

The Bedfordshire Aggregates Archaeological Resource Assessment



The Bedfordshire Aggregates Archaeological Resource Assessment

By The Archaeology Team of Development Management,
Central Bedfordshire Council

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Final Report

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BEDFORD BOROUGH COUNCIL





Broom Quarry South Extension – CAU Excavations 2009

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SUMMARY

The Bedfordshire Aggregates Archaeological Resource Assessment was commissioned in 2009 by English Heritage through the Aggregates Levy Sustainability Fund (ALSF), which was introduced in 2002 to attend to matters arising from the extraction of aggregates. The project has been logged by English Heritage as RaSMIS number 5759.

The project focuses on the historic county of Bedfordshire, comprising the administrative areas that following the local government re-organisation in April 2009 are covered by Bedford Borough Council, Central Bedfordshire Council and Luton Borough Council. The project was awarded to Bedfordshire County Council and has been completed by the Archaeology Team of Central Bedfordshire Council with the consent of and on behalf of the other authorities.

The aim of this project is to improve knowledge of the archaeological resource of the aggregate producing areas of the historic county of Bedfordshire; thereby providing the appropriate tools to facilitate decisions regarding strategic planning, management and preservation of archaeological sites and historic landscapes within those areas. It will also increase public, industry and other stakeholders' awareness of the archaeology and historic landscapes within the aggregate areas.

The project represents a largely HER based archaeological assessment for the aggregate mineral producing areas of Bedfordshire. Between 2004 and 2009 aggregate sales in Bedfordshire averaged around 1.4 million tonnes per year. Quarried deposits include; the river valley sands and gravels from the Lower Ouse and Ivel Valleys, the glacial sands and gravels of the Biggleswade area and the cretaceous sands of the Greensand Ridge. The discovery of archaeological remains associated with aggregate quarrying has a long history in Bedfordshire and includes sites and artefacts of regional and national importance.

Data from the Bedfordshire and Luton Minerals Planning Authority (BLMPA) and from the British Geological Survey (BGS) has been used to divide those geological deposits within the county suitable for aggregate extraction into two Aggregate Study Areas (AS-As) and three Aggregate Study Sub-Areas (AS-SAs). The archaeological resource for each AS-A or AS-SA has been summarised and characterised in chronological order, using the sub-divisions in use in the Bedfordshire and Luton HERs.

The Resource Assessment is followed by a Research Agenda and Mitigation Strategy. The Research Agenda identifies key themes and topics for future study. The Mitigation Strategy uses case studies to present assessments of current methodologies associated with the evaluation, excavation and mitigation of the archaeological resource and proposes a range of options to improve those methodologies.

The results of the project have demonstrated that approximately 37% of the archaeological resource for Bedfordshire lies within areas suitable for aggregate extraction. There is obvious variation in the character of the resource between the riverine study areas and the upland Woburn Sands Formation Study Area. There are also significant differences amongst the river valleys themselves. These differences and indeed similarities demonstrate that Bedfordshire's aggregate producing geologies have some of the most complex and unique archaeological sites within the county and region. As a consequence the recognition of this significance is vital to ensuring their adequate protection and promotion.

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INTRODUCTION

By Hannah Firth & Martin Oake

Minerals extraction in England is regulated by the provisions set out in Minerals Policy Statement 1: *Planning and Minerals* (MPS 1). Bedfordshire has both superficial and solid geological deposits deemed suitable for use as aggregates.

Under the terms set out in the Bedfordshire and Luton Minerals and Waste Local Plan (BLMWLP) the county aims to provide 1.93 million tonnes of sand and gravel per year until 2016. It is preferred that these minerals are extracted from the following areas:

- the river valley sands and gravels from the Lower Ouse and Ivel Valleys
- the glacial sands and gravels of the Biggleswade area
- the cretaceous sands of the Greensand Ridge

In order to facilitate the contribution of 1.93 million tonnes of aggregate per annum Bedfordshire has to maintain a landbank of at least 7 years throughout the life of the BLMWLP. As result the chosen extraction sites have to have the capacity to produce 27 million tonnes of proven aggregate reserves and a further 17 million tonnes of probable aggregate resource (BLMWLP 2005).

Whilst the Milton Keynes and South Midlands Growth Areas have been abolished by the Coalition Government there is still a substantial need for housing provision and extensive infrastructure improvements within Bedfordshire and the wider region. As a consequence the Bedfordshire quarries are likely to have to still meet this demand. Some of this requirement will be met from scheme specific borrow pits which may be located in areas otherwise deemed unsuitable for large scale aggregates extraction and therefore not identified in the BLMWLP (BLMWLP 2005).

The adoption of the Planning and Compulsory Purchase Act 2004 is changing the way the Planning system works in England, it aims to simplify the process and give the local community greater involvement in decision making. Local Plans are gradually being replaced by Local Development Frameworks (LDFs) and this process of change is ongoing in Bedfordshire. Whilst these modifications take place many of the policies from the BLMWLP are being saved and these include those that affect archaeology and the historic environment.

The discovery of archaeological deposits within aggregate quarries has a long history in Bedfordshire. The earliest excavation of archaeological remains as a consequence of aggregate quarrying in the county took place at Shefford between 1820 and 1840 when local antiquarian Thomas Inskip discovered a Roman cemetery and buildings (Simco 1984). Other mid-19th century antiquarian finds from aggregate sites were of national importance and they include an early Saxon cemetery at Kempston and Lower Palaeolithic flint tools found in association with mammalian and molluscan remains from Deep Spinney, Biddenham (Wyatt 1861).

Throughout the later 19th and early 20th centuries finds continued to be made and excavations undertaken in aggregate quarries. Some of the most impressive finds include high quality late Iron Age metalwork from Felmersham (Watson 1949). Although

the excavations were often small scale they did produce important evidence for occupation in the aggregate producing areas, particularly for the prehistoric and Roman periods. For example at Harrold Quarry a sequence of activity from the Neolithic to Saxon period was identified in the early 1950's, including Bronze Age settlement and funerary monuments, Iron Age settlement, a mid-Saxon cemetery and settlement and a regionally rare Viking burial (Eagles and Evison 1970).

In the later 20th century the scale and intensity of aggregate extraction increased and as a consequence so too did the impact on archaeological remains. This increase in extraction was matched by an increase in the scale and extent of the archaeological response to the destruction of archaeological resources. In the 1970's there were major campaigns of excavation at a number of sites in advance of aggregate extraction. At Odell almost the complete plan of a late Iron Age and Roman agricultural settlement was investigated (Dix 1980) which complimented the earlier investigation at the nearby Harrold Quarry. A Bronze Age round barrow cemetery was investigated at Roxton (Taylor and Woodward 1985), where by combining the results of excavation and fieldwalking it was possible to explore the relationship between settlement and funerary/ritual monuments.

Aggregate extraction on the Greensand Ridge has also produced important archaeological evidence. At Grovebury Quarry the remains of a medieval Priory was fully excavated in the 1970's. The Priory was created from a former Royal Manor and the investigations indicated a long sequence of activity at the site, including possible Saxon timber-framed buildings. The Priory itself was short-lived, returning to its status as a Royal Manor after just a short period of time as a religious house.

Not all archaeological investigations resulting from aggregate extraction have occurred in the main aggregate producing areas. At Salford in the extreme west of the county a sequence of occupation from the Neolithic to the Roman period was identified (Dawson 2005).

As larger quarries have been granted planning permission whole archaeological landscapes have been impacted on and as a result it has become possible to undertake investigations at that scale. At Warren Villas/Ivel Farm in the valley of the River Ivel activity from the Neolithic to Saxon periods has been investigated, including well preserved organic remains of Saxon flax retting pits and fish traps next to the river (Dawson and Maull 1996). This site, along with others in the main river systems has produced valuable information on the environmental context for human settlement in the river valleys (Robinson 1992).

Over the last 20 years a Neolithic and Bronze Age ritual landscape has been investigated in the River Great Ouse valley to the east of Bedford at Willington Quarry and Plantation Quarry (Dawson 1996). This was succeeded by an Iron Age and Roman agricultural landscape comprising settlements and field systems marking a radical change in the use of the landscape. Other Investigations at Broom Quarry and its eastward extension also produced evidence of a long sequence of occupation from the Neolithic to medieval period (Cooper and Edmonds 2007). This site shows the changing use of the landscape over several thousand years, it has also demonstrated that the remains of early phases of activity persisted in the landscape to influence later settlement and land use.

MPS 1 requires that Minerals Planning Authorities (MPAs) and Local Planning Authorities (LPAs) undertake their functions in accordance with a series of national planning policies; these include the protection of heritage and the countryside.

The saved policies from the BLMWLP require new applications for minerals extraction to take into account archaeological remains and to undertake suitable measures to either ensure preservation by record or *in situ* of archaeological sites and their settings (BLMWLP 2005). Following the adoption of Planning Policy Statement 5: *Planning for the Historic Environment* (PPS5) in March 2010 all planning applications that affect locally, regionally or nationally important archaeological sites or the historic environment (now collectively termed heritage assets) that do not provide sufficient information should not be validated by the MPA or LPA.

As a result of national planning policy there is a steadily growing corpus of knowledge of the archaeological sites, monuments and landscapes affected by modern aggregate extraction in Bedfordshire. However what is less certain is how much information is available on those archaeological sites discovered in quarries and the wider aggregate areas pre-PPG16 (Planning Policy Guidance 16: *Archaeology and Planning*) and PPS 5.

This project proposes a critical analysis of the known archaeological resource in order to provide a baseline of information that will be used strategically to inform and influence the management of the archaeological resource within Bedfordshire's aggregate areas. In addition it will be used to enhance understanding of and access to previous work and inform future historic environment projects.

RESEARCH AIMS AND OBJECTIVES

Project Aim

To improve knowledge of the archaeological resource of the aggregate producing areas of the historic county of Bedfordshire thereby providing the appropriate tools to facilitate decisions regarding strategic planning, management and preservation of archaeological sites and historic landscapes within those areas. And to increase public, industry and other stakeholders' awareness of the archaeology and historic landscapes within the aggregate areas.

Objectives

Objective 1 To define the aggregate producing areas of the historic county of Bedfordshire by using British Geological Survey (BGS) and Minerals Planning Authority (MPA) data, and to produce detailed mapping and written descriptions of these deposits that can then be used to create aggregate study areas (AS-As).

Objective 2 To define areas of past, present and future aggregate mineral extraction within the historic county of Bedfordshire using BGS (including the BritPits database), MPA, and Historic Environment Record (HER) data.

Objective 3 To identify outstanding Review of Old Minerals Permissions (ROMPs) for the aggregate study areas and the likely effect of continuing or starting extraction on the Historic Environment of specific quarries.

Objective 4 To define and characterise the archaeological resource and assess its current state of knowledge within the aggregate study areas (AS-As) of the historic county of Bedfordshire by using HER and archive data and to produce a resource assessment.

Objective 5 To identify and quantify archaeological investigations that have taken place as a direct result of aggregate extraction but which have been insufficiently disseminated; to rapidly assess these project outcomes and where appropriate to propose further levels of intervention/dissemination.

Objective 6 To develop a research agenda and strategy for the archaeological resource for the aggregate study areas (AS-As) of the historic county of Bedfordshire.

Objective 7 To assess current methodologies associated with the evaluation, excavation and mitigation of the archaeological resource within the aggregate study areas (AS-As) of the historic county of Bedfordshire and to develop and adopt a mitigation strategy to improve those methodologies.

Objective 8 To increase public, industry and other stakeholders' awareness of the archaeology and historic landscapes within the aggregate study areas (AS-As) of the historic county of Bedfordshire by holding a stakeholders seminar and by disseminating the project results through the relevant authority websites and ADS. The published material will include both executive summaries and the full report.

MINERALS PLANNING BACKGROUND

By Hannah Firth

Bedfordshire Minerals Extraction Background

The extraction of minerals within England is controlled principally by national policy, including Minerals Policy Statement 1: *Planning and Minerals* (MPS 1). This planning policy was adopted by the previous Government in May 2006 and replaces Minerals Planning Guidance Note 1: *General Considerations and the Development Plan System* (MPG 1) and Minerals Planning Guidance Note 6: *Guidelines for Aggregates Provision in England* (MPG 6). The Government's objectives for minerals planning reflect the requirements for sustainable development as required by Section 39 of the Planning and Compulsory Purchase Act 2004.

Regional Planning Bodies (RPBs), Minerals Planning Authorities (MPAs) and Local Planning Authorities (LPAs) are required to undertake their duties in accordance with national planning policies that govern:

- The exploration of minerals
- The survey of minerals resources
- The safeguarding of minerals resources
- The protection of heritage and countryside affected by minerals extraction
- The supply of minerals resources
- The sustainable bulk transportation of minerals
- The protection of the environment
- The efficient use of all minerals and their alternatives
- Opportunities for sensitive, appropriate and timely restoration of minerals workings

In 2005 the Bedfordshire and Luton Minerals Planning Authority (BLMPA) adopted the Bedfordshire and Luton Minerals and Waste Local Plan 2000-2015 (BLMWLP). The plan set out the land use policies and proposals for the extraction of minerals and the management of waste within the historic county of Bedfordshire for the period 2000-2016 (BLMWLP 2005). The plan met the requirements of the minerals planning system as indicated by MPG1 and MPG 6.

An additional result of the Planning and Compulsory Purchase Act 2004 was that Structure and Local plans are being phased out in favour of Local Development

Frameworks (LDFs). Accordingly the BLMWLP will be replaced by the Minerals and Waste Development Framework (MWLDF). The MWLDF comprises the following components:

- Minerals and Waste Development Local Development Scheme (MWLDS)
- Statement of Community Involvement
- Annual Monitoring Reports
- Supplementary Planning Document concerning Managing Waste in New Developments
- Combined Minerals and Waste Core Strategy DPD
- General and Environmental Policies DPD

Aggregates Extraction and Archaeology in Bedfordshire

Most of the policies contained in the BLMWLP (adopted in 2005) have been formally saved, and are still in force until existing policies are replaced by replacement policies in LDFs. The saved policies relevant to the historic environment are within Chapter 6, General and Environmental Policies. These include:

GE1: Matters to be addressed by planning applications

“In proposals for minerals and/or waste related developments, planning applications will be required to provide sufficient information to enable the planning authority to assess, where applicable any impact(s) on archaeological features, ancient monuments, buildings or other areas of architectural or historic interest, together with their settings”

BLMWLP 2005: page 75

GE14: Archaeology

“When considering proposals for minerals and waste development the MPA/WPA will require, where appropriate, the preservation of sites of major archaeological importance and their settings through –

- a) Ensuring the availability sufficient information from developers to evaluate the importance of sites and assess the impact of development proposals, and refusing applications where required information is not provided;

- b) Refusing or modifying development proposals likely to have an unacceptable adverse upon sites and their settings;
- c) Ensuring that provision is made for an appropriate level of investigation and recording in advance of the destruction of those sites which do not merit permanent preservation, and refusing applications where such provision is not made;
- d) Requiring a long-term management plan from developers where appropriate, for sites of archaeological importance which are preserved in-situ, and refusing applications where such a plan is not agreed.”

BLMWLP 2005: pages 92-93

GE15: Statutorily designated Historic Buildings and Site

“The MPA/WPA will refuse planning permission for mineral or waste development proposals which would have an adverse impact on:

- a.) Listed buildings and/or their setting;
- b.) Ancient monuments and/or their setting;
- c.) Registered historic parks and gardens and/or their setting;
- d.) Registered battlefields and/or their setting;

unless over-riding need can be demonstrated which outweighs the projected impact on the historic building or area.”

BLMWLP 2005: page 93

GE16: Local Historic Buildings, Conservation Areas and Historic Environment Sites

“The MPA/LPA will only grant planning permission for minerals and waste development which would have an adverse impact on:

- a.) Sites and buildings of local historic interest and/or their setting;
- b.) Conservation areas and/or their setting;

where any adverse impact is reduced as far as practicable and is outweighed by other planning benefits of the proposal.”

BLMWLP 2005: page 93

Best practise for dealing with the historic environment and minerals extraction is also promoted by the Minerals and Historic Environment Forum (a body which includes English Heritage, the Association of Local Government Archaeologists, the Planning

Officers Society and representatives from the minerals industry), who produced “Mineral Extraction and Archaeology: A Practise Guide” in 2008.

Following the abolition of Bedfordshire County Council in April 2009, the three successor unitary authorities, Bedford Borough Council, Central Bedfordshire Council, and Luton Borough Council became the planning authorities responsible for minerals and waste planning within their areas. The three authorities are working in partnership to progress the MWLDF and this process is being carried out by the Joint Minerals and Waste Planning Service employed by Central Bedfordshire Council. At present in accordance with the LDF requirements, the Joint Service is seeking to renew the minerals policies of the BLMWLP by developing a combined Minerals and Waste Core Strategy. The purpose of the Combined Minerals and Waste Core Strategy MDPDs will be to guide minerals planning within the area of Bedford Borough, Central Bedfordshire and Luton Borough Councils.

The Core Strategy addresses the provision of future minerals supplies, the release of reserves, and a strategic approach to the location of sites, and will identify Strategic sites for future extraction. Previously 34 potential mineral working sites were put forward by the industry for the extraction of sand and gravel, and 7 for sand. Of these 41 sites identified 8 have been highlighted as preferred site allocations for sand and gravel, and sand extraction and these are:

- 1.) MD3 (Willington Lock) – Sand and Gravel
- 2.) MD8 (Willowhill Farm, Moggerhanger) – Sand and Gravel
- 3.) MD10 (Bridge Farm, Great Barford) – Sand and Gravel
- 4.) MD12 (Octagon Farm north, Willington) – Sand and Gravel
- 5.) MD15 (Land south of Broom village) – Sand and Gravel (permitted in part)
- 6.) MD21 (Grovebury Road extension) – Sand (application submitted)
- 7.) MD28 (Brooklands Farm, Biggleswade) – Sand and Gravel
- 8.) MD36 (Ivel Farm, Biggleswade) – Sand and Gravel

In addition to these preferred sites 4 of the identified sites have been subsequently granted planning permission for the extraction of aggregates and therefore are no longer included in the MDF. These sites are:

- 1.) MD9 (Dairy Farm, Renhold) – Sand and Gravel
- 2.) MD11 (Land at Octagon Farm South) – Sand and Gravel
- 3.) MD15 (Land at Broom Quarry) – Sand and Gravel
- 4.) MD20 (Land at Whitsundoles Farm, Salford) – Sand and Gravel

In terms of the impact on the historic environment of the 41 sites proposed, 36 are located within archaeologically sensitive areas, 7 of the preferred sites are also within archaeologically sensitive areas, and all of those already granted planning permission have historic environment interest.

In addition to the sites identified within the LDF process, and those with current permission for the extraction of aggregates, minerals extraction has the potential to impact on the historic environment in the Minerals Consultation Areas (MCAs) and the proposed Minerals Safeguarding Areas (MSAs).

Minerals Consultation Areas and Minerals Safeguarding Areas

MPS1 requires that MPAs and LPAs take active measures to protect economically viable minerals resources from sterilisation by other types of development. Under the terms of MPS1 local authorities are required to define Minerals Safeguarding Areas (MSAs). Within the adopted BLMWLP there are a series of Minerals Consultation Areas (MCAs). These MCAs were designed to prevent sterilisation of minerals deposits by ensuring that the MPA is consulted on any planning application submitted within an MCA. The creation of the MCAs was in line with the requirements of the defunct Minerals Planning Guidance (MPG 1, 6 and 15) and the MCAs were revised in 2001 to reflect the extent of geological resources that are capable of being extracted for aggregates.

Saved Policy M4 of the BLMWLP states:

“In the Minerals Consultation Areas, the MPA will make every effort to safeguard mineral resources which are, or may come to be, of economic importance, from unnecessary sterilisation by other types of development which would be a serious hindrance to their extraction. Where development is likely to result in the sterilisation of such resources, the MPA will encourage the prior extraction of the minerals where appropriate.”
BLMWLP 2005: pages 18-19

With the development of MWLDF this issue will be addressed within the Combined Minerals and Waste Core Strategy in line with the requirements of MPS1. In the intervening period it is proposed that the MCAs adopted in the BLMWLP will act as MSAs. The location of the current MCAs is shown in the map below.

The potential impact on the archaeological resource, and the historic environment, from the extraction of minerals within MCAs and MSAs cannot be ignored. Whilst the prior extraction of minerals from within an MCA/MSA will only be undertaken where it is a viable option, the nature of aggregate extraction means that the impact on both buried and upstanding archaeological remains has to be considered carefully, especially when planning proposals relate to large scale housing, industrial or recreational development. This does not mean there are fewer options for mitigation; however it does require early consultation with both minerals planning officers and archaeological specialists.

Minerals Extraction and PPS5: Planning for the Historic Environment.

In March 2010 Planning Policy Guidance (PPG) Note 16: *Archaeology and Planning* was replaced by Planning Policy Statement (PPS) 5: *Planning for the Historic Environment*. Under the terms of PPS5 all archaeological sites and monuments, historic buildings and landscapes identified as having significance meriting consideration in planning decisions are now defined as "Heritage Assets". Heritage assets include nationally designated monuments, landscapes and buildings and locally identified assets; such as those recorded on Historic Environment Records (HERs) or local lists.

Where a development will affect a heritage asset(s) Local Planning Authorities and Minerals Planning Authorities should require applicants to provide a description of the significance of the heritage assets and assessment of the impact of the development on that significance (PPS5, Policy HE6). Since the publication of PPS5 there have as yet been no minerals planning applications submitted in Bedfordshire that affect the historic environment. As a consequence we have little data to suggest how in practise this change in legislation will affect minerals planning applications. The saved policies of the BLMWLP do however provide enough scope for the requirements of PPS5 to be taken into consideration and close consultation with the Minerals Planners is being undertaken to ensure they fully understand the implications of the new policy statement.

METHODOLOGY

By Maurice Hopper, with contributions by Hannah Firth

Definition of the Aggregates Resource in Bedfordshire

Geological and Topographical Background

Bedfordshire is a county largely without dramatic topographical contrasts and yet it is one of the most subtly varied landscapes within the East of England region.

The geological strata run south-west to north-east through the county and in most places the bedrock of the county is obscured by the superficial deposits which comprise the Boulder Clay of the north and centre; the Clay-with-flints in the south and the river terrace sands and gravels which bisect the county as the River Great Ouse and its tributaries the Ivel, Flit and Ouzel makes their way south and west.

The oldest geological formations within the county of Bedfordshire are found to the north-west around Turvey and Stevington. These are the Jurassic limestones deposited around 170 million years ago including the Cornbrash and Oolitic Limestones. They are found in narrow bands, interleaved with marls and clays bordering the River Great Ouse. These rocks are used as building stone and give the villages of Harrold and Sharnbrook their distinct almost Cotswolds like appearance.

In both the north and the middle of the county lie the Oxford Clays; laid down around 160 million years ago they survive in varying thicknesses. To the south-west of Bedford around Stewartby and Marston Moretaine the deposits are deepest, a factor which gave rise to the once prosperous brick pits run by the London Brick Company amongst others. In the north the Oxford Clay uplands are bisected by small tributaries of the River Great Ouse and they are mostly overlain by the later Boulder Clay.

The most prominent feature of the middle part of the county is the Greensand Ridge. Dating to the Lower Cretaceous period around 120 million years ago the Ridge extends between Leighton Buzzard in the south-west and Potton in the north-east. In contrast to the Chalk downland of the south and the Clay hills to the north and south, the distinctive light sandy soils of the Greensand Ridge support areas of heathland and mixed woodland. Bedfordshire's largest surviving ancient woodland; King's Wood (HER 2577) is located on the county boundary with Buckinghamshire right on the very western edge of the Greensand Ridge.

Between the Greensand Ridge and the Chalk downland (see below) lies a belt of Gault Clay comprising mainly grey mudstone and silt that forms a wide low lying clay vale. Where it is overlain by superficial deposits such as Boulder Clay and Glacial deposits small hills are formed such as a Milton Bryan and Pulloxhill.

The highest points in the county lie at around 170 metres AOD in the very south on the Upper Cretaceous Chalk escarpment around Dunstable; this escarpment forms part of

the Chiltern hills that enter the county in the extreme south-west at Whipsnade and exit around Barton le Clay.

The superficial deposits within Bedfordshire dominate the geological landscape. The county is heavily influenced by the four rivers; the Great Ouse, the Ivel, the Flit and the Ouzel which divide it. The latter three and their minor tributaries such as the Hit and the Hiz are really all part of the River Great Ouse system. In the south of the county the River Lea is nonetheless important but its presence is somewhat overshadowed by the fact the Luton has almost entirely absorbed its entire Bedfordshire valley.

The River Great Ouse enters of the county to the north-west, scoring through the Oxford Clay and becoming meandering as it leaves the county in the north-east. The Ivel valley is probably the most typical, broad with gravel terraces and alluvial landscapes. The Flit is the only valley within the county where peat deposits survive; it cuts through the Greensand Ridge creating a unique environment and topography.

In some places the superficial river terrace sands and gravels overly and interleave with earlier glacial sands and gravels laid down in meltwater conditions at the end of the Anglian Glaciation. Glacial deposits are also known over the Clays and create little "islands" of relatively higher ground within the Clay vales.

The Clay-with-flints deposits are largely limited to the south of the county and are found sometimes extensively but also in more localised deposits overlying the Chalk such as at Caddington.

Aggregates Resource Baseline Data

For the purposed of this project the definition of the aggregate resource within Bedfordshire is based upon information derived from the British Geological Survey (BGS), the Bedfordshire and Luton Minerals Planning Authority (BLMPA) and the minerals industry. The relevant resources and their spatial extent comprise a range of data from the BGS consisting of geological maps at a scale of 1:50,000 and the BGS mineral resource maps at 1:100,000.

The BLMPA and the BGS BritPits database provided information on the location of extant and closed extraction sites. The type of aggregates produced by each site, either bedrock or superficial, were identified and the sites were compared to the appropriate underlying geology maps. This enabled the identification of the currently exploited deposits and the potential deposits within the county.

Project data was managed by means of a geographical information system (GIS). The GIS used was MapInfo 10.0, which uses the term 'table' to refer to both the underlying data table and the associated map. Therefore, in this study, the term 'table', in the context of GIS data, will be used to refer to both the map itself and associated data.

The information from the BGS minerals resource list was used to form the basis of a query of the bedrock and superficial geology BGS layers to produce initial versions of exploited bedrock and exploited superficial geologies and these were saved as MapInfo tables. Once the aggregate resource was identified it was subdivided into Aggregate

Study Areas (AS-As) and Aggregate Study Sub-Areas (AS-SAs). At this point it was decided that although the River Ivel, River Flit and River Ouzel all form part of the River Great Ouse system they are geologically and topographically distinct. Therefore because of their unique characters they have been treated as separate areas, their relationship to the River Great Ouse is however acknowledged by the fact they have been assessed as AS-SAs.

The aggregate deposits within the River Lea valley were split into one AS-A and one AS-SA. These comprised the River Lea AS-A (including alluvium) and the River Lea Glacial Sands and Gravels AS-SA. Aggregate deposits within this river system were identified as being unusual, due to the high occurrence of glacio - fluvial deposits within areas expected to contain river terrace deposits. These deposits were therefore treated as an AS-SA in their own right. The River Lea AS-SA was determined and assessed using the 1:100,000 BGS mineral resource maps, rather than the 1:50,000 BGS map layer, due to a gap in the provided BGS data within south Bedfordshire, between Luton and the Hertfordshire border.

For the purpose of this study the AS-As and AS-SAs, were defined as containing all geological deposits with a capacity to produce aggregates (excluding urban areas and village cores) regardless of whether there was a future intention to extract minerals from them. This decision was taken in order to understand the influence the underlying geological strata might have had on the character of the archaeological resource. It is also intended that by including the wider geological resources within each AS-A and AS-SA that a baseline of historic environment data will have been created that can be used to predict the archaeological resource likely to be found within potential extraction sites.

In many areas, generally along the river valleys, alluvium and head appeared to overlie identified aggregates-producing deposits, principally River Terrace Gravels. These deposits were included into the aggregate MapInfo tables, where they were in direct contact with identifiable river terrace deposits.

The geological deposits deemed suitable for aggregate extraction comprise both solid sands and superficial sand and gravel deposits. The sands and gravels extracted in Bedfordshire largely fall into three groups:

- Cretaceous marine sand deposits of the Woburn Sands Formation of the Greensand Ridge
- Quaternary glacio-fluvial sand and gravel deposits associated with the major river valleys
- Quaternary fluvial sand and gravel deposits from the major river valleys

The Woburn Sands Formation

The Woburn Sands Formation of the Lower Greensand was laid down during the Cretaceous period, around 100 million years ago. The deposition took place in a shallow sea environment, possibly in two basins from the south-west and north-east. The Woburn Sands deposits largely comprise very fine to coarse grained silica sand with varied inclusions of iron oxide, silt and glauconite. As a consequence the sands portray a variety of colours from yellow, orange and brown to grey and white of the purer material (Nicholls 1948 and Cuesta 2006).

In some places within the sands heavy concentrations of iron oxide have given rise to sandstone and ironstones appear infrequently in other places. They are also interbedded with fuller's earth, particularly around Woburn. At the base of the Woburn Sands is a thin module bed of Jurassic origin, this contains nodules which were formerly quarried for Phosphate.

The Woburn Sands deposits are found in outcrops along the Greensand Ridge from Leighton Buzzard in the south-west of the county to Potton in the north-east. This may in some part account for the variation in the grain and colour sizes of the sands. For example at Leighton Buzzard the deposits tend to represent the white silicas, whilst around Potton where there are greater concentrations of iron oxide the sands are finer grained, silty and heavily iron-stained (Cuesta 2006).

Quaternary Glacio-Fluvial (Glacial) Sands and Gravels

These deposits essentially represent sands and gravels laid down as glacier-fed 'outwash' during the Anglian Glaciation around 400,000 years ago. The composition of these deposits is often poorly sorted; the gravels are generally flint based however they do contain a high proportion of weak rock types such as chalk (Cuesta 2006).

Glacio-fluvial sand and gravel deposits are found in a number of locations in Bedfordshire; whilst there are smaller deposits of glacio-fluvial deposits spread across the higher ground in the county, the most significant sands and gravels of this type are found within the river valleys. They are currently actively worked for aggregates at Broom on the eastern side of the county.

It should be acknowledged that some of the county's recorded glacio-fluvial deposits also contain younger braided river terrace material, having been re-worked as river terrace deposits, suggesting that they could be only around 25,000 to 30,000 years old. This appears to be particularly true of the lowest terrace of the River Ivel near Sandy (Beds RIGS).

Quaternary Fluvial (River Terrace) Sands and Gravels

The younger fluvial river terrace sands and gravels of Bedfordshire are found alongside and beneath the alluvial deposits of the River Great Ouse and its tributaries the Ouzel, Ivel and Flit. They are variable but are generally characterised by clean to slightly, medium to coarse grained, sub-rounded to sub-angular sands and fine to medium, sub-rounded to sub-angular gravels.

Sands derived from the river terrace deposits are generally much cleaner than those of the Woburn Sands Formation, the silt and clay largely having been cleansed away by the flow of water during their deposition. The gravel content is around 30-45% and in the Ivel valley is predominantly flint, with some chalk inclusions; gravels from the Great Ouse valley around Bedford contain less chalk and higher proportions of sandstone (Cuesta 2006).

Aggregate Study Areas (AS-As)

The Woburn Sands Formation
The River Great Ouse

Aggregate Study Sub-Areas (AS-SAs)

The River Ivel (including the River Hiz)
The River Flit
The River Ouzel

Given the location of the majority of the Quaternary Glacio-Fluvial (Glacial) sands and gravels within Bedfordshire's river valleys it was decided to amalgamate these deposits with the riverine study and study sub-areas.

Topography and Character of the AS-As and AS-SAs

The Woburn Sands Formation Aggregate Study Area (AS-A)

The Woburn Sands Formation forms part of the prominent Greensand Ridge that runs south-west-north-east across Bedfordshire forming an elevated landscape in the middle of the county and providing extensive views north and south. The Ridge has relatively steep sides, specifically on the north-west facing the Ouse valley and its top forms an undulating plateau. Two distinctive valleys have been carved out of the Ridge; by the River Flit and the River Ivel. The Flit valley cuts through the south-eastern face of the Ridge and has a formed a smaller ridge to the south. The Ivel valley cuts through it to the east of Stanford after which the Ridge continues to east of Sandy towards Gamlingay in Cambridgeshire.

The landscape is visually dominated by large woodland blocks and plantations. Intensive arable farming within sizeable fields is the main agricultural activity within the study area. Primary rail and road routes cut north-south across the Ridge including the M1, A5, A6 and the Midland main line. The modern settlement pattern is of market towns such as Ampthill and Leighton Buzzard, interdispersed with some larger villages and smaller hamlets. Mineral extraction has shaped large tracts of land around Leighton Buzzard and a spread of small post-medieval ad-hoc workings have left earthwork remains throughout the study area. Active mineral extraction takes place on the edges of the study area around Leighton-Buzzard/Heath and Reach and on Sandy Heath, near Potton.

Table 1: Aggregate Producing Geology of the Woburn Sands Formation AS-A

Description (LEX_D)	BGS Tag (LEX_RCS)
Woburn Sands Formation	WBS-SDST

The River Great Ouse Aggregate Study Area (AS-A)

The River Great Ouse and its tributaries (including the Ouzel, Ivel and Flit), drains a lowland basin, located south-west to north-east across the south-eastern part of the Midlands, and this lowland is defined by a broad outcrop of Jurassic and Cretaceous Clays. The eastern end of the Great Ouse crosses a broad flat fen landscape, located within Cambridgeshire. The landscape character of the River Great Ouse valley can be broadly divided into that which cuts through the Oolitic Limestones and that which cuts through the clays. This AS-A also contains a small area of glacial sands and gravels (glacio-fluvial deposits) and they are found around Kempston to the west of Bedford.

The Oolitic limestone valley section of the River Great Ouse AS-A enters Bedfordshire around Turvey, heading north-east towards Sharnbrook, before heading south towards Bedford (Land Use Consultants 2007a, 77). Here the Great Ouse meanders across a wide open floodplain with the valley boundaries delimited by the wooded wolds, around Hinwick and Pavenham and by the Clay Farmlands. This change corresponds to the change from limestone of the valley to the clays of the surrounding hills. Former

gravel extraction sites survive as large water bodies within the AS-A around Harrold and Radwell.

The Oolitic limestone valley modern landscape is overlooked by the wooded wolds and Clay Farmlands. The character of the valley is agricultural in nature with a mixed land use of pasture and arable. Meadows, marshes, and wetland vegetation are present along the course of the river. The settlement pattern is of small limestone built hamlets and villages.

The clay valley section of the River Great Ouse AS-A is shallow and wide abuts the Marston Clay Vale (Land Use Consultants 2007a, 99). The valley is bounded to the south by the scarp of the Greensand Ridge and to the north by the Clay Farmlands, around which it forms a broad u-shape. Sand and gravel extraction around Roxton, Wyboston, Willington and Biddenham has created large water bodies within the study area. The clay valley landscape is overlooked by the wooded scarp of the Greensand Ridge and the undulating Clay Farmlands. The land use is a mix of arable on the shallow slopes of the valley, and pasture, quarrying and leisure use along the valley floor. Restored sand and gravel pits have been utilised for recreational purposes at Wyboston and Box End, Kempston. Mineral extraction is extant around Willington. The settlement pattern within the valley is of large villages the urban sprawl centred on Bedford. Major transport routes run along and cut across the valley. These include the A1 (M) the A428 and the London-Midland and the London-North East railways.

Table 2: Aggregate Producing Geologies of the River Great Ouse AS-A

Description (LEX_D)	BGS Tag (LEX_RCS)
Head	HEAD-XCZSV
Felmersham Member	FELM-XSV
Biddenham Member	BIDM-XSV
Stoke Goldington Member	STGO-XSV
River Terrace Deposits (Undifferentiated)	RTDU-XSV
River Terrace Deposits 1	RTD1-XSV
River Terrace Deposits 2	RTD2XSV
River Terrace Deposits 3	RTD3-XSV
Alluvium	ALV-XCZ
Alluvium	ALV-XZSV
Glacio-fluvial Deposits, Mid Pleistocene	GFDMP-XSV

The River Ivel Aggregate Study Sub-Area (AS-SA)

The River Ivel forms a level wide valley that cuts through the Greensand Ridge between Biggleswade and Old Warden and the Chiltern Hills between Letchworth and Shillington. The River Ivel, its tributaries the River Hiz and Hit, and the disused Ivel Navigation run through the area with additional tributary streams and open water bodies derived from mineral workings. This AS-SA also contains a major concentration of glacial sands and gravels (glacio-fluvial deposits) which are found on the western side of the River Ivel particularly between the villages of Upper Caldecote and Broom. The glacial sands and gravels were formed by meltwaters running through and under ice sheets during the Anglian Glaciation. These deposits formed beneath, within and on top of the glacial till (Lowestoft Formation) and mostly survive as terraces along the valley bottoms.

The landscape is visually dominated by large woodland blocks and plantations along the Greensand Ridge to the west of Broom, and by the chalk grasslands of the Chilterns to the south which overlook the valley. Agriculture in the valley is a mixture of market gardening, pasture and arable. The settlement pattern within the AS-SA is of substantial linear villages, often along roads and the market towns of Biggleswade and Sandy. The major truck road the A1 (M) follows the course of the river through the study area.

Table 3: Aggregate Producing Geologies of the River Ivel AS-SA

Description (LEX_D)	BGS Tag (LEX_RCS)
Head	HEAD-XCZSV
River Terrace Deposits (Undifferentiated)	RTDU-XSV
River Terrace Deposits 1	RTD1-XSV
River Terrace Deposits 3	RTD3-XSV
River Terrace Deposits 1 to 2	T1T2-XSV
Alluvium	ALV-XZSV
Glacio-fluvial Deposits, Mid Pleistocene	GFDMP-XSV

The River Flit Aggregate Study Sub-Area (AS-SA)

The River Flit forms a medium scale valley that cuts through the Greensand ridge and runs south-west to north-east across Bedfordshire. At its western end the valley abuts the Greensand Ridge (Land Use Consultants 2007b, 141) and the Toddington-Hockliffe Clay Hills. The valley narrows along the central section around Clophill and Maulden, and widens where its confluence meets the Ivel Valley around Clifton and Stanford. Small pockets of glacial sands and gravels (glacio-fluvial deposits), mostly along the valley bottom are also found within this AS-SA.

The landscape is visually dominated by large woodland blocks and plantations along the Greensand Ridge to the north and north-east. The riverside farmland comprises a mix of arable and pasture, a scatter of farms is present in the wider western end of valley, where the landscape character is dominated by large arable fields. Market gardening, small business parks, golf courses and fisheries are situated along the A507 road corridor within the valley. A pattern of riverside settlements are located along the central section of the valley, including the larger settlements such as Flitwick. The valley is cut by two north-south major transport routes, the A6 trunk road and the London-Midland railway line.

Table 4: Aggregate Producing Geologies of the River Flit AS-SA

Description (LEX_D)	BGS Tag (LEX_RCS)
Head	HEAD-XCZSV
River Terrace Deposits (Undifferentiated)	RTDU-XSV
River Terrace Deposits 1	RTD1-XSV
River Terrace Deposits 1 to 2	T1T2-XSV
Alluvium	ALV-XZSV
Glacio-fluvial Deposits, Mid Pleistocene	GFDMP-XSV

The River Ouzel Aggregate Study Sub-Area (AS-SA)

The River Ouzel valley cuts through the western edge of the Greensand Ridge to the north of Leighton Buzzard and follows a natural, meandering course until it reaches the town where it has been straightened as it runs through urban area. The River Ouzel valley is overlooked by the Chiltern escarpment to the south and the broad clay vale around Eaton Bray. The river is fed from the springs on the Greensand Ridge and from chalk streams off the Chilterns to the south and this AS-SA also contains pockets of glacial sands and gravels (glacio-fluvial deposits), particularly around Leighton Buzzard.

The part of the River Ouzel valley that flows through Bedfordshire is somewhat dominated by the town of Leighton Buzzard although to the north, the wooded end of the Greensand Ridge is a prominent landscape feature. In the vale to the south of Leighton Buzzard there are large arable fields and on the low lying riverside farmland comprises small fields used for pasture. Mineral extraction and associated industries are located within the valley to the north and south of Leighton Buzzard. Primary rail and road routes run north-south following the valley and include the A5. The Grand Union Junction/Canal an 18th/19th century industrial communication route runs parallel with the river through the valley.

Table 5: Aggregate Producing Geologies of the River Ouzel AS-SA

Description (LEX_D)	BGS Tag (LEX_RCS)
Head	HEAD-XCZSV
River Terrace Deposits 1	RTD1-XSV
River Terrace Deposits 2	RTD2XSV
Alluvium	ALV-XZSV
Glacio-fluvial Deposits, Mid Pleistocene	GFDMP-XSV

Baseline data on Active, Permitted and Historic Quarries

Information on active, permitted (but not yet worked) and historic (closed/ceased) aggregate extraction sites was derived from the BGS BritPits database and the BLMPA's files.

The BritPits data on the mineral working sites within the county of Bedfordshire was provided by the BGS in the form of a Microsoft Excel spreadsheet. This dataset provided information on the location of mineral workings; the nature of the mineral extracted, quarry name, quarry operator and the status of mineral extraction. This data was migrated into a MapInfo table and split by extraction status as follows:

Active
 Permitted (not currently worked)
 Historic (closed/ceased)

The BritPits database, BLMPA files and the BGS 1:50,000 solid geology and surface geology MapInfo tables were used to create two tables; Active/Permitted Quarries and Historic (ceased/closed) Quarries, the Active/Permitted table is shown below (Table 6) and the Historic Quarries table forms Appendix 1.

The BritPits MapInfo tables were used to interrogate the geological MapInfo tables that were created for the aggregates resource. This was undertaken to identify the aggregate deposits being worked by each quarry site. Analysis of the historic (ceased/closed) aggregate extraction sites identified a number of the quarry sites in areas that have no identifiable aggregate resource. These historic quarry sites represent late post medieval/early 20th century mineral extraction sites, as well as more modern closed quarries. It is therefore possible that these quarries have removed the aggregate deposits that they were located on, or have worked aggregates that have not been mapped at a detailed scale. Given that many of these quarries were operational at a time when the Ordnance Survey was in its infancy; it is also possible that some of the locations of these quarries may be poorly recorded, and therefore may have been assigned incorrect National Grid References.

The BritPits tables were also used to query the Archaeological Resource Assessment MapInfo tables. This was undertaken to identify archaeological investigations (events) that were associated with mineral extraction activities. The identified associated HER assets were also validated against the HER paper record, published sources and the grey literature deposited within the HER. The identified archaeological investigations were included within the Resource Assessment and were incorporated into the ARCUS Project Microsoft Access database (see below).

Table 6: Active and Permitted Quarries

Site Name	Site No.	Status	NGR	BGS Lexicon Description	BGS Lexicon Rock Classification Scheme
Broom Quarry	239	Active	517300 244000	Glacio - fluvial Deposits, Mid Pleistocene	GFDMP-XSV
Whitsundoles Quarry	261	Active	492250 240150	River Terrace Deposits, 1 River Terrace Deposits, 2	RTD1-XSV RTD2XSV
Willington Quarry (Plantation)	262	Active	510500 250500	River Terrace Deposits (Undifferentiated)	RTDU-XSV
Octagon Farm, Willington	263	Active	509300 249700	Alluvium River Terrace Deposits (Undifferentiated)	ALV-XCZSV RTDU-XSV
Castle Mill, Bedford Airfield, Willington	16443	Active	509150 250660	Alluvium River Terrace Deposits (Undifferentiated)	ALV-XCZSV RTDU-XSV
Dairy Farm, Willington/Renhold	31281	Active	511413 250854	River Terrace Deposits (Undifferentiated) River Terrace Deposits, 1 to 2	RTDU-XSV T1T2-XSV
Broom	50819	Permitted	517240 241955	Glacio - fluvial Deposits, Mid Pleistocene	GFDMP-XSV
Black Cat Island	50820	Permitted	516310 255300	River Terrace Deposits, 1 River Terrace Deposits, 2	RTD1-XSV RTD2XSV

Definition of the Archaeological Resource

The archaeological resource within the AS-As and AS-SAs was defined using the paper records from the Bedford Borough Council (BBC) and Central Bedfordshire and Luton (CBL) Historic Environment Records (HERs) and the digital HER, the Historic Buildings, Sites and Monuments Record (HBSMR) dataset. HBSMR integrates a database of the Historic Environment Records, with digital mapping (GIS). The HERs assign each new monument/site/building a “Preferred Reference Number”, each number is unique and is referred to as a “record”. HER records appear in the format “HER 1234”. For the purpose of this report and at the request of English Heritage the term “HER records” has been replaced by “HER assets”.

Archaeological Resource Baseline Data

In order to establish the archaeological baseline data for each AS-A and AS-SA a series of MapInfo queries were run on the HBSMR tables and those for the AS-As and AS-SAs, these allowed only the HER assets for each AS-A and AS-SA to be selected. The archaeological resource query results were saved as separate tables. These tables were then managed using MapInfo.

Chronological Division

Once the archaeological resource for each AS-A and AS-SA had been established queries were then run to split the HER assets into period tables. These periods were defined using the accepted HBSMR chronological divisions, with one notable exception, that is that now the Palaeolithic period is accepted to run from 900,000 BC;

Palaeolithic	900,000 BC -10000 BC
Mesolithic	10,001 BC – 4,000 BC
Neolithic	4,001 BC – 2,350 BC
Bronze Age	2,351 BC – 700 BC
Iron Age	701 BC – 42 AD
Roman	43 AD – 410 AD
Saxon/Early Medieval	410 AD – 1066 AD
Medieval	1066 AD – 1539 AD
Post-Medieval	1540 AD – 1900 AD
Modern	1901 AD – 2050

Within HBMSR there is a category described as “Prehistoric 500,000 BC – 42 AD the category is intended to be used for all assets that cannot be assigned to a particular chronological period. Consequently a Late Prehistoric table was also produced for each AS-A and AS-SA. Generally speaking this category covers the period 10,000 BC to 42 AD. Period overlaps (where an asset could be assigned to two or more specific periods) were assigned to all periods identified.

In order to establish the nationally recognised significance of the HER assets within the AS-As and AS-SAs queries were run on the HBSMR data to produce tables for

registered Parks and Gardens, Scheduled Monuments and Listed Buildings. A further query was run on the HBSMR for each AS-A and AS-SA to identify archaeological (events). This was to enable the identification of archaeological investigation within known extracting and potential extracting areas.

