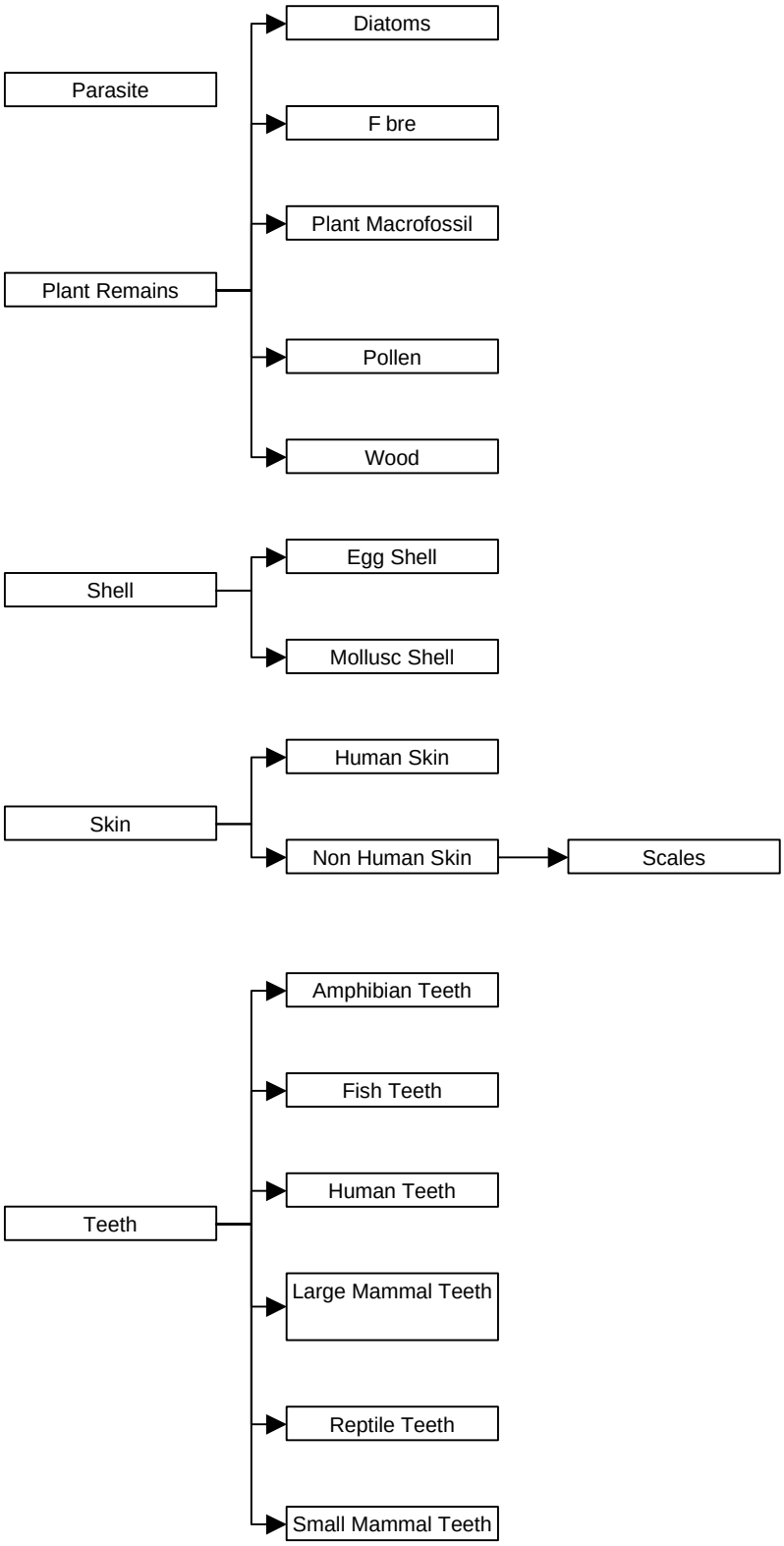
Not modified	
Modified	Desiccated Charred Mineralised Anaerobic or Anoxic Not specified

Appendix 2 - Main Period date ranges used in the Worcestershire HER

Palaeolithic	-500000	-10001
Mesolithic	-10000	-4001
Neolithic	-4000	-2351
Bronze Age	-2350	-801
Iron Age	-800	42
Roman	43	410
Post Roman	411	1065
Medieval	1066	1539
Post medieval	1540	1899
Modern	1900	2050

Appendix 3 – Thesaurus of Environmental Types




Parasite
Plant Remains
Diatoms
F bre
Plant Macrofossil
Pollen
Wood
Shell
Egg Shell
Mollusc Shell
Skin
Human Skin
Non Human Skin
Scales
Teeth
Amphibian Teeth
Fish Teeth
Human Teeth
Large Mammal Teeth
Reptile Teeth
Small Mammal Teeth

Annex 6
Copyright, and Liability Statement and On-Line Library Access Agreement

At all times, Worcestershire County Council seeks to protect the intellectual property rights and copyright of the originators of data where that can reasonably be achieved. It is the responsibility of users to acknowledge and comply with the copyright conditions that may be imposed.