Categorisation of Evidence

The aim of the archaeological resource assessment was to identify which chronological periods were represented within each AS-A and AS-SA, and to critically assess the evidence base in to establish the character of the archaeological resource for the historic county's aggregate producing geologies. In order to achieve this, the categories of evidence listed below were created and each asset was assigned to the appropriate one. These categories are based around the accepted evidence divisions within the published research frameworks for Bedfordshire and the East of England Region (Glazebrook 1997, Brown and Glazebrook 2000, Oake et al 2007, and Medlycott and Brown 2008). Within each AS-A and AS-SA resource assessment the archaeological evidence is discussed under the appropriate evidence sub-heading.

Table 7: Evidence categories used in the archaeological resource assessment

Evidence Categories	Assets
Settlement/Occupation	Cropmark enclosures Earthworks and excavated sites of domestic character Moats and Manorial Sites Flint Scatters Domestic Buildings Villas/High Status Remains Castles demonstrably not military in origin Municipal Buildings/Structures
Ritual/Ceremonial/Burial	Round Barrows and ring ditches Cursus Monuments Mortuary Enclosures Causewayed Camps Hengiform Monuments Burials Cemeteries Votive Offerings
Land Use/Agriculture/Land Division	Field Systems Linear boundaries (ditched and pit alignments) Ridge and Furrow Fishponds Rabbits Warrens Model Farms and associated buildings Woodlands Osier Beds
Industrial	Quarrying Brick and Tile Kilns Pottery Production Metalworking Corn dryers Maltings Mills
Communications/Transport	Roads Railways Canals Bridges Trackways Holloways not easily identified with settlement remains
Military	Castles First World War and Second World War Features Cold War Installations and Active Military Installations
Religious Houses and Buildings	Monastic Buildings and Estates Churches/Chapels and Graveyards
Designed Landscapes	Parks, Gardens and associated features
Findspots	All objects Types

Bedfordshire's HER Assets

A HBSMR period query was run on the three unitary authorities that make up the historic county of Bedfordshire (Bedford Borough Council, Central Bedfordshire Council and Luton Borough Council). This was undertaken to gain a comparison between the individual AS-As and AS-As and the broader landscape.

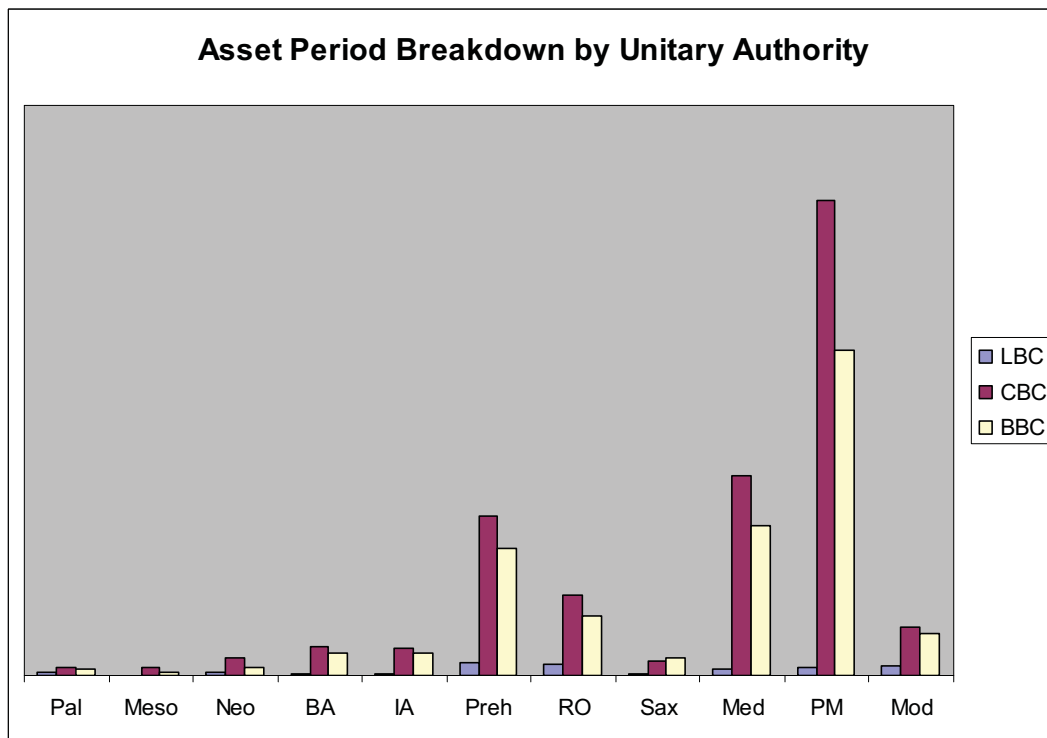


Figure 1: Asset Period Breakdown by Unitary Authority

Assets per Square Kilometre

The calculations regarding the number of assets per square kilometre within the county and individual unitary authorities were also undertaken and the results are shown in Table 8 below.

Table 8 Assets per Square Kilometre

Area	Chronological Period										
	PAL	MESO	NEO	BA	IA	PRE	RO	SAX	MED	PMED	MOD
LBC	0.5	0.09	0.3	0.2	0.7	1.5	1.6	0.2	1.6	9.2	1.6
CBC	0.09	0.07	0.4	1.0	0.9	0.8	1.3	0.2	3.0	8.6	0.8
BBC	0.06	0.02	0.08	0.2	0.2	0.7	1.4	0.2	1.7	3.6	0.4

Data Correction, Validation and Enhancement

HBSMR contains both summary and full descriptions for every asset recorded within it, and during the querying of this dataset both these descriptions were for cross-referenced for each AS-A and AS-SA. Notes were compiled on the HER assets from HBSMR which were checked against the HER paper records for validation and enhancement. Where possible, dates were assigned to undated, wrongly dated or broadly dated entries. Obvious inaccuracies including duplicated entries, redundant entries and geographically misplaced entries were removed from the tables. Where assets have been assigned to two different functions and periods, they were included in both period tables and their contrasting functions discussed in the resource assessments where appropriate.

Excluded Areas

Urban areas are unlikely to be the target of future mineral extraction and as a result HER assets were therefore removed from the assessment when located within urban areas including modern village cores. Urban exclusion areas were created using MapInfo and queries were run on HBSMR to remove these assets from the various tables. There is however one noticeable exception, due to the proximity of past and present mineral extraction to Leighton Buzzard, HER assets located within the urban fringes, close to known aggregate extraction areas were not excluded from the Woburn Sands Formation AS-A or River Ouzel AS-SA.

Historic Landscape Characterisation (HLC)

A historic landscape characterisation exists for Bedfordshire and Luton. However there are baseline data inaccuracies and it is not used by the authorities or publicly accessible. As it does not have sufficient integrity to be used for this project historic landscape character was defined where possible by using the available HER, parish survey, landscape character assessments and local history information.

HBSMR Prehistoric Chronological Issues

The tables produced from the queries run on HBSMR for the prehistoric periods included results from the broad late prehistoric bracket. Exclusion of this broad period using the available HBSMR exclusion filters had the affect of stripping out overlapping and multi-period assets from the tables. To enable the inclusion of the overlapping period and multi-period assets, the HBSMR exclusion filters were not applied. The MapInfo and Microsoft Word tables were manually edited by checking each individual asset against the original HBSMR description, to remove the broadly dated prehistoric assets.

To enable a comparison of the results of the AS-As and AS-SAs with the wider landscape, chronological queries were run using the HBSMR on the unitary authorities within Bedfordshire. However, due to impracticality of manually checking the tables, an accurate breakdown of the assets by periods was not possible.

The Viatores Study Group Data

In 1957 a group of enthusiastic amateur archaeologists embarked on a project to research and record evidence for Roman roads within the counties of Bedfordshire, Buckinghamshire, and parts of Hertfordshire and Northamptonshire. This area was the approximate territory occupied by the Catuvellauni, the late Iron Age tribe who were based around St Albans in the late 1st century BC and the early 1st century AD. The group were guided and assisted by I.D. Margary who had produced *Roman Roads in Britain* and followed the methods and techniques adopted by Margary (Viatores 1964).

In the historic county of Bedfordshire the Viatores suggested that there was a network of Roman roads with a total length of 200 miles. The group arrived at this conclusion by looking for straight lengths of modern tracks or roads, straight hedgerows, parish boundaries and visible earthworks and then extrapolating these lines so that they formed a network of routeways radiating out from known Roman settlements (Viatores 1964, 14-16 and Simco 1984, 78-79). These routes all appear within the Historic Environment Records for the county.

In 1984 a re-assessment of the Viatores work was undertaken by Angela Simco, Senior Conservation Officer (Field Archaeology) for Bedfordshire County Council. Simco used historic maps from the County Records Office (now the Bedfordshire and Luton Archives and Records Services – BLARS) and in particular the late 18th and early century Enclosure Maps to establish whether the supposed Roman features were in existence prior to the re-organisation of the landscape in the later post medieval period. The results of this work concluded that many of the straight routes that were adopted by the Viatores as evidence for Roman roads were in fact created as a result of the enclosure of the once open fields (Simco 1984a, 1 and 1984b, 78-9).

The Viatores Roman roads have been assigned unique HER reference numbers as have of their “associated features” such as suggested aggers (in the case of one agger the feature is in fact a medieval dam related to Warden Abbey) and stretches of “metalling” and thus this means they are often mistaken as real routeways, despite Simco’s re-assessment and information within the paper HER that disproves them. The total removal of the Viatores Roman roads from the Bedfordshire HERs would be inappropriate, effectively censoring the way in which historically, archaeological research was undertaken and therefore they appear archaeological resource assessment. However because they effectively create an unnatural picture of the county’s Roman communication network they have been separated from the known Roman roads which do cross the county.

Portable Antiquities Scheme (PAS) Data

At present discoveries reported to the Bedfordshire and Hertfordshire Portable Antiquities Scheme are not integrated with the Bedfordshire Historic Environment Records. Consequently it has not been possible to use PAS data for this project.

Presentation of results

The Archaeological Resource Assessment is presented by AS-A and AS-SA and the assets discussed under each appropriate evidence category as set out in Table 7. The Microsoft Word tables for the chronological periods form Appendices 2a-e of this report. Maps showing the extent of the AS-As and AS-SAs and the archaeological resource were produced in MapInfo, using the BGS and HBSMR data. These comprise maps of the geological deposits, overlain by the HER assets by chronological period and they are also presented in Appendices 2a-e.

ALSF ARCUS DATABASE

Database Aims, Objectives and Methodology

The ALSF database was provided for this project by Wessex Archaeology-Sheffield, formerly Archaeological Research and Consultancy at University of Sheffield (ARCUS). The data from the database does not form part of this report but is part of a wider project being undertaken by Wessex Archaeology-Sheffield on behalf of English Heritage with ALSF funding. The database was designed to collect and collate information on archaeological projects arising from aggregate extraction in order to identify and quantify incomplete or inappropriately published or archived projects in England. The data collected covered fieldwork carried out on aggregate producing sites from 1900 to the present day. The database fields covered:

- Geographic and local government location
- Quarry Name and aggregate deposit type
- HER and designation numbers
- Regulatory conditions (if any)
- Project Funding (quarry funded/county funded/voluntary etc.)
- Nature of fieldwork, date of fieldwork and fieldwork organisation
- Year range of intervention and scale of fieldwork
- A breakdown of fieldwork by chronological period and monument class
- Project summary
- Project status (complete/ongoing/incomplete etc.)
- Archive and publication details
- Identification and quantification of projects that need further work

The ALSF database for Bedfordshire was completed as part of the BAARA project. The archaeological investigations were identified by running queries using HBSMR; by checking the Bedfordshire archaeological investigations report database; and by cross-referencing the BGS BritPits database with HBSMR and the HER paper records. The quantification of the status and completeness of projects was undertaken by collating information from HBSMR, the HER paper records, mineral planning case files (where available), archaeological grey literature reports and published journal articles or monographs. Where there was inadequate information on the status of projects, information was either gathered from the archives at Bedford Museum or directly from the archaeological bodies involved (for example Albion Archaeology and the Cambridge Archaeology Unit).

Database Issues

During the course of the BAARA project work on the database was delayed because a field was missing in the original copy of the ALSF database that was sent to the Central Bedfordshire Council Archaeology Team. Supply of a revised version of the database was then delayed due to the transition in the management of the database from ARCUS, to Wessex Archaeology-Sheffield.

Other issues were identified in the content and design of the database. Several of the fields within the database were found to have insufficient character lengths for the available pull down options. The available pull down options for the river valley database field contained river valleys in Oxfordshire and the summary text box character length was found to be too small for sites containing more than one period of archaeology. The database was restrictive and narrow in the information it recorded which could adversely affect the results. In addition some of the fields were poorly labelled and laid out.

A short report on the results of this project is found in Appendix 4.

THE ARCHAEOLOGICAL RESOURCE ASSESSMENT

By Hannah Firth and Martin Oake with contributions by Maurice Hopper

The archaeological resource assessments for this project are presented in the following order:

Woburn Sands Formation Aggregate Study Area
River Great Ouse Aggregates Study Area
River Ivel Aggregates Study Sub-Area
River Flit Aggregates Study Sub-Area
River Ouzel Aggregates Study Sub-Area

The HER Asset Maps and Tables for the Resource Assessments can be found in the following appendices:

Appendix 2a Woburn Sands Formation Aggregate Study Area
Appendix 2b River Great Ouse Aggregates Study Area
Appendix 2c River Ivel Aggregates Study Sub-Area
Appendix 2d River Flit Aggregates Study Sub-Area
Appendix 2e River Ouzel Aggregates Study Sub-Area

Woburn Sands Formation Aggregate Study Area

The Archaeological Resource

The Woburn Sands Formation Aggregate Study Area (AS-A) covers approximately one hundred and eighty nine square kilometres. A search of the Bedfordshire HER identified one thousand, one hundred and twenty-four assets which lay either entirely or substantially within the AS-A. The table below illustrates the break down of assets by chronological period and per square kilometre. Appendix 2a contains chronological period tables that include information on whether the assets were impacted upon by aggregate extraction; have been subjected to archaeological investigation and if they are nationally designated sites, monuments, landscapes or buildings.

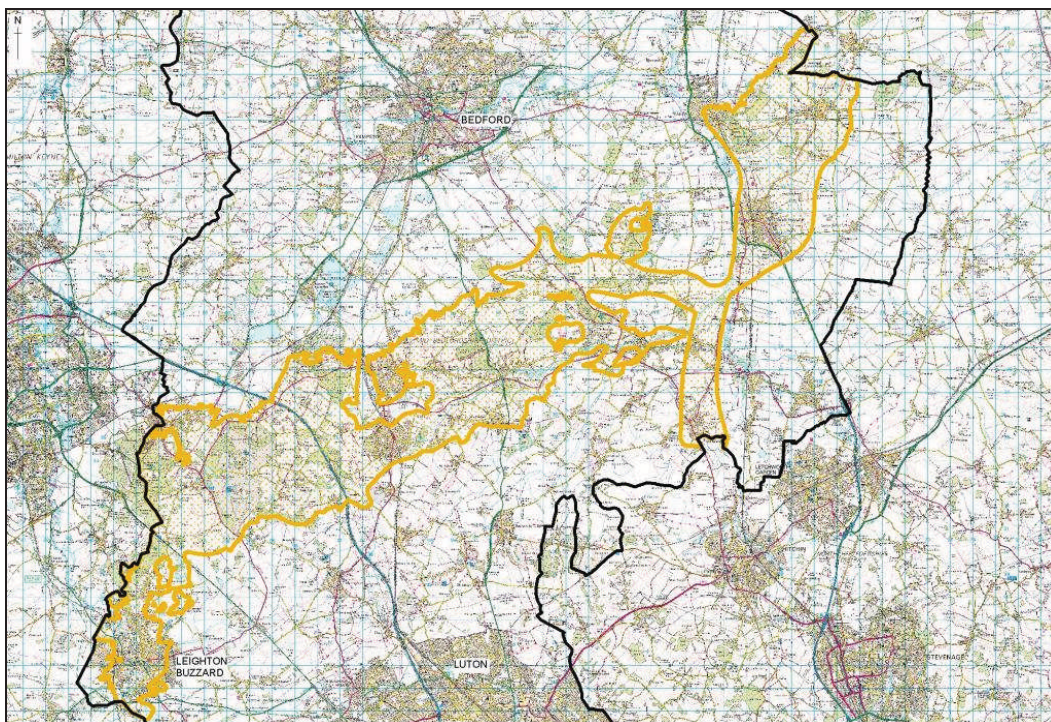


Figure 2: Woburn Sands Formation AS-A Location Map

Table 9: Woburn Sands Formation AS-A Assets

Type of Assets	Number Recorded	Number per sq km
Palaeolithic Assets	0	0
Mesolithic Assets	16	0.08
Neolithic Assets	18	1.0
Bronze Age Assets	25	0.1
Iron Age Assets	26	0.1
Later Prehistoric Assets	52	0.2
Roman Assets	51	0.2
Saxon Assets	10	0.05
Medieval Assets	149	0.8
Post Medieval Assets	702	3.0
Modern Assets	75	0.4
TOTAL	1124	6

Palaeolithic Assets (900,000 – 10,000 BC)

There are no Palaeolithic HER assets recorded within the Woburn Sands Formation AS-A. This is perhaps not surprising; evidence from the county indicates that Palaeolithic remains are primarily found either within the river sands and gravels, the brickearth or clay-with-flints deposits. The county wide evidence relates almost exclusively to Lower and Middle Palaeolithic material and with the exception of the artefacts recovered from the brickearth deposits on the Chilterns almost all the material has been found in the county's lowland contexts, this is a situation generally reflected elsewhere within the region (Austin 2000, 5-8 and Luke 2007, 21).

The absence of Palaeolithic remains from the Woburn Sands Formation may in part be due to glacial and periglacial erosion activity. It has been suggested that natural processes during the Anglian and Wolstonian Glaciations would have effectively scoured and re-deposited the underlying geology, thus impacting upon hominid occupation evidence. (French 2003a, 26-28). This would have been compounded even when the glaciers weren't present because the frozen ground and steppe like nature of the vegetation would have left the surface of the geology - particularly on the higher ground such as the exposed bedrock of the Greensand Ridge, vulnerable to ice cracking and wind erosion (French 2003b, 39-43).

It should however be acknowledged that this view could be too simplistic to explain the absence of all Palaeolithic remains within this AS-A. Since the commissioning of this project two collections of material have been reported to the Historic Environment Record (HER 12688 and 18269), both are from the slopes of the Greensand Ridge around the town of Ampthill. The first collection, HER 12688 from near Cooper's Hill whilst small includes large retouched flake which has been suggested to be either Upper Palaeolithic or early Mesolithic (Scott 2010, 1). The second collection, HER 18269, from within Ampthill Park contains over 4,200 artefacts that have provisionally been assigned to the early Mesolithic through to the Bronze Age (Firth 2010, pers comm.). The early material includes cores and primary flakes but has not be fully analysed yet.

These recent discoveries certainly warrant further study and the second assemblage which is part of a much larger collection recovered by an amateur archaeologist, held in Bedford Museum is a reminder of the presence of hitherto unstudied material that may exist within the county's two museums. Consequently the present absence of Palaeolithic material within the AS-A should be treated with caution and considered an area for additional study.

Mesolithic Assets (10,001 – 4,000 BC)

There are sixteen Mesolithic assets recorded within the Woburn Sands Formation AS-A and they all represent lithic material. Thirteen of these assets represent collections (over 10 objects); and the remaining assets are isolated artefacts or small collections (under 10 objects), six of assets form part of collections that are recorded on the HER as containing Neolithic and Bronze Age material.

The distribution of these assets indicates two distinct geographical areas of activity with smaller localised concentrations. The first area is located at eastern tip of the AS-A around the town of Sandy and the village of Sutton (HERs 442, 1164, 1165, 4472, 4476, 14657 and 16107). Three of the assets have been recovered from the Iron Age hillfort sites that overlook Sandy (HER 442, 1164 and 1165) and one further collection is recorded as having been found the within the RSPB Nature Reserve approximately 500 metres east of the other material (HER 16152). Whilst the circumstances surrounding the recovery of these assemblages are not well recorded all of these collections come from the upper slopes of the Greensand Ridge, as does the material from Everton Road to the north-east (HER 14657). The two final assets in this group (HER 4472 and 4476) are from the lower slopes of the ridge on the outskirts of the village of Sutton and in each case represent a small number of items including flakes and cores.

The second area can be broadly described as the central Greensand Ridge from the villages of Silsoe to Ridgmont (HERs 7476, 7478, 9812, 15610, 15833, 15834, 15844, 12688 and 18269) with a concentration of assets to the west and north-west side of the town of Flitwick (HERs 7476, 7478, 15833, 15834 and 15844).

One of the most significant collections from this area came from a site to the west of Priestley Farm, south-west of Flitwick (HER 15844). The material was recovered during fieldwalking, from a plateau overlooking the River Flit prior to the construction of the Aylesbury to Steppingley gas pipeline. The assemblage contained over 19,000 objects, including Mesolithic cores, blades, bladelets and microliths. The diverse quantity of the material has led to the suggestion that this asset represents a flint knapping and processing site (Luke 2007, 26 and Fadden 1991, 94). To the north-west of the Priestley Farm site fieldwalking within the M1 widening corridor near Ridgmont Station produced further Mesolithic material including waste flakes and cores (HER 15833). An axe and a number of retouched flakes have also been recovered a short distance to the south-east of this collection near Beckerings Park (HER 15834). In both cases this material was found on the upper slopes of the Greensand Ridge.

Conclusions

The Mesolithic assets within the Woburn Sands Formation AS-A are typically found in locations with good vantage points and in some cases these are overlooking the river valleys (for example Priestley Farm and the Sandy Lodge collections). This circumstance is broadly comparable with the county's other area of higher ground, the Chilterns (Luke 2007, 26). Given the small quantity of assets dating to this period and the total lack of investigated sites there is unfortunately a dearth of environmental evidence for the Greensand Ridge. However it is generally assumed the ridge would

have been largely wooded during this period, allowing for the exploitation of game and collection of woodland resources. Where reasonable quantities of artefacts have been recovered from the AS-A they include material indicative of both knapping and processing and possibly represent repeated occupation of the same sites over a number of years. Consequently it seems the Woburn Sands Formation Mesolithic assets probably represent part of the network of seasonal or temporary hunter-gatherer sites.

Neolithic Assets (4,001 – 2,350 BC)

There are a total of eighteen Neolithic assets for the Woburn Sands Formation AS-A and with the exception of a possible long barrow (HER 7487) they all represent lithic objects and collections.

Thirteen of the assets represent lithic collections (over 10 objects) and all of them have been found with either Mesolithic or Bronze Age material and in some cases both. The remaining lithics represent either single objects or small collections of less than 10 items (HER 14799, 7473, 10721 and 8355) and include a scraper from a sand pit outside Leighton Buzzard (HER 8355).

The Neolithic settlement/occupation assets are broadly distributed across the AS-A; there is a small concentration at the eastern edge around the town of Sandy (HERs 14657, 1164, 16152 and 14799), whilst the bulk of the assets are located along the central Greensand Ridge between the villages of Clophill and Ridgmont (HERs 16094, 15835, 15844, 15833, 16086, 15610, 13485, 7483 and 225). The remaining two assets are single objects recorded from the Leighton Buzzard area (HERs 10721 and 8355).

The assets from the Sandy area were all recovered from the upper slopes of the Greensand Ridge (HER 14799, 16152, 14657 and 1164) and with the exception of a single unpolished axe from Deepdale (HER 14799) all relate to multiple items. Two of these collections (HERs 16152 and 1164) are from the RSPB Nature Reserve in close proximity to one another.

The assets from the central Greensand Ridge area fall into two groups; those that lie between Clophill and Ampthill (HERs 225, 15610, 12688 and 18269), and those which are located to the west, south-west and north-west of Flitwick (HERs 16094, 15835, 15844, 7473, 13485, 16086 and 15833), in similarity to those assets recorded from the Sandy area and with the exception of the single blade found within Priestley Plantation (HER 7473) all these assemblages represent over 10 objects.

The largest collection of material from the Clophill and Ampthill area is HER 18269, from Laurel Wood within Ampthill Park. Topographically this site is located just below the crest of the Greensand Ridge. Collected by an amateur archaeologist over a period of thirty years the total collection, which includes Mesolithic and Bronze Age objects, comprises over 4,200 pieces of worked flint, as this is a relatively new discovery it has only been subjected to basic analysis however there is a large quantity of Neolithic type blades as well as primary and secondary flakes, cores and debitage. Despite the size of the assemblage there are few finished tools and in particular scrapers are noticeably absent. Initial interpretation suggests a knapping area and one that was used over a considerable period of time, in addition some of the flints appear to be derived from the glacial gravels (pockets of which overlie the Woburn Sands Formation) whilst others may have originated from the Chalk downlands in the south. Further analysis is needed to confirm this before greater conclusions can be drawn, however it remains an interesting collection and raises questions about the sourcing of raw materials and the function of the site.

The assemblages recovered from Flitwick area also include large quantities of material, such as those recovered from Beckerings Park (HER 16086), land to the west of Priestley Farm (HER 15844) and north-west of Wood End, Westoning (HER 16094). All three collections included cores and flakes dating to the Neolithic and at both land to the west of Priestley Farm and north-west of Wood End, scrapers and blades were also recovered. These collections seem to indicate the presence of knapping and processing sites along the upper slopes of this area of the Greensand Ridge.

The final Neolithic asset (HER 7487) is something of an enigma, it is recorded on the Historic Environment Record as "Pillow Mound, south-east of Bury Farm, Houghton Conquest" and yet it is Scheduled (SM 20455, old county number 94) as a long barrow. It is described as being extremely well preserved; around 70 metres long, 15 metres wide and 1.5 metres high, with straight parallel sides and rounded ends. The mound is flanked by two ditches on its north-east and south-west sides which are around 1 metre in width and 0.3 metres in depth. Close by is this earthwork are the remains of a round barrow (HER 7488, SM 20456) and therefore this made add some validity to the claim that this monument is a long barrow.

Conclusions

The Neolithic lithic assets for the Woburn Sands Formation AS-A demonstrate a consistent presence on the central and eastern ends of the Greensand Ridge during this period. Most of the assets have been found on the upper slopes of the Ridge either overlooking the valleys of the Rivers Flit and Ivel or at good vantage points. In some cases (for example Laurel Wood HER 18269 and Beckerings Park HER 16086) there is a plethora of evidence relating to tool production but few finished articles, whilst in others (such as land west of Priestley Farm HER 15844 and north-west of Wood End HER 16094) core, flake and tool preparation are accompanied by objects typically associated with the processing of animal and plant remains.

For this AS-A the lithic assemblages are the only evidence for occupation during a period that is traditionally believed to have represented a transition to a more sedentary way of life. Identifying and understanding the nature of Neolithic settlements is difficult, it is now recognised that often apparently ephemeral clusters of pits and flint scatters may be all that survive of occupation areas for this period. Establishing whether any of the recorded flint scatters may relate to sub-surface features is something to consider for future research. Where excavation has followed on from fieldwalking the results have not always been successful (Luke 2007, 39-40) and indeed at one of the Ampthill sites (HER 12688) evaluation produced no evidence for sub-surface remains despite the presence of lithics within the ploughsoil (Albion Archaeology 2010).

The Neolithic is a period of time where the creation of the first organised and settled communities is also recognised through the investment in large and ceremonial monuments such as causewayed enclosures, cursus', mortuary enclosures and long barrows. Bedfordshire can claim to have all of these monuments, however they are predominantly concentrated within the county's river valleys where several complexes of these monuments are recorded (see River Ivel AS-SA and River Ouse AS-A). There are only six long barrows recorded for the county as a whole, none have been fully investigated and with the exception of the Houghton Conquest monument and Knocking

Knoll (HER 414, SM 20419) which survive as earthworks the others were identified from aerial photographs or historical documentation. Houghton Conquest is the only example from the Greensand Ridge, the others are located on the Chalk downlands and it has been suggested that even the other surviving earthwork is in fact a modified round barrow. Thus it leaves a very interesting question, did the tradition of long barrow building pass Bedfordshire by? At present the answer to this question remains unknown but it is undoubtedly an area for further research.

Bronze Age Assets (2,351 – 700 BC)

There are twenty-five Bronze Age assets within the Woburn Sands Formation AS-A and they can be divided into two types; evidence for settlement/occupation and evidence for ritual/ceremonial/burial. The distribution of the Bronze Age assets demonstrates the presence of activity across the whole AS-A during this period.

Settlement/Occupation Evidence

There are thirteen assets within the AS-A that represent settlement/occupation evidence and with the exception of a small amount of pottery from the RSPB Nature Reserve at Sandy Lodge (HER 16152) all these assets represent lithic implements. Nine of the lithic collections (comprising 10 objects or more) also contain Mesolithic or Neolithic material or both. The greatest concentration of these assets is found in the central part of the Greensand Ridge between the villages of Clophill and Ridgmont. Most of the assemblages contain evidence for tool production and processing in the form of cores, flakes, scrapers and blades. The largest collections come from Laurel Wood in Ampthill Park (HER 18269), Beckerings Park (HER 16086), land to the west of Priestley Farm (HER 15844) and north-west of Wood End, Westoning (HER 16094). The Laurel Wood collection includes three thumbnail scrapers, items indicative of Early Bronze Age activity and a barbed and tanged arrowhead was also found to the north of the village of Flitton (HER 4326). The lithic assets are primarily found on the upper slopes of the Greensand Ridge.

Ritual/Ceremonial/Burial Evidence

There are twelve assets within this category for the Bronze Age and all of them relate to burial evidence. Eight of these assets are cropmark ring ditches (HERs 658, 746, 2812, 2941, 9099, 13955, 14776 and 13670); ring ditches are generally interpreted as the remains of Bronze Age burial mounds or barrows, where the central mound has been reduced as the result of later agricultural practises such as ploughing. The ring ditches within the AS-A appear either singly (HERs 658, 746, 2941, 9099, 14776 and 13670) or in pairs (HERs 2812 and 13995), in some cases their interpretation is a little dubious; one may in fact be the remains of a windmill (HER 746), another has since been re-interpreted as a modern feature (HER 14776) and a third (HER 658) was not found when the area was stripped prior to sand extraction. Even without these three less secure assets the others are likely to represent Bronze Age barrows.

There are three assets that relate to upstanding earthwork remains of Bronze Age barrows, they comprise two Scheduled Monuments on the northern edge of Leighton Buzzard (HER 3, SMs 20424, 20425, old county number 54), a mound to the south of Leighton Buzzard (HER 3289), and another (HER 7488) to the south-east of Bury Farm, Houghton Conquest (this asset lies in close proximity to the Scheduled pillow mound/long barrow HER 7487). The asset recorded as HER 3289 is believed to have re-used as a windmill mound during in the medieval period. The final asset relating to burial evidence is a single Early Bronze Age cremation burial within a collared urn (HER 3) recovered from the Leighton Buzzard Saxon cemetery (see this AS-A, Saxon Assets).

In contrast to the settlement/occupation evidence, where only two of the assets are located on the eastern end of the Greensand Ridge (HERs 14657 and 16152) there is a small concentration of burial assets (all cropmarks) on the eastern side of Sandy, around Potton (HERs 2941, 2812, 9099, 17156 and 658). The within the central Greensand Ridge area there are two assets to the east of Chicksands (HERs 14776 and 13995), one south of Houghton Conquest (HER 7488) and one near Steppingley (HER 746). Three of the assets are located to the north and south of Leighton Buzzard (HERs 2, 3 and 3289). All of the barrows/ring ditches are located either on the crest of the Greensand Ridge or on false-crests, generally along the upper slopes.

Conclusions

The Bronze Age assets for the Woburn Sands Formation AS-A are broadly distributed across the study area and the majority of the assets, whether they relate to settlement/occupation evidence or burials they tend to be found upon the upper slopes of the Greensand Ridge. There is small contrast between the location of the assets relating to settlement/occupation and the burial evidence; whereas there is a concentration of the former in the central part of the study area, the latter tend to be grouped either at the extreme west or east of the Greensand Ridge (around Leighton Buzzard and Potton). Given the small quantity of assets one should be perhaps somewhat hesitant about drawing too many conclusions about the significance of such disparity, whilst this division may be real we should take into account the quantity and quality of the evidence we are dealing with. For example there have been fewer archaeological investigations in this part of the county and there has never been a NMP aerial photographic project in Bedfordshire. In addition one of the concentrations of assets is along the M1 where four of the lithic assemblages were recovered during fieldwalking exercises within the motorway M1 widening corridor. The latter fact and the two new assets from Ampthill demonstrates that we should be considering the archaeological potential of this AS-A for this prehistoric periods when making decisions regarding development and aggregate extraction.

We should also consider the marked absence of Bronze Age settlement evidence proper, the lithic scatters indicate the utilisation of the Greensand Ridge during this period, but there is such limited information within the Historic Environment Record regarding the specific Bronze Age tool types that it is difficult to assess whether they fall into the earlier or later half of this period. The presence of assemblages that also contain Neolithic material (HERs 15855, 16086, 16094, 13485 and 18269), and the typically early Bronze Age barbed and tanged arrowhead from Flitton (HER 4326) and the thumbnail scrapers from Laurel Wood (HER 18269) might suggest at least some of these assets date to the earlier period. However this could be an over-simplification based on an incomplete picture. Barrow burials also tend to relate to this earlier period, and yet excavated examples show these monuments were often re-used over considerable periods of time (and not just within the Bronze Age) and are therefore more complex than simply an indicator of the early Bronze Age.

Certainly there is no evidence of the agrarian communities of the later Bronze Age within the Woburn Sands Formation AS-A, despite the fact that they are recognised elsewhere within the county (Luke 2007, 39 - 41 and Dawson 2007, 59 - 62). This undoubtedly

raises the question about the environment during this period of time. There is no palaeoenvironmental data for the Greensand Ridge relating to this period and so it is difficult to assess the physical nature of the AS-A during the Bronze Age. We assume woodland clearance of the uplands began during the Neolithic period, but to what extent is at present unknown. To the immediate south within the valley of the River Flit (see River Flit AS-SA) evidence from Flitwick Moor suggests renewed woodland clearance during the later Bronze Age; whilst in the Ivel valley (see River Ivel AS-SA) palaeoenvironmental evidence indicates a wooded environment, with typical fen carr species on the floodplain and oak and lime towards the higher ground (Murphy 2007, 51-52).

Typically the soils of the Greensand Ridge are considered poor, at the highest points topsoil and subsoil cover is extremely thin. Whilst cultivation does take place along the ridge, historically the more agriculturally lucrative areas of the county are the claylands and fertile river valleys. In some ways this poor productivity may explain the lack of evidence for agrarian settlements during this period within the AS-A. During the earlier Bronze Age the Greensand Ridge may have been exploited for its resources (timber and game) and as a prominent land mass upon which to raise visible monuments to the dead but it may never have been settled. This could be equally applied to the latter half of the period when we assume there was large scale landscape re-organisation. Consequently at present there are a number of research questions that relate to the Bronze Age within the Woburn Sands Formation AS-A. Primarily gaining a better understanding of the components of the lithic collections and seizing opportunities to obtain palaeoenvironmental data.

Iron Age Assets (701 BC – 42 AD)

There are twenty-six Iron Age assets for the Woburn Sands Formation AS-A, they are distributed across the AS-A, with a distinct concentration around the town of Sandy. The Iron Age assets can be divided into two categories of evidence; settlement/occupation and ritual/ceremonial/burial.

Settlement/Occupation Evidence

Seventeen of the Iron Age assets within the AS-A relate to settlement activity, these can be broken down into those recorded as a result of archaeological investigations (HERs 373, 743, 453, 1496, 6743, 444, 1311, 15840, 15836, 13932 and 15829), excavated cropmarks (HERs 16507 and 1637), hillforts/hilltop enclosures (HERs 442, 445, 1164 and 4) and unexcavated cropmarks (HER 9073).

There is a prevalence of excavated assets within the Woburn Sands Formation AS-A for this period. However many of the investigations have been small scale, either undertaken as a result of interventions such as a pipeline (HER 1637) or road construction/widening schemes (HERs 6743, 13932, 15840, 15829 and 15836), in these cases the evidence of occupation is somewhat disparate, such as single pits or short sections of ditches. Artefactual material dates these sites to the middle and Late Iron Age, with a slightly greater frequency of the latter. There is only one asset that relates to activity of an Early Iron Age date and this was a possible hearth excavated in 1945 on the outskirts of Sandy (HER 1496). Broadly these assets are distributed across the AS-A, indicating exploitation of the Ridge during this period.

One of the most complete excavations of an asset was undertaken within Woburn Safari Park (HER 16507). Aerial photographs and a magnetometer survey indicated the presence of four conjoined enclosures, when excavated these were dated to the Middle Iron Age and found to have associated gullies, postholes and pits. At least one of the pits contained domestic rubbish and there was some evidence for the presence of a palisade.

The greatest concentration of settlement/occupation assets are found around the town of Sandy. Topographically Sandy lies on the eastern side of the River Ivel which forges a break through the Greensand Ridge. On the eastern side of the town both on the lower and upper slopes of the Ridge there are nine assets relating to the Iron Age, eight of which represent evidence for settlement/occupation (HERs 442, 445, 1164, 453, 1496, 444, 13111, 16107).

Three of these assets relate to hillforts or hilltop enclosures (HERs 442, 445 and 1164) situated in prominent positions overlooking the break in the Ridge and the River. Limited investigations have been undertaken at these sites and the best understood is Galley Hill (HER 445). Galley Hill is situated on a narrow spur of the Greensand Ridge; it is sub-rectangular in shape, using the natural steep slopes on all but the northern sides and its ramparts comprise a single bank and external ditch. A recent earthwork survey suggests had several phases of development, the earliest of which may have dated to the Early Iron Age or Late Bronze Age (McOmish 2005). A second hillfort (Sandy Lodge) is

located 150 metres west (HER 1164) and is also located on a promontory, excavations in the late 1960's at this site produced Early Iron Age pottery and post/stakeholes. Whether these or the final monument, known as Caesar's Camp (HER 442), situated 1.5 kilometres to the north were contemporary is not known.

On the lower slopes of the Greensand Ridge a number of assets suggest the presence of a settlement (HERs 453, 1496, 444, 13111) overlooking the River Ivel. This evidence is limited to small numbers of features that mostly date to the Late Iron Age both within the Roman Town (HER 444) and on its outskirts (HER 13111). Taken with the hillforts this evidence and the cremation cemetery (HER 1501 see below) indicate a small but probably significant settlement was in existence prior to the creation of the Roman town.

Ritual/Ceremonial/Burial Evidence

There are three assets within this category within the AS-A and they all relate to burials (HERs 459, 2775 and 1501). All three assets appear represent Late Iron Age cremation burials however they were found in 19th century and beginning of 20th century and the information regarding the exact nature of each of them is imprecise. Two of the assets are recorded within the central Greensand Ridge at near Maulden and at Old Warden (HERs 459 and 2775) and the third was found to the north of the Roman cemetery at Sandy (HER 1501). Given the proximity of other Late Iron Age activity to this third site the presence of a cremation cemetery contemporary with the settlement is unsurprising.

Findspots

There are five assets that relate to single objects or small quantities of artefacts (less than 10 objects) dated to the Iron Age within the AS-A (HERs 10713, 14643, 15833, 16002 and 16152). These items include chance finds such as a Late Iron Age/Roman bow brooch from Ridgmont (HER 16002) and possible Iron Age pottery from the RSPB Nature Reserve at Sandy Lodge (HER 16152).

Conclusions

It is acknowledged that both in Bedfordshire and southern Britain as a whole that evidence for cohesive settlement increases in the middle Iron Age. In Bedfordshire both enclosed and unenclosed settlements appear from this period onwards and there tends to be something of a bias towards the river valleys; however this may in fact have more to do with the areas of current development than a preference for these types of locations. What is clear is that valley sides, above the floodplain were favoured locations (Dawson 2007, 63 – 67), and the number of settlement/occupation assets within the Woburn Sands Formation AS-A suggest that the higher ground of the lower (and in some cases upper) slopes of the Greensand Ridge were also occupied. This is borne out by the enclosures within Woburn Safari Park which lie close to the top of the Greensand Ridge. The other more incongruent evidence for settlement within the AS-A also demonstrates the utilisation of the higher ground.

There is at present no palaeoenvironmental for the Ridge during this period nevertheless with the increase in settlement density woodland clearance must also have had to take place in order to make areas both habitable and sustainable (Murphy 2007, 70-71)

During the later Iron Age there is a small bias towards the eastern end of the Greensand Ridge around Sandy, here there is a natural break in the Ridge caused by the River Ivel and the quantity of Iron Age assets around this area suggests the presence of a significant settlement prior to the creation of the Roman town. What form this occupation took is unclear, undoubtedly trade along the river would have played an important role in the economy but whether there was a greater degree of control over vessels passing up and down river is purely speculation. The presence of three hillforts is further evidence of significance of the location, their possible early origins are intriguing and worthy of further research.

Evidence for burial is scant within the AS-A elsewhere within the county during this period burials are often found associated with settlements (as it appears is the cremation cemetery from Sandy). Therefore it is perhaps somewhat unusual that two of the assets in this AS-A recorded solely as burials do not appear to have any associated occupation evidence. However these assets were recovered during 19th century and the circumstances surrounding their discoveries are far from clear and thus these locations could yet still have more to offer.

Late Prehistoric Assets

Within the Bedfordshire and Luton HERs there is a category referred to as “Prehistoric 500000 BC – 42 AD”, it is something of a catchall for assets that cannot be confidently assigned to one of the prehistoric periods. Typically these assets represent lithic assemblages or unexcavated cropmark sites and in general this group refers to assets that can be dated to between 10,000 BC and 42 AD. There are fifty-two assets within this category for the Woburn Sands AS-A and with the exception of a small quantity of undiagnostic flint flakes and cores recovered from Cainhoe Castle (HER 14644) and an unspecified number of flints and undated pottery found near the village of Campton (HER 2569) all of these assets relate to cropmarks.

The Later Prehistoric cropmark assets are broadly distributed across the AS-A, there is a small concentration around the eastern end of the Greensand Ridge at Sandy and Potton, another stretching from the eastern side of Haynes to Clophill and a third within the parish of Steppingley. The cropmark assets mostly comprise enclosures of varying sizes and shapes; some appear isolated, whilst others are conjoined or part of apparent complexes. There are also some linear features, including trackways and probable ditches. Topographically many of these cropmarks are located on the lower slopes of the Greensand Ridge.

Conclusions

The cropmark assets recorded within the Later Prehistoric category present an interesting interpretative challenge. On a local level it is generally assumed that many of these undated sites represent Late Iron Age/Roman rural settlements. These assumptions are mostly based upon morphological comparisons with investigated sites. For example the enclosure dated to the middle Iron Age within Woburn Safari Park (HER 16507) shows similarities to an undated enclosure located approximately 4 kilometres to the north-east near Millbrook (HER 14698). However it must be acknowledged that within this AS-A whilst there are a reasonable number of excavated Iron Age and Roman sites, very few of them were initially recognised as cropmarks.

What these assets do demonstrate is not only the presence of what we assume is predominantly settlement activity along the Greensand Ridge, which when compared to the river valleys might be considered a marginal area, but also that these types of site should be considered carefully within the local development and research frameworks. Additionally if these sites do date to the Late Iron Age and Roman periods they suggest that this AS-A was quite densely populated. This is perhaps particularly the case around Sandy and Potton where the dated sites already show this part of the Greensand Ridge was the focus for significant settlements in both periods. If even half of the nineteen cropmark assets recorded in this area date to either or both of the two periods they suggest the Sandy settlements had considerable hinterlands.

Roman Assets (43 AD – 410 AD)

There are fifty-one Roman assets within the Woburn Sands Formation AS-A, there is a distinct concentration of assets around Sandy but elsewhere they are broadly distributed throughout the study area. The assets have been divided into the following categories; settlement/occupation, communications/transport, ritual/ceremonial/burial and findspots.

Settlement/Occupation Evidence

There are thirteen assets that relate to settlement/occupation evidence within the AS-A and they can be divided into investigated sites of which there are eleven examples and unexcavated cropmarks that have been assigned to the Roman period on the basis of morphological comparisons with dated sites (HERs 552 and 3525).

Seven of the settlement assets are located at the eastern end of the AS-A (HERs 444, 658, 1877, 11311, 11313, 13932 and 13407) around the town of Sandy. Three of the assets relate directly to the Roman town of Sandy. Roman finds; features and burials have been recorded on the lower slopes of the Greensand Ridge, to the south-east of the modern town since 17th century, with a number of discoveries made during the construction of the Great Northern Railway in 19th century (HERs 444 and 1877). More recently excavations undertaken at the modern cemetery site (HER 11313) have proposed the presence of a settlement that grew continuously throughout the 2nd and 3rd centuries AD and that at one point may have exceeded 10ha in size. The origins of the town are not clear, it has been suggested it grew from a *mansio* or stopping point located around a ford on the River Ivel. No public buildings have been recorded and those structures that were investigated comprised rectangular timber-framed or post built buildings. The settlement seemed to be centred upon a stream and a gravel road surface which many of the buildings fronted on to. Evidence was also recovered for possible artisan zones with metalworking areas separated from the other parts of the town (Dawson 1995 and 2007, 72-73).

To the south of the probable core of the Roman town a further focus of activity has been recorded around Stratford Road, Sandy (HERs 11311 and 13407) and this area also had its own cemetery (HER 11309). Whether these assets represent the southern limits of the town or a satellite settlement is not known as excavations have been piecemeal, undertaken in response to small-scale modern developments. Nevertheless like the evidence further north, this settlement is located on the lower slope of the Greensand Ridge overlooking the River Ivel which flows to the west.

Within the central area of the AS-A between Shefford and Ridgmont, the excavated evidence suggests the presence of what were most likely to have represented small rural farmsteads, some like the cropmark site alongside the M1 near Segenhoe in Ridgmont may have been enclosed (HER 552). At Haynes Church End, a late Roman cereal drying oven was excavated prior to the construction of an access road (HER 15840) and during the construction of the Ampthill Bypass rescue excavations recorded the presence of early Roman pottery kilns possibly associated with occupation activity (HER 6743).

There one asset relating to evidence of settlement activity at the western edge of the AS-A. At the Double Arches sand quarry in Heath and Reach, large quantities of Roman material including pottery and tile were recovered during the first half of 20th century. Features noted included a stone-lined well, inhumation burials and a floor surface (HER 1170). The quantity of material recovered and its nature has led to the suggestion that this asset represents either a significant settlement or a villa (Simco 1984, 106).

Communication/Transport Evidence

There are seventeen assets that relate to Roman roads within the Woburn Sands Formation AS-A. However this number is unfortunately misleading as thirteen of these assets relate to roads and associated features such as aggers identified by the Viatores study group. Further information on the problems with the Viatores data can be found in the methodology section of this document ([VSGD](#)). However the key issue with this information is that many of these routes were created by linking modern features such as hedgerows, trackways and roads or by the misinterpretation of later earthworks such as medieval headlands.

Of the “true” Roman roads within the county both Watling Street (HER 5508) and the Baldock to Godmanchester road (HER 505) cross the AS-A, in addition cropmarks show a short section of road/trackway within the parishes of Cardington and Willington (outside this AS-A) that may be related to Akeman Street (HER 738), which passes through the AS-A at the eastern end. A possible Roman road surface has also been recorded in the parish of Lidlington (HER 5080) but there is so little information on this asset that it should be treated with caution. Undoubtedly there was a network of roads and trackways connecting to the major settlements such as Sandy and the arterial routes but at present we have little information on their extent.

Ritual/Ceremonial/Burial Evidence

There are three assets that relate to Roman burials within the AS-A. Two of the assets are recorded at the western end of the study area near Leighton Buzzard (HERs 10727 and 10728). Both were discovered at the beginning of 20th century, at Grovebury Quarry information held at the Bedfordshire and Luton Records and Archive Service (BLARS) and within the Buckinghamshire Museums suggest Roman burials and cremations were recovered on a number of occasions within the quarry (HER 10727).

The third asset relates to a small cemetery (HER 11309) located near the Stratford Road, Sandy Roman settlement, at the eastern end of the AS-A. Cremations and inhumations were recorded in this area around the turn of 20th century and a watching brief undertaken at the same location in the 1990's recorded a further thirteen inhumation burials. It is likely these remains represent the cemetery associated with the Stratford Road settlement (HERs 11311 and 13407).

Findspots

There are eighteen assets that relate to Roman findspots within the AS-A, these predominantly represent small quantities of material or single items and they are broadly distributed across the study area. Over half the findspots relate to pottery, with other items including quern fragments (HERs 1972 and 11295), a lamp (HER 230) and coins (HERs 442 and 236). Some items have been recovered from monuments such as a small number of coins from Caesars Camp hillfort near Sandy (HER 442) but the majority of the finds have no apparent site/monument context.

One of the most interesting findspots relates to the recovery of over 2000 Roman copper alloy coins during sand quarrying in the parish of Tingrith towards the western end of the Greensand Ridge (HER 236). Most of these coins were donated to Luton Museum but at the time it was suggested the quarry workmen had removed some before the find was reported. This was confirmed when a further 684 coins from the same site were shown to the Welwyn Archaeological Society. The coins had been put inside one pottery vessel with another placed over the top then buried within a pit and apparently marked by a lozenge shaped piece of ironstone. The discovery site was observed by a local amateur archaeologist who suggested the presence of further sherds of pottery, burnt soil and stone nearby represented the remains of a hearth contemporary with the hoard. Most of the coins were minted in London or Trier and they range in date from 306 to 350 AD (Deacon and Lockyear 1991, 106 -107).

Conclusions

The Roman assets within this study area are broadly distributed across the Greensand Ridge; however there is a noticeable concentration around the eastern end near the town of Sandy. Whilst there are only a small number of cohesive Roman settlement/occupation assets for this AS-A when taken with the findspots it does seem that the whole of the Ridge was utilised during this period. Clearly there was at least one significant settlement at Sandy (HERs 444, 658, 1877, 11311, 11313, 13932 and 13407), possibly located to take advantage of trade along the Ivel or as a stopping point along the Baldock to Godmanchester road (HER 505) which passes close by the Roman town.

The Viatores data creates an unnatural picture of the transport and communication network within the AS-A (and the county as a whole). However routes linking the major arterial roads and significant settlements must have existed and there is some evidence whether as cropmarks or possible surfaces (HERs 738 and 5080). Gravelled surfaces have also been found during the excavations at Sandy (HERs 11311, 13407 and 11313), whether these directly relate to the Baldock to Godmanchester road (HER 505) or more minor routes isn't known but they were clearly constructed with local materials.

Whether there were any high status settlements or "villa estates" within the AS-A is simply not known. Within the county as a whole there are few examples of villa sites and those recorded either tend to be concentrated along the River Great Ouse valley or close to the Chilterns (Dawson 2007, 73-74). The remains found at Double Arches Quarry (HER 1170) may be an indication of the presence of such sites on the lighter soils of the Greensand Ridge but the circumstances of the discoveries prior to the controls imposed by PPG16 and PPS5 means that at present this unfortunately remains little more than speculation.

Evidence for continuity between occupation in the Late Iron Age and Roman periods is evident within the Woburn Sands Formation AS-A. At Sandy there is the suggestion that the Roman town and the Stratford Road site may have originated as Iron Age settlements (HERs 444 and 11311), also at this end of the Greensand Ridge Roman coins have been found at Caesars Camp hillfort (HER 442). Within the rural Roman landscape there is also the suggestion of possible continuation as demonstrated at Haynes and Westoning (HERs 15840 and 15836). The site of the kilns recorded during rescue excavations undertaken prior to the construction of the Ampthill Bypass (HER 6743) may have also originally been used during the Late Iron Age but unfortunately these excavations remain unpublished and therefore few conclusions can be drawn. When comparing the settlement/occupation data for the two periods within the AS-A there are a few more Iron Age assets of this type, this does appear to be reflected in the county as a whole and it has been suggested that this may be because the Roman period settlement was more focussed whereas Late Iron Age occupation tended to be dispersed (Dawson 2007, 74).

Whatever the case for settlement density during the Roman period there is scant palaeoenvironmental evidence for the AS-A; only one site, Haynes Park (HER 15840) has produced reasonable evidence of this type and it suggests that manured cultivation was practised at least until 2nd century AD, that cereals were cultivated and managed sufficiently to require structures to dry them. Pollen relating to trees and shrubs were also absent at this site suggesting a largely open landscape (Murphy 2007, 79 - 81).

Few reasonable sized faunal assemblages have been recovered from the excavated sites within the AS-A but the animal bones recovered from the Sandy modern cemetery excavations (HER 11313) is dominated by cattle, with some smaller concentrations of pig, sheep/goats, poultry and horse. This assemblage has yet to be fully studied, although butchery marks were noticed on many of the bones (Murphy 2007, 80). The lack of published faunal data from Sandy highlights one of the greatest issues with our understanding of the Roman town. The modern cemetery excavations have yet to be published in full as English Heritage refused to fund the post-excavation analysis. This settlement is undoubtedly the most significant within Bedfordshire and without full publication our interpretation of this end of the Greensand Ridge during the Roman period will remain incomplete.

Saxon Assets (411AD – 1066AD)

There are ten Saxon assets within the Woburn Sands Formation AS-A and they can be divided into evidence for the following activities; settlement/occupation, ritual/ceremonial/burial, communications/transport and findspots. Despite the small number of assets there do appear to be three distinct areas of activity along the Greensand Ridge; between Old Warden and Haynes, Ridgmont and Milton Bryan, and Leighton Buzzard. There are no Saxon assets thus far recorded at the eastern end of the AS-A.

Settlement/Occupation Evidence

There are four assets relating to settlement/occupation evidence within the AS-A, three of them are located within what can be described as the central Greensand Ridge area between Old Warden and Haynes. The first asset is the Scheduled Quince Hill Ringwork, Old Warden (HER 972, SM 20411). The monument is situated between the 65 and 60 metres AOD contours on the upper slopes of the Greensand Ridge and only part of it survives as an earthwork (within a small area of fairly recent woodland), the south-eastern side has been damaged by ploughing with only slight traces remaining. The surviving earthworks represent a central enclosure around 80 metres wide surrounded by a two sets of banks and ditches. On the uphill side the defences seem greater, the inner ditch has a v-shaped profile and is around 10 metres deep and 20 metres wide, the outer bank and ditch are smaller and there is a possible entrance causeway on the north-west side.

Ringworks date to between the late Saxon period and 12th century AD. In general they comprise an enclosure surrounded by one or more sets of banks and ditches, in some cases the central enclosures have adjoining baileys (or courts). The outer banks would have been topped by a timber palisade or more occasionally a stone wall. These monuments are considered to be military fortifications but in some cases would have also represented defended manorial or aristocratic settlements.

The Quince Hill Ringwork overlooks the Church End, Old Warden, like many of the Bedfordshire parishes Old Warden comprises a series of small dispersed settlements, in this case "Church End", "Hill" and "Old Warden". According to the Domesday survey of 1086AD the parish had over 10 hides which was quite large considering it was such a small parish. Church End is likely to be the earliest of the three settlements and probably has late Saxon origins; therefore the placement of the Quince Hill Ringwork may indicate the presence of the manorial residence.

The second asset relating to settlement evidence within this AS-A refers to two parallel ditches recorded during excavations within Haynes Park (HER 15840). The site is located to the west of Church End, Haynes and also produced evidence dating to the Iron Age and Roman periods. The two ditches seemed to be slightly earlier than several timbers from an adjacent area which have been dated to 1081AD. This area also produced evidence for hearths, and post holes, also of Saxo-Norman date. Whether there was a connection between the two ditches and this apparently later structure and occupation is not certain.

The third asset in this part of the AS-A is recently discovered evidence for Saxon occupation on the crest of the Greensand Ridge within Ampthill Park (HER 18265). In 2009 trial excavations at the site of Ampthill Castle (HER 810) recorded the presence of hitherto unknown Saxon activity to the east of the Castle site. This represented a series of linear features all of which produced pottery dating to between the 5th to 7th centuries AD. At present there are two possible interpretations for these features; timber slots for a substantial building or the remains an enclosure with a series of internal divisions. The pottery assemblage consists entirely of domestic wares and therefore whatever the exact nature of the features this undoubtedly a settlement site (Northamptonshire Archaeology 2010b).

The final settlement/occupation asset is located at the western end of the AS-A to the south of Leighton Buzzard at Grovebury Quarry (HER 1870). In the 1970's and 1980's prior to the extraction of sand from this area a series of archaeological investigations were undertaken at the site of the alien Priory. The excavations suggest that the Priory had been constructed in an area of existing Saxon occupation. This site has yet to be fully published but the Saxon evidence is thought to include at least one sunken-feature building and possibly a timber-framed hall (Slowikowski 2010, pers comm.).

Ritual/Ceremonial/Burial Evidence

There are two assets that relate to Saxon burial evidence within the Woburn Sands Formation AS-A, these are the cemeteries at Deadman's Slade and Chamberlain's Barn (HERs 1 and 3) to the north-east of Leighton Buzzard, both cemeteries were recorded as a result of sand quarrying.

At Deadman's Slade (also known as Hillside Road) a number of cremation burials in decorated urns were recovered in 1850 during sand quarrying (HER 1). The urns and subsequent finds including two copper alloy brooches date to 6th century AD. The earliest documentary reference to the name "Deadman's Slade" dates to 16th century and may suggest that the presence of burials in the area was still known through the medieval and into the early post medieval period.

Approximately 500 metres south-east of Deadman's Slade two inhumation cemeteries dating to between 6th and 7th centuries AD were recorded during sand quarrying in 1930's (HER 3). Grave goods, including glass beads, iron buckles and knives, recovered from Cemetery I suggested it was in use between the 6th and early 7th century AD, there were also three 6th century cremations recorded from this area. Cemetery II, was larger and dated to 7th century, grave goods included an iron shield boss, a necklace made from silver rings, spindle whorls and pottery. All most all the burials in Cemetery II were orientated with their heads to the south-west, whereas there was no set pattern within Cemetery I, this has led to the suggestion that the two sites represent pre-Christian (Cemetery I) and Christian (Cemetery II) burial sites.

Communication/Transport Evidence

There is one that relates to a Saxon routeway (HER 10843) within the AS-A. The Thiodweg, (also referred to as Theedway) enters Bedfordshire in the south-west, just below Leighton Buzzard and runs along to Dray's Ditches (HER 113) just to the north of Luton. Documentary records including a charter of 926 AD suggest this was a significant Saxon routeway, in some cases outside the AS-A it may be preserved within the ancient parish boundaries such as between Chalgrave and Houghton Regis.

Findspots

Three of the Saxon assets relate to the recovery of isolated objects or small numbers of items (less than 10) within the Woburn Sands Formation AS-A and they represent a brooch (HER 14850), a spearhead (HER 2820), and a small number of pottery sherds recovered during fieldwalking in the M1 widening corridor (HER 15833). The spearhead may have originated from the Chamberlain's Barn cemetery (HER 3) as it was apparently recovered from soil derived from the vicinity of the site.

Conclusions

There are only a small number of assets for the Saxon period within the AS-A however this is a circumstance that reflects the county (and in some senses southern England) as a whole. Despite the increasing number of Saxon sites being recorded within the county it is the least well understood of all the periods. The major Roman towns in Bedfordshire of Dunstable and Sandy do not appear to have continued past the 5th century (Edgeworth 2007, 87-98) and within this AS-A there is a sharp contrast between the concentration of Iron Age and Roman assets around Sandy and the total absence of assets in the same location for the Saxon period. However that is not to say that there wasn't continuity between locations of settlements of Roman and Saxon periods. The Haynes Park excavations (HER 15840) indicate occupation of this area over a considerable period of time beginning in the Iron Age. This is a circumstance recognised elsewhere within the other aggregates study areas (for example the River Great Ouse and the River Ivel).

We believe that the landscape of Saxon Bedfordshire was a largely rural one, of the county's towns only Bedford has consistent evidence for this period. However the interesting cluster (all be it a small one) of Saxon assets (HERs 1, 3, 2820, 10843 and 1870) around Leighton Buzzard plus documentary references for the later Saxon period suggest a reasonable settlement at this end of the Greensand Ridge. Whether many of the larger settlements within the county had these antecedents is however at present unknown.

There is a local assumption that many of our villages have Saxon origins, some have more cohesive evidence than others and small scale local developer funded archaeological investigations are producing more traces of this all the time, these assets are however excluded from the present study because they are within "urban areas" and therefore unlikely to be subjected to aggregate extraction. One such recent example is

the village of Henlow, located towards the eastern end of the AS-A, here recent excavations have produced a small amount of domestic evidence dating the Saxon period (Heritage Network 2009 and 2010).

Research into the Saxon period is a local and regional research priority (Wade 2000, 24-25, Oake 2007, 14 and Medlycott and Brown 2008, 96). The presence of Saxon remains recovered from aggregate quarries associated with the Woburn Sands Formation around Leighton Buzzard demonstrates both potential in terms of future extraction sites but also the significance of this area during the Saxon period. The full publication of the Grove Priory site (HER 1870) may shed some light on the type of settlement within this area and in the meantime we should be alert to any proposals for quarry extensions or new extraction sites.

Medieval Assets (1066 AD – 1539 AD)

There are one hundred and forty-nine assets that relate to the medieval period within the Woburn Sands Formation AS-A. The assets are broadly distributed across the study area with the greatest concentrations along central Greensand Ridge (from Old Warden to Milton Bryan) and at the western end near Leighton Buzzard. The assets have been divided into evidence for the following; settlement/occupation, rural land use/agriculture/land division, communication/transport, industrial activity, religious houses/buildings and findspots

Settlement/Occupation Evidence

There are sixty-two assets that relate to settlement/occupation evidence within the Woburn Sands Formation AS-A. This category comprises; deserted and shrunken settlements (recorded as earthworks, cropmarks or both), moated sites, excavated sites, extant settlements (particularly “Ends”), settlements/buildings securely identified through documentary evidence and a small number of surviving buildings.

Twenty-eight of the settlement/occupation assets relate to evidence for medieval villages and hamlets within the AS-A. These assets comprises deserted medieval settlements such as the earthwork remains at Old Woodbury (HER 14785); shrunken settlements like the cropmarks at Haynes (HER 5481) and earthworks at Segenhoe (HER 753), excavated sites (Haynes Park, HER 15840, Dunton Lane, Biggleswade HER 17738 and Beauford Farm/Grand Burry, HER 13932) and surviving small hamlets many of which are “Ends”, for example Hills End (HER 16908) and Potters End (HER 16912) both of which are in the parish of Eversholt at the south-western end of the AS-A.

The pattern of rural settlement within the county as a whole during the medieval period was varied, dependant on topography and soil type, in some areas there are more nucleated settlements, where as in others dispersed settlements predominated. However as Edgeworth points out natural limitations and resources do not appear to have been the only influences on the type of settlements during this period. It is not uncommon for two adjoining parishes, with similar topography to have very different settlement patterns. This Edgeworth feels may relate to the particular style of the ruling classes (Edgeworth 2007, 99).

In general dispersed settlement seems to have been more common along the Greensand Ridge and thus within the AS-A. Typically these villages comprised a number of small “Ends”, all associated with one another. In some cases in the intervening years one of these settlements has succeeded the others (often there were three) and has gone on to represent the modern village. In others, such as the village of Haynes on the central Greensand Ridge the “Ends” have become almost interchangeable and are now perceived as one larger settlement.

There are few true deserted medieval settlements within this AS-A but that is a circumstance that is recognised in the county as a whole. That is not to say the social and economic factors and the plague epidemics of the 14th century did not have an impact on Bedfordshire, it is more that we have little earthwork or cropmark evidence of

these influences. Within the AS-A there are more shrunken settlements, which suggest that partial abandonment of settlements was a more common reaction to these external factors.

Moated sites are prevalent within this AS-A and there are sixteen in total, the majority surviving as earthworks or cropmarks. A number of these sites are also designated as nationally important Scheduled Monuments (see medieval table in Appendix 3). Medieval moated sites in Bedfordshire all represent domestic settlements; most date to 12th and 13th centuries AD and comprise a central rectangular, square or oval platform, accessed by an entrance causeway across a water-field ditch that enclosed the entire internal platform. Within the interior of most moated sites there would have been a house as well as a number of ancillary buildings, such as barns and storage sheds. In some cases moated sites represented the manorial residences, in others they are likely to have been constructed by wealthy landowners as a display of status. Some Home Farms also appear to have been moated.

None of the moated sites within the AS-A have been the subject of comprehensive archaeological investigation, however where both intrusive and non-intrusive investigations have taken place elsewhere within the county these types of sites have shown several phases of re-modelling, including the widening of the retaining ditches. In some cases such as at Tempsford and more recently at Houghton Conquest there is evidence to such the re-occupation of Saxon sites (Maul and Chapman 2005 and Northamptonshire Archaeology 2010a).

Within the AS-A a number of these sites are located close to either shrunken or surviving settlements such as Segenhoe (HER 7103) which sits in a complex that includes the now decommissioned church of All Saints (HER 29) and the deserted settlement earthworks (HER 753). Others appear more isolated such as Bolbec north of Maulden (HER 221, SM 11537). Even where these sites appear isolated they would have sat within a larger managed landscape and this is illustrated by the moat at the Hoult, Potsgrove (HER 37, SM 29893) which sits within an extensive earthwork complex that includes ridge and furrow.

Other settlement/occupation assets within the AS-A include two “true” castle sites; Cainhoe (HER 225, SM 20440) and the Quince Hill Ringwork (HER 972, SM 20411). A third, Amphill Castle (HER 810, SM 20429) was in fact a grandiose mansion house (see further details below). Cainhoe Castle (HER 225, SM 2044) is situated on a natural greensand knoll overlooking the River Flit in the central part of the AS-A, a location that affords a commanding view over the river valley but also across the rest of the Greensand Ridge to the north. The castle is a motte and bailey, with a central mound (motte) and actually three baileys to the south, east and west. A complex of fishponds is also located on the lower ground to the north-west and there are other earthworks including at least one enclosure.

Cainhoe is recorded in the Domesday survey as being held by one Nigel d’Albini and it is assumed it was constructed by him probably as a display of status rather than with any serious intent to be a defended site. A manor house is believed to have been built on the same site in 13th century. An earthwork survey undertaken in the 1980’s indicated that the motte and western bailey are probably the earliest elements at the site; it also recorded the square enclosure defined by a shallow ditch, which may be the site of the manor or a small settlement. Documentary material suggests that in the late 13th century

the Cainhoe estate included a manor house with stables, a bake house, dovecote and gardens.

Small scale excavations on the southern side of the site prior in 1973 failed to confirm whether there was a settlement associated with the castle site, but did find evidence of a possible road surface (although not necessarily contemporary with the castle) and demonstrated that on the southern side quarrying had seriously modified the earlier remains. This latter problem had also been identified during the earthwork survey. (Taylor and Woodward 1975, 45-52).

The other real castle site is the Quince Hill Ringwork, Old Warden (HER 972, SM 20411), already discussed in the Saxon section of this AS-A resource assessment. The ringwork lies between the 65 and 60 metres AOD contours on the upper slopes of the Greensand Ridge, overlooking the hamlet of Church End, Old Warden. The monument has been damaged by ploughing and only part of it survives as an earthwork. The surviving earthworks represent a central enclosure surrounded by a two sets of banks and ditches, the defences on the uphill side seem greater and the outer bank and ditch are smaller than the internal bank and ditch. A possible entrance causeway is located on the north-west side of the monument.

Ringworks date to between the late Saxon period and 12th century AD and generally they comprise an enclosure surrounded by one or more sets of banks and ditches, in some cases the central enclosures have adjoining baileys (or courts). The outer banks would have been topped by a timber palisade or more occasionally a stone wall. These monuments are considered to be military fortifications but in some cases would have also represented defended manorial or aristocratic settlements. Nothing is known of who constructed the Quince Hill ringwork or when it was built (hence its appearance in both the Saxon and medieval sections of this document). It is located near what is presumed to be the earliest of the three Old Warden settlements and therefore it may have a more domestic origin than a military one.

Eight of the medieval settlement assets relate to manorial and high status house sites (without associated settlement remains surviving), recorded as earthworks (Berrystead, Maulden HER 1178), cropmarks (Everton HER 1627) or known from documentary evidence (Gastlings, Southill HER 14193).

Among this group is Ampthill Castle (HER 810 SM 20429). Situated within Ampthill Park (HER 1369) on the northern edge of the Greensand Ridge, originally the site was thought to be represented by a series of earthworks. Never a Castle in the true sense, it was a mansion house constructed by Sir John Cornwall (later Lord Fanhope) in the early 15th century at the centre of an estate that may have included a deer park. Cornwall married Henry IV's sister, Elizabeth and historical documentation suggests the house which was grandiose in style and size was built to reflect the royal connection. Later Ampthill Castle became part of the Royal estate and Katherine of Aragon resided there during her divorce from Henry VIII. The house was surveyed for Elizabeth I in 1567 and shortly after became ruinous. It is understood to have been demolished some time in the later 1500's or early 1600's. The new estate house was moved to north below the Greensand Ridge after the Civil War (see Post Medieval section of this AS-A resource assessment for further details).

Amphill and District Archaeological and Local History Society (ADALHS) have been undertaking non-intrusive geophysical surveys of the Amphill Castle site for a number of years and these results indicate the presence of a complex range of buildings. The 1567 survey suggests the building had four wings and an outer or “Base” court. A community based archaeological field evaluation was undertaken in 2009 (Northamptonshire Archaeology 2010b) and whilst the orientation of the original building is still hotly debated the presence of foundation trenches and a brick hearth were recorded. Large quantities of building material including glazed floor tiles and dressed Totternhoe stone were also recovered.

There are three settlement/occupation assets that represent medieval standing buildings; these are a Grade II* Listed 15th century farmhouse in Eversholt (HER 4291), an early 16th century Grade II Listed cottage at Haynes Church End (HER 4969) and a Grade II Listed early 16th century house in Maulden (HER 6620). That there are so few standing medieval buildings surviving within the AS-A is not surprising. There are relatively few surviving medieval buildings within the county as a whole, and most of them tend to be within the urban areas and village cores, areas deliberately excluded from this resource assessment.

Rural Land Use/Agriculture/Land Division Evidence

Fifty-eight of the medieval assets for the Woburn Sands Formation AS-A relate to evidence for the management of the landscape during this period. These assets include ridge and furrow cultivation earthworks and cropmarks; ancient woodlands (in existence before 1600 AD), rabbit warren sites, deer parks, lynchets and cropmark evidence for closes and other pre-enclosure boundaries.

Prior to the Parliamentary Acts of Enclosure in the 18th and 19th centuries Bedfordshire was cultivated using the open field system. Each parish had a series of open fields as well as common land and meadows, and this method of farming probably originated in the Saxon period. Each open field was sub-divided into furlongs that were divided into strips or lands and tenanted out to members of the local community. Common crop-rotation was practised with each open field (or sometimes furlong) growing crops such as wheat, legumes, oats and barley and having a fallow period (usually a year). The practise of assarting was also common place during the medieval period; this was the creation of fields by the clearance of land that had previously been used for other purposes such as woodland. In some cases these small “closes” were used for pasture.

The most common evidence of the open field system within Bedfordshire (and southern England) is ridge and furrow cultivation earthworks and cropmarks. Ridge and furrow was created by a particular type of ploughing which involved the clockwise and anti-clockwise ploughing of fields early and then late in the farming season. These actions created the characteristic corrugated earthworks that survive within post medieval enclosed landscape. Within the AS-A there are several areas where small pockets of ridge and furrow cultivation earthworks still survive today, these include Southill (HERs 2123 and 4494), Old Warden (HER 638), Tingrith (HER 8297), Potsgrove (HER 3317) and Wilstead (HERs 662 and 4466). In other parishes where earthworks were recorded from the RAF aerial photographs of the 1940's these earthworks have long since been destroyed by ploughing. Nevertheless this category includes seventeen assets relating

to these remains, indicating that whilst the soils of the Greensand may not have been as productive as other areas in the county, the area was worked fairly intensively during this period.

In addition to the evidence for ridge and furrow cultivation for this AS-A there are eight assets that relate to field and parish boundaries, these are recorded as cropmarks (HERs 3525, 550 and HER 766) earthworks (HERs 4419 and 7642) and through placename evidence (HERs 13603 and 13607). There is also one example of an excavation of a parish boundary, at Steppingley, during the construction of a pipeline (HER 18199).

Fourteen of the assets within this category relate to ancient woodlands (recorded and present prior to 1600 AD) and their associated woodbanks. The Greensand Ridge and thus this AS-A has the largest number of ancient woodlands within the county, this undoubtedly relates to the active organisation of the landscape so that the poorer soils of the Ridge were utilised to their full potential. Many had enclosing woodbanks; with external ditches, their function dual purpose, to demarcate ownership and prevent livestock from the surrounding fields entering. Internally these woodlands were also well organised, with smaller banks and ditches indicating areas for different management, such as coppicing. Saw pits and woodsman cottages would have also been present in the bigger woodlands.

Bedfordshire's largest surviving ancient woodland, Kings Wood (HER 2577) which straddles the border with Buckinghamshire at the western end of the AS-A in Heath and Reach has an impressive range of surviving woodbanks and internal management features. Kings Wood was part of the Royal manor of Leighton Buzzard and there are also a series of surviving medieval and post medieval wood accounts which detail how the woodland was divided, managed and the uses of the timber.

The Greensand Ridge was also the perfect location for the active management of rabbits during the medieval period, unlike elsewhere in the county where mounds would have been constructed to manage the rabbits the loose sandy soils of the Ridge provide natural habitats for rabbits to burrow into. These areas of managed warrens may have been quite extensive in some places (such as Sandy HER 13729) and there are eight assets relating to warrens within the AS-A.

Five of the medieval assets in this category also relate to deer parks (or probable deer parks) and they include Ampthill Park (HER 1369). How extensive and successful the deer parks of the Greensand Ridge were is not known. None of the surviving assets retain the characteristic park pales designed to keep the deer in, although this may be because some of them such as Woburn, Ampthill and Haynes (HERs 8762, 1369 and 13958) went on to form the basis of post medieval landscaped parks and were subsequently heavily modified. Interestingly though even at Ampthill which was a Royal estate where one would expect hunting to have been a favoured sport, documentary sources suggest the numbers of deer were quite small and it is not even certain that Ampthill originated as deer park. Other apparent deer parks such as Combe/Lidlington HER 9595 appear to have been de-parked early in the post medieval period and it is only documentary evidence that suggests Beckerings Park (HER 8763 also in Lidlington) performed this function at all.

Communication/Transport Evidence

Thirteen of the medieval assets for the Woburn Sands Formation AS-A relate to evidence for communication/transport and more specifically to roads or tracks. With the exception of the Thiodweg (HER 10843) which during this period may have been a long distance routeway utilised for the transportation of salt from East Anglia to the west, all of these assets represent local routes. Some survive as earthwork holloways (for example HERs 4468, 4470, 5099 and 11463), whilst others appear as cropmarks (such as HERs 15104, 15126 and 9616). These routes would have formed part of a network of local roads and trackways linking the settlements, small towns and the national routes such as Watling Street and the Great North Road (A1).

Industrial Evidence

There are four medieval assets within the Woburn Sands Formation AS-A that represent evidence for industrial activity. These are a pottery production site at Campton (HER 458), a possible iron working site in Maulden (HER 2768) and two windmills HERs 3148 and 6607). The Campton kiln site was excavated in the 1930's by Bedford Modern School (they undertook a number of amateur investigations during this period) and the pottery recovered suggested the kilns were in use between 13th and 14th centuries. The iron working site was recorded in Maulden parish, when workmen recovered a large quantity of slag, whilst the windmill sites are located in Steppingley and Sutton.

The absence of industrial sites within this AS-A is not surprising; during this period most activities of this type (with the exception of mills) were located on the margins of settlements or within designated zones within towns; as settlements have expanded over time so these zones have become absorbed into the urbanised areas excluded from this study. This is not however to say that rural industrial sites don't exist within the AS-A, the proximity of the ancient woodlands would have certainly provided ample fire wood for kilns and the Campton one is located fairly close to the Chicksands ancient woodland (HER 9142). It is perhaps rather that these sites have yet to be recorded.

Religious Houses and Buildings

There are seven assets within the Woburn Sands Formation AS-A that relate to religious houses and buildings. Three of these assets represent former parish churches; two All Saints, Segenhoe (HER 29, SM 101) and St Mary's Old Church, Clophill (HER 2476, SM 83) are ruins, having been decommissioned by the Church of England in 20th century. The third; St Leonard's, Old Warden (HER 1146) is still in use and located within one of the Parish's "Ends".

The earliest phases of All Saints Church, Segenhoe (HER 29, SM 101) date to 12th century AD and it was constructed using a variety of materials including limestone, clunch, ironstone (from the Greensand Ridge) and brick. Prior to its abandonment in 1927 it had undergone a number of restorations, particularly during 18th and 19th centuries. With the exception of the roof and windows most of the external structure of the church remains. At Segenhoe the remains of the settlement that once supported the church are still evident. In the fields surrounding it there are the earthwork remains of

enclosures, holloways and ridge and furrow (HER 753), there is also a moat (HER 7103) and the manor site (HER 34) which belonged variously to both Dunstable Priory (HER 131) and the Woburn Estate and which is now occupied by a 18th century house (HER 4417). As a settlement Segenhoe was probably superceded by nearby Ridgmont, although when this took place is uncertain.

St Mary's Old Church, Clophill (HER 2476, SM 83) is situated in an isolated, but prominent spot at a height of around 85 metres AOD on the upper slopes of the central Greensand Ridge. It dates to between 14th and 15th centuries, is constructed from ironstone rubble and is entirely ruinous, only the tower and part of the nave remain. The modern village centre, which probably originated in the medieval period, is around a kilometre to the south-west. There may have been a settlement around the church during the medieval period (an orchard and some cropmarks, HERs 9145 and 9147 are recorded on the Central Bedfordshire and Luton Historic Environment Record as possible evidence for occupation) but it is far from clear whether there was ever a cohesive settlement around the church that was abandoned in favour of the more sheltered downslope location of the present village.

St Leonard's Church, Old Warden (HER 1146) is 12th century in origin with 13th – 16th century additions, and 19th century restorations. It is mainly constructed of cobblestones with some limestone dressings. It is located within Church End, Old Warden which is now a very small cluster of houses and remains the parish church. Church End is probably the earliest of the three settlements at Old Warden (the other being Old Warden and Hill) although it does not appear to have even been anything more than a small hamlet.

The remaining four assets within this category relate to religious houses and they are; Chicksands Priory (HER 375 and 376), Woburn Abbey (HER 40) and Grove Priory (HER 1870).

Chicksands Priory (HER 375, SM 93 and HER 376) is located on the lower slopes of central Greensand Ridge overlooking the valley of the River Flit. The Priory, founded in approximately 1150 AD was a double house (comprising both nuns and monks) of the order of Gilbert of Sempringham. The Gilbertines were the only religious order of English origin and eleven houses were founded, with Chicksands being the third largest. Chicksands Priory was dissolved in 1539 when the property and lands were passed to Richard and Elizabeth Snowe. In around 1587 the estate was acquired by the Osborn family who held it until 1938 when it was purchased by the Crown. The remaining Priory buildings and subsequent post medieval park are currently held by the MOD.

Details surrounding the Gilbertine order at Chicksands, the extent of their estate and their influence over the surrounding area are not as well documented. However perhaps the most interesting aspect of Chicksands Priory is that substantial parts of the Priory buildings are still standing, and the extant remains comprise four stone built ranges around the original monks cloisters (the nuns and monks would have led entirely separate lives). Dendrochronological analysis of some of the surviving timbers indicate a range of felling dates from 13th to 18th centuries, with clusters at the beginning of 16th century and shortly after the dissolution (presumably indicating modification after the property had been acquired by the Snowe family).

Attempts to find the below surface remains of the rest of the Priory precinct were undertaken in 2001 when Channel 4's Time Team were invited to evaluate the site. Geophysical survey results indicated the presence of some possible structural remains but the trial trenching was surprisingly inconclusive. A single inhumation believed to have come from the Priory's burial ground (HER 376) was also recovered (Time Team 2004). The burial ground had been previously disturbed in 1969 when twelve graves were located, where analysis of the remains were possible all appeared to adult males, except one young child (Dyer 1970 101-108).

The second religious house located within the AS-A is Grove Priory (HER 1870) and it was located on the upper slopes of the Greensand Ridge overlooking the valley of the River Ouzel, to the south of the town of Leighton Buzzard. Extensive archaeological excavations at Grove were undertaken prior to the destruction of the site by sand extraction. These excavations are due to be published in 2011 (Slowikowski 2010, pers comm.)

The site of Grove Priory was originally part of the Royal Manor of Leighton; in 1164 AD Henry III converted it by gift into one of six alien cells of the Benedictine Abbey of Fontevrault. The Priory was relatively short-lived; in the early 14th century Edward I installed his daughter Mary of Woodstock, herself a nun, at Grove. The Abbess of Fontevrault appears to have retained an interest, receiving rent but by the end of 14th century the Priory had fully reverted to the Crown. During 15th century the Manor had belonged to the Dukes of Suffolk, although never appears to have been occupied by them.

Given its original manorial origins and the relatively short period of time that Grove was a religious house it is not surprising that the archaeological excavations demonstrated that the Priory buildings had never conformed to a typical monastic plan. Documentary sources suggest that the stone manor house had only built in around 1155, and the excavations confirmed the presence of structural features dating approximately to this period. The excavations did however also confirm the presence of buildings specifically associated with the Priory; these included a chapel and hall and indeed a licence had been granted in 1220 AD for an oratory, burial ground and chapel.

Grove also had extensive agricultural lands, gaining income from pasture (particularly grazing for sheep). In addition there was a network of fishponds, which still survive today as earthworks and their drainage system was recorded during the excavations. Other buildings included a bake or brew house and a dovecote.

The final religious house within the Woburn Sands Formation AS-A is Woburn Abbey (HER 40). The Abbey was a Cistercian house founded in 1145 by Hugh De Bolbec with a colony of monks of from Fountains Abbey in Yorkshire and it was dissolved in 1538. Little is known of the extent of the Abbey precinct and there are very few documentary references to the religious house. The present "Woburn Abbey" (HER 4949) is a largely 18th century country house, rebuilt and modified from the time the estate was acquired by the Earl of Bedford in 16th century. It is believed the house lies on site of the Abbey's cloister and the former county Archaeologist noted the possible presence of a medieval wall under the north-western corner of the present "Abbey". Observations of the excavation of trenches in 1986 however failed to find any evidence of the abbey but did suggest a significant amount of landscaping had taken place in the early post medieval period (BCAS 1986, 26)

Findspots

Five of the medieval assets for the Woburn Sands Formation represent findspots (HERs 15419, 7451, 7475, 13768 and 16093); with the exception of 14th century gold pendant (HER 15419) found near Ampthill Park, they are all pot scatters. The quantities of material recovered/recorded are uncertain, they range in date from 12th to 15th century, were found on the central Greensand Ridge and were all reported to the HER by an amateur archaeologist. In some cases this material may be indicative of settlement activity but without further details it is not possible to assess this.

Conclusions

The medieval assets for the Woburn Sands Formation suggest that the landscape during this period was one of small dispersed settlements, surrounded by open fields and managed woodlands. The estates of the religious houses at Chicksands, Grove and Woburn would also have had a major impact on the Ridge, with much of their surrounding hinterlands belonging to or supporting the Orders. Of the major settlements along the Greensand Ridge both Leighton Buzzard and Ampthill were certainly founded and prosperous in the medieval period and would have been important centres of commerce for the rural settlements. Interestingly, Sandy which had been so important during the Iron Age and Roman periods seems to have been a very small and fairly insignificant town during the medieval period. Moated sites suggest the upper classes remained ever present, but distanced, within their properties which could be “cut-off” from the peasants and non-landed even if in truth these moats created more of a metaphorical barrier than a physical one.

Whilst the poor sandy soils of the Greensand Ridge may not have been as agriculturally productive as the clay vales to the north and south of it, the assets relating settlement and land use demonstrate it was not an entirely marginal area during the medieval period. Excluded from this study are all the medieval village cores as well as the towns of Ampthill, Biggleswade and Leighton Buzzard which developed and prospered during this period. The ancient woodlands and warrens also indicate the recognition of the limitations soils of the Ridge and the deliberate utilisation the land for its greatest potential. The location of so many of the county’s religious houses on within the AS-A may also have been in part related to granting of less productive lands to the Monastic Orders by the ruling classes. Nevertheless these houses prospered, making the most of the resources granted to them and survived until the dissolution.

Even before the establishment of the great post medieval estates the AS-A was the seat of the Royal Manor at Grovebury and the Royal Estate at Ampthill. Whilst situated in topographically different locations (Ampthill is on the crest of the Ridge proper whilst Grovebury is on the lower slopes) they nonetheless were both in positions with commanding views across the surrounding landscapes. This sense of isolation and elevation is also reflected by the sheer number of moated sites, only a small number would have been manorial suggesting the others belonged to the upper classes undoubtedly constructed in such locations to give them the physical sense of distinction from the lower orders.

Consequently whilst most of the medieval assets for this AS-A are common to the rest of the county, the topography was clearly an important influence on the management and development of this area during the period. The medieval landscape of the AS-A was highly organised to take best advantage of the natural resources both for social and economic gain.

The Post Medieval Assets (1540 – 1900 AD)

There are seven hundred and two assets within the Woburn Sands Formation AS-A assigned to the post medieval period and they can be divided into evidence for the following; designed landscapes, industrial activity, land use/agriculture/land division, settlement/occupation activity, religious houses and buildings, communications/transport and findspots.

Designed Landscape Evidence

Two hundred and twenty-eight of the post medieval assets within the Woburn Sands Formation AS-A relate to designed landscapes and estates. It has to be acknowledged that the prevalence of these assets somewhat misleading, there are not over two hundred designed landscapes within the AS-A, rather it is that in some cases separate HER numbers have been assigned to individual statuary and other “decorative features” within some of the estates, which accounts for why ninety-five of the assets relate to Woburn Park (HER 8762). Nevertheless without all their associated features this category still contains twenty-two designed landscapes and estates, which is a sizeable number in a study area that is only one hundred and eighty-nine square kilometres in size.

Some of the assets in this category have their antecedents in the medieval period, for example Amphill Park (HER 1369) was part of a large estate acquired by Sir John Cornwall in 15th century and Southill Park (HER 6997) developed from the medieval manor of Gastlings (HER 14193). In addition both Chicksands (HER 6992) and Woburn (HER 8762) were sites of former monastic houses (HERs 375 and 40 respectively) which following the dissolution were granted to some of Henry VIII’s supporters. In the case of Woburn nothing of the monastic precinct survives above ground level, but at Chicksands the monk’s cloisters still stand today and were converted into domestic buildings by the Snowe family after they acquired it following the dissolution. In the parishes of Old Warden and Southill lands and buildings once part of Warden Abbey (HER 460 – but just outside the AS-A) were absorbed into what later became the Southill and Shuttleworth Estates. In some cases such as Combes/Lidlington Park (HER 9595) which was de-parked early in the post medieval period these landscapes may also have originally been deer parks.

Of the twenty-two designed landscapes and estates within this category the majority are fairly minor, in some cases such as the small 19th century Crawley Park, Aspley Guise in the western half of the AS-A (HER 6981) they are only recorded as a result of cartographic research. Other small scale designed landscapes such as Sutton Park (HER 7005) which is now a golf course, are recorded as have surviving features like its associated dog cemetery (HER 4467), boathouse (HER 4439) and footbridge (HER 4450).

In terms of the shape of the post medieval and modern landscapes of the AS-A there are two designed landscapes and estates which have had the greatest impact; these are Woburn (HER 8762), home of the Dukes of Bedford at the western end of the AS-A and

Southill (HER 6997), which belongs to the Whitbread brewing dynasty towards the eastern end.

The Woburn Estate is situated towards the western end of the AS-A on the upper slopes of the Greensand Ridge, with the house (HER 4949) and the pleasure grounds immediately surrounding at the highest point of the Ridge in this area. Woburn Park (HER 8762) is situated on the site of a former Cistercian Abbey (HER 40), which was founded in c.1145 as a daughter house to Fountains Abbey in Yorkshire. Following the dissolution the Abbey and its estate were granted to Lord John Russell in 1547 who later became the 1st Earl of Bedford.

How much of the Cistercian Abbey precinct and buildings remained when the Bedford's acquired the estate is uncertain, the present house, also known as Woburn Abbey (HER 4949) was originally constructed around 1630 by Francis the 4th Earl. It has however been remodelled on a number of occasions; including works undertaken c.1747-61 by Henry Flitcroft (based on plans by John Sanderson) and between 1787-1790 by Henry Holland, other contributions were made by William Chambers. Constructed from Oolitic limestone and Totternhoe clunch its 18th and 19th century plan was quadrangular, but further work in 20th century resulted in the demolition of the east wing and the eastern ends of the north and south wings. The early landscape park was developed in 17th century, with early 18th century work by George London and Charles Bridgeman. In the early 19th century considerable remodelling was undertaken by Humphrey Repton.

The plethora of assets associated with Woburn Park include buildings related to the house; such as the sculpture gallery (HER 4951), Chinese pavilion (HER 4954), and stable block (HER 14259), statuary including a series of urns within the private gardens (HERs 14248-14250, 14252-14258, 14264-14267), and features that form part of the landscaped grounds like the Temple on the island of Lower Drakeloe Pond (HER 14212), the log hut (HER 14211) and the grotto (HER 4956). Other elements of the estate comprise various lodges such the Star (HER 2426) and Trussler's (HER 14291). The Park itself is on the national register of park and gardens and many of the features (buildings, statues and monuments) are Listed. Today the Duke of Bedford is one of the county's foremost landowners, and the presence of the Russell family is evident not only within the Woburn Park estate but within the landscape of Bedfordshire as a whole. Many of these features relate to the creation of the post medieval and modern rural landscapes and are discussed further below.

The Southill Estate is located towards the eastern end of the central part of the AS-A, its position in the landscape fairly low lying, on the lower northern slopes of the Greensand Ridge. The original estate and park was considerably smaller than the present one and was located to the west of Southill Park House (HER 756) around the site of the medieval manor of Gastlings (HER 14193). In 1693 the early estate was purchased by Admiral Sir George Byng (Viscount Torrington) who by the 1720's had the Gastlings house demolished and a new residence constructed in the present location of Southill Park House. Torrington is believed to have instructed Lancelot "Capability" Brown to undertake the landscaping of the new centre of the estate in around 1777. The extent of the early landscaped grounds is not fully clear, but the Enclosure Map of 1800 indicates Brown's work may have been largely confined to the south and south-west of the mansion.

In 1795 the Southill Estate was purchased from Viscount Torrington by Samuel Whitbread I, MP for Bedfordshire and brewery founder. Despite dying shortly afterwards Whitbread commissioned Henry Holland to remodel the house and the grounds. The present size of Southill Park (HER 6997) is largely related to the Enclosure Award for the parish of Southill, when through land exchange the Whitbread's were able to acquire much of the northern extent of the parkland.

The central block of Southill Park House (HER 756) is rectangular in plan; Holland reworked it and the outer pavilions, rebuilding the linking wings and re-facing the building with Portland and Totternhoe stone. Of the post medieval assets for the AS-A thirty-seven relate to the Southill Estate and in similarity to Woburn many of the individual features associated with the house such as the statuary (HERs 12967-12979) have been assigned unique HER numbers. Buildings and structures of note include the Orangery (HER 8465), Ice house (HER 7342), lodges (HERs 3343, 5937 and 12957) and the Gothic cottage (HER 5936).

Of the landscaped grounds, the northern edge of the park boasts a large lake, and is overlooked by the Tuscan Temple (HER 2241) and Smeaton's Bridge (HER 5938). It is the view across to the lake which comprises an important part of the special character of Southill Park (it is on the national register of parks and gardens); as it is best viewed from the north terrace (HER 2242), and is one of Holland's deliberately created vistas.

Industrial Evidence

There one hundred and sixty-nine post medieval assets that relate to industrial activity within the Woburn Sands Formation AS-A, of these one hundred and sixteen represent sand and gravel quarries (eighty-four and thirty-two assets respectively). It should perhaps be noted here that the presence of "gravel" quarries and indeed clay pits (of which there are thirteen) in this AS-A is not an error in the data. Pockets of glacial sands and gravels overlie some of the parts of the Ridge and localised deposits of clay, particularly around Amptill are common on the lower slopes.