Questions about copyright should be addressed to the: -

Historic Environment and Archaeology Service Historic Environment Record Manager
Historic Environment and Archaeology Service
Woodbury
University College Worcester
Henwick Grove
Worcester
WR2 6AJ
Tel: 01905 855494
e-mail: vbryant@worcestershire.gov.uk

Copyright Statement

A non-exclusive, non-transferable licence is hereby granted to those using or reproducing, in whole or in part, the material for valid not-for-profit teaching and research purposes, providing the copyright owners are acknowledged. The WHEAS should be cited as the source of the material from this server. Anyone wishing to use the catalogue for any other purpose must contact WHEAS/ copyright holder to seek permission.

Liability Statement

The WHEAS archaeological library is a catalogue of reports, and as such, the maintainers of the catalogue explicitly disclaim to the extent permitted by law any responsibility for the accuracy, content, or availability of information located through use of the catalogue, or for any damage incurred owing to use of the information contained therein.

Information located through use of the catalogue may be subject to specific use constraints, details of which will be made accessible to potential users by the catalogue. It is the responsibility of potential and actual users to be aware of such constraints and to abide by them.

By making use of material on this web server, including the contents of the catalogue, you accept these copyright and disclaimer provisions.

On-Line Access Agreement

The WHEAS levies no charge to use its library when used according to the terms detailed below (although a charge may be made for data that is extracted from the Historic Environment Record as part of a commercial search). However, by accepting the terms of the Access Agreement all users are entering into a legally binding agreement.

It is the aim of the WHEAS to provide integrated access to reports of fieldwork in Worcestershire at no cost to end users to help them to understand and protect the Historic Environment of Worcestershire. This aim can only be achieved if the organisations that supply data can be assured that their own rights are protected. Consequently, use of the office and on-line library is covered by a variety of legal instruments to protect us, our users, and those who supply data to us.

The Access Agreement asks that users be fair and reasonable in their use of the data supplied through the WHEAS library. We ask that you acknowledge the source and copyright of the data you use, that you tell us of any errors you find in it, and that if you undertake any work based substantially upon it, that you tell us about it and send us a copy of any subsequent publication. The data must not be sold or supplied to a third party.

The data should only be used for teaching, learning, and research purposes, except by prior agreement. By teaching, we mean directed teaching undertaken with a designated tutor in a formal setting. By learning we mean self-directed study, whether or not attached to an educational institution, including the educational activities undertaken in museums, libraries and cognate institutions. By research we mean any work undertaken for the advancement of archaeological knowledge and/or the understanding of the historic environment. Such work may be commercially sponsored or it may be funded by academic bodies or learned societies, or it may be unsupported: but it is a condition of use that the results are placed in the public domain and are made freely available for others to use according to the normal principles of professional and academic practice.

Terms

By using the WHEAS on-line library you are bound by the following Terms & Conditions. Please read them carefully.

I have read and I understand the following statement:
All material supplied via WHEAS is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the Collections is not permitted, except that material may be duplicated by me for my research use or educational purposes in electronic or print form. I must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.

I further agree:

1. To acknowledge, in any publication, whether printed, electronic or broadcast, based wholly or in part on the reports in the library, the original depositors.
2. To declare, in any publication, whether printed, electronic or broadcast, based wholly or in part on the reports in the library, that those who carried out the original collection of the data bear no responsibility for the further analysis or interpretation of it.

Continued…

3. To supply the Worcestershire Historic Environment Record with one copy of any published work based wholly or substantially on the library or alternatively with references and supporting information if this is requested.
4. To notify the WHEAS of any errors discovered in the library.
5. To accept that WHEAS and the copyright holder bear no legal responsibility for the accuracy or comprehensiveness of the reports, and that WHEAS and the copyright holder accept no liability for indirect, consequential, or incidental, damages or losses arising from use of the reports, or from the unavailability of, or break in access to, the service, for whatever reason.