Given the composition of the underlying geology the prevalence of quarry sites is unsurprising. The nature of the evidence for early aggregate extraction is varied, in some cases these sites may remain as earthworks; the majority however are recorded from cartographic sources (specifically from 1st and 2nd Edition Ordnance Survey maps).

Early quarrying both for aggregates and building stone would have been localised concerns, in some cases tenants were given the right to dig for sand or stones on common ground, such as is recorded on the Heath (HER 11095) in Heath and Reach. Even into the early 19th century in Bedfordshire quarrying was likely to have still been small scale. It is only really from latter half of 19th century that large scale quarrying for aggregates was undertaken. The distribution of the sand and gravel quarry assets for the AS-A suggests the utilisation of the Woburn Sands Formation across the Greensand Ridge, however the main area of extraction, which continues to produce aggregates today was the western end around Heath and Reach and Leighton Buzzard. Sandy and Potton at the opposite end of the AS-A also had a concentration of extraction sites.

Settlement/Occupation Evidence

One hundred and thirty-two of the post medieval assets represent evidence for settlement activity and the majority of them (one hundred and twelve) relate to domestic buildings. Many of these buildings such as 3 - 9, Church End, Old Warden (HERs 2125-2129) were constructed in 19th century as accommodation for workers on the county's large estates, in particular those of Woburn (Duke of Bedford), Southill and Shuttleworth. The desire to improve the living conditions of estate workers was begun in Bedfordshire by the Whitbread family at Cardington (outside the AS-A) in the late 18th century. These buildings are quite distinctive, each portraying both the architectural fashion of the time and the particular style favoured by their patron. For example those buildings associated with Shuttleworth, Old Warden often have an idyllic, sometimes thatched appearance and they bear the date of construction and whose estate they belong to. Whilst living standards undoubtedly improved, the benefits did not come entirely without cost, as those tenants on the Shuttleworth Estate were required to wear a uniform based on rustic Swiss dress, complete with tall red hats (Edgeworth 2007, 124). This apparent whim fitted in with Lord Ongley's passion for all things Swiss as the landscaped grounds included the alpine themed Swiss Garden (HER 6996).

Land Use/Agriculture/Land Division Evidence

One hundred and twenty-seven of the post medieval assets for the Woburn Sands Formation relate to evidence for the management of the rural landscape for agricultural purposes and the majority, one hundred in total represent farms and their associated buildings. The remaining assets in this category represent boundary features and relics of the preceding age, such as warrens that continued in some places into the post medieval period.

During the late 18th and 19th centuries there was a radical shift how the Bedfordshire landscape was organised and this was as a result of the Parliamentary Acts of Enclosure. Unlike other counties, Enclosure came to Bedfordshire fairly late with many parishes still operating open field farming well into 19th century. Within the AS-A the Enclosure Acts allowed the large estates such as Woburn, Southill and to a degree Old Warden to re-organise the landscape, both for agricultural gain and in the case of Southill and Old Warden to extend to the parkland.

Of particular note within this AS-A are the farms which formed part of the Woburn Estate. In the 18th and 19th centuries the Woburn Estate comprised around a tenth of the land in Bedfordshire (Edgeworth 2007, 124) and much of that area was concentrated on the Greensand Ridge. In the late 18th century the Dukes of Bedford had begun to take a serious interest in the improvements in agricultural techniques and machinery designed for bettering agricultural yields. The Estate Office (HER 14223) at Woburn became the centre of the new research and experimentation and in the 1790's the Duke of Bedford had Robert Salmon design and build Park Farm (HER 14217), which comprised symmetrical ranges constructed in a neo-classical style. Park Farm was equipped with the latest agricultural machinery including seed drills, chaff-cutters, threshers and reapers.

By the middle of 19th century the Park Farm form had been extended out to other parts of the Bedford estate and developed into the more utilitarian “model farms”, whose primary goals were efficiency through industry. Park Farm, Peakes End, Steppingley (HER 15575 and 15597) is one such example of this type of Bedford estate model farm.

Another peculiarity of the agricultural buildings within this AS-A are the onion sheds, of which there are eight in total. By no means restricted to this study area they are nevertheless an indicator of an additional element of the post medieval landscape. In later 18th and early 19th centuries Bedfordshire began to establish itself as one of southern England’s market gardening areas, the most prolific production areas are located outside this AS-A, within the fertile river valleys. However the industry stretched across the county and on to the Greensand Ridge and other areas of higher ground such as the Gault Clay on which the village of Meppershall sits. The industry still continues on albeit a smaller scale today but many of the buildings, such as the vast greenhouses, associated with it have demolished.

Onion drying sheds were an integral part of the market gardening industry and emerged as specific building type in the early 19th century; they are mostly found in Central Bedfordshire, with the Ivel valley being one of the centres of onion production in the county. Other areas known for cultivating onions however included Chicksands on the Greensand Ridge, where they are still grown today. Onion sheds are characterised by light timber frames, with slatted sides and floors to increase ventilation. Early buildings were built entirely of wood but the later sheds often have a brick base, in some cases they had a dual use with the lower floor comprising stables or store with the onion loft above. Within the AS-A notable examples of onion sheds are found at Laundry Farm on the Shuttleworth Estate (HER 13391) and Model Farm (HER 13396) in the parish of Maulden.

Communication /Transport Evidence

Thirty-three of the post medieval assets relate to evidence for communications and transport networks and the majority of which relate to local trackways and roads, many associated with the re-organised post medieval landscape (for example the “old lanes” at Potters End, Woburn – HER 9606). Of note however within this category are the remnants of the turnpike roads, the Grand Junction/Union Canal and the railways.

The Bedfordshire Turnpike Trusts were set up for the main routes between about 1706 and 1827, each Trust maintained a series of toll or turnpike houses, only a small number of which survive today and none within the AS-A. As a consequence of the Turnpike roads a number of Bedfordshire’s towns on the major routes opened coaching inns, Biggleswade, on the Great North Road at one point had 15 coaches leaving a day. In truth the state of the roads maintained by the Trusts was exceptionally variable and the transportation of goods along these routes was a difficult and slow process.

Improvements in the county’s transport network came in 18th century with the construction of the Grand Junction/Union Canal (HER 11015) which clips the AS-A close to Leighton Buzzard, the canal which runs from London to Birmingham became a vital means of shipping coal and other material to the Midlands. It also subsequently proved vital to the movement of aggregates from Leighton’s sand quarries. Within the AS-A

other assets that relate directly to the canal comprise a swing bridge (HER 13770) and Leighton Lock (HER 13771).

The development of the railways in 19th century saw the gradual demise of the turnpike roads and canals as means of transporting goods. Three of the assets within this category relate to the railways, the first is the London and North Western Railway (LNWR, HER 11091) which passes through the AS-A south of Leighton Buzzard, the second is the now defunct LNWR branch line from Leighton Buzzard to Dunstable (HER 2436), and the third is the also defunct Bedford to Sandy Railway (HER 11833), which was opened in 1862 but closed just over a hundred years later.

Religious Houses and Buildings

Eight of the post medieval assets for the Woburn Sands Formation AS-A represent religious buildings or associated features (such as graveyards); in some respect the presence of even a small number of this type of asset should perhaps be a little surprising as in general most of the HER assets relating to religious buildings are located within urban centres or village cores and thus excluded from this study. However during the post medieval period and particularly in 18th and 19th centuries the rise of non-conformism resulted in a number of chapels being located away from the traditional centres of the community and this is represented within the AS-A. Two examples of non-conformist buildings within the AS-A are the Wesleyan Chapel in the parish of Everton, eastern Bedfordshire (HER 13600) and another Methodist Chapel at Millbrook (HER 3070).

Findspots

There are two assets that represent findspots, HER 13769 – a brick and tile scatter in Everton and HER 15833 – post medieval pottery found during fieldwalking in the M1 widening corridor. In both cases these assets could represent occupation sites but the information within the HER is so limited no further conclusions can be drawn.

Conclusions

The post medieval assets of the Woburn Sands Formation AS-A demonstrate that there was the wholesale reorganisation of the landscape on the Greensand Ridge during this period. Whether for creation of large (or indeed small) estates or to increase the agricultural potential of the area the post medieval landscape would have quickly become unrecognisable to those from the previous period.

Families such as the Russells (Dukes of Bedford), Snowes and latterly the Ongleys profited from the lands acquired by the great medieval monastic houses of the AS-A and went on to utilise and improve these assets. The Greensand Ridge may not be agriculturally as productive as the Bedfordshire river valleys and yet it became the seat of agricultural innovation led by the Dukes of Bedford. This is a tradition that continues today both on the Woburn Estate and at Shuttleworth which was turned into an agricultural college following the early death of Richard Shuttleworth in 1940.

Evidence for the antecedents of the modern sand and gravel industry are also unsurprisingly ever present within the AS-A, starting undoubtedly on a small, local level the quality and variety of the Woburn Sands would eventually lead to the large scale extraction at sites like Grovebury in 20th century, ironically in this case allowing for the almost total archaeological excavation of Grove Priory.

What is very clear from the post medieval assets within the Woburn Sands Formation AS-A is that any previous sense of marginality of the Greensand Ridge was dispelled during this period.

Modern Assets (1901 – 2050 AD)

There are seventy-five assets assigned to the modern period within the Woburn Sands Formation AS-A and they can be divided into evidence for military activity; industry and settlement/occupation.

Military Evidence

By far the greatest number of modern assets (fifty-two in total) relate to evidence for military activity and forty-nine of these specifically represent structures from the Second World War. The main source of evidence for the Second World War structures recorded on the Bedfordshire HERs is the Defence of Britain Survey initiated in 2002, largely compiled by volunteers the quality of the survey results are mixed and include both extant structures and alleged sites.

Within the AS-A there are perhaps two distinct areas of Second World War assets that present a picture of their purpose. The first is located around the RAF bases at Henlow (HER 9265) and Chicksands (HER 9275) on the central part of the Greensand Ridge and the second is around the small town of Potton at the eastern extremes of the study area. RAF Henlow (HER 9265) was formed as the No.5 Eastern Area depot in 1918 and still operates as base today. In addition to the base during the Second World War there was a decoy airfield (HER 17918) and numerous pillboxes (HERs 17865, 17902-17906, 17993 and 17994) were constructed should an extra line of defence be needed in the face of invasion. RAF Chicksands (HER 9265) less than four miles north-west of Henlow is situated on the site of Chicksands Priory (HER 375) and the later post medieval estate belonging to the Osborn family (HER 6992), it was acquired by the Crown in the early 20th century and began as a wireless station in the Second World War intercepting German messages, later becoming a US airforce base. It was still in use during the Cold War as a listening station and is a MOD intelligence security centre today.

The identification of Second World War assets located around Potton is in part because of work undertaken by a keen local volunteer and also because of the presence of an ammunition and fuel dump (HER 17969) at Deepdale and the army camp (HER 17978). In the areas surrounding Potton there are records for numerous pillboxes (including HERs 17962, 17964, 17970 and 17968) and one set of tank traps (HER 17958). One of the extant structures is an Air Raid Warden's post (HER 17959), similar in design to a pillbox the Potton post is now isolated in a small field behind a modern housing estate.

Other Second War World features of note include a the site of the "National Camp" at the Heath near Leighton Buzzard (HER 17919) which was built in 1939 to house mothers and children from towns liable to be bombed; an anti-aircraft battery at Cooper's Hill near Ampthill (HER 17811); the site of an Italian Prisoner of War Camp near Waterloo Wood in Sutton (HER 5112) and two sets of cropmark remains showing the location of searchlights (HERs 556 and 1637).

Industrial Evidence

Eleven of the modern assets represent evidence for industrial activity, the majority of which relate to 20th century sand quarries and these are mostly situated in the parish of Heath and Reach near Leighton Buzzard. They include Grovebury (HER 11141) and Shenleyhill Road (HER 11240), also within this category is the Leighton Buzzard narrow gauge railway (HER 11090). It was opened in 1919 to transport sand from the Double Arches Quarry to Grovebury where it was transferred to the standard gauge wagons of the LNWR. The line also took in Stonehenge Brickworks (HER 8452) and the Tile Works at Grovebury Road (HER 8449). It closed in 1967 when the Arnold plant was moved from Grovebury. It has subsequently been restored by a group of railway enthusiasts and serves as a pleasure line.

Settlement/Occupation Evidence

Twelve of the modern assets relate to settlement activity. They comprise locally interesting domestic buildings such as Stonhill (HER 16457) on the Billington Road, near Heath and Reach which is Grade II Listed and was designed E Turner Powell and the odd asset such as the K6 Telephone Kiosk (HER 15131) on the Woburn Estate (also a Listed Building).

Conclusions

The modern assets for the Woburn Sands Formation AS-A are dominated by the evidence for the Second World War activity and this a common factor across the aggregates study areas and county as a whole. The relics of the Second World War are an important part of Bedfordshire's history and the distribution of these assets within the AS-A, grouped around the two RAF bases and strategically located to offer some form of protection to important resources for the war effort demonstrate the very real fear of invasion. Whether any of the pillboxes or tank traps would have been an effective stop line is hard to tell. However the placement of the listening station at the relatively secluded once private grounds at Chicksands was a calculated manoeuvre, even today the base is well shielded from the county's arterial roads such as the A507 and the A600 and set back into the folds of the Greensand Ridge.

The small number of 20th century sand quarries and their associated railway around Heath and Reach and Leighton Buzzard demonstrate the importance this part of the Greensand Ridge had for the production of aggregates. Whilst the original Grovebury site is now restored, Grove Quarry to the north continues to produce a significant quantity of the county sands.

The River Great Ouse Aggregate Study

The Archaeological Resource

The River Great Ouse Aggregate Study Area (AS-A) covers approximately 99 square kilometres and includes both the river terrace deposits and the glacial sands and gravels. A search of the Bedfordshire HER identified seven hundred and sixteen assets which lay either entirely or substantially within the AS-A. The table below illustrates the breakdown of assets by chronological period. In Appendix 2b there are chronological tables listing the assets by which category they have been assigned to and information on whether the assets have been subjected to archaeological investigation, are designated or relate to aggregate extraction.

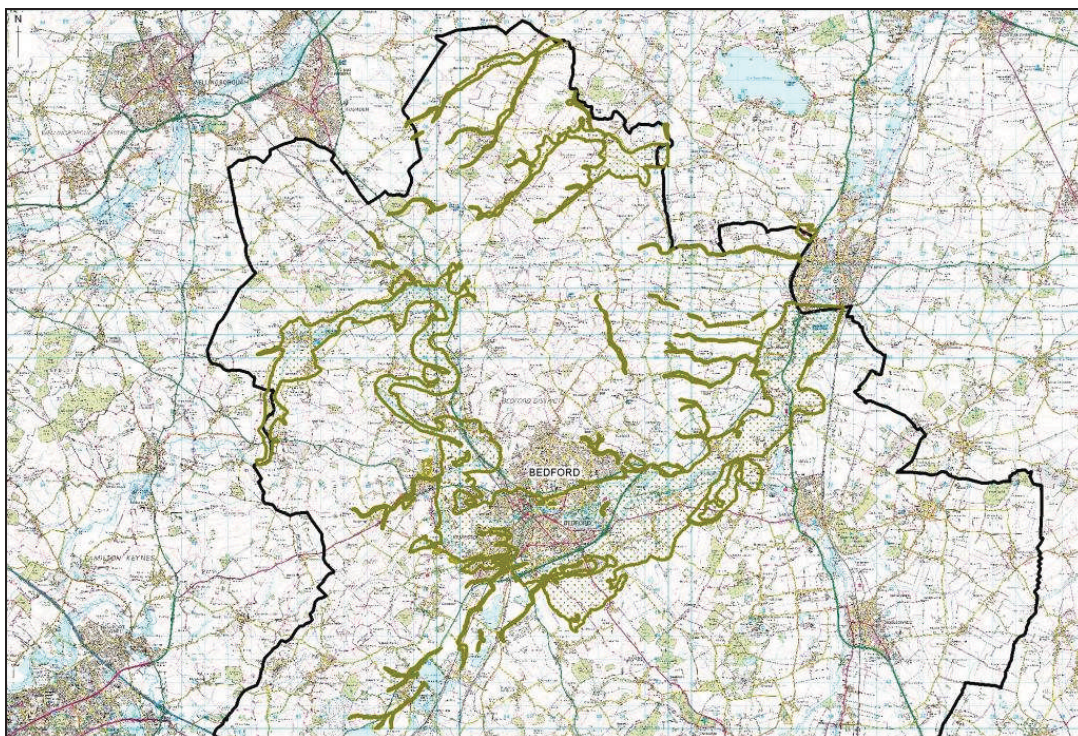


Figure 3: River Great Ouse AS-A Location Map

Table 10. River Great Ouse AS-A Assets

Type of Assets	Number Recorded	Number per sq km
Palaeolithic Assets	11	0.1
Mesolithic Assets	9	0.09
Neolithic Assets	22	0.2
Bronze Age Assets	75	0.7
Iron Age Assets	48	0.5
Later Prehistoric Assets	66	0.6
Roman Assets	83	0.8
Saxon Assets	23	0.2
Medieval Assets	107	1.1
Post Medieval Assets	240	2.4
Modern Assets	32	0.3
TOTAL	716	7.2

Palaeolithic Assets (900,000 – 10,000 BC)

There are eleven Palaeolithic assets recorded within the River Great Ouse AS-A, they all represent finds of flint artefact and seven of them are finds of hand axes. The finds were made in a variety of circumstances from antiquarian records of large assemblages of flint artefacts, mammalian and molluscan remains to single artefacts recovered during modern investigations.

The Great Ouse Valley around Bedford is notable for the density of Palaeolithic finds and the size of the assemblages; they represent the most substantial finds from this period in the whole Great Ouse river system (Wymer 1999, 123-125). The largest concentrations of finds were made in the mid 19th century at Biddenham by James Wyatt at Deep Spinney Pit (HER 327) and another gravel pit to the north of Bromham Road (HER 328). At Deep Spinney over three hundred hand axes were found along with cores, hand axe roughouts and flakes in association with mammal and molluscan remains. The nature of the assemblage suggests that hand axes were being made at the site. Wyatt described the artefacts and other material as being found *in situ* at the base of the gravel deposits at a depth of c.7m. A reinvestigation of the site in 1986 confirmed the context of the finds was as described by Wyatt (Harding et al 1991). The other asset at Biddenham (HER 328) is slightly to the north of Deep Spinney and produced around seventy hand axes. There have been other finds of Palaeolithic material from the Great Ouse Valley around Biddenham Loop (HERs 253 and 257), unfortunately information about the circumstances of their discovery and the nature of the assemblages are not available. Two further hand axes were found during archaeological investigations in advance of development on Biddenham Loop (HER 1476). These finds were made from the modern ground surface, but rather than indicating the possibility that Palaeolithic material can be found at this level it is likely that these artefacts had been removed from their original context within the gravels as part of small scale post medieval quarrying and redeposited on the modern ground surface within the upcast from the quarries (Luke 2008). One of the hand axes may be of a Middle Palaeolithic form.

The molluscan evidence from Deep Spinney suggests a temperate (interglacial) environment at the time when the flint artefacts were deposited (Harding et al 1991, 87). There is no direct evidence for the dating of the site. Wymer (1999, 123) notes that the finds come from Terrace 3, the highest terrace in the Great Ouse Valley, and that they were found directly above the Oxford Clay taken to be of Anglian age so they must post date the Anglian cold stage. It has been suggested that the Deep Spinney finds date from either ISO 11 (Hoxnian Interglacial 427,000 – 364,000 BP) or ISO 9 (334,000 – 301,000 BP) (Wymer 1999, 123).

Other finds of Palaeolithic material have been made from the east of Bedford. Twenty hand axes were found at Harrowden in the 19th century (HER 622), and a single hand axe was found at Eastcotts (HER 683). Both these assets come from the valley of the Elstow Brook, a tributary of the Great Ouse. However, although the circumstances of these of these finds are obscure they do suggest that the gravels deposits in this area have the potential to contain important Palaeolithic remains.

A similar situation applies to the Octagon Farm area. Here two hand axes associated with faunal remains were found during 19th century railway construction at Summer House Hill (HER 572). Two hand axes (HER 1480) and a knife (HER 586) were found

during fieldwalking at Octagon Farm, these reasons for their occurrence within the modern ploughsoil may be same as the finds from Biddenham Loop.

Beyond the areas immediately to the east and west of Bedford, Palaeolithic assets are rare, comprising two finds from Roxton; a hand axe (HER 8801) and a core (HER 15901). Both these finds are surface finds.

Conclusions

The part of the Great Ouse Valley AS-A around Bedford has produced major finds of Palaeolithic material including, at Deep Spinney, a site where the finds are *in situ*. They are a clear indication that the gravel deposits in this area have a very high potential for producing further Palaeolithic deposits of national importance. The prolific nature and importance of these deposits is reinforced by finds from Kempston (e.g. HER 256) to the south and east of the river which are of a similar scale and quality to those from Biddenham (Wymer 1999, 123). These finds are outside the AS-A as defined by the project because they are in the present urban area of Kempston, but they are likely to come from the same Terrace. Although the sites from the east of Bedford are not as prolific as those from Biddenham and Kempston they suggest that similar deposits may also exist in this part of the AS-A.

All the major finds date from the 19th century when gravel was extracted by hand digging making the identification and collection of individual artefacts and ecofacts easy, a process doubtless stimulated by the interest of antiquarians such as Wyatt. In the 20th century the mechanisation of aggregate extraction has made the identification of Palaeolithic finds and deposits much more difficult. There has been little or no modern extraction in the area of the Biddenham and Kempston finds, but to the east of Bedford there has been extensive quarrying in areas such as Octagon Farm where earlier finds of Palaeolithic material have been made. In spite of attempts to identify and record Palaeolithic remains in the Octagon Farm quarry no new finds have been made (see Mitigation section of this report).

It seems unlikely that all the gravel deposits that have produced important Palaeolithic remains were worked out by the end of the 19th century, so the expectation must be that more of these gravel deposits and their Palaeolithic content survive in the area around Bedford. However, the exact deposits containing the Palaeolithic material have never been fully defined so we cannot predict where they are located or their extent. Therefore, neither is it possible to identify aggregate extraction proposals that will impact on potentially nationally important Palaeolithic remains. As a matter of urgency work needs to be done on both archaeological material in museum collections, particularly Bedford Museum, to better understand the nature of existing finds and on the geological context of those finds as well as the geology of the gravels in Great Ouse Valley in order to develop useful predictive models for where *in situ* Palaeolithic deposits are likely to be found. A structure for interpreting artefacts that do not come from *in situ* deposits also needs to be developed.

The question of whether there are Palaeolithic deposits in the rest of the River Great Ouse AS-A also need addressing. There have been no recorded finds from north and west of Biddenham and to the east of Willington only two artefacts have been found at

Roxton. Does this reflect a real distribution of finds and deposits? If so why are they concentrated immediately to the east and west of Bedford? Is it that there are a particular set of geological conditions which preserve the remains or were there a set of Pleistocene climatic and environmental conditions that made this area particularly attractive to hominid groups? Alternatively were these finds purely the result of the presence of antiquarians with an interest in the Palaeolithic who were able initially identify the importance of the finds and then encourage the gravel pit workers to make and report further finds. These questions need to be answered in order to understand the nature of the undoubtedly important Palaeolithic resource in the AS-A so that it can be properly managed in the face of future proposals for aggregate extraction.

Mesolithic Assets (10,001 – 4000 BC)

There are nine Mesolithic assets for the River Great Ouse AS-A and they all represent lithic material. Seven of these assets represent collections (over 10 objects) and the other two are isolated flint artefacts. Eight of the assets form part of collections that are recorded on the HER as containing Neolithic and Bronze Age material (HERs 594, 617, 1476, 1480, 8802, 14844, 15459 and 16471).

The distribution of these assets indicates three areas of activity. The first of these is to the west of Bedford (HERs 1476, 15459, 15982 and 16471). Field artefact collection within Biddenham Loop (HER 1476) identified eight concentrations of Mesolithic to Early Neolithic flint material (Luke 2008, 19). The assemblage included cores, core fragments and hammer stones suggesting flint working was taking place at some of the sites. Other struck flints included microliths, blades, a range of retouched pieces, arrowheads and scrapers. Four of them were subject to some form of intrusive investigation but none of them produced any sub-surface features. A number of Mesolithic flint artefacts were recovered during the excavation of later features, including a pick from a tree throw; it has been suggested that Mesolithic picks were used in woodland clearance (Luke 2008, 19). On the basis of the flint assemblages concentrations have been identified as representing a range of activity within landscape from limited activity locations through short term/ seasonal residential locations to multiple occupation sites (Luke 2008, 78). All the concentrations were located on the edge of the river terrace overlooking the river. The interior of Biddenham Loop may have been wooded making the terrace edge locations ideal for the exploitation of resources from two distinct environments: the river below the terrace and woodland of the interior (Luke 2008, 19). The other three assets from the area west of Bedford are a small collection of lithics (less than 10 objects) (HER 15459) and isolated finds (HERs 15982 and 16471). Their size mean that the nature of the activity these assets represent cannot be determined, however they do come from river terrace edge locations similar to the Biddenham Loop sites.

To the east of Bedford collections have been at Octagon Farm (HER 1480) and Dairy Farm (HER 594). At Octagon Farm a collection of artefacts was recovered during fieldwalking from the floodplain of the Great Ouse and its tributary the Elstow Brook. The assemblage included blades, but the character of the assemblage is ill defined suggesting that the collection represents off-site activity within the landscape rather than activity foci. The Dairy Farm collection, found in fieldwalking and trial trenching, comes from the terrace overlooking the river.

Roxton, close to the confluence of the rivers Great Ouse and Ivel in the north east of the county, is the third area where Mesolithic assets are located. Roxton Quarry (HER 617) produced an excavated Mesolithic collection from the site of a Bronze Age barrow cemetery. It came from the terrace above the floodplain at the conjunction between terrace gravels and glacial clays. The assemblage included blades and blade cores; it was interpreted as a possible habitation site (Taylor and Woodward 1985, 108 and 139). Roxton Quarry Extension (HERs 8802 and 14844), immediately to the north of Roxton Quarry, produced a collection of Mesolithic material. The nature of the assemblage is not well recorded so it is difficult to characterise it. In topographical terms, although close to the river, it is not possible to tell whether the material came from the floodplain or the terrace above the river.

Conclusions

The Mesolithic assets within the River Great Ouse AS-A typically but not exclusively come from terraces over-looking the river, this is one of two common locations found in Bedfordshire (Luke 2007, 26). An exception is at Octagon Farm where the evidence suggests that the floodplain was also used though whether this activity represents occupation or just broader use of the landscape is not clear. Most of the Mesolithic assets are individual sites, but a Biddenham Loop where eight concentrations were found it is possible to see how Mesolithic communities may have exploited and lived in the landscape. Although the individual concentrations cannot be placed in a chronological sequence so there is no indication of intensity of the activity through time, Biddenham Loop does present a picture of an both an extensive and potentially intensive use of the river landscape than is presented by the individual and isolated sites that make up the other assets for this period.

With two exceptions, all the Mesolithic sites in the AS-A have been found in archaeological investigations. This means that the distribution site largely reflects archaeological activity rather than reflecting the use of the landscape by Mesolithic groups. It is probably safe to assume that as a favoured environment, the River Great Ouse was used by Mesolithic groups throughout its area and throughout the period and that a network of seasonal or temporary hunter-gatherer sites existed within the AS-A. The density of such sites within a given area is shown at Biddenham Loop. These are only likely to be detectable through surface artefact collection and are unlikely there are unlikely to be any subsurface features relating to the artefact scatters. This should be borne in mind when considering future proposals for aggregate extraction and appropriate evaluation and mitigation strategies put in place to deal with assets from this period.

Neolithic Assets (4,001 – 2,350 BC)

There are a total of twenty two Neolithic assets for the River Great Ouse AS-A. They can be divided into two types: evidence for settlement/occupation and evidence for ritual/ceremonial/burial.

Settlement/Occupation Evidence

There are a total of thirteen assets representing evidence of settlement or occupation. Eight of the assets relate lithic artefacts, four of the assets represent lithic collections (over 10 objects) and all have been found with either Mesolithic or Bronze Age material and in some cases both (HERs 594, 617, 1387, 15459 and 16471). The other lithic finds represent either single objects or small collections of less than 10 items (HERs 1867, 14781, 15911 and 15917). There are also four assets comprising excavated settlement/occupation remains including pits and pit cluster, ditches and post holes (HERs 1476, 7030, 14844 and 15853).

The distribution Neolithic settlement/occupation assets show suggests three areas of activity. At Biddenham Loop (HER 1476), to the west of Bedford, evidence for settlement/occupation included both collections of artefacts from fieldwalking and excavated features. It was not possible to distinguish a clearly Neolithic element in any of the flint scatters at Biddenham Loop. It is assumed that the range of activities present in the Mesolithic continued into the Earlier Neolithic (Luke 2008, 20). Fourteen of the struck flint concentrations from within Biddenham Loop contained material from the later Neolithic to Early Bronze Age. The assemblages contained relatively few diagnostic tools but did include quantities of flakes, cores and retouched pieces suggesting that flint working was occurring in many of the concentrations (Luke 2008, 80). The concentrations were spread throughout the Loop in contrast to the terrace edge locations of the Mesolithic concentrations. The activities represented by the concentrations ranged from limited activity locations (two) through short permanent/seasonal residential locations (six) to long permanent residential locations (six) (Luke 2008, 80).

The excavated evidence for Neolithic settlement/occupation at Biddenham Loop consisted of twenty two small pits usually occurring in small groups. The pits contained a range of material including Peterborough Ware pottery, struck flints, animal bone, charred wood and hazel nuts. These pits are thought to represent occupation, possibly of a sporadic or specialised nature (Luke 2008, 21). Generally the pits were found away from the flint concentrations or occasionally on their edge (Luke 2008, Fig 5.1). The remains of Neolithic occupation within Biddenham Loop seem to represent an intensification in the use of the landscape with more occupation sites of greater permanence.

On the west side of the Great Ouse, opposite Biddenham Loop at Kempston Bury (HER 7030) two Late Neolithic/Early Bronze Age pits were excavated. They would appear to fit into the pattern of small groups of pits of this date spread across the landscape that has been identified within Biddenham Loop. A collection of lithics was found east of the river at Hill Ground, Kempston (HER 15459).

The second group assets representing Neolithic settlement/occupation is from the east of Bedford. At Manor Farm Harrowden (HER 15853) a cluster of Neolithic pits was excavated on the line of the Bedford Southern Bypass. They were located on the terrace overlooking the Elstow Brook, a tributary of the Great Ouse. A collection of flint artefacts was recovered from a similar topographical position at Dairy Farm (HER 594). A further collection was found at Octagon Farm (HER 1480) from the floodplain between Great Ouse and Elstow Brook.

The final group of assets representing Neolithic settlement/occupation are from the area of the confluence of the Great Ouse and Ivel around Roxton and Tempsford. The evidence from Roxton Quarry (HER 617) is equivocal in that it consists of leaf shaped and transverse arrowheads and it is possible that these finds do not represent either settlement or occupation and might be better grouped with the single objects and small collections. Immediately to the north at the Roxton Quarry extension (HER 14844) a collection of flint artefacts were found together with a ditch and post hole of Late Neolithic to Early Bronze Age date were found; although the site is not published so it is difficult to be categorical about its character. The Barns, Tempsford lies on the east bank of the river to the north east of the Roxton sites. The flint scatter from this site (HER 1387) comprised mostly flakes and cores; it was interpreted as an initial extraction and tool production site rather than domestic occupation.

Ritual/Ceremonial/Burial Evidence

There are nine assets within this category for the Neolithic. They relate to cropmark and excavated evidence for ritual or ceremonial monuments, funerary monuments and burials. There are two groups of early features from Biddenham Loop and Octagon Farm. At Biddenham Loop (HER 1476) mortuary enclosures and hengiform monuments and mortuary enclosures have been identified. The hengiform monuments have been dated by C14 dating to the Early Neolithic (M Luke pers. comm.) in contrast to the generally accepted Late Neolithic/Early Bronze Age date for Bedfordshire. At Octagon Farm (HER 1480) there are five mortuary enclosures some of which have an unusual "paper clip form". They are located on gravel islands in the floodplain between the Great Ouse and Elstow Brook on alignments that follow the courses of palaeochannels (Malim 2000, 75-76).

Chronologically the next monument is the cursus at Octagon Farm (HER 1480). Only the eastern end of the cursus is known from cropmarks, its course is inferred from the alignment of ring ditches thought to be associated with it (Malim 2000, 75-79). The HER records two other assets that may be possible cursuses in the AS-A, although the evidence is far from conclusive. At Kempston (HER 1475) the cursus was identified from a 90m length of ditch excavated within a gravel pit in 1936 (Thomas 1964, 18). A Late Neolithic Beaker vessel was recovered from the ditch and a crouched inhumation was recorded from close by. No other evidence for this monument has subsequently been identified. The second possible cursus has been identified from cropmarks to the south of Willington (HER 1861). It is from an extensive complex of cropmark enclosures dated to the Iron Age and Roman periods and the feature identified as a cursus may actually be a part of ditched trackway.

There are four assets representing Late Neolithic/Early Bronze Age ring ditches and mortuary enclosures in the AS-A. Cropmarks and excavation evidence have identified three oval enclosures at Biddenham Loop (HER 1476), they may be the ploughed remains of oval barrows or mortuary enclosures (Luke 2008, 21-23), although one of the monuments is substantially larger than the others and may at one stage been a long barrow (Luke 2008, 23). Oval enclosures and ring ditches were also found at Octagon Farm (HER 1480) where they were associated with the cursus. Further ring ditches were found at Octagon South (HER 586) and Plantation Quarry (HER 337). Also at Plantation Quarry a square enclosure was excavated, it contained a single central human burial dated to the second half of the fourth millennium BC (Dawson 1996, 4-11). At Biddenham Loop two rectangular, possibly mortuary enclosures were identified as cropmarks and weak geophysical anomalies. One of the rectangular enclosures is compromised by an oval barrow, although the relationship between the two monuments is not apparent from the evidence available.

South of Octagon Farm a causewayed enclosure has been identified from aerial photographs (HER 585). It comprises three concentric circuits of interrupted ditches located on a gravel island between two palaeochannels.

At Biddenham Loop there is a single Late Neolithic/Early Bronze Age shaft was excavated in proximity to one of the oval monuments. It contained a possible ritual deposit consisting of an auroch horn core and other large bones from domestic cattle. The shaft was truncated by a Bronze Age ring ditch.

The Neolithic ritual/ceremonial/burial assets within the River Great Ouse AS-A occur in two groups at Biddenham Loop and around Octagon Farm in what might be described as ritual/ceremonial landscapes or complexes. At Biddenham Loop the assets all occur within an area tightly defined by the river meander. It also contains a relatively restricted range of monuments: oval enclosures/barrows, ring ditches, rectangular (possible mortuary enclosures) and a shaft. In the Octagon Farm area the ritual/ceremonial/burial monuments occur over a much wider area, some 6km east – west by 3km north – south. The area is not topographically constrained as it is at Biddenham Loop, spreading across the floodplain of the Great Ouse and Elstow Brook and on to the terraces above the flood plain; although the core of the monument complex is clearly located between the River and the Brook. In fact it should be seen as including assets that are outside the AS-A as defined by this project but which are topographically and geologically part of the Great Ouse. At Goldington to the north of the river a henge monument and triple ring ditch both of which are firmly dated to the Neolithic have been excavated (Mustoe 1988). The Octagon Farm complex is the largest in the Great Ouse valley (Luke 2007, 31) and contains a wide range of monuments including a causewayed enclosure, cursus, henge, rectangular mortuary enclosure, oval enclosures, ring ditches and unusual forms of enclosure (paper clip enclosures). The scale and complexity of this complex suggest that it provided a focus for ritual/ceremonial activity in the Neolithic over a long period and for a community or communities from a wide area.

Conclusions

The Neolithic period in the River Great Ouse AS-A is dominated by ritual and funerary monuments, with two concentrations to the east and west of Bedford. They reflect the investment of communities in large ceremonial monuments at a time when the first organised and settled communities were being established. Although much of the evidence for these monuments comes from excavation most of them were first identified through aerial photography. This may mean that the recorded distribution of monuments with none of them apparently to be found north of Biddenham or east of Willington may be real and not the product of location of archaeological investigation. This apparent concentration of monuments to the exclusion of other parts of the AS-A needs further exploration, particularly as the some of the large numbers ring ditches attributed to the Bronze Age could in fact be late Neolithic in origin. If this is the case it would extend the ceremonial use of the landscape beyond its currently defined core area.

Although both the concentrations of monuments to the east and west of Bedford can be considered ritual complexes or landscapes they are different in character. At Biddenham Loop the complex covers a smaller which is tightly defined by the river meander and contains a more limited range of mainly smaller monuments. Octagon Farm on the other hand covers a much larger area of landscape, on both sides of the Great Ouse and ignoring natural features such as streams that might provide natural boundaries to the complex. It also includes a wider range of monuments some of which: the cursus and causewayed enclosure are on a large scale. Although dating of these monuments is not precise enough to establish which ones were in use at the same time, it is clear that they were in use during the same period. At present there is no explanation for the differences between the two monument complexes. It is possible that they served different functions for the same community. Or it is possible that if they had different functions that the functions were specific to different communities distinguished either geographically or by some other bond of organisation or kinship. Other monument complexes exist in other parts of the Great Ouse valley beyond Bedfordshire (Malim 2000). The relationship of the two monument complexes to each other and to the communities they served expressed through the contemporary settlement pattern needs to be explored.

The evidence for Neolithic settlement is much more ephemeral taking the form of either surface scatters of flint artefacts or excavated evidence for small groups of pits. All the most substantial evidence for Neolithic settlement, of both types, comes from archaeological investigations, so its distribution is heavily biased towards areas that have seen archaeological activity. Given the nature of the remains it is unlikely that they will be found through aerial photography or geophysics. They are most likely to be found in fieldwalking or when large areas of sites are stripped for excavation; it is even difficult to identify Neolithic settlements in trial trenching.

There is also a presently a strong correlation between Neolithic settlement and ceremonial/ritual monument complexes. This is partly a function of how the sites were found in archaeological investigations, although it is also a reflection of how settlement and ceremonial activity were integrated in the landscape, even if they were not occupying exactly the same space. It is an important question as to how extensive Neolithic settlement was outside the monument complexes, was it that in generally the landscape

of the AS-A was fairly empty beyond the areas around the monuments where settlement was concentrated or was contemporary settlement spread widely throughout the river valley with the monument complexes forming a focus for communities spread over a wide geographical area. The extent and nature of Neolithic settlement is an important area for future research and with the difficulty of identifying such sites, it needs to be given serious attention in the consideration of future development proposals and appropriate investigation techniques need to be adopted to provide the best chance of the identifying the sites.

Bronze Age Assets (2,351 – 700 BC)

There are a total of seventy five Bronze Age assets within the River Great Ouse AS-A. They can be divided into three types: evidence for settlement/occupation, evidence for ritual/ceremonial/ burial, land use/agriculture/land division and findspots. The distribution of Bronze Age assets demonstrates the presence of activity across the whole AS-A during this period.

Settlement/Occupation Evidence

There are seven assets within the AS-A that represent settlement/occupation evidence plus five other assets where settlement evidence is also found within assets relating to ritual/ceremonial/burial activity (HERS 594, 618, 1476, 1480 and 14844). Four of these assets represent or include lithic collections (comprising 10 objects or more), all of these collections also contain Neolithic flint material and in some cases Mesolithic material as well and there are three assets single items or small collections of lithics (less than 10 objects). Six of the assets represent or include excavated evidence for settlement/occupation. They occur in three geographical groups: west of Bedford, east of Bedford and around the confluence of the Great Ouse Ivel in the north east of the county.

In the area to the west of Bedford the main concentration of evidence settlement/occupation evidence has been found at Biddenham Loop (HER 1476). Fourteen flint scatters were identified during field artefact collection, they represent a range of activity: permanent occupation, limited activity sites and non-site activity (Luke 2008, 31) and are distributed throughout the interior of the area enclosed by the river meander not just on the edge of the terrace suggesting extensive woodland clearance possibly as a result of agricultural intensification and an increase in population. The five scatters interpreted as long term or permanent occupation are all located within the interior of the Loop. No sub-surface features were found beneath any of the flint scatters. Four pits dating to the Early Bronze Age were found during excavations at Biddenham Loop (Luke 2008, 31). They were dated by ceramic finds (Collared Urn and Beaker) and one pit produced a radiocarbon determination of 1910 – 1670 cal BC (95% probability). Ecofacts from the pits including grains of wheat and barley, straw and bones of cattle pig and sheep indicate a mixed farming regime during their period of use. Hazel nuts from these pits and faunal remains from a ritual pit within the Loop also show that wild resources were being exploited at the same time (Luke 2008, 31). The absence of obvious domestic settlement or structural features other than the small number of pits may be a reflection of the ephemeral nature of structures during the period, which are susceptible to truncation by ploughing and, therefore, do not survive well.

Two area of Late Bronze Age/Early Iron Age settlement have been identified at Biddenham Loop (Luke 2008, 34). The settlements appear to have been open in character and comprised a round house, two- and four-post structures, small pits, water pits, hearths/ovens and possible fence lines. There is evidence for the cultivation of wheat and barley from the settlements as well as crop processing (Luke 2008, 38). The animal bone assemblage is too small to allow inferences about animal husbandry to be made. Environmental evidence points to periods of scrub regeneration over parts of the

area which may have been linked to grazing and the presence of isolated water pits away from the settlements may also indicate open grassland. Luke (2008, 38) suggests that the floodplain was used for pasture during the greater part of the year with stock being moved on to the higher ground of the interior of the Loop during the wetter seasons of the year (winter).

The other evidence for Bronze Age settlement from the area west of Bedford comprise flint collections from Clapham (HER 15459) and Kempston (16471) and lengths of ditch described as boundary ditches from Windmill Hill (HER 1867) and Mushroom Hill (HER 9085) both in Bromham. The dating of these sites is not specific within the Bronze Age and it is difficult to draw any conclusions from these finds as they are limited in scale and extent.

In the area to the east of Bedford there are three assets providing evidence for Bronze Age settlement/occupation at Octagon Farm (HERs 586 and 1480) and Dairy Farm (HER 594). The Octagon Farm evidence consists of two assets representing collections of flint artefact (10 or more objects) found in the floodplain. At Dairy Farm pits have produced pottery and flint artefacts dating to the Early Bronze Age; with similar material being recovered from tree throws. A Late Bronze Age dispersed settlement has also been identified at this site, possibly comparable to that found at Biddenham Loop.

The third group of settlement/occupation assets is from the eastern part of the AS-A from Great Barford, Roxton and Tempsford. At Great Barford (HER 604) a cluster of Bronze Age pits were identified in a field evaluation. Evidence for Early Bronze Age settlement at Roxton Quarry (HER 617) was in the form of post holes sealed beneath the mounds of round barrows and in a substantial collection of flint artefacts (Taylor and Woodward 1985, 108). The post holes probably represented fences and huts, but none of the post holes had any artefacts associated with them, all the flints were residual in the fills of the barrow ditches. Taylor and Woodward (1985, 110) suggest that the settlement was transitory and temporary in nature because it was in a marginal area susceptible to flooding. Roxton Quarry Extension (HER 14844) also produced structural evidence of Late Bronze Age - Early Iron Age settlement in the form of ditches, pits and post holes. A flint scatter at The Barns, Tempsford (HER 1387) was interpreted as an extraction site where initial working of the flint took place.

Ritual/Ceremonial/Burial Evidence

There are sixty five assets within this category for the Bronze Age. All of them include cropmark or excavated evidence for ring ditches. Ring ditches are generally interpreted as the remains of Bronze Age burial mounds or barrows where the central mound has been reduced as a result of later agricultural practices such as ploughing. The ring ditches are distributed throughout the AS-A. They occur either singly or are in groups numbering between two and six. Groups of ring ditches are found at the two monument complexes identified for the Neolithic within the AS-A: Biddenham Loop and Octagon Farm.

At Octagon Farm the ring ditches (HERs 337, 480, 586, 1478, 1480, 1618, 14455, 15009 and 16720) include single and multiple ditched examples. They are associated with the Neolithic cursus and mortuary enclosures (HER 1480), in fact some of the ring

ditches may have had origins in the Neolithic such as the excavated example from Plantation Quarry (Dawson 1996, 11-15). From the location of the ring ditches it is clear that at least some of them were constructed in deliberate relationships to the existing monuments. For example a ring ditch was built over the eastern end of the cursus, and it is possible that four other ring ditches were located on the conjectural line of the cursus. In another instance a ring ditch was built to block one of the entrances of a mortuary enclosure (Malim 2000, 78). The relationships between the Neolithic monuments and ring ditches strongly suggest that the earlier monuments were still clearly visible in the landscape and their ritual/ceremonial significance was still understood and appreciated by the builders of the ring ditches. However, the fact that a ring ditch was used to block the entrance to an earlier mortuary enclosure may suggest that ring ditches might represent a new ritual/ceremonial activity or function and that such a change needed to be marked by closing off monuments of a previous rite by constructing the newly dominant ring ditches.

Cropmark and excavation evidence from Biddenham Loop (HERs 1476, 1863 and 7357) has identified twenty ring ditches (Luke 2008, 24). They form three clusters of ring ditches or cemeteries each focused on an earlier Neolithic monument. The cemeteries are located above the floodplain but away from the centre of the Loop and each individual barrow would have been visible from the river. Although not uniform in composition the cemeteries do have some similarities in that they all included a double ring ditch and southernmost monument was the smallest in the cluster. That earlier monuments acted as a focus for the barrow cemeteries suggest that they were still visible in the landscape and may have been associated with ancestors of the family group buried in the ring ditches (Luke 2008, 24). Recent and unpublished excavations suggest that some of the ring ditches originally characterised as Bronze Age round barrows may in fact be Neolithic hengiform monuments (M Luke pers comm).

A cemetery consisting of five ring ditches located in the floodplain was excavated at Roxton Quarry (HER 617). The ring ditches were set out in two alignments with the south easternmost monument at the apex of the alignments. The barrows were constructed in two phases with the first phase barrows having primary or secondary burials while those from the second phase did not appear to have any associated burials (Taylor and Woodward 1985, 111).

The location of ring ditches throughout the AS-SA appears to have been carefully chosen to ensure that they were prominent and visible in the landscape. The nature of the visibility may have been relatively localised, for instance at Biddenham Loop where the monuments would have dominated the landscape within river meander but may not have been so visible from outside it. Elsewhere two single ring ditches at Radwell (HERs 733 and 755) were situated in the edge of the gravel terrace and would have been visible from along the river corridor and another ring ditch at Sharnbrook (HER 15045) was built on the upper slopes of the river valley, overlooking the valley and would have been visible for considerable distances up and down stream.

There are three assets for Bronze Age burials within the AS-A not within ring ditches. Cremations were identified during top soil stripping at Dairy Farm Quarry in 2009 (HER 594). No dateable evidence was recovered with the cremations but the proximity of the cremations to a ring ditch/barrow indicates that these may be Bronze Age in date (Cambridge Archaeology Unit pers. comm.). Two pits containing five crouched burials were found at Octagon Farm Quarry (HER 1480). These burials were located twelve

meters to the east of a ring ditch. One of the pits contained a Beaker vessel suggesting an Early Bronze Age date for the pits (Lisboa 2008, 9).

At Biddenham Loop (HER 1476), excavations uncovered four Early Bronze Age cremation burials there did not appear to be any association with the ring ditches (Luke 2009, 28). Late Bronze Age burial activity was also recorded at Biddenham in the form of two cremation burials. Eight pits containing quantities of unidentified bone were also recorded and possible 'token' burials were recorded in eight water pits (Luke 2009, 33-34). These burials were located between the dispersed settlement and a Late Bronze Age pit alignment (HER 1476). Four pits were also recorded at Biddenham Loop which contained possible Bronze Age ritual deposits (HER 1476). Flint, pottery vessels and a cow were recovered from these pits. The depositional evidence indicates that these pits were infilled in a very short period of time (Luke 2008, 29). Pits containing deliberate deposits of flint, Beaker or Grooved Ware were also recorded at Dog Farm Quarry, Willington (HER 1618).

Land Use/Agriculture/Land Use Evidence

Five assets represent Bronze evidence for Bronze Age land use and management in the AS-A, they are all form part of assets which also include evidence for settlement or ritual activity. Three of the assets are pit alignments although only one them is securely dated. The dated alignment was located to the south of the dispersed settlement at Biddenham Loop (HER 1476). It extends over 1km across the Loop, from the eastern to the western river banks which had the effect of cutting off an area of land at the southern end of the meander (Luke 2008, 32-33). A further unexcavated pit alignment was identified within the loop to the south. A 300m section of the pit alignment was excavated, five of the pits contained distinctive non-primary 'special' deposits, including pig and pike skeletons (Luke 2008, 32-33). This pit alignment may have represented a symbolic boundary and may have denoted land ownership boundaries or demarcated different resource zones. Cropmarks of other pit alignments have been identified within the AS-A at Red Barn, Felmersham (HER 547) and Marsh Farm, Carlton (HER 15017). However, the date and function of these alignments can not be determined without further investigation.

There are two assets representing evidence of Middle Bronze Age field system, within the AS-A. Investigations at Dairy Farm Quarry (HER 594) identified ditches which may form part of a Middle Bronze Age co-axial field system. Investigations at Biddenham Loop (HER 1476) recorded two separate areas of Middle Bronze Age fields (Albion Archaeology 2009, 3-4). This pit alignment was situated on a different orientation to the earlier Middle Bronze Age field systems but ran diagonally across a gap between the two systems. This may indicate fields relating to two different community groups (Mike Luke pers. comm.). These field systems respected the earlier monument complexes. Ecofactual evidence recovered from the Bronze Age features at Biddenham Loop indicated that a mix of stock and arable farming was being undertaken in the area during the Bronze Age (Luke 2008, 31)

Findspots

The River Great Ouse AS-A has three assets representing findspots. All of them are for single finds of bronze artefacts, two spearheads (HERs 14781 and 15918) and a socketed axe (HER 15964). Given the density for Bronze Age activity in the AS-A the dearth of bronze artefact finds is perhaps surprising, particularly in the light of increased reporting of metal artefacts found by metal detectorists as a result of the Portable Antiquities Scheme; however, it does fit into the situation that exists in the rest of Bedfordshire where relatively few Bronze Age bronze artefacts are known (Oake 2007, 10).

Conclusions

On the basis of the distribution of a large number of ring ditches throughout the AS-A it would appear that the River Great Ouse was densely occupied in the Bronze Age. However, the distribution of settlement evidence does not match that of the funerary monuments. This is probably a function of how the types of site are recognised. Ring ditches are very susceptible to detection by aerial photography while settlement sites are mainly found through surface artefact collection or intrusive excavation. This means that the bulk of settlement evidence is concentrated where there have been archaeological investigations whereas the distribution of ring ditches is closer to a real distribution of this class of site and a reflection of contemporary use of the landscape in the AS-A.

The two monument complexes at Biddenham Loop and Octagon Farm continue to be foci of activity with the construction of numbers of ring ditches, often in relationships to the Neolithic monuments such as the cursus at Octagon Farm and mortuary enclosures at Biddenham Loop. This suggests both a continuity of function and continued visibility of the earlier monuments that were still valued by the Bronze Age communities. However, the distributions of ring ditches throughout the River Great Ouse either as individual monuments or cemetery groups (Roxton Quarry), suggest that the funerary monuments were also important to local communities and it was not necessary to focus all ritual or ceremonial activity at one or two specific locations.

Evidence for Early Bronze Age settlement is similar to that for Neolithic settlement: surface scatters of artefacts and small groups of pits. There is also a close association between the funerary monuments and settlement clearly seen at Biddenham Loop and Roxton Quarry, although the two activities do seem to have been spatially exclusive. If, as has been observed in the excavated examples, Bronze Age settlement frequently existed close the funerary monuments that served the community then wherever a ring ditch is found it could be expected that there will be settlement evidence nearby. This correlation is one that needs to be explored and taken into account when development proposals affect known ring ditches.

In the later Bronze Age the nature of settlement changes and, as at Biddenham Loop, evidence for round houses, four post structure and other domestic structures are found. Although at Biddenham and Dairy Farm they are found in the same area as funerary monuments the correlation between the two is far less sure, as most of the ring ditches date to the Early Bronze Age, although the monuments which originally had mounds

would have been visible in the landscape and could have provided the focus for a community even if they no longer performed their funerary function. The Middle and Late Bronze Age also sees the first evidence of major land division and allotment. Middle Bronze Age field systems have been found at Biddenham Loop and Dairy Farm. Pit alignments also become a feature of the landscape. They seem to be constructed to cut off or areas of land but may have had a symbolic function rather than form part of agricultural land allotments.

The picture of the River Great Ouse AS-A in the Bronze Age is one of occupation throughout the area. In the early Bronze Age there is substantial evidence of funerary activity which often appears to be associated with settlement. In the later part of the period the archaeological evidence suggests that the nature of settlements changed and there is was an increasing emphasis on organisation in the landscape with the appearance of field systems and pits alignments dividing up the landscape.

Iron Age Assets (701 BC – 42 AD)

There are forty eight assets for the Iron Age from within assets for the River Great Ouse AS-A. They are broadly distributed throughout the AS-SA but there are concentrations of assets in the valley to the east and west of Bedford. The assets have been divided into the following categories: evidence of settlement/occupation, ritual/ceremonial/burial/, land use/agriculture/land division and findspots.

Settlement/Occupation Evidence

There are twenty one assets representing Iron Age settlement/occupation activity within the AS-A. Ten of the assets represent evidence for Early to Middle Iron Age settlements. Excavations at Biddenham Loop (HER 1476) demonstrated that the large Late Bronze Age dispersed settlement site continued in use into the Early Iron Age. At Roxton Quarry extension a dispersed settlement of similar date was identified (HER 14844). At Biddenham Loop the settlement was linked a field system that had its origins in the Middle Bronze Age and remained in used through the Iron Age (Mike Luke pers. comm.). A further four Early-Middle Iron Age dispersed settlements were identified within the Biddenham Loop area (Albion Archaeology 2009, 4). These were all located around the edge of the Loop. Two of these settlements were located at either end of the Late Bronze Age pit alignment, this suggests that the pit alignment had continued significance into the Iron Age.

Archaeological investigations in 2002 at Castle Mill Airfield, Willington Quarry (HER 1480), identified an Early to Middle Iron Age enclosed settlement. The settlement was located on a small gravel island under a metre of alluvium (Oetgen 2004, 27-28). These conditions resulted in a high level of artefact preservation, with organic remains including wood surviving. This site may have abandoned due to the rising water table (Lisboa 2008, 12-13), with settlement activity shifting its focus during the Late Iron Age on to the river terrace within the Octagon Farm North and Castle Mill Airfield area(HER 1480).

An Iron Age enclosed farmstead was excavated at Plantation Quarry, Willington (HER 14457) in 1984. The farmstead consisted of two conjoined enclosures, in which evidence of domestic occupation including round houses was found within the smaller of the two enclosures (Pinder 1986, 22-23). This suggests that the larger enclosure was used for stock management. The enclosure ditches were recut twice and the round house rebuilt twice suggesting that there were two major refurbishments of the site. The refurbishments may indicate that the site may have not been a permanent settlement and was perhaps seasonally occupied (Pinder 1986, 34). This site was situated on the edge of a gravel terrace with cropmark evidence for ditches running off over the gravel. This was thought by the excavator to indicate that the settlement site was located on the edge of the prime arable land and that the floodplain was utilised for pasture.

There are nine assets representing cropmark evidence for Iron Age enclosures. These enclosures may indicate the sites of Late Iron Age settlement and/or fields, such as the excavated Late Iron Age field enclosures at Box End Quarry, Kempston (HER 13976). The cropmark enclosure complex identified to the South of Willington (HER 1861) has been interpreted as representing an extensive Late Iron Age - Roman settlement. This

interpretation was supported by a small evaluation on a less dense area of cropmarks which recorded the ditches of a double ditched enclosure (HER 1861).

Four Late Iron Age farmsteads have been identified during archaeological excavation at Biddenham Loop (HER 1476). These sites are located on the gravel terrace within a meander of the River Ouse. Excavations identified associated stock enclosures, tracks and droveways (Luke 2007, 49-50). However, unlike the other identified enclosure settlements such as to the East of Black Cat Island (HER 2664) an associated field system was not identified. It is possible that the Middle Bronze Age field system at Biddenham was, unusually, still in use during this period (Mike Luke pers. comm.)

Land Use/Agriculture/Land Division Evidence

There are nineteen assets that represent evidence of Iron Age land management and agriculture in the River Great Ouse AS-A. An Early Iron Age plough soil was found filling the ditches of the Bronze Age round barrows in the excavations at Roxton Quarry (HER 617). The establishment of cultivation over the monuments suggests that even if they were still visible in the landscape their significance had been lost and they were no longer valued by the community. The recovery abraded pottery and a number of undated post holes over the monuments, were interpreted as indicating an Iron Age seasonal temporary occupation, possibly associated with the agricultural use of the site (Taylor and Woodward 1983, 10). An enclosure field system was laid over monuments in the Late Iron Age. These fields were interpreted as being used stock and arable farming and further truncated the Bronze Age barrow mounds.

There six assets representing Iron Age boundary features within the AS-A. The excavation evidence indicates that the Late Bronze Age pit alignment identified at Biddenham Loop (HER 1476) continued in use into the Early Iron Age. A further Early Iron Age pit alignment was identified running parallel to the river in the north-east corner of the Loop. This was later replaced by a ditch boundary (Albion Archaeology 2009).

A Middle Iron Age pit alignment was identified during trial trenching at Great Barford (HER 604). This boundary runs from the River Ouse, across the gravel terrace. Running parallel to this was a triple ditched boundary, which was also dated to the Middle Iron Age (HER 604). A triple ditched boundary has also been identified from cropmarks at Eastcotts (HER 1623). This boundary ran between the Ouse and Elstow Brook. Excavations at Roxton Quarry (HER 617) found a Late Iron Age palisaded boundary. This boundary was constructed close to the Bronze Age Barrow cemetery. It may indicate the remarking and strengthening of a territorial boundary and may have indicated a tribal grouping, controlling communication along the Ouse Valley (Taylor and Woodward 1983, 10).

Five assets represent evidence of Iron Age agricultural activity, not associated with settlement activity. Excavations at Octagon Farm (HER 1480) on the line of the Bedford Southern Bypass (Shepherd 1995, 7-9) identified ditches from an Early Iron Age field system. This had been laid out over the Neolithic and Bronze monument complex. The field ditches cut the Neolithic mortuary enclosures but respected the Bronze Age ring ditches. This indicates that the Bronze Age barrows were probably still visible during this period and may have had retained some significance. Subsequent investigations within

Octagon Farm North area of Willington found further evidence of the Early Iron Age field system continuing across the landscape. It has been tentatively suggested that these boundaries may have Bronze Age foundations (Jeremy Oetgen pers. comm. 2010).

Ritual/ Ceremonial/Burial Evidence

There are five assets representing evidence relating to Iron Age burial activity within the AS-A. Early Iron Age inhumations were excavated on the periphery of the Late Bronze Age - Iron Age settlement at Biddenham Loop (HER 1476). Skull fragments were also recovered from pits within the settlement (Luke 2008, 34). An Early Iron Age cremation was found within the ditch of a Bronze Age ring ditch at Radwell Quarry (HER 1797). This burial indicates that the monument had continued significance during the Iron Age. Six cremations were identified with a Late Bronze Age - Early Iron Age ditch at Bromham Quarry (HER 1867).

Late Iron Age - Early Roman burial activity has been found at several sites. A cremation burial was discovered during gravel digging in the 19th century at Biddenham (HER 325). Four Late Iron Age inhumations were found about three hundred metres from an enclosure at Radwell Quarry (HER 1797). The burials were dated by a Belgic funerary urn which had been placed by the side of a skull (Hall, 1972, 69). Late Iron Age cremations were recorded on the periphery of the enclosure farmsteads within Biddenham Loop (HER 1476). The Iron Age burial evidence identified within the AS-A indicates that funerary activity was closely associated to individual settlements.

There are four Iron Age/Early Roman temples or shrines within the AS-A. Excavations at Plantation Quarry, Willington (HER 337) found a rectangular enclosure interpreted as a shrine. The enclosure was sub-divided and overlay a Bronze Age ring ditch at its eastern end; a pit, which been deliberately backfilled, had been located on the ring ditch and may have been the focus of activity within the enclosure (Dawson and Maul 1996, 31). Deposits within the pit contained a pig's head, flint and ceramics. Pottery evidence from the site also indicates that the shrine continued in use into the Roman period. The positioning of the shrine on the ring ditch suggests a continued significance was attached to the earlier monument. A similar sub-rectangular enclosure was identified to the south Castle Mill Airfield (HER 1480) during investigations for Octagon Farm Quarry (Howlett and Richmond 2001, 10). A further possible ritual site was found at Willington Plantation where two penannular enclosures were found (HER 337). These enclosures however, may represent domestic or stock features (Dawson 1996, 32-33). To the south of Willington Plantation Quarry, excavations in advance of gravel extraction at Dog Farm (HER 1618) recorded an oval ring ditch which contained the base of a limestone structure and evidence for a possible funeral pyre.

Excavations at Biddenham Loop (HER 1476) identified an alignment of three square structures. These were interpreted as being Late Iron Age - Early Roman shrines (Albion Archaeology 2009, 6). Two of these structures were surrounded by a rectangular enclosure ditch. The evidence indicates that these structures represent small square buildings containing ritual pits. However, no 'special' deposits were recovered from these pits (Albion Archaeology 2009, 6). An enclosure cropmark was identified just off the A6 at Sharnbrook (HER 13745), the enclosure contained a smaller sub-rectangular enclosure with internal features. This cropmark has a similar form to the excavated shrine at Biddenham Loop.

In 1942 a group of Late Iron Age bronze objects were found during gravel quarrying near Felmersham Bridge (HER 67). The assemblage includes parts of a bucket with cow-head escutcheons, a spout in the form of a fish head, and fragments of two bowls and several bronze fragments. The spout and one of these other fragments may belong to one of the bowls. A group of early 1st century AD pottery was also reported to have been found with the bronze artefacts. It has been suggested that the finds formed part of a Welwyn burial but there is no firm evidence to support this. Given the find's location in the floodplain it seems likely that the objects are part of a votive offering made at a watery shrine.

Findspots

There are three assets representing findspots for this period. Two of them represent finds of individual gold staters (HERs 15945 and 15920), they are both metal detector finds reported to Bedford Museum.

Conclusions

The evidence for the Iron Age within the River Great Ouse suggest a densely settled and organised landscape throughout the AS-A. There is some continuity of Late Bronze Age settlements into the Early Iron Age, for example at Biddenham Loop. But there is also an intensification of settlement with the foundation of new sites in the Early – Middle Iron Age. The character of settlements is varied with both enclosed and unenclosed settlements existing side by side and in some cases the situation changing with formerly unenclosed settlements becoming enclosed and others losing their enclosures.

The settlement and agricultural pattern saw an extensive shift and intensification during the Late Iron Age. This is seen at Octagon Farm Quarry (HER 1480) where a new enclosure field and settlement pattern was laid out over the more dispersed Early Iron Age field and settlement pattern. At Biddenham Loop (HER 1476) the enclosure farmsteads were situated on previously unoccupied land (Luke 2009, 46). Unusually however, these Iron Age settlements were possibly still associated with the Middle Bronze Age field system (Mike Luke pers. Comm.). This evidence indicates a more intensive occupation of the landscape, greater organisation of the communities and the development of a more structured and hierarchical society (Dawson 2000, 120-121).

The pit alignment and ditched boundaries known from the AS-A suggest that communities felt the need for clear demarcation of their territories. The pit alignment and triple ditched boundary identified at Great Barford (HER 604) may represent the remarking of such a boundary; alternatively it could have been used as a means of controlling access and movement along the Ouse Valley. A similar remarking of territorial boundaries may have identified at Roxton Quarry (HER 617). The palisaded ditch boundary at this site may indicate the reinforcement of a Bronze Age boundary, symbolised by the barrow cemetery (Taylor and Woodward 1983, 10). The Bronze Age - Iron Age pit alignments identified at Biddenham Loop (HER 1476), may have also separated agricultural zones and domestic and ritual zones.

The evidence for ritual/ceremonial and funerary activity identified within the AS-A indicates that the landscape saw a shift away from the monument complexes of the earlier periods. This is a feature of the other AS-As and the county as a whole. However, the Late Iron Age temple site at Plantation Quarry (HER 337) indicates that the Iron Age communities still placed some significance on the earlier monuments. The funerary activity evidence, identified within the AS-A, indicates that burial activity was taking place on the periphery of settlements, rather than in ritual zones.

Late Prehistoric Assets

The Bedfordshire and Luton HER has a category referred to as “Prehistoric 500,000 BC – 42AD”, it is rather a catchall for assets that cannot be confidently assigned to one of the prehistoric periods. Typically these assets represent lithic assemblages or unexcavated cropmark sites. There are a total of sixty six Late Prehistoric assets for the River Great Ouse AS-A. The majority of these assets represent cropmark evidence, that from their morphology, topographical location and relationship to datable assets, were assigned a broad late prehistoric date but to due the lack of direct datable evidence could not be assigned a specific prehistoric period.

There is a single asset representing a flint scatter. This was located at Church Farm, Clapham (HER 16153). However, no further information is available on the assemblage, so the date or function for this site cannot be ascertained. The rest represent cropmark evidence within the AS-A. These mostly provide evidence for enclosures and linear features (sixty two in total). Enclosure systems are a feature of the Iron Age and Roman landscapes within the county (Dawson 2007, 66-67). These assets are commonly located on the river valley terraces in the River Great Ouse AS-A, a feature shared with other AS-As. A linear spread of enclosures and trackways at Barford Road, Willington (HER 770) is similar in character to a group of enclosures excavated at Castle Mill Airfield, Octagon Farm Quarry (HER 1480). These were identified as being Late Iron Age - Early Roman settlement enclosures and fields supporting the interpretation of the undated enclosures are in fact Late Iron Age/Roman settlement and land management features.

Fourteen of the cropmark complexes identified within the AS-A are associated with Bronze Age ring ditches, such as complex identified at Carlton (HER 540). These cropmark of enclosures and linears may represent Neolithic - Bronze Age funerary or ceremonial activity but are more likely represent Iron Age - Roman land management and settlement activity, as they are morphologically similar to the dated enclosures within the AS-A (such as at Biddenham Loop, HER 1647). However, a cropmark of an oval enclosure was identified close to a cropmark of a ring ditch at Ousebank Farm, Great Barford (HER 9083). Similar oval enclosures have been found within Biddenham Loop (HER 1647) where they are associated with the Early Neolithic mortuary enclosures and were part of the Neolithic monument complex (Luke 2008, 81-82).

A possible ‘banjo’ enclosure was identified at Rookery Farm, Eastcotts (HER 16659). This enclosure is associated with a cluster of enclosures and linear features. Banjo enclosures have been dated from the Middle Iron Age to the Roman period (Cunliffe 1995, 52). These features are more common on Southern England and have been interpreted as stock enclosures, seasonal settlements and/or ritual sites. Only three other possible ‘banjo’ enclosures have been identified within the county (such as at Manor Farm, Harrold HER 14008), none of which have undergone investigation.

There are eight later prehistoric ditched boundary features or pit alignments identified within the AS-A. The excavated pit alignments in Bedfordshire have been variously date to the Late Bronze Age (Biddenham Loop, HER 1476) and the Iron Age (Great Barford, HER 604). Some of these boundary features have been interpreted as being associated with the Neolithic - Bronze Age ritual landscape (Malim 2000, 80. The Iron Age

examples have been interpreted as separating agricultural and settlement zones (Dawson 1996, 33). The undated examples within the AS-A include the excavated alignment at Castle Mill Airfield, Octagon Quarry (HER 1480). This alignment is thought to predate an Early to Middle Iron Age settlement (HER 1480), indicating it may have a Bronze Age to Early Iron Age date (Oetgen pers. comm. 2010). A pit alignment was identified separating Bronze Age ring ditches at Marsh Farm, Carlton (HER 15017) and six ring ditches were located running parallel to a pit alignment at Red Barn, Felmersham (HER 547). These features may be contemporary and may represent the boundary between the ritual zones of different community groupings or the separation of a ritual zone from an agricultural zone. However, these boundaries may also represent the later remarking of territorial boundaries. A triple ditch/pit alignment was identified from cropmarks to the north east of Willington (HER 985). This boundary ran between Elstow Brook and the River Ouse, cutting off an area of land. It was interpreted as a symbolic boundary enclosing a small promontory between the two watercourses. A ring ditch is also visible to the south east of the boundary (HER 985).

Conclusions

The Late Prehistoric assets for the River Great Ouse Aggregate Study Area mostly represent cropmarks of enclosures. These enclosures and the associated linears are likely to date to the Iron Age and/or Roman period but cannot be securely dated. These assets are located in similar topographical locations within the river terraces of the AS-A as the dated enclosures and land management features for example the enclosures at Octagon Farm Quarry, HER 1480. However, without further investigation they cannot be discounted as being from an earlier period. The pit alignments and boundaries identified within the AS-A can only be broadly dated without further investigation. They could be assigned to two different periods (Late Bronze Age or Iron Age) with two different functions. The banjo enclosure could date to the Iron Age or Roman period and may also have had a settlement/ritual or stock management function. In general when the Later prehistoric assets are securely dated they are likely to further emphasise the density of human use of the landscape in the Iron Age and Roman periods at the same time as confirming the character and of those periods within the AS-A.

Roman Assets (43 AD – 410 AD)

There are a total of eighty three Roman assets from within the River Great Ouse AS-A. They have been divided into the following categories: settlement/occupation, ritual/ceremonial/burial, communications/transport and findspots.

Settlement/Occupation Evidence

There are thirty nine assets representing evidence for Roman settlement sites within the AS-A. The majority of these assets represent cropmark, excavated or finds evidence for small rural settlements. There is some evidence that suggests that the Roman rural settlement pattern partly continued the Late Iron Age pattern, for instance at Harrold Pit (HER 543 and Dix 1980) where an Early Roman settlement succeeded a Late Iron Age one at the same location. However, the Roman farmsteads and fields investigated at Octagon Farm South (HER 586) and Peartree Farm, Elstow (HER 1625), were constructed in the 2nd century in different areas to the Late Iron Age - Early Roman settlements, indicating a partial reorganisation of the settlement pattern and landscape during the Roman period. This is supported by the excavation evidence from Biddenham Loop (HER 1476). Here new settlements were constructed in empty areas along the gravel terrace edge (Albion Archaeology 2009, 5). These settlements however, were unusual as they may have continued to use a field system originating in the Middle Bronze Age (Mike Luke pers. comm.).

Commonly Late Iron Age to Early Roman settlements are known from cropmark evidence representing farmsteads and associated field systems. Some of these assets have been dated by associated find or artefact scatters, such as at Odell (HER 2678) and Moggerhanger/Willington (HER 1860). The rest have been dated by comparing their morphology with those from sites that have been positively dated elsewhere. Examples of this are the ditched trackway and enclosures identified to the south east of Willington (HER 7204). A similar Roman dated enclosure pattern was excavated to the west of Willington at Octagon Farm South (HER 586).

A large settlement was identified during excavations on the river terrace at Kempston, Church End (HER 162). This settlement was laid out shortly after the Conquest on a metalled trackway grid (Dawson 2007, 73). Peripheral remains of this settlement were found during investigations in adjacent areas including an inhumation cemetery at Box End Quarry, Kempston (HER 13976). At Kempston Bury (HER 7033) where evidence of cultivation trenches for vines or fruit trees was found (Luke et al 2009, 7), and at Cutler Hammer Sports Ground (HER 17731). The Kempston Church End site may have been planned and laid out as roadside settlement (Mike Luke pers. comm.). A further large rural settlement was found during excavations for Bedford Southern Bypass on the river terrace at Cambridge Road, Eastcotts (HER 1623). The evidence from this site indicates a possible hamlet or a loose conglomerate of individual settlements (Shepherd 1995, 7-8). This site was in use from the 1st to 4th centuries AD but shifted gradually westwards through time possibly as a response to rising water tables and increased liability to flooding. These factors may ultimately have resulted in the abandonment of this settlement.

A possible seasonal settlement was identified during excavations at Roxton Quarry (HER 617). The enclosure field system was reorganised at the site in the 2nd century AD and a small enclosure was constructed around a Bronze Age barrow containing slight structural features. This settlement was interpreted as a seasonal site, located in an outfield of a possible Roman estate (Taylor and Woodward 1983, 11).

There are eight assets that represent cropmark, excavation or finds evidence for Roman villas and/or high status buildings within the AS-A. Only one of these assets has been confirmed as a villa by excavation. This is the asset at Newnham Marina which was excavated in advance of quarrying in the 1970s (HER 986). The excavations identified a 2nd century AD stone built structure within the quarry area. A bath house with a hypocaust was added in the 3rd - 4th century (Dawson 2007, 73). Unfortunately the excavation of this site await full publication so it not possible to provide a full description of what was found. It has been suggested the settlement at Kempston Church End (HER 162) was also a villa, but recent investigations strongly suggest that it was another type of settlement, possibly containing high status elements. Three other assets in this group include the finds of building debris and 3rd to 4th century pottery from an area to the South West of Peartree Farm, Elstow (HER 263) and a scatter of building debris identified near the A6 at Elstow (HER 18248). Six of the assets relate to cropmark evidence for potential villa sites. This includes the possible villa site at Biddenham Loop (HER 3663). Excavations were undertaken as part of the proposed development of the Loop on the edge of the enclosure complex (HER 1476) but did not include the possible villa area.

The known distribution of Roman villas in the Ouse Valley, suggests that a Villa site may be expected every few miles along the valley sides of the AS-A (Simco 1984 28-29). The villa sites are all situated in similar prominent positions, on the better agricultural land along the valley sides of the Ouse. These villas may represent the rural homes of the aristocracy and were possibly the centre of Roman estates (Simco 1984) and may have operated as a central place, with a dependant hinterland with tied or 'model' estate villages (Dawson 2007, 74). The possible villa sites at Biddenham Loop (HER 3663) and to the south of Willington (HER 1861) were identified within extensive enclosure cropmarks, indicating the presence of these dependant settlements.

A common find within excavated Roman settlements is evidence of industrial activity. Three sites contain the remains of Roman corn drying ovens. These were recorded at river terrace sites along the Ouse at Odell (HER 543), Bromham (HER 975) and Wyboston (HER 476). These indicate the processing of arable crops within the settlements within the AS-A. The excavated corn drying oven recorded at Wyboston was identified as being fired by coal (Tebbutt 1957, 80). As there are no coal deposits within the AS-A this indicates that goods would have been transported and traded within the AS-A from across the country and that the small rural settlements would have access to such goods. Two Roman pottery kilns were identified within a settlement at Biddenham Loop (HER 1476), they were located close to each other but operated at different times (Luke 2009, 49). Pottery production, smithing and crop-processing were recorded associated with the settlement recorded at Eastcotts (HER 1623).

Land Use/Agriculture/Land Division Evidence

There are eight assets representing evidence for Roman field systems and land division. The bulk of these comprise cropmarks of linear features. These are generally thought on morphological grounds to represent field systems and trackways such as at Willington (HER 7204). At Black Cat Roundabout, Wyboston the remains of a coaxial field system was identified in excavation (HER 2664), though the appearance of this type of field system in Bedfordshire is rare.

Although field systems and boundary features have been identified in isolation and apparently not associated with a settlement they are more frequently found in associated with settlements. This is the case were both elements of the landscape are known only from cropmarks and where they have been subject to archaeological investigation. Excavation often shows that field system and settlement were very physically very closely associated such as at Harrold Pit (HER 543) where the small farmstead was set within its field system. At Biddenham Loop (HER 1476 and Luke 2008) a more extensive agricultural landscape has been investigated with six farmsteads located within the river meander. Each farmstead appears to be located close to or within a field system which spreads across much of land within the meander and contains within it trackways linking fields and settlements to each other. From the excavated evidence it is clear that the field systems were not static and though individual systems continued in use throughout the period, they were altered and restructured during their life.

Communication/Transport Evidence

There are fifteen assets relating to Roman roads within the River Great Ouse AS-A. However this is a misleading number as all the assets relate to roads and associated features such as aggers identified by the Viatores study group. Further information on the problems with the Viatores data can be found in the methodology section of this document ([VSGD](#)). Many of these routes were created by linking modern features such as hedgerows, trackways and roads or by the misinterpretation of later earthworks such as medieval headlands. Although none of the “true” Roman roads cross the AS-SA there would undoubtedly have been a network of roads and tracks connecting settlements and other sites both within and beyond the AS-SA, however these features have yet to be identified. One of the assets in this category at Kempston (HER 814) has been described as a Roman ford and designated as a Scheduled Monument on that basis. Although there is some limited evidence, in the form of metalling, that there is a ford at this location it's dating to the Roman period is largely on the basis that it was on the line of one of the conjectural Roman roads. More recent research suggests that it is in fact post medieval in date.

Ritual/Ceremonial/Burial Evidence

There are eleven assets include evidence for Roman ritual/ceremonial/burial within the River Great Ouse AS-A, only three of them refer specifically to this sort of activity the rest form part of assets that also contain evidence for settlement or occupation. They include the inhumation cemetery associated with the Roman settlement at Kempston

Church End (HER 13976) dating from the late 2nd to the early 4th century. This cemetery included both cremations and inhumations with a number of the inhumation burials having been decapitated before burial with the heads placed between the legs or at the feet of the body (Dawson 2004). Two Late Iron Age - Early Roman cremation cemeteries were found at Odell quarry (HER 307). These were located on the periphery of the settlement (Dix 1980). The excavations also recorded the remains of a severed head and neck placed behind the woven basket framework of a well. Ritual deposits including an inhumation were also recovered from a stone lined well, during 19th century gravel extraction at Bromham Road, Biddenham (HER 330).

There are a total of five assets relating to cropmark and excavation evidence for Roman temples or shrines within the AS-A. Excavations at Biddenham Loop (HER 1476), identified remains of three small structures recorded as Late Iron Age - Roman shrines. A similar structure, within an enclosure was identified from cropmarks at Vicarage Farm Sharnbrook (HER 13745). A possible temple associated with a villa was identified from cropmarks at Stoke Brook Field, Sharnbrook (HER 1989). A possible Roman-Celtic temple was recorded at Octagon Farm Quarry/Castle Mill Airfield (HER 1480). This temple or shrine was identified from cropmarks and geophysical survey and was subsequently excavated. However, the investigations of this potential temple in advance of quarrying did not produce convincing evidence on its function or date (Oetgen pers. comm. 2010). To the south east of this site at Dog Farm (HER 1618) excavations identified the site of a possible Late Iron Age/Roman funerary pyre (See Iron Age Summary for this AS-A).

Findspots

Eighteen of the Roman assets record findspots. These mostly represent individual or small groups of items such as the Roman ring found at Bromham (HER15846) or the small group of 3rd – 4th century coins from Great Denham (HER 15155). Many of these assets are metal detecting finds reported to Bedford Museum before the inception of the Portable Antiquities Scheme; they are chance finds and do not present any particular pattern or add substantially to our understanding of the Roman period in the AS-A.

Conclusions

The character of the Roman landscape within the River Great Ouse AS-A can be defined as predominately agrarian in nature. This activity was focused along the prime agricultural land along the floor of the valley. It has been suggested that the river terraces within the AS-A were divided into large estates based around large farmsteads or villas (Dawson 2007, 74). The evidence of these villa estates has been found within the AS-A, such as at Willington (HER 1861), where the villa is associated with cropmark complex indicative of a dependant settlements/agricultural hinterland. These villa sites have been identified as being spread evenly along the Ouse Valley (Simco 1984, 29). This suggests the reorganisation of the landscape of the AS-A during the Roman period moving away from the Late Iron Age settlement pattern. This is supported by the shifting of settlements early in the Roman period at Biddenham Loop (HER 1476), Octagon Farm South (HER 586) and Peartree Farm, Elstow (HER 1625). Whether any of the possible but unconfirmed high status buildings are “villas”, part of villa estates, is not

known. In Bedfordshire as a whole there are very few villas with a concentration at the foot of the Chilterns and in the Great Ouse Valley (Dawson 2007, 73-74). It has to be acknowledged that with few exceptions (e.g. Newnham Marina) none of the supposed villa sites have been confirmed by detailed investigation and that their attribution is based on morphological comparison of cropmark sites or the presence of certain classes of building material, usually roof tiles and less frequently tesserae, on or close to cropmarks. Without confirmation of the nature of the proposed villa sites it is not yet possible to be certain about the organisation and management of the countryside and whether it was based on a system of villa estates. Even if the existence of villas is confirmed the structure of the estates has also to be confirmed before it will be possible to fully understand the nature of the landscape in the River Great Ouse.

The large planned rural/road side settlement at Kempston (HER 162) also shows landscape reorganisation and economic and infrastructure development, in the post-conquest period. It is an unusual form of settlement and its formal organisation and associated cemetery may have more in common with small towns than rural settlements or even villa estates. If it is some sort of urban or semi-urban settlement it would fill a gap in the settlement hierarchy as there are no other Roman towns in the AS-A, the nearest being at Sandy (HER 444) or Irchester in Northamptonshire. Neither of these towns had direct road links into the AS-A as far as is known meaning that the Roman communities of River Great Ouse in Bedfordshire did not have easy access to the markets and other functions provided by urban places.

The excavated field enclosures, such as that excavated at Octagon Farm South (HER 586), indicated that a mixture of stock and cultivation was being undertaken within the AS-A. The presence of pottery kilns and the smithing activity from Eastcotts (HER1623) indicates that a mix of subsistence strategies was being undertaken within the communities in the AS-A with small scale industrial activity taking place within settlements to serve that community. There is no evidence of major dedicated industrial sites in the AS-A, but the Roman pottery production site at Harrold, just outside the AS-A, (HER 1182) may indicate the potential for them to exist.

Funerary activity during the Early Roman period within the AS-A initially followed the Late Iron Age tradition of cremation cemeteries and isolated cremation burials associated closely with settlements. The temples/shrines recorded at Biddenham Loop (HER 1476) and the funerary pyre ring ditch recorded at Dog Farm (HER 1618), also indicate the continuation of Iron Age traditions into the Roman period. The Dog Farm pyre and Octagon Farm (HER 1480) shrine temple were also located within the area of an earlier monument complex. This indicates that continued significance was given to the earlier ritual monuments. From the late 2nd century AD Roman burial tradition shifted from cremation to inhumation burials. This is evidenced within the AS-A by the Late Roman inhumation cemetery at Kempston (HER 13976). A number of cropmarks, frequently rectangular enclosures, some with internal features have been interpreted as shrines or temples. These sites would repay research or investigation to confirm their nature, and if they do have religious or ritual significance to try and work out how they fitted into the contemporary settlement pattern.

The Roman road network identified by the HER within the AS-A's, has been re-interpreted as post-medieval enclosure boundaries (Simco 1984, 78). Further work is necessary for all the AS-As to gain a better picture of the Roman Road infrastructure.

The Roman landscape of the River Great Ouse was clearly densely occupied and exploited and well, organised. However, the nature of that landscape, whether it was organised into villa estates or not and the relationship between settlements has yet to be adequately defined. This is the sort of research objective that might be answered in the sort of landscape investigation that is possible within the context of modern large scale aggregate extraction.

Saxon Assets (411 AD – 1066 AD)

There are twenty three Saxon assets within the River Great Ouse AS-A, they are mainly located in the central and eastern parts of the AS-A. They can be divided into evidence for the following activities: settlement/occupation, ritual/ceremonial/burial, and findspots.

Settlement/Occupation Evidence

Fourteen of the assets represent evidence for Saxon to Saxo-Norman settlement/occupation. Eight of these assets represent excavated evidence for Early - Middle Saxon settlements. At five of these sites (HER 586, 986, 1476, 1624 and 17184) the Saxon settlements were located within or close to the sites of Roman farmsteads. At Octagon Farm South (HER 586) where some of the pits and wells were possibly in use from the Late Roman period into the Post-Roman phase, but generally there is no evidence of continuity of settlement activity between the Roman and Saxon settlements, just the use of the same location for settlement. The excavations at Biddenham Loop site (HER 1476) identified a small Early-Middle Saxon settlement within an enclosure part of the field system of the of the most easterly of the Roman farmsteads within the Loop (Albion Archaeology 2009, 6). The same excavations identified four isolated sunken feature buildings on the western side of the Loop

Excavations in the 1970's on the Newnham Roman villa site (HER 986) recorded a small number of Early Saxon occupation features within the villa site and an inhumation, which had been inserted though the floor of the villa building. The planned Roman settlement at Kempston, Church End (HER 162) was also abandoned by the post-Roman period. A small inhumation cemetery was located within the former settlement site. An Early Saxon settlement however has been recorded just to the east at Kempston Bury (HER 7003). Settlement shift was also identified at Odell Quarry (HER 543) where the Early Saxon settlement was located half a kilometre to the north west of the Roman farmstead. The Early Saxon settlement identified at Eastcotts (HER 1623) however, may have moved east on to the gravel ridge due to the inundation recorded in the area of the Roman settlement (Shepherd 1995, 7).

Two Middle to Late Saxon settlement sites were identified within the AS-A at Tempsford Park (HER 9726) and during trial trenching for a flood alleviation scheme at Great Barford (HER 13358). Occupation features were recorded at Great Barford and pottery dating to the 8-9th century was recovered). The excavation of a moated site at Tempsford Park (HER 9726) recorded an oval enclosure ditch containing a small settlement dating to the 8th - 9th century AD (Maull and Chapman 2005, 16-21). The 8th - 9th century settlement site at Tempsford Park was reorganised in the late 9th - early 10th century, a new pattern of rectangular plots was laid over the earlier enclosure which was interpreted as the establishment of a series tenements (Maull and Chapman 2005, 21-22). Excavations at Kempston Bury (HER 7033) recorded beam slots from a Saxo-Norman a timber framed building and quarry pits. These features were interpreted as being on the edge of a settlement (Luke et. al. 2009, 7).

Assets relating to Saxon settlements are usually identified by finding characteristic features or dating firm dating evidence within features either in excavations or intrusive

evaluations. Occasionally surface scatters of diagnostic Saxon pottery are found such as at Great Barford Bridge (HER 2792). There has been no excavation at this site to confirm whether there are any subsurface features relating to the surface scatter. Although it is generally assumed that scatters of Saxon pottery do represent buried settlements, it is interesting to note that fieldwalking at Biddenham Loop did not identify either of the locations where Saxon settlement features were found.

Ritual/Ceremonial/Burial Evidence

There are five assets representing Saxon burial and ritual activity within the AS-A including one associated with evidence of settlement. Two of these assets are Saxon activity associated with earlier prehistoric/Roman monuments. Excavations at Roxton Quarry (HER 617) found a flexed burial, within the ditch of a Bronze Age barrow. An iron knife of possible 6th - 7th century date was recovered with the burial. This excavation also recorded two hearths cut into two of the barrows. One of these hearths was dated to the early post-Roman period and may have had a ritual function (Taylor and Woodward 1983, 13-14). Excavations undertaken in advance of quarrying at Dog Farm (HER 1618) recorded two Middle Saxon inhumations. These were located within the ring ditch of a possible Late Iron Age/Roman funeral pyre structure. These two sites indicate that Saxon/Post-Roman communities within the AS-A attached some significance to earlier prehistoric/Roman ritual/ceremonial monuments.

Two of the assets represent burial activity within the demolition layers of Roman settlements. The Newnham Marina excavations (HER 986) recorded an inhumation within the demolition layers of the Roman villa and some of the Saxon inhumations recorded at Kempston, Church End were inserted through the floors of a high status building (HER 162).

There are two assets that represent burials associated with Saxon settlement. An Early Saxon cremation was identified close to the settlement at Kempston Bury (HER 7033) and three inhumations were recorded associated with the 8th - 9th century settlement at Tempsford Park (HER 9726).

Findspots

There are seven Saxon find spot assets. These mostly represent chance losses of individual or small groups of items such as the Saxon brooch recovered from Honey Hill, Great Denham (HER 15240). These finds form no obviously recognisable pattern and do not enhance our understanding of the Saxon period in the AS-A.

Conclusions

The relatively small number of assets representing the Saxon period in the River Great Ouse reflects the situation in the county as a whole. It is believed that the landscape of this period was one of largely rural settlements. The recovery of occupation evidence from predominantly Roman settlement sites such as Octagon Farm Quarry South and Octagon Farm suggests there may have been a degree of continuity in the choice of

location between the Roman and immediate post-Roman periods within this AS-A. It may also suggest some continuity of occupation between Roman and post-Roman periods although the direct evidence for this is largely lacking. This is a pattern that is recognised elsewhere within the county. It is also acknowledged that where Saxon settlement does not appear continuous with earlier sites this could be as a result of a level of de-population in the county following the collapse of the Roman infrastructure. Where these settlements have been identified they seem to consist of small numbers of distinctive sunken featured buildings and the occasional post built hall.

The evidence from the Newnham Villa site (HER 986) and from Kempston, Church End (HER 162), indicates that the high status sites were abandoned early in the post-Roman period. The demolition of these buildings and the deliberate insertion of burials within the demolition layers suggests that there may have been a collapse of the local hierarchy within the county. The Saxon-Norman period within the AS-A saw a shift and growth in the settlement pattern and the establishment of the medieval settlement pattern. This is indicated by the continuity from Late Saxon to medieval periods of settlements identified within the AS-A, such as at Tempsford Park Moat (HER 9726).

The funerary/ritual activity within the AS-A was largely associated with settlement activity. The evidence identified from Dog Farm and Roxton Quarries (HER 1618 and 617) also indicates that the communities within the AS-A still attached significance to the prehistoric monuments. One element missing from the AS-A is large Early Saxon cemeteries. However, there is large and early (5th – 6th century AD) cemetery found in a gravel pit at Kempston (HER 258). This site in the urban area of Kempston and therefore outside the AS-A as defined by this project, but in many ways it forms part of the Saxon landscape of the River Great Ouse. Although it was founded in the 19th century it was investigated and recorded to a very high level by the standards of the time. It is an important asset in itself and increase in value when seen in the context of the early Saxon activity at Church End, Kempston and the recently found Saxon settlements in Biddenham Loop. This group of sites and finds has the potential to reveal a great deal about the nature and structure of the Saxon landscape. The early date of the Kempston cemetery means that it and any other associated sites have considerable potential to inform our understand of the progress of Saxon colonisation of the area.

There are no Danish (Viking) assets for the AS-A although there is documentary evidence from the Anglo-Saxon Chronicle that Danish armies were present in the River Great Ouse in the 10th century AD. The town of Bedford, outside the AS-A although actually part of the Ouse Valley, was a Viking town within the Danelaw which ran on along the River. It is possible that the Danish presence was a matter of administration and ownership rather than of settlement and colonisation so that there was no distinctively Danish population or material culture in the area. However, the nature of the Viking presence at some distance to their British heartland much further north is an area of research interest which can be addressed in the AS-A.

Medieval Assets (1066 AD – 1539 AD)

There are one hundred and seven assets for the medieval period in the River Great Ouse AS-A. They are distributed throughout the AS-A. The assets can be divided into evidence for the following activities: settlement/occupation, land use/agriculture/land division, communications/transport, industry, religious houses and buildings and findspots.

Settlement/Occupation Evidence

Thirty nine assets within the AS-A represent medieval settlement/occupation evidence within the River Great Ouse AS-A. This category includes deserted, shrunken and shifted settlements recorded as earthworks, cropmarks or both, moated sites, excavated sites and one surviving building.

Eighteen of the settlement/occupation assets relate to evidence for medieval villages and hamlets. They include deserted medieval settlements such as the earthwork remains at Hardwick End, Keysoe (HER 4898), Bromham Hall (HER 1359) and the cropmark and earthwork remains at Medbury (HER 7089). There are also shrunken or shifted settlements such the earthwork remains at Little Barford (HER 1806), where the village was focused on the church during the medieval period shifted east during the Late medieval-post-medieval period to a new focus on the Barford Road; and the earthworks at Melchbourne (HER 1810).

Two assets relate to excavated evidence for Saxo-Norman settlement activity, within the AS-A. Investigations at Kempston Bury (HER 7030), recorded the remains of a Saxo-Norman timber framed building on the periphery of a medieval settlement area (Luke et. al. 2009, 7). Excavation of a medieval moat at Tempsford Park (HER 9726) recorded evidence for Late Saxon to late 12th century tenement plots. These plots indicate the creation of a planned settlement, which was laid out over a Late Saxon enclosure settlement (Mauil and Chapman 2005, 21). This settlement however, was altered in the late 12th century with the insertion of an aisled hall. This indicates the possible insertion of a small manor in the settlement or the shifting of manorial buildings within an existing plot (Mauil and Chapman 2005, 26). Both of sites demonstrate that the medieval settlement pattern had its origins in the Late Saxon period.

The pattern of rural settlement in the county as a whole is varied in the medieval period. In some areas nucleated settlements predominated in others; topography and soil type seem to have been major influences on the character of medieval settlement. However, it has been pointed out (Edgeworth 2007, 99) that natural environment and resources are not the only influence on settlement type in this period as nucleation and dispersion can exist in adjacent parishes with similar environments. Edgeworth believes that this may reflect the influence of the activities of the ruling classes. In spite of this the broad character of medieval settlement in the River Great Ouse is one of mainly nucleated settlements typically located close to the Great Ouse and its tributaries (Edgeworth 2007, 99). Conventionally deserted and shrunken settlements are a product of agricultural recession and economic decline in the 14th century exacerbated by outbreaks of plague from 1348. It has been suggested (Edgeworth 2007, 101) that clay

areas, being more marginal might be more susceptible to external pressures. The northern tributary streams of the Great Ouse fall into this category, flowing through the Boulder Clay plateau of north Bedfordshire. There does not, though, seem to be any difference in the levels of desertion, shift or shrinkage of settlements between the main river valley and the tributary streams. Other than the general assumptions about the reasons for settlement decline in 14th century little is known about the precise mechanisms operating in the River Great Ouse AS-A: although it is possible that in two cases, Melchbourne (HER 1810) and Bromham Hall (HER 1359), villages that survived through the medieval were cleared by the landowner in order to create parklands in the post-medieval period.

There are eleven assets relating to cropmark and earthwork evidence for medieval moats. In Bedfordshire medieval moated sites all represent domestic settlements, mainly dating from the 12th to 13th centuries AD. They comprise a central rectangular, square or oval platform with a water filled ditch completely surrounding the platform. Access to the platform was by means of a bridge or causeway. The interior of most moats would have contained a house and a number of ancillary buildings such as barns. In some cases moated sites represented manorial residences but many others were built by wealthy landowners in order to express their wealth and status. An example of moated manorial site is at Chawston where the earthwork (HER 475) has been identified through documentary evidence as the site of Chawston Manor.

The moated sites in the AS-A generally occur on the edges or within villages rather than in more isolated positions in the landscape. For example Risely, Moat Hall Close (HER 1810), a Scheduled Monument, is located on the northern edge of the village and is associated with earthwork remains of house platforms, boundaries and ridge and furrow and the moat at Wyboston (HER 474), another a Scheduled Monument.

Two of the moated sites in the River Great Ouse have been subject to archaeological excavation. At Tempsford Park (HER 9727) a moat was constructed in the mid 13th – late 14th century AS a moat was constructed on the site of an existing aisled hall set within a system of plots defined by ditches (Maull and Chapman 2005) The moated enclosure contained a substantial building that has been identified with the manor of Brayes. The occupation of the moat was relatively short lived, although the manor house was refurbished in the 15th century, the site was abandoned and the manor house demolished by the early 16th century. The Scheduled Monument known as Danish Dock, Willington (HER 769) has also been subject to partial excavation. The name by which the site is known is misleading. The earthwork is right on the bank of the River Great Ouse and has an unusual form; it was identified as the remains of a base for Danish raiders who are referred to being present in the Ouse Valley in the Anglo-Saxon Chronicle (Edmondson and Mudd 2004). The excavations, though limited in scale have conclusively shown that the earthworks are the remains of a medieval moat occupied in the early 12th to mid 13th century, but within that short period there were several phases of building construction

There is a single asset within the AS-A relating to a medieval castle: Howbury ringwork (HER 2806), a Scheduled Monument. It is a Norman ringwork located on a prominent situation overlooking the River Ouse. Ringworks date from the late Saxon period to 12th century and generally take the form of an enclosure surrounded by one or more sets of banks and ditches; in some cases they have adjoining baileys. The outer banks would have had timber palisades or more rarely a wall on top of them. These monuments have

been thought of as military fortifications but in some cases would have been defended manorial or aristocratic settlements or residence. Howbury is simple form of ringwork and it is not known who built it or when. It may have been in use for only a short period as the medieval routeway between Bedford and St Neots cuts through the castle earthwork (HER 2806).

Land Use/Agriculture/Land Division Evidence

There forty four assets for the River Great Ouse relating to the management of the landscape on the medieval period. They include earthwork remains of ridge and furrow, fishponds and other water management features and ancient woodland (in existence before 1600 AD).

Prior to the Parliamentary Acts of Enclosure in the 18th and 19th centuries Bedfordshire was cultivated using the open field system. Each parish had a series of open fields as well as common land and meadows, and this method of farming probably originated in the Saxon period. Each open field was sub-divided into furlongs that were divided into strips or lands and tenanted out to members of the local community. Common crop-rotation was practised with each open field (or sometimes furlong) growing crops such as wheat, legumes, oats and barley and having a fallow period (usually a year) when the land was used for grazing. The practise of assarting was also common place during the medieval period; this was the creation of fields by the clearance of land that had previously been used for other purposes such as woodland. In some cases these small "closes" were used for pasture.

The most common evidence of the open field system within Bedfordshire is ridge and furrow cultivation earthworks and cropmarks. Ridge and furrow was created by a particular type of ploughing which involved the clockwise and anti-clockwise ploughing of fields early and then late in the farming season. These actions created the characteristic corrugated earthworks that survive within post medieval enclosed landscape. Ridge and furrow covered much of the Bedfordshire landscape and survived the enclosure of the open fields which started in the 16th century reaching its climax in the Parliamentary Enclosures of the 18th and 19th century which saw the end of the open field system. Although enclosure imposed a whole new network of boundaries and land ownership on the rural landscape the earthwork remains of the medieval system survived substantially intact until the middle of the 20th century when the pressure for increased agricultural production during the Second World War and immediately after saw most of the ridge and furrow earthworks destroyed by ploughing as arable cultivation became a priority to feed the nation. Today less than 4% of the original stock of ridge and furrow earthworks that once existed in the county survives as earthworks and many parishes only retain small fragments and pockets of earthworks of the once extensive open field systems.

The River Great Ouse AS-A does not contain the full extent of any open field system belonging to the medieval communities that lived within or close to it. Also given the low levels of survival of ridge and furrow earthworks, particularly in the north of Bedfordshire, the occurrence of well preserved earthworks is at best sporadic, its survival the result of chance and local circumstances rather than any topographical or geological factors. Small pockets of ridge and furrow earthworks can be found both in the main river valley, such as at Felmersham (HER 5104), Renhold (HER 3325) and Little Barford (HER 3538)

and the tributary streams; for example Sharnbrook (HER 1642). Excavated evidence of ridge and furrow is also often encountered for instance at Biddenham Loop (HER 1647), where the fields were associated with the township of Biddenham to the north (Albion Archaeology 2009, 6) The ridge and furrow earthworks are usually located on terraces above the floodplain partly because this land was less liable to flooding and therefore more suitable for cultivation but also because the lower lying land was more valuable as meadow and important resource in the medieval period.

Six assets relate to earthwork evidence for Medieval fishponds. Six of these fishpond complexes were associated with moated sites, such as at Manor Farm, Church End, Colmworth (HER 471). Also in Colmworth are earthwork remains of what is described as a swannery (HER 8021). This comprises a dam designed to create a pond in a small stream running into a tributary of the Great Ouse with a breeding island constructed in the centre of what would have been the pond. There is no evidence that the site was actually a swannery, but it was certainly built for the management and breeding of wildfowl.

Ancient woodlands are represented by three assets. They are all on tributary streams at Stagsden (HER 7266), Melchbourne (HER 9519) and Moggerhanger (HER 13202). Although woodland was an important resource in the medieval period, very little survives in north Bedfordshire. The location of woods that do survive is not surprising as the main river valley would have been too valuable and probably the wrong environment for the creation of extensive woodlands.

Communication/Transport Evidence

Six assets relate to medieval communications and transport. Two of them (HERs 9537 and 167874) are cropmark evidence for tracks or roads. These are part of what would have been a very extensive communications network which is probably largely preserved in the present road and footpath network.

However, of particular importance in the River Great Ouse are the four assets representing bridges. The River Great Ouse meanders its way through north Bedfordshire from Cambridgeshire to Buckinghamshire and would, without crossing points, effectively cut the north of the county off from access from the south. Crossing the river is absolutely for economic, administrative and social reasons. Undoubtedly early crossing points would have been by fords, but the Great Ouse is quite wide and prone to flooding which would make crossing difficult at some times of the year. Therefore, there is a strong incentive to construct bridges to provide permanent river crossing points that would not be made inoperable in flood or seasonally wet conditions.

Three of the bridge assets are standing structures still in use for their original purpose: Bromham Bridge (HER 998), Harrold Bridge (HER 999) and Turvey Bridge (HER 1000). The other asset is Stafford Bridge, connecting Oakley and Pavenham which no longer survives but whose history can be reconstructed from documentary sources (Simco and Mc Keague (1997, 47-50).

The fabric of the bridges all contain medieval elements, but the structures cannot themselves be dated. The earliest documentary references for each bridge are: Harrold

1136 -1146 AD, Turvey 11336 – 1138 AD and Bromham 1224 AD. (Simco and McKeague 1997). The construction of the bridges had a major impact on the landscape and economy of the adjacent areas. They fossilised the local road network by formalising the river crossing point and in the case of Bromham may actually have led to the creation of a new road to access the bridge. At Harrold the focus provided by the bridge may have been a factor in the development of the local settlement pattern, attracting settlement from Chellington on the top of the valley side to Carlton on the southern end of the bridge. The bridges also attracted other structures, Turvey and Bromham had chapels on or near the bridges and at Harrold a causeway was built across the floodplain on the southern side to provide access to the bridge even in times of flood.

Religious Houses and Buildings

This category comprises three assets for the River Great Ouse. One of them (HER 9031) is for two burials dated by association 13th century pottery salvaged from a service trench in the 1950's at Little Odell; the findspot is not close to any known church or chapel site. The other two assets are existing parish churches at Little Barford (HER 1013) and Bromham (HER 1027). It is perhaps interesting that both these churches are located within deserted medieval settlements.

Findspots

Fourteen of the HER entries record the sites of Medieval find spots. These represent individual and small groupings of finds, such as a buckle recovered from near Bromham Bridge, Biddenham (HER 14801). These finds were recovered by chance and by metal detecting reported to Bedford Museum and represent casual losses. They do not provide any additional information that can inform our understanding of the AS-A in the medieval period.

Conclusions

The medieval assets of the River Great Ouse AS-A have much in common with those of the rest of the county. It was a highly organised landscape organised to make best advantage of the natural resources of the area with the result that the topography and geology had a strong influence on the landscape and settlement patterns.

The medieval settlement pattern had its origins in the Late Saxon period as shown by the excavations at Tempsford Park. The predominantly nucleated villages are spread throughout the AS-A, often focusing in the river and tributary streams. The number of deserted, shrunken or shifted settlements show that the settlement pattern was far from static, and although some of these changes were doubtless the result of the various pressures in the population that manifested themselves in the 14th century, the exact mechanisms and chronology are not well known or understood. The other prominent element in the medieval landscape in Bedfordshire, moated sites, are well represented in the AS-A. The excavated examples giving a good picture of the nature of the occupation on the platform.

The agricultural system of the AS-A was based on the open field system with its characteristic ridge and furrow earthworks. As is true of the rest of the county there is little in the way of surviving ridge and furrow earthworks, though there are some small pockets within the AS-A. One element of the medieval agricultural landscape that must have been of major significance in a river landscape was meadowland which has left virtually no archaeological trace.

There is evidence of water management as part of the rural economy, including fishponds and the swannery at Colmworth. Again in the river landscape this is not surprising and it is likely that other similar features exist and have not yet been recorded. It is also probable that there are the remains of smaller scale river base activities in the valley, though they will be much more difficult to detect without intrusive investigation. The lack of assets relating to watermills is surprising in a river landscape with a predominantly agricultural economy. These sites are likely to exist within the AS-A, some may have occupied the same locations as watermills identified in the post medieval period, other sites which may not exhibit such continuity remain to be identified.

Little is known about the transport network of this period, but the medieval bridges of the River Great Ouse represent important and characteristic structures within the AS-A. They had a major impact on the organisation of the landscape and in some cases on the settlement pattern in their vicinity.

A major influence on the River Great Ouse would have been the town of Bedford which, as an urban area that cannot be subject to aggregate extraction, is outside the AS-A defined by the project. As the county town it would have had an administrative and social impact well beyond the AS-A. As an economic and commercial centre it would have been the focus of much of the AS-A, being particularly dominant in its central area. The small town of Harrold at the western end of the AS-A was barely urban in character in the medieval period and would consequently have had a much smaller influence restricted to the immediately surrounding area.

Post Medieval Assets (1540 – 1900 AD)

There are two hundred and forty assets for the post medieval period in the River Great Ouse AS-S. They can be divided into evidence for the following: settlement/occupation, land use/agriculture/land division, industry, communications/transport, designed landscapes, other activity and findspots

Settlement/Occupation Evidence

A total of eighty one assets relate to post medieval settlement. Seven of these assets are earthwork remains of now abandoned settlements. They are all for sites also recorded as medieval settlements, showing that the process of settlement abandonment that began in the medieval period was in some cases lengthy. The post-medieval element in these settlements has been identified from documentary sources often indicating that individual buildings or small groups of buildings survive into the post medieval period. Examples of this include Medbury (HER 7089), Wyboston (HER 8617) and Stagsden (HER 1844). They are distributed throughout the AS-A.

The rest of the assets representing post medieval settlement are standing buildings or sites of now lost buildings which for which there is good documentary evidence. Most of the surviving building assets are listed buildings which accounts for their presence in the HER, the others are not formally designated assets and the reasons for inclusion in the HER is obscure. These assets include a typical range of vernacular buildings and the occasional grander building such as Bromham Hall (HER 1028) but do not include buildings in villages or other substantial settlements which are excluded from this study. Therefore, the assets for buildings cannot be used to characterise the stock post medieval buildings for the AS-SA.

There three assets representing other post medieval activity in the AS-A relate to Kempston cemetery (HER 8915) and two schools: Tempsford (HER 7180) and Bromham (HER 7449). These are typical of 19th century municipal developments representing contemporary concerns for education and public health.

Land Use/Agriculture/Land Division Evidence

This category of evidence for the post medieval period is represented by forty seven assets. The Enclosure Acts of the late 18th and 19th centuries saw a radical reorganisation of Bedfordshire's landscape; it also witnessed the decline and final demise of the open field system. The new land divisions created by enclosure were superimposed on the open fields and the ridge and furrow earthworks. The physical remains of enclosure are represented by three assets; evidence of enclosure boundaries such as those recorded at Wilstead (HER 9602) and Wootton Broadmead (HER 9603).

There are thirty assets relating to post medieval farms and farm buildings such as barns and dovecotes; they represent the typical range of buildings that are to be expected in a predominantly agricultural area. There is one representing a 19th century model farm, within the AS-A. This was located at Chawston Manor, near Wyboston (HER 15624).

Model Farms were first constructed in Bedfordshire in the 18th century within the Duke of Bedford's estate (Edgeworth 2007b 124). These farms were copied throughout Bedfordshire during the late 19th century and represent an industrialisation of the agricultural landscape, and were often associated with large rectangular field (Edgeworth 2007b, 134).

Post medieval water management is represented by four assets. These include fishponds at Biddenham (HER 7194), Melchbourne and Yielden (HERs 9674 and 9675) and Little Barford (HER 9061). They occur both on the main river and tributary stream

Osier beds are an important facet of the post medieval period in the Great Ouse Valley and there are four assets relating to them within the AS-A. These were located adjacent to the River Ouse at Willington (HER 3568), Little Barford (HER 9062 and 9063) and at Tempsford (HER 9735). Osier beds were used to grow willows, for basket making (Bagshawe 1972, 164). These beds were situated in waterlogged riverine locations and may have had their foundations in the medieval period for fish traps and basket making (Bagshawe 1972, 166). Osier beds were often situated in market gardening areas due to the demand for baskets transport produce (Bagshawe 1972, 164).

Industrial Evidence

Fifty two post medieval assets relate to evidence of industrial activity. The majority of these assets (thirty five in total) relate to evidence for post medieval sand/gravel extraction. These mostly represent small scale exploitation of the river gravels to serve localised markets. Generally these extraction sites survive as earthworks and these remains can found through the AS-A, however, they have also been found in archaeological excavations such as at Peartree Farm, Eastcotts (HER 162). However by the end of the 19th century, larger scale aggregate extraction was being undertaken within the AS-A as at Cardington (HER 11989).

Three assets related to brickmaking are found within the AS-A, at Renhold (HER 1328), the Victoria Works (HER 3015) and Melchbourne (HER 9529). Brickmaking was an important industry in Bedfordshire in the post medieval and modern periods (Cox 1979) and was distributed throughout the county. It range in scale from small scale or estate focused production to serve local need to very large scale industrialised brickworks serving national markets. Most of the brickworks lay outside the River Great Ouse where the clay deposits that provided the raw material are found. The two assets in this AS-A are peripheral to both the main brickmaking areas and to the River Great Ouse.

Water mills represent eight assets within the River Great Ouse for the post medieval period. Five of them are only known from documentary sources while the other three are extant buildings. It is to be expected that a major river in an agricultural area would contain a number of watermills in the post medieval period, in fact it is perhaps surprising that there are not more recorded in the HER. It is also interesting that more than these assets no longer survive as buildings, suggesting that traditional milling was replaced by more centralised grain processing operations in the late post medieval and modern periods.

Communication/Transport Evidence

Twenty five of the post medieval assets for this AS-A transport and communication features. Five of these represent cropmark, earthwork and documentary evidence for Post-Medieval roads and tracks. These included the cropmark evidence for a trackway at Melchbourne and Yielden (HER 9537). This trackway was possibly moved during the reorganisation of the landscape during enclosure.

There are four assets (HER 8805, 9423, 9514 and 12895) relating to river locks and one for a staunch (HER 8016) between Roxton and Cople. The River Great Ouse was first made navigable from St Neots to Bedford during the late 17th century (Godber 1969, 258-259) and improvements were made throughout the late post medieval period. Goods transported to Bedford included coal and salt fish (Godber 1969, 320).

There are three HER entries for dismantled railways within the AS-A. This includes the Hitchin to Bedford line (HER 11832) which was opened in 1857 (Godber 1969, 512) and the Bedford to Sandy line which was opened in 1862 (HER 11833). These two lines connected Bedford to The Great Northern Railway, which ran through the Ouse Valley between Tempsford and St Neots. These routes shifted trade away from the navigation (Godber 1969, 518), which gradually had an impact on the viability of the navigation and was a factor in its decline. The creation of the railways also increased the access of the AS-A to the large urban markets and contributed to the development of the brickworks located just outside the AS-A, particularly the Marston Vale immediately to the south (Cox 1979, 57).

Designed Landscape Evidence

Eighteen of the assets for this period represent evidence for designed landscapes. Most of these landscape parks were created during the 18th and 19th century, such as the 19th century Tempsford Park (HER 7001). However, two of the post medieval landscape parks were centred on earlier manors or estates Kempston Bury (HER 7030), and Bromham Park (HER 7000) were centred around 16th century houses. Some of the designed landscapes contain a range of garden structures and features such as at Bromham Hall which has an ice house (HER 7310), boathouse (HER 7448), a bothy (HER 7450) and a boat house (HER 9842). The designed landscapes of the Great Ouse are relatively small scale and built by minor gentry and wealthy landowners or industrialists rather than the grand aristocratic landscape of the Woburn Sands Formation. In spite of their more modest scale they have a significant impact on the local landscape including at Bromham the clearance of a settlement to provide the land for the designed landscape.

These parklands were constructed on a much smaller scale to the large scale parks identified within the WSF AS-A, such as at Woburn Abbey (see WSF AS-A Post-Medieval summary). These assets possibly represent the sites of Medieval/Early Post-Medieval manors (Godber 1969, 299), which were created out of the enclosure of open fields and the demolition of settlements. This possibly included the clearance of two settlements at Bromham Park (HER 1350 and 7265).

Findspots

Fifteen of the post medieval assets represent find spots of medieval artefacts. These represent individual and small groupings of metal finds, including coins (HERs 15954 and 15921) or ornaments (HERs 15947 and 15958). These finds were recovered by chance or by metal detecting reported to Bedford Museum and represent casual losses. They do not provide any additional information that can inform our understanding of the AS-A in the medieval period.

Conclusions

The character of the River Great Ouse AS-A for the early post medieval period is similar to that of the Late Medieval period. The landscape saw the continued shift/nucleation of the settlement pattern and a large part of the open field system remained unenclosed during that period (Godber 1969, 402). Small scale enclosure of the open fields had taken place within the AS-A during the Medieval period (Godber 1969, 411). This small scale enclosure continued within the county, including within the AS-A in the early post medieval period. Further enclosure of the agricultural and marginal areas of the AS-A was undertaken during the creation of the landscape parks such as the 18th century landscape park at Bromham (HER 7000).

The late 18th to 19th centuries saw further reorganisation of the landscape, when most of the remaining open field systems were enclosed. These enclosures were promoted by the major landholders within the AS-A to increase productivity and their income from rents (Godber 1969, 404). Where these large estates held all of the land within a parish such as the Bedford estate did at Cople and Willington, enclosure could take place without an Act of Parliament (Godber 1969, 404-405). However, most parishes within the AS-A were enclosed by act of parliament (Godber 1969, 404-406). This landscape reorganisation is illustrated within the AS-A by the construction of the model farm at Chawston Manor (HER 15624). The osier beds identified within the AS-A are situated close to the Ivel Valley market garden area situated between Sandy and Tempsford.

The development of the communication network within the AS-A during the late post-medieval period, had the impact of increasing trade and communication within and outside the county. The navigational improvements undertaken to the River Ouse up to Bedford during the 17th to 19th centuries, increased trade and communication along the Ouse Valley (Godber 1969, 320). The construction of the railways also had the affect of increasing access for the brickmaking industry just outside the AS-A to the London and Midland urban markets (Cox 1979, 56-57). Aggregate extraction also grew during the Late Post-medieval period as shown by the gravel pits around Cardington/Cople (HER 1358, 11826, 11942 and 11989)

Although outside the AS-A the county town of Bedford would continued to exert an increasing influence on the AS-A. With the development of local government structures in the 19th century the town's administrative role would have expanded, linked to its role as a focus for civil and military society. It would also have acted as an economic and commercial centre with activities based on the agricultural produce of the surrounding AS-A and the need to service the increasingly industrialised and mechanised farming regimes. The links between agriculture and the development of industry in Bedfordshire in general and Bedford in particular have been commented on by Edgeworth (2007b).

The concentration of industrial activity in the expanding urban area of Bedford may account for the overall paucity of industrial sites within the AS-A.

Modern Assets (1901 – 2050 AD)

There are thirty two assets relating to the modern period for the River Great Ouse AS-A. They can be divided into evidence for the following: industry, military activity, settlement/occupation evidence and designed landscapes.

Industrial Evidence

Nine of the modern assets for the River Great Ouse represent industrial activity; seven of them are for sand and gravel extraction. They are distributed throughout the AS-A and tend to be examples of medium sized aggregate quarries from the early to mid 20th century, when extraction had been mechanised but was not on the scale that has been achieved in recent decades.

Military Evidence

Thirteen of the River Great Ouse AS-As modern assets relate to evidence for military structures or sites of structures. Six of these assets are associated with RAF Cardington airship works (HER 11944). This RAF installation was located on the edge of Marston Vale, on the river terrace to the south of Bedford and the River Great Ouse. The airship works (HER 11944) were constructed in 1916-1917 to build naval airships (Edgeworth 2007b, 136). A large airship hanger shed (HER 11945) and administration office (HER 11947) were constructed at this time. The airship works were nationalised in the 1920s and a second shed (HER 11946) was built in 1928 (Edgeworth 2007b). However, the ill-fated maiden voyage of airship R101 in 1930, led to the abandonment of production. The works and sheds were reused during World War Two (WWII), for the training of barrage balloon operators (Edgeworth 2007b, 136).

There are three assets for WWII pillboxes within the AS-A. Two of these (HER 17855 and 17854) were associated with RAF Cardington. There are two WWII HER assets for tank traps within the AS-A. These were constructed as defensive features, to restrict movements across the Ouse at Tempsford Bridge (HER 18001) and Bromham Bridge (HER 17852). There is one HER asset for a WWII decoy site at Great Barford (HER 17897). This was a 'Q' decoy site, which consisted of electrical lighting to represent airfield flare paths at night time, to divert bombers from nearby airfields (Lowry 1995, 64). There is one HER asset for a WWII guard's hut at Yelden (HER 17943). There is one for a WWII water pumping station at Sharnbrook (HER 17852). This pumping station was constructed originally to supply the WWII airfields located outside the AS-A to the north of Bedford.

Designed Landscape Evidence

The single asset for 20th century designed landscapes at Westfield Farm, Oakley (HER 17744) represents the fashion for horticulture and garden design adopted by the wealthier middle classes in the 20th century.

Settlement/Occupation Evidence

There are nine assets relating to modern settlement in the AS-A. Six of these assets relate to lion head standpipes within the AS-A (HER 3526, 4227, 8263, 8404 and 8405). These were bought by Bedford Rural District Council in 1926 and were placed throughout the district to supply running water to the rural areas of the district (HER General File). The other assets in this category: a group of almshouses in Oakley (HER 6919) and a water treatment works at Clapham (HER 16350) are typical examples of philanthropic and municipal activity in the first half of the 20th century.

Conclusions

The modern assets of the River Great Ouse AS-A present a very limited view of the period; and this is in part the result of the types of information available on the HER. What The River Great Ouse modern assets do show, is demonstrated by the earthwork remains of the large aggregate extraction pits at Willington (HER 685 and 794), which indicate the development and mechanisation of the aggregate industry within the AS-A, during this period. Extraction has continued around Willington within the AS-A (such as at Octagon Farm) but are not recorded by the HER. The two large airship hangers at RAF Cardington (HER 11945 and 11946) are a prominent feature within the Ouse Valley. These represent a unique early 20th century military/civilian industry, which although was only utilised for a short period of time, had a great impact on the character of the AS-A.

The River Ivel Aggregate Study Sub – Area

The Archaeological Resource

The River Ivel Aggregate Study Sub-Area (AS-SA) covers approximately 63 square kilometres and includes both the river terrace deposits and the glacial sands and gravels. A search of the Bedfordshire HER identified a total of three hundred and eighty-one assets which lay either entirely or substantially within the AS-SA. The table below illustrates the breakdown of assets by chronological period. In Appendix 2c there are chronological tables listing the assets by which category they have been assigned to and information on whether the assets have been subjected to archaeological investigation, are designated or relate to aggregate extraction.

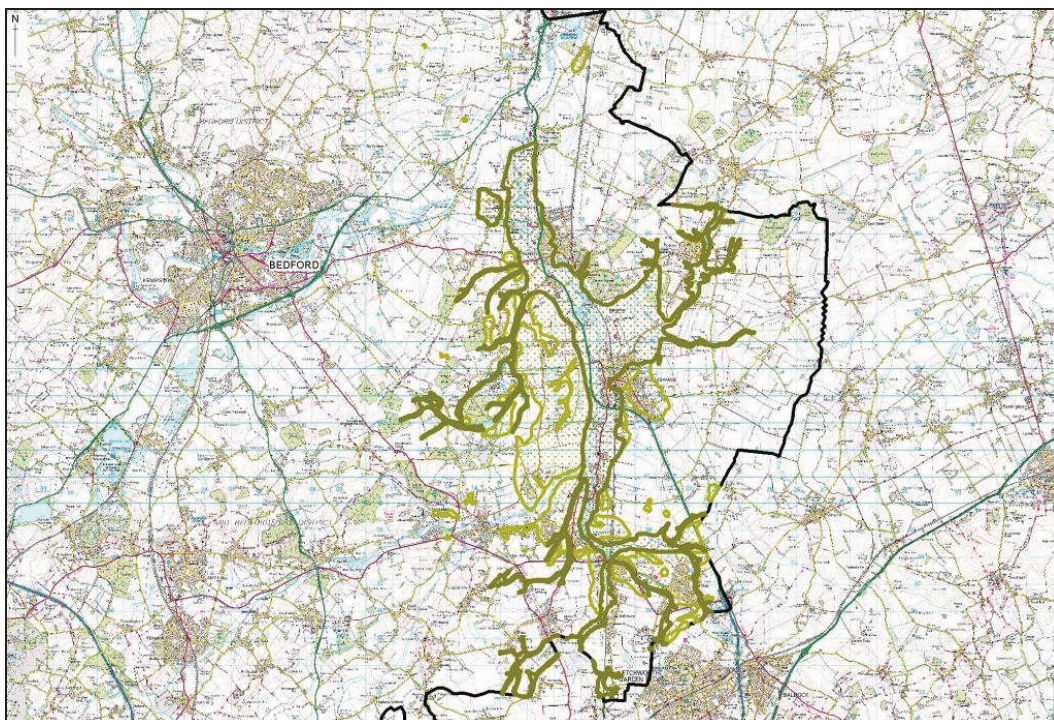


Figure 4: River Ivel AS-SA Location Map

Table 11: River Ivel AS-SA Assets

Type of Assets	Number Recorded	Number per sq km
Palaeolithic Assets	7	0.1
Mesolithic Assets	3	0.04
Neolithic Assets	30	0.5
Bronze Age Assets	48	0.8
Iron Age Assets	15	0.2
Later Prehistoric Assets	44	0.7
Roman Assets	41	0.6
Saxon Assets	12	0.1
Medieval Assets	48	0.8
Post Medieval Assets	117	1.8
Modern Assets	16	0.2
TOTAL	381	6.0

Palaeolithic Assets (900,000 – 10,000 BC)

There are seven Palaeolithic HER assets recorded within the River Ivel Aggregate Study Sub-Area (AS-SA) and they all relate to the recovery of single hand axes. Five of the assets were recovered from gravel pits near Blunham (HERs 14664, 14665, 14666 and 14668) and Biggleswade (HER 13974). The sixth asset (HER 14677) is recorded as having being found close to the River Ivel on the eastern side of Stotfold, however further contextual details about the discovery are not recorded within the HER. The final asset represents two upper Palaeolithic hand axes recovered during the archaeological investigations at Broom Quarry on the western side of the Ivel (HER 18273).

The four Blunham assets were recovered from what are known locally as the “Tempsford Gravel Pits”, located on the eastern side of the River Ivel. The hand axes recorded from this area are part of a group of records that relate to the recovery of artefacts and faunal remains from these gravel pits. The records originate from Bedford Museum and the artefacts were all in the possession of the owner of one of the local plant nurseries (Zwetsloot’s). Little is known about the exact circumstances of these discoveries but the Bedford Museum records suggest they may have come from re-deposited soil removed prior to the extraction of the gravel sometime during the 1970’s. Each record is accompanied by a drawing of the object, if the scales (each object has been drawn at 1:1) and illustrations are correct these are relatively small hand axes and have attributes that could assign them to the Middle Palaeolithic; however without studying the artefacts themselves this must remain a tentative suggestion.

The hand axe recovered from the Biggleswade area (HER 13974) came from Ivel Farm Quarry (also known as Sandy Quarry) which is located on the western side of the River Ivel to the north-west of the town of Biggleswade. It was found in 2006 on a reject gravel heap by one of the quarryman. This site has a rich and varied archaeological resource and the later assets will be discussed in the succeeding sections. The artefact has been identified as a flat-butted cordate or bout coupé hand axe of the type associated with the Neanderthals.

The sequence of the Middle Devensian deposits of the River Ivel at Ivel Farm were studied in 1998 and it was shown that there were three units present in the quarry. These units began with eroded Lower Greensand bedrock (Unit 1), overlain by gravels originally derived from the Anglian glaciation within which were a series of silt deposits relating to a series of slow moving channels (Unit 2), this deposit was below a silty clay representing a recent floodplain sediment (Unit 3). Two radiocarbon dates were obtained from organic materials within Unit 2 and these dated to 34,055 years BP and 29, 250 years BP (Gao et al 1998, 127-137).

Following the discovery of the hand axe an attempt was made to determine whether it was possible to identify the context of this discovery. The results have just been published in *Bedfordshire Archaeology* (Stephens et al 2010, 5-10). This recent work determined that the sequence of deposits noted in 1998, with exception of Unit 3 (which had already been removed) were all present in the area of the quarry where the hand axe had been recorded. The hand axe is in good condition and shows very little sign of damage. Thus the authors suggest that it is doubtful that it came from the gravels, instead they believe that it is more likely to have come from the silty deposits within Unit 2. In this part of the quarry the Unit 2 silts were quite extensive leading the authors of the

recent work to suggest that they may represent a swampy area. This would indicate that the Ivel Farm hand axe may have come from a primary context (Stephens et al 2010). The Gypsy Lane, Broom Quarry (HER 18273) hand axes are interesting because they are the only assets that have been recorded as Upper Palaeolithic. One was recovered from the gravels themselves and the other from an early Iron Age pit suggesting deliberate curation of the object.

Conclusions

The Palaeolithic assets from Bedfordshire as a whole indicate that both primary contexts sites and artefacts found in secondary contexts (re-deposited as a result of natural processes) are present within the county. To date most of the county's Palaeolithic assets have been assigned to either the Lower or Middle Palaeolithic (with a bias towards the former) and are largely restricted to the river valleys and the brickearth and clay-with-flints deposits of the Chilterns. Consequently the recovery of hand axes from the River Ivel AS-SA conforms to the county wide pattern, with the exception of the Upper Palaeolithic hand axes from Gypsy Lane (HER 18273). The Ivel Farm hand axe (HER 13974) may represent the existence of primary context site within this AS-SA, certainly the presence of similar sites are known from the River Great Ouse AS-A such as Deep Spinney (HER 327). It must therefore be acknowledged that it is the sand and gravel aggregate extraction sites of the river valleys that present the greatest opportunities for gathering further information on this period.

Mesolithic Assets (10,001 – 4,000 BC)

There are three Mesolithic assets for the River Ivel Aggregate Study Sub-Area and these all represent collections of over 10 lithic objects; found near Tempsford at the northern end of the AS-SA (HERs 490 and 491) and at Warren Villas Quarry north-east of Biggleswade on the western side of the Ivel (HER 3527).

The first Mesolithic asset relates to the recovery of flint flakes and blades from an arable field on the western side of the River Ivel south-west of the village of Tempsford (HER 490) in or around 1955 by archaeologist C.F. Tebbutt. At approximately the same time Tebbutt also found Mesolithic flint blades and flakes in rabbit burrows on a natural sand mound (HER 491) around 600 metres south-east of HER 490. The identification of the material as Mesolithic was undertaken by Professor Grahame Clark of Cambridge University; they are now in Bedford Museum and between the two sites total fifty-five artefacts.

Tebbutt believed that the natural sand mound at HER 491 would have been located above the surrounding floodplain during the Mesolithic period; thus making it an ideal location for the exploitation/utilisation of riverine resources, and that scatter he'd collected from the western side of the river (HER 490) had also once been a "sand island" that was subsequently reduced by ploughing (Tebbutt 1955, 53). In 1979 as part of research undertaken for the Tempsford Parish Survey a site visit was made and apparently recorded the presence of more flakes within the rabbit burrows (although its unclear whether any of these were collected.)

The third asset represents a collection of flints from the Warren Villas Quarry (HER 3527). A series of archaeological investigations was undertaken at Warren Villas Quarry between 1989 and 1994 and the flints were recovered during a fieldwalking phase. The interim report (full publication has stalled due to a refusal by English Heritage to fund the post-excavation analysis) suggests the lithics formed a series of dispersed spreads of flints located along the top of the river terrace overlooking the River Ivel. There does not appear to be any information on the types of material found (such as whether there are any finished tools or debitage) but the assemblages did include Neolithic material as well (Dawson and Maull 1996, 60-61). This lack of data on the composition of the collection would of course be rectified if full analysis and publication was forthcoming.

Conclusions

Given there are only three assets for the Mesolithic period and the composition of the lithic assemblages are not fully recorded it is somewhat difficult to draw conclusions about the significance of the evidence for this period. Mesolithic assets are recorded within the other study areas and the location of the Tempsford "island" finds is similar to an assemblage found at the Roxton Quarry site, within the River Great Ouse AS-A only a short distance north beyond the confluence of the two rivers (Taylor and Woodward 1985, 139). Similar lithic spreads to those at Warren Villas have also been identified at Biddenham, also within the River Great Ouse AS-A (Luke 2007, 26-27).

We do not have any palaeoenvironmental data to indicate the course of the level during the Mesolithic period and yet the presence of lithics does suggest that the river valley was accessible enough for at least the seasonal exploitation of riverine resources.

Neolithic Assets (4,001 – 2350 BC)

There are thirty Neolithic assets for the River Ivel Aggregate Study Sub-Area and they can be divided into the following evidence categories; findspots, settlement/occupation activity and ritual/ceremonial/burial.

Findspots

Fourteen of the Neolithic HER assets relate to lithic artefacts and represent the chance recovery of single and multiple (HERs 14663, 16095 and 16096) items. Four of these assets comprise Neolithic axes recovered from the “Temptford Gravel Pits” at the north of the study area (HER 14661-14662 and 14668) and they include a large polished greenstone axe (HER 146618). These records come from Bedford Museum and include 1:1 scale drawings of the artefacts which were taken to Museum by the owner of Zwetsloot’s Nursery. There is no specific information regarding the context of the finds however the gravel pits are located close to the Ivel on its eastern side.

Six of the Neolithic findspot assets represent arrowheads, five of which are described as barbed and tanged (generally this type arrowhead is found in later Neolithic/Early Bronze Age contexts), in similarity to the axes recovered from the Tempsford area the records are all from Bedford Museum and there is no further information on the circumstances of their discovery. In contrast the axes the arrowheads were found in the south of the AS-SA to the north and south of Biggleswade, with a concentration around Broom.

The final two Findspot assets represent Neolithic/Bronze Age flints recovered during fieldwalking in advance of the Arlesey/Stotfold Bypass (HERs 16095 and 16096) at the mid point of the study area.

Settlement/Occupation Evidence

Eleven of the Neolithic assets are likely to represent evidence of settlement or occupation activity, they comprise a cropmark enclosure (HER 468), and a series of excavated features (HERs 631, 3527, 13544, 9093, 9094, 3576, 18273, 18274 and 6741). The cropmark is located to the west of Biggleswade at the site of the Biggleswade medieval ringwork (HER 468); it consists of a large broad ditch running in an arc from east to north, with an external ditch to the north-west. The site is located on a gravel island within the River Ivel flood plain, the enclosure has been dated from its relationship with a ring ditch which overlies it and its morphological and topographical similarity to other enclosures (Evans 1994). Other broadly comparable enclosures to the Biggleswade site are known at the Brampton Complex in the Great Ouse Valley to the north (Malim 2000, 63 and 73).

Evidence for Neolithic occupation was recorded during the archaeological investigations at Warren Villas Quarry (HER 3527), excavations through a palaeochannel at the southern part of the site produced palaeoenvironmental material which may have dated to the Late Neolithic. Pollen analysis indicated that close to the river alder carr dominated, whilst the presence of oak and elm suggested areas of dry land woodland in

close proximity. Cereal and herb pollen were also recorded suggesting the presence of human activity close by. The investigations also recorded a truncated Neolithic pit from which arrowheads, an axe and Neolithic pottery were recovered (Dawson and Maul 1996, 60-61).

Neolithic pits were also recorded to the south of Warren Villas Quarry at Ivel Farm (HER 13974, also known as Sandy Quarry) and represented two large Neolithic pits associated with a cluster of smaller one and one isolated pit (Albion Archaeology 2010).

To the south-west of Biggleswade Hospital a small number of pits containing lithics and pottery were revealed during trial trenching (HER 13544). These pits were situated on a gravel terrace between the River Ivel and a tributary Two of the pits contained datable material: waste flakes and pottery of Late Neolithic date, with a third dated to the same period by association (Albion Archaeology 2008, 10).

Archaeological excavations at Broom Quarry have been ongoing since the early 1990's, and the extraction of glacial sands and gravels from this area on the western side of the River Ivel between the villages of Upper Caldecote in the north and Broom in the south have offered a unique opportunity to study a palimpsest of archaeological landscapes. Disperse Neolithic occupation activity has been identified both within the original quarry site (HERs 6741, 9093, 3576, 18273, 18274) and the southern extension (HER 631). At this point it should be noted that for the purposes of this study the names used in the 2007 Monograph for the individual sites have been used (see Cooper and Edmonds 2007).

At Hill Lane, Broom Quarry early Neolithic flints were spread across the investigation area, many of them incorporated into later features; however a small number of pits and tree throws also contained material of this date (HER 9093). The broad distribution of the lithics and evidence for later truncation led the excavators to suggest that other features had been lost as a result of later activities, especially those which were more superficial (Cooper and Edmonds 2007, 21). Significant clusters of early Neolithic pits and tree throws were also identified to the south of Hill House in the area known as King's Hill (HER 3576).

Evidence for later Neolithic occupation at Broom was recorded at Gypsy Lane, where six later Neolithic (Beaker period) pits along with residual lithics in later features were investigated (HER 18273); a similar picture was discovered to the south at Ash Covert (HER 9094), and in the southern extension (HER 631), with the exception of one substantial pit which produced large sherds of late Neolithic (Beaker period) pottery representing at least three different vessels. At Toll House (HER 6741) two otherwise isolated Neolithic pits were discovered

Both early and late Neolithic features were recorded at the Brookland Farm site (HER 18274) but perhaps one of the most significant discoveries was a waterlogged pit which had a primary deposit containing posterior skulls and horn cores of five aurochs; one domestic cow, a small assemblage of other cattle bones, burnt and waterlogged wooden planks and a worked flint. Aurochs were the wild ancestors of domestic cattle and became extinct during the Bronze Age in Britain. Later Neolithic deposits of single aurochs skulls are recorded but the Brookland Farm pit is currently the only known example to contain multiple skulls in the region. What makes the deposit more interesting is that two of the skulls had been pole-axed demonstrating the method of

their departure. What these deposits represent is uncertain, analysis suggested that the skulls were possibly collected over some period of time, and different degrees of weathering was evident, indicating some of them may have been subjected to longer periods of exposure than others (Cooper and Edmonds 2007, 51-53). Certainly the burial within the pit was a deliberate act but its significance is far from clear.

Dispersed Neolithic/Early Bronze Age settlement activity was also recorded in the Broom Quarry southern extension (HER 631). This activity was concentrated on the upper slopes of the gravel terrace and represented pits and tree throws containing Neolithic and Bronze Age material. The most interesting of which was a large pit which contained several sherds of Beaker pottery (Josephs 2008, 7).

Ritual/Ceremonial/Burial Evidence

Five of the Neolithic assets within the River Ivel AS-SA represent what are perhaps best described as ceremonial and funerary monuments. Two of these assets located to the north of Biggleswade represent evidence for cursus monuments and in fact probably represent the same feature (HERs 644 and 10138), and a third possible cursus or long mortuary enclosure is situated to the south of these monuments (HER 16818). The cropmark of a possible long barrow has been identified to the north of Zwetsloot's Nursery near Tempsford (HER 16786) and a C-shaped monument (Monument II) was excavated at King's Hill, Broom Quarry (HER 3576).

Cursus monuments are generally described as elongated rectilinear enclosures between 170 metres and 4 kilometres in length and there are very few examples in Bedfordshire as a whole, although all of those that have been suggested are located within river valley contexts (Luke 2007, 33). The cropmark of a cursus has been identified from aerial photographs at Furzenhall Farm, on the eastern side of the River Ivel to the north of Biggleswade (HER 644). Around 700 metres in length and 70 metres wide it has a square eastern end surrounded by a small cluster of ring ditches (probably Bronze Age barrows) but the location of the western end has not yet been identified.

In 2004 investigations (HER 10138) at the Biggleswade Sewage Treatment Works to the west of HER 644 identified the presence of a short section of what is believed to be the southern ditch of the same cursus. The ditch was found to have two phases of construction, the first of which had partially silted up before being cut by the later one, it may also have had an internal bank. Environmental samples recovered from the earlier ditch were not very productive but did produce barley grains and fragments of oak charcoal. The later ditch had probably also naturally silted up and produced a greater quantity of palaeoenvironmental remains including a small concentration of charred grain including barley and wheat. Evidence for the deliberate clearance of the landscape prior to the construction of the monument may also have been found as the cursus ditch had truncated a large tree throw hole (Abrams 2010, 43-46). A section across a probable ring ditch to the south-west of the monument was also excavated, several of these ring ditches adjacent to the east-south-east end of the cursus had been identified from aerial photographs, and the investigated example was shown to have a 1.7 metre wide ditch with a postulated diameter of around 30 metres (Abrams 2010, 46).

To the south of the Furzenhall Farm cursus there is a further, somewhat indistinct cropmark which has also been tentatively interpreted as a cursus (HER 16818). In similarity to the Furzenhall Farm example it also has a squared end and is on the same west-north-west, east-south-east alignment. However the visible length appears too short to truly fit into the cursus category (Abrams 2011, pers comm.) and therefore is perhaps best described as a possible long “mortuary” enclosure.

A further cropmark assigned to the Neolithic period within the AS-A has been identified to the North of Zwetsloot’s Nursery, Tempsford (HER 16786) and it has been interpreted as representing the remains of a ploughed out long barrow, although it has not been investigated.

On the western side of the River Ivel and to the south of the Furzenhall Farm cursus monuments within Broom Quarry a further Neolithic ceremonial/burial monument has been investigated to the south of Hill House within the area referred to by the excavators as King’s Hill (HER 3576). Visible initially on aerial photographs as one of two of ring ditches excavation revealed this feature was in fact a large semi-circular pit cut ditch, with an internal diameter 28 metres and a maximum external diameter of 32 metres, it may also have had internal mound or bank. Almost the entire monument was excavated and a charcoal rich deposit was recorded at the northern end and fragments of a child’s skull were recovered from one of the middle sections (Cooper and Edmonds 2007, 53-61).

Dating the “C-shaped Monument” as it has become known (also referred to as Monument II in the Monograph Cooper and Edmonds 2007) has proved problematic; at either end sealed early Neolithic pits were recorded with some evidence that they had held upright posts and it was also located within an area where significant clusters of early Neolithic pits have been recorded. However the pottery assemblage suggested the monument was more likely to be later Neolithic/early Bronze Age in date (some middle Bronze Age pottery was also recovered). Radiocarbon dates from the charcoal rich deposit also recorded a calibrated date of 1780 – 1680 BC with 68.2% confidence (or 1880-1640 BC with 95.4% confidence), suggesting an overlap with some of the later pottery, this at least may provide a date for one of the episodes in the monuments life (Cooper and Edmonds 2007, 57). In conclusion the excavators suggested that the C-shaped monument probably represented the re-working of a funerary/mortuary monument over a considerable period of time which spanned the end of the third millennium and beginning of the second millennium BC (Cooper and Edmonds 2007, 61).

Conclusions

The Neolithic landscape of the River Ivel AS-SA is perhaps best described as demonstrating evidence for the development of communities. This period of time is traditionally seen as heralding the adoption of a more sedentary way of life that manifested itself by the domestication of plants and animals following large scale woodland clearance. Palaeoenvironmental evidence collected from the AS-SA indicates the presence of fen carr close to the Ivel but with some woodland further up the valley sides. Occupation evidence is present on both sides of the river and dates to the earlier and later Neolithic. This apparent settlement activity is very similar on both sides of the

river and on the two different geological formations; seemingly ephemeral spreads of lithic material, clusters of pits and tree throws are all that at present show us where these communities lived. However these are features which have come to be widely recognised within the county as something of a signature of occupation sites dating to this period (Luke 2007, 29-31 and 39-41).

The presence of monumental structures is also evident on both sides of the Ivel, although perhaps interestingly they exhibit different characteristics. Cursus monuments are generally believed to be associated with funerary or other ceremonial activities and are often found in proximity to other Neolithic monuments within river valley contexts (Bradley 2007, 64-67). Allowing for the changes in the course of the Ivel since the Neolithic; Abrams suggested that the Biggleswade cursus (HERs 644 and 10138) may have been surrounded by water on three sides, with the river to the west and the low-lying fen to the north and east (Abrams 2010, 47). Size notwithstanding the monument would have been highly visible the landscape, particularly from the higher Greensand Ridge which overlooks the area from the north. In contrast to the Biggleswade cursus the C-shaped monument at Broom Quarry (HER 3576) was situated on "higher" ground, on a slight break of slope or false crest, which would have had the effect putting the monument on the skyline if viewed from the lower ground to the east (Cooper and Edmonds 2007, 53). The deliberate placement of monuments on false crests is not uncommon and particularly evident during the Bronze Age in river valley contexts (see this section Bronze Age assets).

The physical locations of the Neolithic monuments within the AS-SA were clearly of great significance to the communities who built and maintained them, but the relationship (if there is one) between the settlement/occupation activity recorded in the AS-SA and these ceremonial monuments is far from clear. The Biggleswade cursus appears to have been constructed in a landscape devoid of settlement activity, with the closest known occupation of comparable date on the other side of the river to the north-west at the Warren Villas Quarry (HER 3527). It has been postulated that this type of monument was deliberately located within a landscape that wasn't settled (Bradley 2007, 68) and on the eastern side of the River Ivel this may have been the case. Although in the absence of excavated examples we should be perhaps a little cautious at assuming this was the case, particularly as the cursus is situated within a landscape that is full of cropmarks (for example HER 15507) none of which have been investigated and may yet yield evidence of occupation activity.

On the western side of the Ivel the excavations at Broom Quarry certainly indicate a rather different picture. Evidence for Neolithic occupation activity was recovered from a substantial part of the landscape and one of the densest concentrations was around the C-shaped monument (HER 3576) at least part of which was in existence during this period. The function of the C-shaped monument is not certain but is apparently funerary nature.

Occupation, almost certainly agrarian in nature to some degree was obviously taking place during the Neolithic period in the Ivel valley and the charred plant remains recovered from Broom produced evidence of cultivated cereals such as emmer wheat (Stevens, 2007, 284). At present, whether dating to the earlier or later half of the period it is entirely found on the western side of the river whilst monument building is found on both sides of the river. Whether this is a real difference or one based on the absence of excavated material from the eastern side of the river is impossible to tell, however it

raises a series of interesting questions about the management and manipulation of the landscape during this period of time.

Bronze Age Assets (2351 – 700 BC)

There are forty eight Bronze Age assets for the River Ivel Aggregate Study Sub-Area and they can be divided into evidence for the following; ritual/ceremonial/burial activity, findspots, land use/agriculture/land division and settlement/occupation activity.

Ritual/Ceremonial/Burial Evidence

There are twenty-seven Bronze Age assets that relate to ritual/ceremonial/burial activity within the AS-SA, the majority are ring ditches and barrows (twenty-five), whilst there are two assets that relate to cremations (HERs 3576 and 18274). Ring ditches commonly represent Bronze Age burial mounds or barrows, where the central mound has been destroyed or reduced as a result of later activities such as ploughing. They are found singly, in pairs or in larger groups (referred to as cemeteries) and are found in isolation and in proximity to other monuments both of earlier and later dates. All of the ring ditches within the AS-SA were initially identified as cropmarks from aerial photographs and the majority have not undergone any form of investigation.

The ring ditches within the AS-SA are found both on the river terrace deposits and the glacial sands and gravels, on both sides of the River Ivel and are distributed throughout the study area. They tend to be located on the valley sides, many on false crests, which would have meant they would have appeared as if they were on the skyline to anyone on the valley bottom below them.

There is one noticeable concentration of ring ditches, which is located within one of the AS-SA's as lowest lying areas and this is Biggleswade Common. Located to the north of the town of Biggleswade the Common forms a broad inverted u-shape with the river running along its western boundary, the Greensand Ridge lies to the north and one of the River's tributaries on its east. Preserved within this landscape and in the arable fields to the north and south are a series of cropmarks and earthworks dating from the Neolithic through to the Second World War. There are two small concentrations of ring ditches around the Biggleswade cursus (HER 10138 and 644), the mostly noticeable of which is at its eastern end (HER 644). A further group comprising at least six ring ditches (HER 1343) is located south of the canalised Potton Brook and an isolated monument lies a short distance from this group to the south-east (HER 701). To the north-west of the Biggleswade Sewage Treatment Works there is a group of cropmarks that include a ring ditch which appears to define an earthen mound (HER 15507). Only one of the Biggleswade Common ring ditches has been subjected to archaeological investigation and this is the one located towards the western end of the cursus monument (HER 10138). During the evaluation stage of the project found to have a 1.7 metre wide ditch but as it could be preserved *in situ* no further information was obtained and it was not possible to investigate the interior of the monument (Abrams 2010, 46)

Other excavated examples of ring ditches are known within the AS-SA. At Warren Villas Quarry (HER 3527) a penannular shaped ring ditch had been constructed in an area that lay between one of the palaeochannels and a large pool, which the excavators suggested would have been possibly still waterlogged during the Bronze Age. It was 19 metres in diameter, with a ditch that measured between 1.7 and 2.2 metres in width. No

central or later burials were recorded but it did have a gap in the ditch on its eastern side (Dawson and Maull 1996, 63 – 64).

On the western side of the River Ivel, between the villages of Upper Caldecote and Broom, archaeological investigations have been underway since the 1990's to record the archaeological landscape prior to its destruction by Broom Quarry and its extensions. The archaeological sensitivity of proposed extraction area was initially highlighted as a result of a series of cropmarks, visible on aerial photographs. Amongst these cropmarks were two possible ring ditches within an area to the south of Hill House known as King's Hill (HER 3576). A further ring ditch was excavated at Ash Covert (HER 9094) and one earthen barrow on the northern side of Hill House at Hill Lane (HER 9093).

The problems of dating the earlier phases of the C-shaped Monument to the south of Hill House (HER 3576) has already been discussed in greater detail in the Neolithic section of this resource assessment but the excavated evidence did indicate that it had been in use during the early Bronze Age and possibly through to the middle Bronze Age. Around 75 metres to the south of the C-shaped Monument a further ring ditch was located and excavated (referred to as Monument III). It had been built at the end of a narrow spur, where the ground dropped away into the lower parts of the river valley to the east. Approximately 20% of the ditch was excavated; it had an external diameter of 30 metres and an average width of 2.4 metres. In two areas charcoal rich dumps were recorded, the central mound (if it had one) had been completely removed by ploughing but the truncated remains of a small pit, just off centre containing sherds of a Collared Urn and a cremation pit to the west was recorded (Cooper and Edmonds 2007, 61-62).

The investigated sections of Monument III suggested that following the excavation of the ditch (and presumably the construction of the central mound) it had silted up naturally over time, with very little modification. Few artefacts were recovered from the ditch; a mixed flint assemblage comprising both Neolithic and Bronze Age items was recovered although there was greater evidence of Bronze Age material. Palaeoenvironmental remains were also infrequent, suggesting the presence of scrub woodland comprising oak with some hawthorn and elder. Of cultivated plants only a single grain of emmer wheat was recovered and some possible tubers (Cooper and Edmonds 2007, 64 – 64).

The ring ditch at Ash Covert, Broom Quarry (HER 9093), known as Monument IV, was only investigated during the evaluation stages and subsequently preserved *in situ*. It was situated on slight terrace on a broader slope that ran west down towards the bottom of the valley, had an external diameter of around 27 metres and the ditch ranged from between 3.3 to 3.8 metres in width, one sherd of Collared Urn was recovered from the excavated sections of the ditch. The trial trenching recorded the presence of an internal pit and three cremation burials, one of which was accompanied by a later Bronze Age cremation urn, indicating these burials were probably secondary (Cooper and Edmonds 2007, 64).

At Hill Lane, Broom Quarry (HER 9093) a large bell barrow was the subject of trial trenching. It was situated in a gravel spur and had a diameter of around 44 metres. Parts of this monument (including the mound) had been preserved beneath a medieval headland. Within the mound there was a primary cremation burial which had been disturbed by a later inhumation. A truncated pit also contained sherds of decorated Beaker pottery and two cremations with Collared Urns (including one which was a complete miniature vessel) were also recorded (Cooper and Edmonds 2007, 64 – 71).

During the evaluation stage of the Broom Quarry southern extension (HER 631) two ring ditches was investigated, one of which produced a flint blade.

The final assets that relate to ritual/ceremonial/burial evidence for this period were also recorded at Broom Quarry they represent a group of four Bronze Age cremations from Brookland Farm (HER 18274) and a middle Bronze cremation cemetery from King's Hill (HER 3576). The latter asset comprised forty-two cremations some urned and some un-urned located around 20 metres north-east of the C-shaped monument. Osteological examination demonstrated the presence of young infants through to adults and that in some cases more than one individual had been buried in one urn/feature (Cooper and Edmonds 2007, 95 – 98).

Findspots

There are eleven HER assets for Bronze Age findspots within the River Ivel AS-SA, nine of them represent single objects (flint arrowheads and one later Bronze Age spearhead HER 1975) and the remaining assets relate to small quantities of lithics (less than 10 items). The arrowheads are mainly concentrated around Broom (HERs 16200, 16197 - 16199 and 16206 – 16208) and the majority are recorded as barbed and tanged, which typically date from the Late Neolithic to Early Bronze Age. The records come from Bedford Museum and there is no further contextual data for them within the HER, presumably represent chance recoveries.

A Late Bronze Age spearhead was recovered from an area of market gardening at Henlow (HER 1975), the HER suggests that it may have been associated with other items but there is no evidence to suggest exactly what and there for the potential significance of this asset is unknown.

Settlement/Occupation Evidence

There are eight assets that relate to Bronze Age settlement/occupation evidence within the AS-SA. Close to the western bank of the River Ivel there are two assets that relate to ephemeral occupation activity dating to this period. At the Ivel Farm (Sandy) Quarry (HER 13974) a single Early Bronze Age pit was recorded in an area of later activity (see Iron Age section of this resource assessment) and similarly at the land south - west of Biggleswade Hospital (HER 13544), a single Late Bronze Age/Early Iron Age pit was investigated (Albion Archaeology 2008 and 2010)

The remaining assets relating to Bronze Age settlement/occupation have been found on the glacial sands and gravels to the west of the River Ivel between Upper Caldecote in the north and Broom in the south, prior to the extraction of aggregates from Broom Quarry and its extensions.

The earliest Bronze Age settlement evidence at Broom may have been recorded in the southern extension (HER 631) where a scatter of Neolithic/Early Bronze Age pits were found to be concentrated on the upper slopes of the gravel terrace. One of these

features was a substantial pit which contained several sherds at least three Beaker vessels (Josephs 2008, 7).

To the north of the southern extension within the original quarry area further possible early Bronze Age settlement activity was recorded at the Brookland Farm site (HER 18274). This comprised pits, post holes and possible ring gully; however the exact time span for this occupation is uncertain as both early Bronze Age and late Bronze Age pottery was recovered from this area, in addition two probable middle Bronze Age cremations were recorded at the edge of the settlement area.

At Ash Covert to the south of Gypsy Lane (HER 9094) middle to later Bronze Age settlement activity was found during the evaluation phase, some of it was subsequently preserved *in situ* whilst one area of later occupation was excavated. Middle Bronze Age evidence included a roundhouse, pits, post holes, and some possible boundary features that may represent an associated field system.

Evidence for later Bronze/early Iron Age occupation has been found at a number of locations within the Broom Quarry area. At Gypsy Lane (HER 18273) a significant Iron Age settlement (see next section) clearly had its origins in the later Bronze Age with at least one post built roundhouse and numerous pits dated to the earlier period. Settlement/occupation activity of a similar nature to Gypsy Lane and Ash Covert was recorded at the sites in the western and north-western parts of the Broom quarry area. At Hill Lane (HER 9093), settlement activity was located on a slight promontory to the north and west of the early Bronze Age barrow (Monument I) and to the south of a double-ditched boundary feature and comprised two groups of features. The first consisted of two post built roundhouses and some possibly associated pits whilst the second was a cluster of pits closer to the monument. The dates for this activity span the latter half of the Bronze Age into the middle Iron Age.

Later Bronze Age/early Iron Age settlement activity was also found at the Toll House site (HER 6741). This was located on the higher gravel terraces of the river valley and included a post built roundhouse, pits, post holes, four and six post structures, the site was unenclosed but the excavators raised the possibility of southern boundary, possibly marked by a hedge (Cooper and Edmonds 2007, 23).

Land Use/Agriculture/Land Division Evidence

During the excavations at Broom Quarry evidence was recorded of what may represent a mid Bronze Age boundary system, the most prominent element of which was a double ditched linear to the north and west of the bell barrow (Monument I), Hill Lane (HER 9093), which had an apparent "entrance" gap to the north of the barrow. In some cases these features seem to have been dug in sections of varying lengths. A concentration of Bronze Age ditch alignments was also found in Moat Field (HER 3576) to the south.

Conclusions

The Bronze Age assets for the River Ivel AS-SA present an image of a landscape overwhelming dominated by monuments to the dead and to a degree if all of the ring ditches identified within the study area do represent burial mounds then they certainly would have had a big impact upon the area during this period. These monuments are found throughout the AS-SA and the majority are located along the valley sides, with some like those identified at Broom Quarry (HERs 631, 3576, 9093, 9094), situated on false crests, which would have made them even more prominent, particularly from the river itself and the lower terraces along it. However not all these types of monuments were located on the higher ground, in fact those located on the opposite side of the river on Biggleswade Common (HER 1343 and 701) are some of the lowest lying monuments in the AS-SA. Whether this is significant is difficult to tell, the excavated examples demonstrate that these features were indeed constructed as burial monuments and as is common elsewhere were often re-used for later burials. At Broom during the middle part of the Bronze Age at least one of the early monuments also became the focal point for a flat cremation cemetery (HER 3576) but interestingly this is one of the areas at the site where there is no evidence of Bronze Age settlement, a circumstance which is recognised as being often found close to flat cemeteries of this date (Bradley, 2007, 197-198)

At present what we know about settlement in this AS-SA during the Bronze Age is almost entirely restricted to the western side of the river from the excavations at Broom Quarry and it is only in the latter half the period that these occupation sites appear to represent organised settlements, which may have been part of a landscape divided by a series of boundaries. However, whilst the earlier occupation at Broom may not appear as cohesive there is certainly evidence for the creation of recognisable structures such as roundhouses.

The Broom excavations also showed that during the earlier period occupation activity was located on the lower terraces of the one of the Ivel's tributaries, whilst from the later Bronze Age, more elevated positions were favoured. Whilst there is far less evidence (only a few seemingly ephemeral pits from Ivel Farm Quarry and south-west of Biggleswade Hospital HERs 13974 and 13544) from the river terrace deposits close to the present course of the River Ivel the topographical situations of these sites to a degree mirror those early Bronze Age occupation found at Broom. The excavators at Broom explored the possibility that the apparent shift in settlement location between the earlier and later Bronze Age may have been influenced both by the rising water table and by the move to a more sedentary and permanent way of life (Cooper and Edmonds 2007, 139-142), but concluded that there was no clear evidence to support either hypothesis as being a determining factor in the movement uphill.

The Palaeoenvironmental evidence from Broom suggest that during the Neolithic and Bronze Age the landscape would have been predominantly grassland with alder carr in the lower areas with areas of oak woodland presumably located on the higher ground (Boreham, 2007, 287) and this is an environment remarkably similar to that recorded at Warren Villas closer to the western banks of the Ivel for the Neolithic period (Dawson and Maull 1996, 61-62). The main shift in cultivated plants between the early and later Bronze Ages seems to be the increase in the amount of barley amongst the cereal

remains during the latter part of the period. Otherwise this evidence seems to support the excavated material, suggesting that even the early Bronze Age occupation at Broom was a largely agrarian and sedentary in nature.

The Bronze Age assets for the River Ivel AS-SA show a continued investment in the landscape that was clearly begun during the Neolithic period. The excavations at Broom Quarry indicate that there may have been a shift away from the lower valley terraces towards the higher ground during the latter half of the period and it is at this time that the presence of more robust archaeological signatures for settlement is observed. The reasons behind this movement uphill are unclear and the excavated material at present is too limited to draw conclusions that can be applied across the study area. However what the investigation of a "landscape" as facilitated by the excavation of sand and gravel at Broom has demonstrated is that we should be paying closer attention to the valley sides particularly on the eastern side of the valley when attempting to predict locations for Bronze Age settlement.

Iron Age Assets (701 BC – 42 AD)

There are fifteen Iron Age assets for the River Ivel AS-SA; they are found on both the river terrace and glacial sands and gravels deposits, and can be divided into evidence for settlement/occupation and land use/agriculture/land division. In addition one instance of Iron Age pottery was recovered from a fieldwalking exercise for the Arlesey/Stotfold bypass (HER 16095) and two early Iron Age cremations were recorded during the excavations of the Stratton Saxon and medieval settlement to the south of Biggleswade (HER 518).

Settlement/Occupation Evidence

Ten of the Iron Age assets for the River Ivel AS-SA relate to settlement/occupation activity; two of the assets represent cropmarks (HERs 468 and 1486), whilst the remaining have been assigned to this period as a result of archaeological investigations. On the western side of the Ivel, to the north of Biggleswade and close to the banks of the river, Iron Age settlement activity has been recorded Ivel Farm (Sandy) Quarry (HER 13974). The site sits on the floodplain and the sands and gravels of the river terraces deposits are cut by a series of former river channels. The Iron Age activity at the quarry can be classified as representing three phases; the transitional period between the end of the Bronze Age and beginning of the Iron Age, early/middle Iron Age and later Iron Age/early Roman) .

Late Bronze/early Iron Age activity was found on both the eastern and western sides of the quarry. This mostly comprised pits and post holes; some appeared to be in distinct groupings, whilst others were more dispersed. Early Iron Age activity was largely found along the western boundary of the site (up against the A1, Great North Road), at the northern edge, and in the south, alongside the river. Settlement evidence in the west was characterised by a series of pit clusters, four-post structures and an enclosure. Animal bone, pottery and burnt stones were recovered from the features and whilst there was some later ceramic material, most of the pottery was of early to middle Iron Age date (Albion Archaeology 2010, 22-23).

Towards the south of the site was a second enclosure dated to the early/middle Iron Age; sub-oval with a south-east facing entrance, it was dated from pottery recovered from the terminal segments. A group of flat based pits, found around 5 metres to the west were thought to be contemporary. Further pits were found at the northern limits of the site and these produced animal bone, fired clay and a possible weaving comb. Pottery from these features included some later Iron Age material (Albion Archaeology 2010, 23).

Settlement features dated to the later Iron Age (and probably early Roman period) were recorded on the site's western edge; including an enclosure with a funnel shaped entrance and series of pits and post holes, which produced animal bone, fired clay, burnt stone and pottery. To the south-east further features of a broadly similar transitional Late Iron Age/early Roman period were also recovered; they included a concentration of boundary features and a series of rectilinear enclosures, associated with which was a later Iron Age inhumation burial. Five later Iron Age cremation burials were also

recorded at the site three of which were associated with the main settlement areas, within a ditched enclosure, both urned and un-urned burials were recorded (Albion Archaeology 2010, 23-26).

At Broom Quarry there are three main concentrations of Iron Age activity at Broom Quarry and these are found at Hill Lane (HER 9093), Gypsy Lane (HER 18273) on the northern edge of the quarry where it abuts Hill Lane and in the southern extension (HER 631). The extraction area is situated on a spur of higher ground on the western side of the Ivel in between the villages of Upper Caldecote in the north and Broom in the south. The quarry extracts glacial sands and gravels the area is bisected by a canalised tributary of the River Ivel. Archaeological fieldwork has been ongoing at Broom and its southern extension since the 1990's, and it has given us the opportunity to study the progression of the landscape from the prehistoric periods onwards.

At Hill Lane (HER 9093) evidence of what may have been continuous settlement from the later Bronze Age through to the middle Iron Age was recorded in an area that concentrated around an early Bronze Age burial mound (known as Monument I, discussed in the Bronze Age section of this resource assessment). The extent of the settlement was defined by an east to south-west ditched boundary, which lay to the north-west of the settlement area and that might have been in use from the later Bronze Age (Cooper and Edmonds 2007, 21).

The main settlement at Hill Lane comprised; a number of large pits in two clearly defined rectangular areas, two post built roundhouses, the ring gully of another, stone filled pits, post holes and a possible midden. It appears as the activities were clearly zoned and there was no evidence that the settlement continued beyond the middle Iron Age (Cooper and Edmonds 2007, 21-22). At Gypsy Lane (HER 18273), to the south-east of Hill Lane, Iron Age activity was concentrated to the south-west of the excavation area. There were two areas of activity; the earliest of which dated to the later Bronze Age/earlier Iron Age transition and later which dated to the middle Iron Age (Cooper and Edmonds 2007, 28-29).

The earlier Iron Age activity was found at the southern end of the excavation area; it was an open settlement and consisted of two roundhouses, with associated post built structures, small charcoal rich pits and over twenty large grain/storage pits. There was no evidence the roundhouses had been repaired, suggesting they were only in use for a short period of time (between about 50 and 100 years); animal bones recovered from the site included sheep, cattle, pigs and horses and identified activities included weaving. One of the more intriguing aspects of the site were a series a deposits recovered from some of the large grain/storage pits; they were all found at base of the pits and included, a near complete fineware pot, a Palaeolithic hand axe and a complete skeleton of a sheep. To the north of the earlier Iron Age activity was a bounded middle Iron Age settlement; it comprised four small enclosures with two buildings and groups of storage pits connected by linears. The excavators felt that these parts two areas of settlement would have almost certainly been contemporary; however there was no sign of any spatial overlap (Cooper and Edmonds 2007, 28-29).

Within the Broom Quarry southern extension (HER 631) the archaeological investigations are still continuing, most of the activity thus far identified has been Iron Age in date and was generally located on the upper slopes of the gravel terrace. Three concentrations of settlement features appear to have been focussed on a pit alignment

which extends for around 700 metres east-west along the southern boundary of the site. The first area consisted of an unclosed settlement of post holes and pits directly to the north of the pit alignment; also to the north of this feature was a discrete area of substantial enclosure ditches, pits and post holes, whilst to the south were a cluster of pits that produced typically domestic artefacts (Josephs 2008, 7-8).

Away from the two main aggregate extraction areas within the AS-SA (Broom and north of Biggleswade) Iron Age settlement activity has been found through excavation at land to the south-east of Stotfold (HER 16829) which like Broom are located on glacial sands and gravels deposits. The Stotfold site is situated close to the western banks of the River Ivel on a slight gravel spur; and early to middle Iron Age settlement comprising a rectangular ditched enclosure with a single roundhouse in its interior was recorded. Large quantities of domestic “rubbish” included animal bone, pottery, fired clay, burnt stone and charred plant remains. To the north-west of the enclosure was a cremation cemetery representing nine un-urned interments, only one contained any pottery and it has tentatively been assigned to the Iron Age, although it is acknowledged the burial could be earlier in date (Wessex Archaeology 2006). This site is presently in the post excavation analysis phase.

Late Iron Age occupation was also found at Norton Road, Stotfold (HER 74), along with evidence for possible industrial activity and a high status burial. The burial represented a cremation within a small square enclosure; pedestal urn, wheel made vessels, an iron disc, whetstone and a skeleton of a pig were found in the burial pit and secondary inhumations cut the enclosure boundary (Steadman 1995, 14-16). This site is also presently in the post excavation analysis phase.

Land Use/Agriculture/Land Division Evidence

There are three assets that can be defined as evidence for management of the Iron Age landscape within the River Ivel AS-SA and they represent two cropmark triple-ditched boundary systems (HERs 16813 and 16831) and excavated features at Warren Villas Quarry (HER 3527). The Warren Villas Quarry occupies an area that straddles the floodplain of the Ivel and the first river terrace. Iron Age activity at the site was mostly found on the northern side and represented a large enclosure; drainage ditches, pits, post holes and a post built structure. The enclosure was sub-circular in shape; and in its interior the excavations revealed post holes, slots, gullies and a number of large, mostly circular pits filled with domestic type rubbish. The only recognisable structure was post built; rectangular, of medium size with some evidence of an internal partition (Dawson and Maull 1996, 62).

To the south and east of the enclosure within the current floodplain were several small rectilinear enclosures, within which were excavated a number of plough scores. Environmental evidence recovered from the plough scores indicated that towards the end of the Iron Age the water table was rising and cultivation was being undertaken in increasingly waterlogged conditions. Both the larger enclosure and the smaller “fields” have been interpreted as the remains of an agricultural landscape with perhaps the larger enclosed area being using for livestock (Dawson and Maull 1996, 62). There may also have been settlement at this site but as English Heritage refused to pay for full post excavation analysis and publication it is at present unclear.

The two assets that represent triple-ditched boundaries are located within the parishes of Arlesey (HER 16813) and Stotfold (HER 16831) in the south of the AS-SA. Both have been identified from aerial photographs, have not been investigated and appear to run to or from tributaries of the river. At Arlesey the boundary runs on an east-south-east course from the eastern channel of the River Hiz (a tributary of the Ivel) and appears to converge with the line of the prehistoric Icknield Way (HER 353) where it crosses Hertfordshire. A second similar boundary feature has been identified to the south of Stotfold where it runs from a small stream in the north-west to the higher ground in the south-east. The Stotfold boundary is bisected by a cropmark of an undated linear feature (HER 16832); this feature may represent a trackway and to the south of both features the trackway is abutted by a washing line enclosure system.

Conclusions

The extraction of aggregates from the River Ivel AS-SA have presented the opportunity to record and study two large areas of the Ivel valley and they have demonstrated that the Iron Age landscape was well organised and largely agrarian in nature. However where the excavations at Broom have benefited from full publication, those at Warren Villas Quarry have not and therefore it is frustrating that we cannot compare this material in greater depth. Settlement activity is located both on the lower valley slopes and in some cases like south-east of Stotfold (HER 16829) and Ivel Farm (Sandy) Quarry (HER 13974) within the river's floodplain.

There is evidence for settlement activity that span the transitions between the second and first millenniums BC and the first millenniums BC and AD, demonstrating consistent occupation of the river valley from the later Bronze Age through to the early Roman period. Whether this occupation represented a continuous presence of a series of generations of related people is unknown, but the respecting of the earlier Bronze Age barrow (HER 9093) and the possibility of some overlap between the early and later settlements at Broom (HER 18743) demonstrate knowledge of past populations and perhaps a degree of respect. Both enclosed and unenclosed settlements appear earlier in the period as well as later and across the AS-SA the diversity of the settlement types suggests a degree of personal choice and well as topographical situation was the motivation for this variation.

In part contrast to the Bronze Age, the excavated assets from the River Ivel AS-SA suggest Iron Age burials were being undertaken within or at least close to domestic foci, with both Ivel Farm (Sandy) Quarry (HER 13974) and two sites at Stotfold (HERs 74 and 16829) producing evidence for burials within or in close proximity to the settlements.

The middle to later Iron Age evidence suggests the presence of what may have been a greater degree of landscape organisation; at Warren Villas Quarry (HER 3527) the excavations revealed a system of fields, some probably designated for livestock, whilst others would have been arable, there may have been a system of agricultural rotation, but there is no trace of it within the excavated record. At Warren Villas the palaeoenvironmental evidence suggested a worsening of conditions towards the end of the Iron Age, in this part of the Ivel valley. Full analysis of the record from Ivel Farm

(Sandy) Quarry to the south is still ongoing but it will be interesting to see whether a comparable record is evident there too.

The presence of possible boundary features such as the pit alignment at in the Broom southern extension (HER 631) and the triple-ditched features at Arlesey and Stotfold could be interpreted as evidence of the more structured and hierarchical communities (Dawson 2000, 120-121), with the pit type boundaries developing into the more sophisticated/complicated ditch structures as the period progressed. Tracing evidence of “tribal units” or boundaries is virtually impossible, that is not to say Iron Age society was not complex or multi-tiered, and the Norton Road, Stotfold individual (HER 74) may well have been part of the upper echelons of Iron Age society, however we have no excavated evidence to indicate exactly how sites like Broom, Ivel Farm (Sandy) Quarry, Warren Villas and south-east Stotfold fitted into the wider spatial and societal organisation of the Iron Age landscape.

Late Prehistoric Assets

It is a function of the Bedfordshire and Luton HERs that assets which cannot be confidently assigned to one or more chronological periods appear within a general “Prehistoric 500000 BC – 42 AD” category. Most of the assets that appear in this category are cropmark sites which have not been excavated or lithic assemblages which do not conform to the typology of a particular period or periods. Given that none of the assets for this study that appear in the general “Prehistoric 500000 BC – 42 AD” can be said to represent Palaeolithic material we have changed this category to Late Prehistoric – in date terms this broadly corresponds to assets that could range in date from 10,000 BC to 42 AD. Accordingly there are forty-four Late Prehistoric assets for the River Ivel AS-SA.

Thirty-nine of Late Prehistoric assets represent cropmarks, identified from aerial photographs and they are evenly distributed throughout the study area, on both the river terrace and glacial sands and gravels deposits. The majority of these assets represent enclosures of varying sizes and shapes. Many of these features are rectangular, sub-rectangular, curvilinear or rectilinear; they appear singly (for example HERs 652, 1644 and 3338) or more commonly in groups that seem to form parts of complexes (such as HERs 509, 624, 625 and 13724); sometimes they also include linear features. Some of the enclosures appear to have internal features such as one enclosure identified at Seddington (HER 13724), which may to have two possible hut circles within it.

One of the Late Prehistoric assets represents a series of linear earthworks situated adjacent to the eastern side of the River Ivel on Biggleswade Common (HER 1615). The morphology of these earthworks indicates that they are highly likely to relate to the management of the Common as meadow land and are probably medieval or post medieval in origin.

Five of the Late Prehistoric assets represent objects, four of which were recovered from the “Temptford Gravel Pits” at the northern end of the study area and they represent a flint “pick” (HER 14667), an antler (HER 14670), worked flints (HER 14671) and animal bone (HER 14672). All these records relate to items taken to Bedford Museum for identification by the owner of Zwetsloot’s Nursery and are accompanied by 1:1 scale drawings. However the Central Bedfordshire and Luton HER does not record more information about context of these discoveries or whether they were donated to the Museum. The final asset represents some wood recovered from a palaeochannel to the south of Biggleswade Common (HER 15576), it has been assigned a “prehistoric” date as it was recovered from a pre-Roman context.

Conclusions

Excavated sites suggest that enclosure systems are a feature of the Iron Age and Roman landscapes within the county and they tend to appear with more frequency within the river valleys (Dawson 2007, 66-67). A number of the cropmarks within this AS-SA appear on Biggleswade Common (HERs 509, 1343 and 13928), on the eastern side of the River Ivel but within close proximity to the excavated cropmarks within the Warren Villas and Ivel Farm (Sandy) quarries (HERs 3527 and 13974). Morphologically the

Common enclosures are exceptionally similar to those within the quarries, and a recent walkover survey undertaken by English Heritage concluded that the Common features are most likely to represent the remains of an Iron Age/Roman landscape (McOmish and Newsome 2006). If this is the case then both the quarry and Common sites form part of a much wider relic landscape and one that may have been quite extensive.

Roman Assets (43 – 410 AD)

There are forty-one assets that relate to the Roman period within the River Ivel AS-SA, they can be divided into settlement/occupation evidence, ritual/ceremonial/burial activities, communication/transport and findspots. There is also one asset that relates to evidence for a field system (HER 15877), but it was only partially recorded as part of a key hole investigation for a pipeline.

Settlement/Occupation Evidence

Sixteen of the Roman assets for the River Ivel AS-SA relate to evidence settlement/occupation, they include cropmark enclosures such as one located on the same gravel island as the Biggleswade Ringwork (HER 468) which have been assigned to the period on morphological grounds and other cropmark sites that have produced Roman finds (but not through excavation). Examples of the latter include a block of enclosures near Deny Cottage, in the parish of Langford where a metal detectorist recovered four Roman coins (HER 1486) and Roman pottery (HER 15940) recovered from a rectilinear series of enclosures in the parish of Astwick (HER 3550). The majority of the settlement/occupation assets however relate to excavated sites.

Archaeological investigations at Warren Villas Quarry on the western banks of the River Ivel, to the north of Biggleswade were undertaken in the 1990's but have yet to be fully published because English Heritage will not fund the post excavation analysis. The excavated area straddles the floodplain and the first river terrace, an area that was prone to flooding prior to the extraction of the aggregates. The archaeological record for this site demonstrates the presence of settlement and agricultural activity certainly from the Neolithic onwards, with some Mesolithic flints also being recorded within the ploughsoil (HER 3527).

Later Iron Age activity at the site had largely represented a series of arable fields and paddocks, with some of the arable fields located on the floodplain. The excavators suggested that towards the end of the period ploughing had been undertaken in increasingly waterlogged conditions, they felt the site would have been abandoned prior to the Roman period (Dawson and Maull 1996, 62).

Activity dating to the Roman period was most extensive at the site and dated from 1st to 4th centuries AD; a settlement was located on the edge of the river terrace, parallel with the river and comprised a series of enclosures with some evidence for internal structures and numerous pits containing domestic rubbish. Associated with the settlement were a series of small fields located on the floodplain and pollen evidence suggested that in the southern area of the site the landscape had been dominated by cereal crops. The ditches associated with the fields showed signs of having been continually re-cut, some were probably designed for drainage, and willow bundles were found in two places, suggesting an early form of fagotting, designed to assist drainage (Dawson and Maull 1996, 62-63).

On the northern edge of the settlement a single chambered; semi-sunken kiln was recorded, large quantities of pottery were recovered from the feature and it has been

dated to 2nd century AD. Burials were also recorded, both inhumations and cremations and there was a small cemetery of the former to the north of the settlement area (Dawson and Maull 1996, 62-63).

To the south of Warren Villas on the same side of the river, archaeological investigation were undertaken at Ivel Farm (Sandy) Quarry between 2002 and 2007 and the project is currently within the post excavation analysis phase. Topographically the site is situated on the floodplain and cut by a series of palaeochannels. The pattern of human activity at Ivel Farm is remarkably similar to Warren Villas, evidence for occupation has been recorded from the Neolithic through to the post medieval period (HER13974).

Roman period occupation was mainly concentrated within the south-western part of the site and originated in the later Iron Age to Roman transitional period. It was characterised by a series of rectilinear enclosures, the main time frame for this settlement appeared to be 2nd to 3rd centuries AD and it has been suggested it went out of use because of increased flooding. Associated features included possible droveways and watering holes/pits. Three cremations, possibly dating to the transitional phase were also recorded within the enclosure (Albion Archaeology 2010, 25-28).

Roman settlement activity has also been recorded on the glacial sands and gravels deposits at Broom Quarry southern extension. Archaeological investigations at Broom have been ongoing since the 1990's and have offered an opportunity to study the development of a whole landscape from the prehistoric through to the post medieval period. The Broom landscape sits on a spur of higher ground on the western side of the Ivel in between the villages of Upper Caldecote in the north and Broom in the south. It is on the edge of small valley formed by one of the Ivel's tributaries.

A series of Roman farmsteads with associated paddocks were evaluated as part of the archaeological investigations at Broom South (HER 9095). These farmsteads are located at intervals of around half a kilometre along the river valley and may have had their origins in the later Iron Age. Given the relative density of these sites within the quarry area it was decided to preserve them *in situ*. One small area has been investigated (HER 631), they included settlement features associated with a pair of droveways at the north of the quarry extension, and a small group of enclosures at the south. All the artefactual material recovered dates to the early Roman period (2nd century AD) and in similarity to the site preserved *in situ* these sites are located on floodplain promontories (Josephs 2008, 10-11).

There is also some evidence within the AS-SA for high status occupation (HER 801), although it is not well recorded and we should be cautious about suggesting the presence of villas or villa estates. In the parish of Tempsford, at the northern end of the study area close to the A1 (Great North Road); cropmarks show a large sub-rectangular enclosure, situated on a north-south ridge. In the 1960's deep ploughing brought a series of artefacts and building debris to the surface and trial excavations found no evidence of a buildings but marble wall facing were recovered, along with evidence for metal working and possible pottery production in the form of kiln wasters. Opposite the site, on the other side of the A1 aerial photographs show a large rectangular enclosure and the Central Bedfordshire and Luton HER records that tesserae have been found in the vicinity. These areas are part of the same HER number and thought to be connected.

Communication/Transport Evidence

There are thirteen assets for Roman roads and associated features within the River Ivel AS-SA, however this number is unfortunately misleading as nine of the assets were recorded by the Viatores Study Group. The issues surrounding the Viatores data have been explained in more detail in the Methodology section of this document ([VSGD](#)); needless to say the Roman roads identified by the Viatores were almost entirely conjectural, created by linking post-Enclosure boundary features such as hedgerows and by the misinterpretation of features such as medieval headlands.

Of the true roads recorded in Roman Britain only the Baldock to Godmanchester (HER 505) route crosses the AS-SA, where it underlies the A1 for a distance. Other possible more localised routes include a cropmark (HER 451) in the parish of Biggleswade and an excavated stretch of a double-ditched cropmark (HER 11984) due west of sandy. It should also be noted that droeways have been recorded at Broom southern extension (HER 631) and that there were undoubtedly a series of smaller routeways connecting the major routes such as the Baldock to Godmanchester Road in the east (HER 505) and Watling Street (HER 5507) in the west.

Ritual/Ceremonial/Burial Evidence

There are four assets that relate to evidence for Roman ritual/ceremonial/burial activities within the River Ivel AS-SA, three of which relate to burials not immediately associated with settlements. These are a cremation cemetery dating to 1st to 2nd centuries AD at Deepdale on the eastern side of the AS-SA (HER 14045), two to three inhumations recorded at Ickwell in 1845 that were accompanied by glass vessels and samian pottery (HER 425) and several inhumations at Astwick (HER 503), although the latter were also found with 7th century artefacts so could be Saxon in date.

The fourth asset is situated on the northern edge of Biggleswade Common below the Greensand Ridge; it survives partly as a cropmark and partly as an earthwork and has been bisected by a modern drainage channel (HER 446). Aerial photographs show a double-ditched square enclosure, with a number of exterior rectangular features. In 1959 small scale investigations recovered pottery dating to 3rd and 4th centuries and building materials, a site visit in 2010 by one of the Central Bedfordshire Council Archaeologists confirmed that further artefactual material was eroding into the watercourse and large pieces of pottery and tile fragments were observed. The morphology of this feature is very similar to Roman temple complexes with a broadly comparable series of features having recently undergone investigation in Hertfordshire (West 2010, pers comm.) and an English Heritage walkover survey of the Common in 2006 also highlighted the site as a possible temple (McOmish and Newsome 2006, 6). Further investigation is needed to confirm or refute this interpretation and opportunities are being sought with the relevant landowners.

Findspots

Seven of the assets for the Roman period within the AS-SA relate to Findspots; they include single items such as slightly spurious record of a Roman cavalry object (HER

16257) and large assemblages such as a quantity of 1st to 2nd century samian recorded from near Arlesey (HER 389). Coins have also been recovered (HERs 14815 and 15906), but are metal detector finds and therefore have no contextual evidence. These assets demonstrate activity in a broad sense but the records in the Central Bedfordshire and Luton HER are of such poor quality (especially for the metal detector finds) that their value is unfortunately limited.

Conclusions

The excavated sites (and in particular the evidence recorded from the three quarries at Broom, Ivel Farm and Warren Villas) demonstrate the presence of a series of rural farmsteads/settlements within the AS-SA during the Roman period. They are found in areas where settlement had taken place during the Iron Age, both close to the banks of the River Ivel and its tributaries and in positions of relative high ground (Broom) but also within the floodplain itself.

In some places such as Ivel Farm (Sandy) Quarry (HER 13974) and the southern extension at Broom (HERs 9095 and 631) there appears to have been some continuity between the late Iron Age and early Roman settlements and the practise of burying the dead within or close to settlements seen during the later Iron Age is also evident during this period. However elsewhere such as Warren Villas Quarry (HER 3527) it appears that the later Iron Age features were abandoned due to rising water levels and re-occupation of the area did not take place again until the 1st century AD (Dawson and Maull 1996, 62 – 63).

The chain of settlements recorded on the gravel promontories along the Ivel valley within the southern extension at Broom (HERs 9095 and 631) give a good indication of both the types of locations we should be considering when attempting to predict the archaeological resource for this period, but also should allow us to identify (all be it tentatively) some of the presently undated “prehistoric” cropmarks in comparable areas within the AS-SA.

The absence of high status or villa sites is not really surprising, Bedfordshire does not appear to have had the same types of villa estates as recorded elsewhere in southern England, despite assertions that they could or should exist (Dawson 2007, 74). Sites like Tempsford (HER 801) and indeed the possible temple on Biggleswade Common (HER 446) would undoubtedly benefit from further research to see whether it is possible to confirm or dismiss the presence of high status buildings, of either settlement or ceremonial function.

Understanding the Roman transport network within Bedfordshire as a whole and the AS-SA is marred by the misleading Viatores data, however we must not lose sight of the fact that both the River Ivel and the Baldock to Godmanchester Road (HER 505) would have been important communication routes. It is also worth noting that the northern end of the AS-SA would have undoubtedly formed the hinterland of the Roman town at Sandy (HER 444) which is located on the Greensand Ridge (Woburn Sands Formation AS-A) but overlooks the river. At present understanding the relationship (if any) between the town and sites like Warren Villas, Ivel Farm (Sandy) Quarry and Biggleswade Common

is hampered by the fact that both the Sandy and Warren Villas excavations have not been fully published.

Saxon Assets (410 – 1066 AD)

There are twelve assets that relate to Saxon activity within the River Ivel AS-SA and they can be divided between evidence for the following; settlement/occupation, ritual/ceremonial/burial and findspots.

Settlement/Occupation Evidence

The majority of the Saxon assets relate to settlement/occupation evidence, there are eight assets in total and they all represent information recovered as a result of archaeological investigations. Settlement evidence for the early to middle Saxon has been recovered from Stratton (HER 518) and Ivel Farm (Sandy) Quarry (HER 13974).

The settlement of Stratton was located on a low north-south running ridge of glacial sands and gravels between the Ivel and one of its tributaries to the south-east of Biggleswade. Archaeological investigations at the site began in 1990 and continued until 2003, the project is currently in the post excavation analysis phase. The original Saxon settlement covered an area of approximately 0.1 square kilometres and comprised post built timber structures, sunken-featured buildings, pits and wells. At least six different clusters were identified but it is not known whether these small occupation areas were contemporary and there is little evidence of physical boundaries associated with the early settlement. In 7th century a small cemetery was associated with the settlement and there may have been single cell church/chapel. High precision radiocarbon dating has been undertaken on a selection of the burials and it has helped to establish that the cemetery was in use throughout 7th century with the latest burial dating to the beginning of 8th century (Shotliff 2010, 6).

During 8th and 9th centuries the settlement at Stratton underwent a significant re-organisation; in the early 8th century three farmsteads were established and towards the end of 8th century the sunken-featured buildings became larger and boundary features (possibly representing property boundaries) became more established. A new cemetery was created to the north of the original one in 9th century. By the Saxo-Norman period (1000 to around 1150AD) the three farmsteads were well established and there is no further evidence of burials, the excavators have suggested the reason for this may be the development of the parochial system with all burials during this period of time taking place at St Andrews Church in Biggleswade (Shotliff 2010, 6 – 7).

Between 2002 and 2007 a series of archaeological investigations were undertaken at Ivel Farm (Sandy) Quarry on the western edge of the River Ivel to the north of the town of Biggleswade. Evidence for multi-period occupation from the prehistoric through to the Saxon periods was recorded and the project is currently in the post excavation analysis phase.

Saxon occupation activity was recorded in the north and mid sections of the quarry on its western side, closest to the A1 Great North Road. In the northern part of the site settlement evidence comprised at least five sunken-featured buildings and pits, artefacts recovered included a bone spindlewhorl, a whetstone and a fragment of a quernstone. Pottery recovered from the sunken-featured buildings has been provisionally assessed

as early to middle Saxon in date (5th to 8th centuries AD). Animal bones were recovered from the Saxon features in this area, however they have been assessed as too fragmentary to offer much information about husbandry or butchery practises (Albion Archaeology 2010, 29, 38 -40).

The second area of Saxon activity at Ivel Farm was located on the western margins of the middle section of the site. Here in similarity to the northern area, at least four sunken-featured buildings and an associated pit were recorded. Artefacts from this area included a bone needle/pin, a ceramic spindlewhorl and worked antler. The pottery assemblage was broadly contemporary with the site to the north, dating to the early-middle Saxon period (Albion Archaeology 2010, 29-30).

In contrast to the previous periods Saxon settlement activity at Broom Quarry is relatively sparse, with the only convincing occupation evidence coming from the southern extension where at least one 5th century sunken-featured building has been recorded (HER 631). Topographically it is located on the higher ground overlooking the River Ivel and its tributary and two of the farmsteads previously occupied in the Roman period (see Roman resource assessment).

Late Saxon (9th – 11th century) and Saxo-Norman (1000 to approximately 1150 AD) settlement activity has been recorded in both the north and the south of the AS-SA. To the north of Biggleswade at Warren Villa Quarry (HER 3527) a small farmstead developed during the Saxo-Norman period and it may have been associated with a series of flax retting pits and fish/eel traps (Dawson and Maull 1996, 63-64). Whilst on the south-eastern edge of Stotfold (HER16829) at a which had a long occupation history beginning in the Iron Age (see Iron Age and Roman section of this resource assessment); specifically late Saxon evidence was limited to a series of linears, that probably formed property boundaries, in the Saxo-Norman period the site developed into what may have become a small farmstead (Wessex Archaeology, 2006).

Ritual/Ceremonial/Burial Evidence

There are two assets that relate to Saxon burials within the AS-SA and they do not appear to have any immediately associated settlement remains and these are possible 7th century inhumations recovered in 19th century near the river at Astwick (HER 503) and five 7th century inhumations excavated at King's Hill, Broom Quarry (HER 3576). Little is known of the burials from Astwick beyond that they may have come from an area that was being quarried for coprolites were recovered with Roman pottery and it has been suggested they could be of either Roman or Saxon date.

The five inhumations from King's Hill, Broom Quarry (HER 3576) were found to west of and south of Monument III, the remains of an early Bronze Age round barrow (see this resource assessment Bronze Age section). Three of burials (to the west of the barrow) were very poorly preserved with only fragments of bone surviving whilst the southern pair had fared better. Artefacts were recovered from all of the graves and they included knives, beads, and a buckle. At least two of the graves could be assigned gender and they were an adult male and an adult female (both accompanied by a knife). The inhumations have been assigned a 7th century from the grave goods. These burials may also have had a structure associated with them, to the north of the "cemetery" a façaded,

rectangular post-built structure was excavated, measuring about 6 by 4.5 metres; it appeared to have two entrances. Charred seeds from one of the post holes produced a calibrated radiocarbon date of 600 – 680 AD indicating it was broadly contemporary with the burials. Given there is no domestic evidence for this period from this part of the site the building has been interpreted as a shrine or mortuary structure (Lucy et al 2007, 267-272).

Findspots

Two of the HER assets for the Saxon period within the River Ivel AS-SA represent the recovery of material that may date to the Saxon period and comprise pottery from north-east of the village of Arlesey recovered during fieldwalking prior to the construction of the Bypass (HER 16095) and some wooden stakes and hurdles recovered from a palaeochannel south-west of the Ivel north of Biggleswade (HER 15878). These were found within a similar context to other possible Saxon fish/eel traps found to the north of this location during quarrying at Warren Villas (HER 3527) and therefore may represent further evidence of subsistence activities dating to this period.

Conclusions

The Saxon assets for the River Ivel AS-SA indicate the presence of both small farmsteads (Broom southern extension, Ivel Farm and Warren Villas) and larger settlements (Stratton) along the Ivel valley during this period. Perhaps somewhat unusually for a period that is generally poorly understood there is a great deal of excavated settlement evidence and it is both early and later Saxon in date. Ivel Farm, Broom southern extension, Warren Villas and south-east Stotfold all demonstrate Saxon occupation in places previously occupied during the Iron Age and Roman periods. However this was not necessarily continuous, particularly in areas such as Warren Villas and Stotfold where there is good reason to suppose these sites were uninhabitable during the Later Roman/Early Saxon periods due to the rising water table and topographically the earlier settlements (Broom south extension) do appear to be on the relatively “higher ground”.

The archaeological excavations at Stratton provided an incredible opportunity to study the development of the settlement over an extended period of time. The benefit of using high precision radiocarbon dating to help narrow down specific burial/ occupation episodes has also been illustrated at this site. Whilst much smaller the Broom cemetery and its possible mortuary chapel have proved an interesting discovery – not least because they does not appear to be any contemporary settlement evidence within the surrounding area.

Medieval Assets (1066 – 1539 AD)

There are forty-eight HER assets dating to the medieval period within the River Ivel AS-SA and they can be divided into evidence for the following; settlement/occupation, land use/agriculture/land division, and findspots.

Settlement/Occupation Evidence

Twenty-five of the medieval assets directly relate to settlement/occupation activity. Half of the assets represent moated sites; moated sites in Bedfordshire generally date to the 12th and 13th centuries, some of them may be manorial residences but the majority are likely to represent high status domestic settlements. Bedfordshire's moats generally comprise a central rectangular, square or oval platform, accessed by an entrance causeway across a water-field ditch that enclosed the entire internal platform. Within the interior of most moated sites there would have been a number of buildings, including the main house, barns and storage sheds.

The moated sites within the AS-SA are found either in association with other settlement earthworks such as Hill House, Old Warden (HER 464), Stratton (HER 520) or on the edges of still inhabited settlements for example Stotfold Green (HER 1774) and Tempsford (HER 761). This is a circumstance that is also noticeable within the other river valley AS-SAs and the River Great Ouse AS-A, but is something of a contrast to the Woburn Sands Formation, where many of the moated sites appear in isolation.

Only two of the moated sites (HERs 761 and 520) within the AS-SA have undergone archaeological investigation. At Gannocks Castle, a Scheduled moat (HER 761) to the west of the village of Tempsford at the northern end of the study area, geophysical survey of the interior of the moat indicated the presence of possible structures; these were interpreted as domestic buildings (Masters and Bunn 2004).

Non-intrusive survey work has also been undertaken at the Scheduled Stratton moat and manorial earthworks to the south-east of Biggleswade on the glacial sands and gravels (HER 520). The surviving Stratton moat and earthworks were once part of a much larger medieval settlement and landscape at Stratton (HER 518), one that began in the Saxon period (see this resource assessment Saxon section) and which has undergone extensive developer funded archaeological investigation (see below).

The non-intrusive archaeological work consisted of two earthwork surveys, the first undertaken by the RCHME in 1993 and the second by English Heritage in 2009. The RCHME survey focussed on the earthworks to the west of the moat and whilst slightly inconclusive suggested the remains of paddocks, closes and possible building platforms (Kenny 1993).

The English Heritage survey concentrated on the moat itself; roughly square in plan the central platform covers an area of around 0.02 square kilometres, and the survey suggested the presence of at least two raised (house) platforms within it. This work also indicated that the circuit of the moat had been re-worked on a number of occasions, in

particular north and east arms of the moat seem to have been remodelled (McOmish et al 2009, 29-32).

The date for the construction of the Stratton moat is uncertain; it has been suggested that the moat represents the manorial residence for Stratton, which during 12th and 13th centuries was one of two manors that formed honour of Huntingdon, certainly the medieval settlement at Stratton during this period appears to be aligned on to a trackway that leads to the moat and therefore a manorial origin seems likely.

Excavated examples of medieval settlements are known from both the river terrace and glacial sands and gravels deposits within the AS-SA and the most complete one is Stratton, south-east of Biggleswade (HER 518). Archaeological investigations at Stratton began in 1990 and continued until 2003. The site is situated on a low ridge of glacial sands and gravels that runs north–south between the Ivel and one of its tributaries. At the time of the Domesday survey in 1086 AD Stratton was part of the Biggleswade Hundred along with settlements at Biggleswade and Holme; and the archaeological investigations demonstrated that the earliest settlement at Stratton dated to between 6th and 7th centuries AD (see this resource assessment Saxon section) and reached its peak between the 10th and 14th centuries (Shotliff 2010, 5-8).

In the Saxo-Norman period (1000 to around 1150AD) the settlement was focussed in the same area as the earlier occupation, with three individual farmsteads represented. From the late 12th to early 13th century there seems to have been a major period of re-organisation and the axis of the settlement was moved eastwards becoming aligned along a north-south trackway that led to the Stratton moat (HER 518) the supposed manorial centre. At least four farmsteads were recognised both sides of the track as dating to this period and each farm was located within its own well defined enclosure. Part of a second moat located to the north of the four farmsteads and north-west of the Scheduled site (HER 520) was also investigated. Cartographic sources suggest it had been extant until the late 19th century but was subsequently filled in and ploughed flat. This seems to have been a smaller version of the Scheduled site; it dated to 14th century, and may have been one the smaller sub-manors (Shotliff 2010, 7).

In 15th century most of the occupation evidence was concentrated on the eastern side of the trackway and a new manorial residence may have been constructed around this time to replace the moat (HER 520). Traces of a large masonry building and a cob-built dovecote were found at this close to the moat (HER 520) as were two 15th century gold coins (Shotliff 2010, 7-8). The date for the abandonment of the settlement at Stratton is not certain but it may relate to the Parliamentary Enclosure of the Parish in 17th and 18th centuries and in 19th century it became part of Stratton Park (HER 7003).

Other medieval settlement remains have been recorded through excavation in the south of the AS-SA on the south-eastern edge of Stotfold (HER 16829). Here occupation of a gravel terrace west of the River Ivel began in the late prehistoric and Roman periods (see Iron Age and Roman section of this resource assessment). Late Saxon and early medieval (up to 13th century) activity was identified on the site and comprised a series of enclosure ditches, pits, watering holes and post-built structures. Between 12th and 14th centuries at least two properties were present in the excavation area, within which were ancillary buildings, a possible crop dryer and evidence of both animal husbandry and arable cultivation. Cultivated crops during this period included; barley, wheat and maybe even lentils, whilst there was also some suggestion of small scale metal and bone

working (Wessex Archaeology, 2006). What is particularly interesting about this site is it demonstrates that a range of activities were being undertaken within the floodplain, less than 100 metres from the river, this may indicate that flooding wasn't a particular problem or that there was a well developed system of water management at the site during this period. This site is still undergoing assessment at the moment but detailed analysis may provide more information.

Evidence for settlement overlying the floodplain to the north of Biggleswade during this period was found at Warren Villa Quarry (HER 3527). It appeared that there was a small farmstead dating to the Saxo-Norman period, which comprised a single post built structure within an area defined by rubbish pits and fence lines. U-shaped sections of ditches that may indicate paddocks were recorded and on the eastern side of the site, beside an earlier river channel waterlogged wood hurdle structures were recovered from a series of intercutting pits. In some cases there was evidence for minor repairs to these structures whilst in others more substantial timbers had been re-used presumably from demolished buildings. Dendrochronological dating suggested the wood was felled between 1084 and 1125 AD and environmental samples taken from the pit fills produced flax seeds and capsules, which led the excavators to conclude that flax retting may have been undertaken along the waterfront. Eel or fish traps and lead and sandstone weights were also recovered from the same area (Dawson and Maull 1996, 63-64).

Despite the wealth of archaeological evidence produced for the prehistoric and Roman periods at Broom Quarry the medieval settlement activity was restricted to one area south of the Scheduled moated site and earthworks at Hill House (HER 464). During the evaluation phase a complex medieval enclosure system was identified on edge of this activity, within Moat Field (HER 3576) and given the association with the Scheduled Monument it was decided to preserve it *in situ* (Cooper and Edmonds 2007, 26-28).

In addition to the earthwork moats and the excavated settlement sites there are two possible areas of shrunken settlement remains to the south of Potton (HER 10802) and west of Tempsford (HER 3539); both sites appear to have evidence for building platforms and close boundaries. Entirely deserted settlements are recorded to the south-west of Portobello Farm near Biggleswade Common (HER 110), Brookend, Northill (HER 14866) and at Holme (HER 465), although only one of these (HER 110) represent earthwork remains which are reputed to represent the medieval site of Kinwick.

There is one asset for a ringwork within this category (HER 468), a Scheduled Monument; it lies on low gravel island to the west of Biggleswade, with the present course of the River Ivel and one of its tributaries on its east and a further tributary on the west. The ringwork is visible as a cropmark and consists of a circular enclosed area between 30 and 25 metres in diameter; surrounded by two concentric circuits of ditches around 6 metres in width. On the western side of the central enclosure lies another large outer oval enclosure which is divided into two sections; it measures around 120 metres north-south and 75 metres east-west, and is surrounded by ditch that is approximately 10 metres in width. An entrance causeway into the outer enclosure is located on the northern side and this in turn gives access to the northern side of the central enclosure.

Ringworks date to between the late Saxon period and 12th century AD. In general they comprise an enclosure surrounded by one or more sets of banks and ditches, in some cases the central enclosures have adjoining baileys (or courts). The outer banks would have been topped by a timber palisade or more occasionally a stone wall. These

monuments are considered to be military fortifications; in some cases they would have also represented defended or aristocratic settlements. Small scale archaeological investigations were undertaken at the Biggleswade ringwork in 1962 found traces of wattle and daub and early to mid 12th century pottery in a layer between the ditch circuits.

Land Use/Agriculture/Land Division

Seventeen of the medieval HER assets for the River Ivel AS-SA represent evidence for the management of the landscape during this period. Mostly these assets relate to agriculture such as ridge and furrow cultivation remains, field boundaries and cropmarks relics of the open field system practised during the medieval period within the area. Unsurprisingly there is also evidence for water management and drainage.

Agriculture in the medieval period largely comprised open field farming. Under the open field system each parish was divided into a series of open fields, common land and meadows, the cultivated fields were sub-divided into furlongs that were divided into strips or lands and tenanted out to members of the local community. Common crop-rotation was practised with each open field (or sometimes furlong) growing crops such as wheat, legumes, oats and barley in rotation and having a fallow period (usually a year).

The most common evidence of the open field system within Bedfordshire (and southern England) is ridge and furrow cultivation earthworks and cropmarks. Ridge and furrow was created by a particular type of ploughing which involved the clockwise and anti-clockwise ploughing of fields early and then late in the farming season. In some cases headlands also survive, these were the area at the end of the furlongs on which the plough was turned. Within the AS-SA evidence of ridge and furrow has been found in the parishes of Northill, Little Barford and Tempsford (HERs 460, 1776, 3538). Whilst a headland was found during the Broom Quarry excavations to the north of Hill House (HER 9093) and the cropmark of another survives within Langford parish (HER 1791).

Evidence for drainage and water management systems have also been found in the AS-SA, which is unsurprising, in places earthworks of the features have been recorded such as at Sandeye Place on the south-western side of Sandy (HER 3033), similar earthworks are known from Biggleswade Common on the eastern side of the river, north of Biggleswade, however they are not recorded as discrete features on the HER. Many of these features would have been an integral part of the management of parish meadows. In an area like the Ivel valley meadows would have played an important role in the economy of the area's towns and villages.

Findspots

There are six medieval assets for the medieval period in the River Ivel AS-SA, three of which represent the chance recovery of seal dies (HERs 15991, 15246 and 15978), two of which have been dated to 13th century. These and the discovery of a token all appear

to represent metal detector finds found close to surviving settlements such as Tempsford and Upper Caldecote. Without contextual information their value is sadly limited.

Conclusions

The modern Ivel valley is dominated by the towns of Sandy and Biggleswade (excluded from this study along with the other village cores). Both towns were established during the medieval period; despite the extensive Roman settlement (located on the Greensand Ridge and discussed in the Woburn Sands Formation AS-A resource assessment) medieval Sandy was a much more modest, closer to the Ivel and didn't really grow to its present size until the advent of the railways in 19th century. The settlement at Biggleswade was once secondary to Stratton but gradually outgrew its southern neighbour, becoming a market town in 13th century, although interestingly until recently medieval archaeology within the town has remained illusive.

Rural settlement in the Ivel valley was typically nucleated and situated close to the river, although in contrast to other areas many of the Ivel valley villages are linear in character and examples include Arlesey and Henlow. Generally the assets from this AS-SA conform to this pattern, excavated evidence from sites such as Stotfold and Warren Villas demonstrate just how close to the river medieval communities were prepared to live, and the flax retting pits and fish/eel traps show that the natural resources were an integral part of the subsistence strategies of these communities. At Stratton the archaeological investigations illustrate the development of a linear settlement, closely related to the manorial centre.

Moated sites are present within the AS-SA and the proximity of these to surviving and deserted settlements may indicate that some like Hill House, Gannocks Castle and Stratton do indeed represent the manorial residences. Excavated examples notwithstanding settlement shrinkage, shifting and desertion is evident but the surviving archaeological resources doesn't give any indication of whether the social, economic and disease factors of 14th century were the reasons for these changes to the settlement pattern during this period. However as some of these sites were undoubtedly small farmsteads external factors may have been the reason for their decline.

Post Medieval Assets (1540 – 1900 AD)

There are one hundred and seventeen assets that relate to post medieval activity within the River Ivel AS-SA, they are found across the study area on both the river terrace and glacial sands and gravels deposits and they can be divided into evidence for; settlement/occupation, designed landscapes, industrial activity, land use/agriculture/land division and communication/transport. There are also three assets that relate to objects and these are; a thimble, brass swivel eye, ring, locket and pendant from Sandy (HER 15906), a 17th century silver box from Dane Hill Farm in Tempsford (HER 16856) and pottery recovered during fieldwalking for the Arlesey – Stotfold bypass (HER 16095).

Land Use/Agriculture/Land Division Evidence

Thirty-three of the post medieval assets for the River Ivel AS-SA represent activities that relate to rural land management and agriculture, twenty-three of which are farms and associated buildings. The agricultural buildings include farmhouses; dating from 17th to 19th centuries, some of which are nationally designated such as Holwell Bury Farmhouse in the parish of Shillington at the southern end of the study area (17th century, Grade II HER 4803), whilst others are simply considered to be of local interest such as Scroup's Farmhouse south of Biggleswade (also 17th century HER 4909). Other agricultural buildings include barns and farm complexes such as the Furzenhall Farm buildings north of Biggleswade (HER 15619).

The most distinctive and characteristic buildings within this group are the onion sheds and there are eleven assets in total which relate to these structures. Market gardening developed as an important rural agricultural industry in Bedfordshire during 18th and 19th centuries and the most profitable areas were the river valleys. Today in the valley of the Ivel it still continues but on a much reduced scale, and as a result many of the associated buildings such as greenhouses have been dismantled, in some cases the only evidence of their existence are concrete bases or images on early aerial photographs.

One of the major crops grown as part of Bedfordshire's market gardening industry was onions, with the Ivel valley being the focus for this activity. Onion drying sheds developed as a specific building type in 19th century, their purpose to allow increased ventilation to speed the drying process. Many resemble light-weight timber barns but they tend to have slatted sides and floors, the earliest buildings were constructed entirely of wood, whilst later on many had brick bases with the onion "loft" forming the second storey. In some cases this allowed the buildings to be dual purpose, with storage for animal feeds or carts or stables on the ground floor.

An example of an early 19th century timber framed onion shed (also Grade II Listed) was located at Waterloo Farm, Arlesey (HER 13861). It was a low building, with timber slats along the sides, weather boarding on the gable ends and a thatched roof; unfortunately it has since been demolished. A dual purpose brick-based onion shed still survives off Gypsy Lane, Old Warden (HER 16359) and another is located at Bridge Farm, Sandy (HER 13366).

Other assets that relate closely to the market gardening industry are osier beds and there are two recorded within the AS-SA at Potton and Tempsford (HERs 10661 and 9731). Osier beds were used to grow willows, chiefly for basket making. These beds were situated in waterlogged riverine locations and may have had their foundations in the medieval period for the construction of fish traps. Osier beds were often situated in market gardening areas due to the associated demand for baskets (Bagshawe 1972, 164 - 166).

Other assets that relate to the specific management of the floodplain within the post medieval period include a series of water management earthworks (HER 9335) along the eastern side of the Ivel to the north of Biggleswade Common (now destroyed by quarrying); cropmarks of drainage channels close to the Ivel at Stotfold (HER 9097) and excavated evidence of the early post medieval agricultural landscape from Ivel Farm (Sandy) Quarry (HER 13974), where evidence for boundary ditches and dykes were recorded during the archaeological investigations (Albion Archaeology 2010, 30-31)

Communication/Transport Evidence

Twenty-five of the post medieval assets for the River Ivel AS-SA relate to the transport network during the period. They include evidence for the Turnpike Trusts in the form of sites of former toll houses (HER 14926) and one road in Old Warden (HER 8246). The Bedfordshire Turnpike Trusts were set up at the beginning of 18th century with each Trust responsible for maintaining several stretches of roads and the associated toll or turnpike houses. Of the AS-SA's towns, Biggleswade was one of the most successful as it was situated close to the Great North Road (A1). It was able to benefit from the passing trade, setting up multiple inns for weary travellers. Excavations at one of these inns, the Black Bear (or simply the Bear) on Hitchin Street were undertaken in 2010 and demonstrated a complex system of cellars dating from the early post medieval period through to 19th century (Edmondson 2010, pers comm.)

The most interesting communication/transport assets of post medieval date for the study area relate to the River Ivel itself and specifically the Ivel Navigation (HER 14539). In 1757 the Ivel Navigation Act was passed, allowing for the canalisation of the river from its confluence with the Great Ouse at Tempsford through Biggleswade, Shefford and down to Baldock and Hitchin in Hertfordshire. Its purpose was to speed up carriage of goods and to reduce costs by avoiding the expensive and poorly maintained turnpike roads. The work was undertaken in two stages; the first from Tempsford to Biggleswade began in 1758 and involved the cutting of the channel at Blunham and the construction of a series of locks and staunches. A second phase of works involved the extension of the navigable waterway to Shefford, with a new channel cut upstream of Langford and the construction of a series of cast iron girder bridges (Simco and McKeague 1997, 93).

Assets that relate to the Ivel Navigation within the AS-SA include the canalised section of the river itself (HER 14539); the demolished lock at Tempsford (HER 9861), a wharf at Northill (HER 15297), Holme Mills Bridge (HER 3287) and the Grade II Listed Blunham Navigation Bridge (HER 15057). The Blunham Navigation Bridge (HER 15057) dates to 1823 and represents the most complete unaltered of the navigation bridges. The Ivel Navigation was sadly short-lived, and it ceased in the late 1870's following the Ivel Navigation (Abandonment) Act 1876. The reasons for the abandonment were the

inability of the route to compete with the railways such as the Bedford to Hitchin railway (HER 11832) which also crosses the study area.

Other communication/transport assets include (unsurprisingly) a series of bridges across the River Ivel; these include the three-arched Grade II Listed Girtford Bridge, constructed in 1793 (HER 2044) and the non-designated but locally interesting Girtford Side Arch Bridge, Flett/King's Bridge and the hump-backed Ford Bridge at Stotfold (HERs 15168, 14134 and 14849).

Settlement/Occupation Evidence

There are twenty-three assets that relate to post medieval settlement/occupation evidence within the River Ivel AS-SA. Most represent domestic buildings; such as cottages, some are recorded on the Central Bedfordshire and Luton HER because they have been deemed locally interesting like a pair of 19th century cottages in Hatch, Northill (HER 12780) and an apparently 16th century cottage (though much modified) in Old Warden (HER 12853). Whilst other building assets are designated, such as the Grade II Listed 17th century Hill House, north of Broom Quarry (HER 5831) and Brook End House, Northill (HER 5807, Grade II Listed) which is a timber-framed 17th to 18th century dwelling.

Evidence for abandoned settlements includes Brook End, Northill (HER 14866) which was one of seven small hamlets in the parish of Northill and was occupied from 14th century until late 19th century, last recorded as occupied in 1873. The settlement at Stratton (HER 518) which has Saxon origins (see Saxon and Medieval resource assessments for this AS-SA) probably continued to be occupied as until the Parliamentary Enclosure Acts of 17th and 18th centuries. Other settlement/occupation assets relate to municipal buildings/structures such Stotfold, Potton and Blunham cemeteries (HERs 8973, 8495 and 9771), the latter of which is non-conformist.

Industrial Activity

Twenty-two of the post medieval assets for the River Ivel AS-SA represent evidence for industrial activity and they can be divided between sand and gravel extraction sites (of which there are thirteen assets) and mills and associated structures (of which there are nine assets).

The sand and gravel extraction sites are largely recorded as earthworks present on first and second edition Ordnance Survey maps. During the medieval and post medieval periods quarrying was largely a localised concern and excavated evidence for these types of pits have been found at both Ivel Farm (Sandy) Quarry (HER 13974) and Stratton (HER 518). Unlike the Woburn Sands Formation AS-A none of the larger sand and gravel quarries in operation today (such as Broom) have their antecedents in the post medieval period. This is undoubtedly because the river terrace and glacial sands and gravels are much shallower deposits and thus only allowing a shorter lifespan for the quarry.

Nine of the post medieval industrial assets relate to watermills; these include the Tempsford corn mill (HER 1137) which was converted into a sawmill in 1888; Ivel Mill (HER 15460), near Stotfold (now a house), Holme Mills (HER 14543) and the Grade II Listed corn mill at Astwick (HER 1010).

Most of the surviving mills and associated buildings date to the latter half of the post medieval period and subsequently we know little of their development from the earlier period. At Stratton (HER 518) however the remains of some waterlogged 16th century waterwheel paddles were recovered during the excavations and it has been suggested that if they relate to a horizontal wheel then technology that was thought to have ceased in the medieval period (around 13th century) was still being used over three hundred years later (Edgeworth 2007, 123). It has been suggested that in the middle of 19th century there were around four hundred mills making flour in Bedfordshire. Most of these were steam powered watermills, harnessing the power of the county's rivers.

Designed Landscapes Evidence

Eleven of the post medieval assets for the River Ivel AS-SA relate to designed landscapes; and they can be divided between Henlow Park (HER 6993), Shortmead House and grounds (HERs 2046 and 9439) and Stratton Park (HER 7003). When compared to the county's great estates such as Woburn, belonging to the Dukes of Bedford (HER 8762) and Southill (HER 6697), home of the Whitbread brewing dynasty, the Ivel valley parks and gardens are somewhat overshadowed. The Ivel AS-SA designed landscapes are much smaller and without inputs from the post medieval period's great landscape architects such as Lancelot "Capability" Brown they do not appear to have had many interesting features or vistas.

Henlow Park (HER 6993) is situated between the western banks the River Ivel and one of its tributaries, on the eastern side of the village. It is 18th century in date and associated with the Grade II* Listed Henlow Grange (HER 714). Associated landscape features were a now gone double avenue of trees, and extant walled garden, a lake and boathouse (HER 13555) and the site of a former ice house (HER 7863). Some of the water features and pleasure gardens were undoubtedly constructed to take advantage of the proximity of the river.

Shortmead House is late 18th century two storey brick, Grade II Listed Building (HER 2046) located on the southern edge of Biggleswade Common, north of Biggleswade. The house is surrounded by a small plot today, but on Bryant's 1826 map of Bedfordshire it appeared to have more extensive landscape grounds. Stratton Park (HER 7003) was associated with Stratton Park House (HER 519), a 16th century house demolished in the 1950's. The landscape park was developed around the house in the early 19th century and once contained ornamental trees and pasture but has since been divided into arable and pasture fields. A section of walled garden and some relic apple trees growing in the centre of the Stratton manorial moat (HER 520) may also relate to the park.

Conclusions

The post medieval settlement landscape of the River Ivel AS-SA was established in the later medieval period, today the AS-SA is populated by nucleated (but linear) settlements many of which developed either pre or post Norman conquest and certainly at the beginning of the post medieval period the landscape would have remained unenclosed, with the open field farming system remaining in operation in some areas until 18th century (Edgeworth 2007b, 121). Settlements such as Stratton (HER 518) continued until the Parliamentary Acts of Enclosure divided up the landscape and created the field pattern that mostly persists today (although there has been some post-Second World War boundary loss).

Just as in previous periods the River Ivel has shaped the way the area has developed. The fertile soils of the Ivel valley provided prime agricultural land and allowed for the development of rural industries such as market gardening, however despite the significance to the local area and the county as a whole, only a small number of assets (the onions sheds and the osier beds) are recorded on the Central Bedfordshire and Luton HER. This is something of a concern particularly when considering how best to direct research into this industry.

From the 18th century onwards there is further evidence of the Ivel being harnessed as a source of power for watermills and as a communication/transport route. The latter, whilst short-lived only declined because of the development of the railways which were to ultimately increase the success of industries such as the market gardening allowing fertiliser to be brought in to the area and goods to be transported to London and further afield. Evidence for aggregate quarrying during this period appears small scale, the large scale landscape extractions characteristic of the area now, are a much more modern construct.

Modern Assets (1901 – 2050 AD)

There are sixteen assets that relate to the Modern period within the River Ivel AS-SA; all are located on the river terrace deposits and the majority (thirteen) relate to Second World War activity/structures. The other assets represent cropmarks of drainage ditches near Stotfold (HER 9097) which probably originated in the post medieval period, a brick Mortuary Chapel built in 1904 near Blunham (HER 12607) and a war memorial to those killed in the First World War at Tempsford within the village hall (HER 13491).

Military Evidence

The majority of the Second World War assets (nine in total) represent pillboxes and tank traps of which eight are located on crossing points on the Ivel at Biggleswade (HER 17840-43 and 17848), Sandy (HER 17176 and 17849) and Tempsford (HER 17849). The high number of pill boxes located along the Ivel when compared to the other river valleys within Bedfordshire suggests that River Ivel may have been seen as a possible defensive stop-line. However, this stop line was not part of the known national defences. It should be noted that the full network of national and regional stop-lines has not been mapped (English Heritage 1998, 3-5) and therefore it is not inconceivable.

Conclusions

The Modern assets for the River Ivel AS-SA re-affirm the significance the river, whether part of a national network of stop-lines the Second World War structures constructed along the Ivel demonstrate the sense fear about an invasion felt in the area and recognition of the importance of the river as communication route and resource. Whilst not presently on the Central Bedfordshire and Luton HER RAF aerial photographs also show a number of features, including searchlight emplacements constructed on Biggleswade Common (McOmish and Newsome 2006, 1-2) and doubtless there are other features presently unrecorded within the AS-SA.

The River Flit Aggregate Study Sub-Area

The Archaeological Resource

The River Flit Aggregate Study Sub-Area (AS-SA) covers approximately twenty five square kilometres and includes both the river terrace deposits and the glacial sands and gravels. A search of the Bedfordshire HER identified one hundred and seventy two assets which lay either entirely or substantially within the AS-SA. The table below illustrates the breakdown of assets by chronological period. In Appendix 2d there are chronological tables listing the assets by which category they have been assigned to and information on whether the assets have been subjected to archaeological investigation, are designated or relate to aggregate extraction.

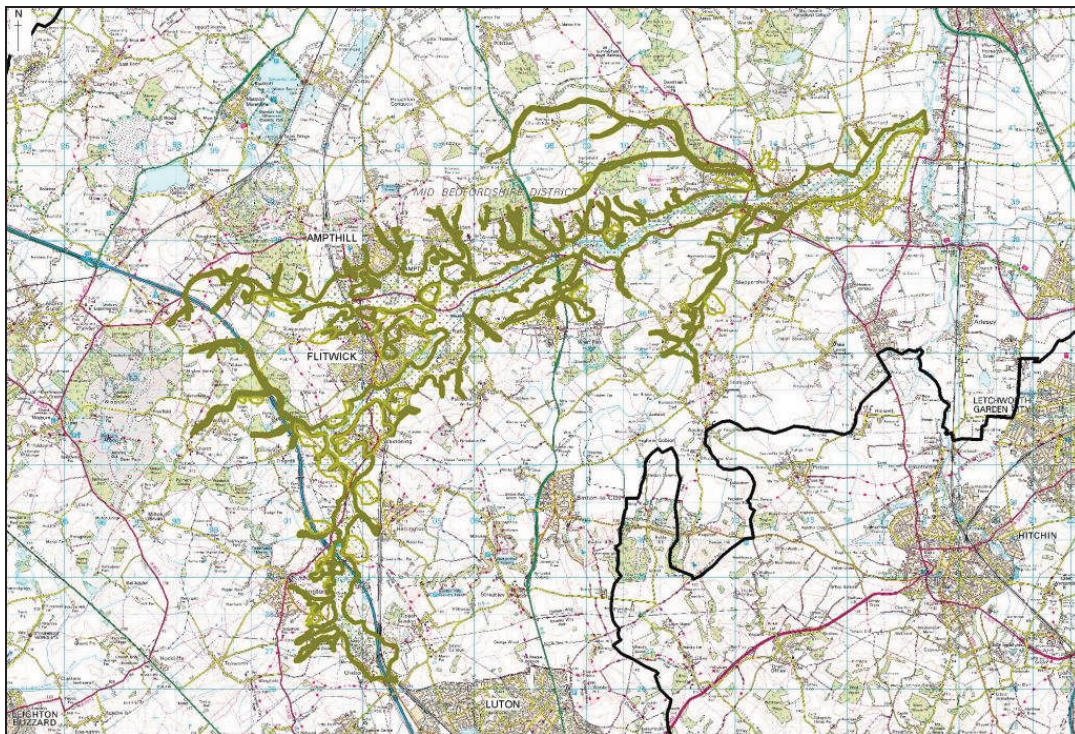


Figure 5: River Flit AS-SA Location Map

Table 12: River Flit AS-SA Assets

Type of Assets	Number Recorded	Number per sq km
Palaeolithic Assets	1	0.04
Mesolithic Assets	4	0.1
Neolithic Assets	2	0.08
Bronze Age Assets	6	0.2
Iron Age Assets	6	0.2
Later Prehistoric Assets	7	0.3
Roman Assets	15	0.6
Saxon Assets	3	0.1
Medieval Assets	44	1.8
Post Medieval Assets	80	3.2
Modern Assets	4	0.1
TOTAL	172	6.9

Palaeolithic Assets (900,000 – 10,000 BC)

There is only one Palaeolithic HER asset recorded within the River Flit Aggregate AS-SA. It represents a single flint hand axe recovered during fieldwalking at Ruxox Farm (HER 2771). It was identified as a Mousterian cordiform type axe which may date to the Middle Palaeolithic (Fadden 1972, 79). The hand axe was found on Head Deposits close to the River Flit. The Head Deposits, possibly derived from the glacial material to the south or from river deposits to the north, were created by mass downward slope movement of material as a result of periglacial action during the last glacial period. This was compounded by hill wash, soil creep and upstream erosion (B&LGG 8/12/2009). This deposit post dates the hand axe, suggesting that the hand axe had been geologically transported to its find site and is highly unlikely to have been found in its primary context.

As there is only one Palaeolithic HER asset from this AS-SA it is difficult to define its character for this period. Evidence from the county indicates that Palaeolithic remains are primarily found either within the river sands and gravels, the brickearth or clay-with-flints deposits. The county wide evidence also relates almost exclusively to Lower and Middle Palaeolithic material which given the hostile environment during the early stages of the Devensian Glaciation is not uncommon elsewhere within the region. Topographically, with the exception of the discoveries made within the brickearth deposits on the Chilterns the majority of the Lower and Middle Palaeolithic artefacts within the county have been found within the river valleys and this is a situation generally reflected elsewhere within the region (Austin 2000, 5-8 and Luke 2007, 21).

The general absence of Palaeolithic remains from the River Flit AS-SA may in part be due to glacial and periglacial erosion activity. It has been suggested that natural processes during the Anglian and Wolstonian Glaciations would have effectively scoured and re-deposited the underlying geology, thus impacting upon hominid occupation evidence. (French 2003a, 26-28). This would have been compounded even when the glaciers weren't present because the frozen ground and steppe like nature of the vegetation would have left the surface of the geology vulnerable to ice cracking and wind erosion (French 2003b, 39-43).

More recent factors may also be part of the explanation for the lack of Palaeolithic assets in the River Flit AS-SA. Although it contains exploitable aggregate reserves there has not been a history of aggregate quarrying on the same scale as that found in the River Great Ouse AS-A in particular where the bulk of the substantial Palaeolithic finds have been made, often in the 19th and early 20th centuries. Without a comparable scale of extraction when extraction made the recovery of Flint artefacts possible in the Flit Valley it is much less likely that any Palaeolithic material would have been recovered or identified. There is no reason that the aggregate deposits of this AS-SA should not contain Palaeolithic material and the present absence of Palaeolithic material within the AS-A should be treated with caution and considered an area for additional study.

Mesolithic Assets (10,001 – 4,000 BC)

There are four Mesolithic assets recorded within the River Flit AS-SA and they all represent lithic material. One of the assets represents a collection (over 10 objects), and the remaining assets are isolated artefacts or small collections (under 10 objects). Two of the assets form part of collections that are recorded on the HER as containing Neolithic material (HERs 2771 and 2595).

One of the collections (HER 2771) was found in fieldwalking immediately to the east of Ruxox Farm close to a tributary of the Flit. The assemblage included cores, flakes and some tools including burins and a scraper (Fadden 1970 and 1972). The other, slightly smaller collection (HER 2595) was found during fieldwalking at Beadlow Golf Course above the floodplain of the Flit. Included in the assemblage were a core, scrapers, a microlith, a scraper and a burin. From the location of these two assets it might be tentatively suggested that they represent the exploitation of riverine resources by Mesolithic communities.

Conclusions

The small number of Mesolithic assets make it difficult to characterise the period for the River Flit AS-SA. The limited evidence suggests the exploitation of riverine resources by Mesolithic groups, which would certainly accord with the evidence from the rest of the County (Luke 2007, 27). However, the distribution of the assets is largely an artefact of the interest of fieldworkers and so cannot be seen as a true representation of the activities of Mesolithic communities in the AS-SA. However, on the basis of finds elsewhere in the county it would be expected that this riverine AS-SA should contain sites from this period. This AS-SA should not be seen in isolation in this period. Where the River Flit runs through the Woburn Sands Formation AS-A there are contemporary assets known from locations which overlook the river valley (e.g. Priestley Farm HER 15844). It is likely that groups active at these upland locations overlooking the river valley were also exploiting the resources of the valley as well as the woodland resources of the valley sides and ridge tops. Any understanding of the Mesolithic assets of the Flit Valley AS-SA must take into account assets of adjacent areas and the activities they represent as the two areas are likely to be inextricably interlinked.

On the limited basis of the few Mesolithic assets from this AS-SA and from the surrounding area it is possible to suggest that the River Flit has the potential to contain the remains of a network of temporary or seasonal hunter-gather sites. These sites should be looked for in the appropriate river valley locations. It must be recognised that they are only likely to exist as artefact scatters appropriate survey and investigation techniques have to be employed to detect the.

Neolithic Assets (4,001 – 2,350 BC)

There is two Neolithic asset for the River Flit AS-SA. One represents a collection of lithic material (over 10 objects) recovered by fieldwalking from a low promontory between the River Flit and one of its tributaries (HER 2771). The assemblage included cores, scrapers, blades, an adze, arrowheads, burins and an awl (Fadden 1970 and 1972). This suggests that activities at the site included flint knapping, although the fieldworker acknowledges that although cores were collected no other flint working debitage was picked up during the survey, hunting and the processing of raw materials. The collection also included Mesolithic and Bronze Age material. The other asset relates to lithic material recovered from fieldwalking at Hinksley Road, Flitwick (HER 573). No details of this assemblage are available so it is not possible to characterise the type of activity it represents; it may be similar to that indicated by HER 2771).

Conclusions

On the limited evidence of two asset it is impossible to characterise the Neolithic of this AS-SA. The lack of Neolithic assets in the HER may not represent a genuine absence of Neolithic remains in the AS-SA but reflect the overall low level of archaeological fieldwork and investigation in the Flit Valley.

Because of the lack fieldwork and investigation the lack of evidence must not be taken to mean that the Flit Valley did not see human occupation or exploitation in the Neolithic. There is evidence from the upper slopes of the Greensand Ridge overlooking the Flit valley for a consistent presence during the period (see Woburn Sands Formation AS-A). It is very unlikely that communities exploiting or living on the upper slopes of Greensand Ridge were not also active in the river valley below the ridge because it would have furnished a different range of resources. Pollen samples taken from the excavation of Roman deposits at Ruxox (HER 918) provide evidence for the local environment (Scaife 2004). In the Late Neolithic the environment was Alder carr woodland suggesting a wet wooded environment and lime dominated woodland. This was not cleared until the Late Bronze Age. This suggests that the Flit Valley was not cleared or settled in the Neolithic, retaining a “natural” environment. This does not mean that the area was not exploited for the resources it did contain, hunting wild fowl and game and fishing perhaps, but that these resources were exploited from settlements on the adjacent Greensands Ridge by short term, though possibly frequent, visits to the valley. The remains of Neolithic settlement are generally ephemeral (flint scatters and low density clusters of pits) and often difficult to detect (Luke 2007, 29-31), so the remains of what is basically hunting and gathering expeditions from bases outside the AS-SA will be even more difficult to find.

Another facet of the Neolithic is the creation of large ritual and ceremonial monuments as part of the development of a more organised and settled society. In Bedfordshire these monuments are concentrated in the river valleys (Luke 2007, 31-37). The apparent lack of clearance and settlement may also explain why there is no evidence of such monuments in the Flit Valley where on the face of it they might be expected. Although as these monuments are often first identified from air photographs the fact that this

technique has not been widely used in the Flit Valley may also be part of the explanation.

Bronze Age Assets (2,351 – 700BC)

There are a total six Bronze Age assets within the River Flit AS-SA. They can be divided into two types: evidence for settlement/occupation and evidence for ritual/ceremonial/burial.

Settlement/Occupation Evidence

There are two assets within the AS-SA that represents settlement/occupation evidence. It is a small collection (less than 10 objects) of lithic material from Ruxox Farm (HER 2771, Fadden 1970 and 1972) recovered during fieldwalking. The collection also contains Mesolithic and Neolithic material. Only two pieces were identified as diagnostically Bronze Age: two barbed and tanged arrowheads. This may indicate hunting activity in the riverine environment. The other asset relates to lithic material recovered from fieldwalking at Hinksley Road, Flitwick (HER 573). No details of this assemblage are available so it is not possible to characterise the type of activity it represents.

Ritual/Ceremonial/Burial Evidence

There are four assets within this category for the Bronze Age. Three of these assets are cropmark evidence for ring ditches (HERs 1664, 1785 and 14734). Ring ditches are generally interpreted as the remains of Bronze Age burial mounds or barrows where the central mound has been reduced as the result of later agricultural practices such as ploughing. Two of the assets are at Clifton in the eastern part of the AS-SA. There are two ring ditches, one of which has internal features, to the north of Clifton cricket pitch (HER 1664) located on a terrace overlooking above the river. The second asset at Clifton is a possible ring ditch within a complex of other, probably later cropmarks to the west of Clifton sewage works (HER 1785). This asset is located on a low ridge between the River Flit and River Ivel. The third ring ditch asset (HER 14734) is found at the south western extremity of the AS-SA at Sundon. Here there is cropmark evidence for three or four ring ditches located on a terrace overlooking the upper reaches of the River Flit. The location of these ring ditches may be significant as these probable barrows are located in positions that would have been visible along the Flit Valley.

The final asset in this category is a chance find of the base of an Early Bronze Age biconical urn from near Ruxox Farm (HER 15848). This type of pottery is usually found in funerary contexts, and as the find was unlikely to have travelled far since its deposition it could suggest that there is an as yet unrecognised Bronze burial, possibly in a round barrow in the vicinity. It was not found near any of the ring ditches known from the AS-SA; the nearest contemporary site is the settlement/occupation asset also from Ruxox Farm (HER 2771).

Conclusion.

The assets representing the Bronze Age in the River Flit are very limited in number and largely unequivocal evidence of human settlement and use of the landscape. There has been relatively little archaeological investigation or survey within the AS-SA which means there have been few opportunities to identify sites. This situation reflects the relative lack of development in the area and in Bedfordshire archaeological investigation has been largely tied to the development process since the 19th century (Oake 2007, 3-4). Specifically for the Bronze Age there is environmental evidence from Ruxox (Scaife 2004) that the valley was not cleared until the Late Bronze Age, up to that time the environment was one of Alder carr, a wet woodland environment, and lime dominated woodland. Without clearance it is likely that the Flit Valley was not an appealing place for settlement and agriculture or ritual activity. It may even have been largely exploited, if at all for its natural resources.

In the light of this situation the ring ditches at Clifton (HERs 1664 and 1785) and Sundon (HER 14734) located at the eastern and southern edges of the AS-SA may be seen as part of patterns of activity that relate to areas outside the: the Ivel Valley and Chilterns chalk ridge respectively. The other assets, a small lithic collection (HER 2771) and sherds from a biconical urn, possibly representing a burial (HER 15848) were found close together at Ruxox. The close juxtaposition of Bronze Age funerary activity and settlement are found Roxton Quarry (HER 617) which may be the pattern that is hinted at by the Ruxox Farm assets, although the evidence at present is so slight that it would be unsound base too much on it.

In effect the River Flit in the Bronze Age is a blank. Other river valleys in the county (see River Great Ouse AS-A and River Ivel AS-SA) have substantial evidence for Bronze Age settlement and ritual activity. On that basis there is an expectation that another river valley, the Flit, would also have been heavily used in that period. This is contradicted by the available evidence and although this can be partly explained by the lack of archaeological investigations in the AS-SA it does not provide the whole answer. The River Flit flows through the Greensand Ridge for much of its length and although there is more evidence for Bronze Age activity from within it (see Woburn Sands Formation (AS-A) it does not appear to have been as intensively occupied as the larger river valleys. Therefore, the apparent absence of Bronze Age activity in the River Flit may reflect an actual difference in the nature of human occupation. It may be that the area was not attractive to Bronze Age communities who concentrated their activities elsewhere in the county and it genuinely contains few assets for this period. Alternatively it was the communities used it in a very different way from the Great Ouse and Ivel which has left remains that are not easily detected by chance or through remote sensing. The enigma of the absent Bronze Age of the River Flit is a research topic that needs addressing, and should form part of the research objectives of any major archaeological project in the AS-SA. This is important both to understand specifically the archaeology of the AS-SA and more broadly the character of the Bronze Age in the county as a whole; why if it is the case some areas were heavily exploited and settled and others not.

Iron Age Assets (701 BC – 42 AD)

There are five Iron Age assets for the River Flit AS-SA, they are located in the central part of the AS-SA, with a concentration around Ampthill and Flitwick. The Iron Age assets can be divided into three categories: settlement/occupation, ritual ceremonial /burial and industrial.

Settlement/Occupation Evidence

Three of the Iron Age assets within the AS-SA relate to settlement activity. All the assets are recorded as a result of archaeological investigations (HERs 686 and 918).

Investigation on the line of a water pipeline at Ward End, Steppingley (HER 686) produced evidence of an Early – Middle Iron Age settlement (Network Archaeology 2003, 147-168). The site is located on a terrace overlooking the headwaters of one of the tributaries of the River Flit. The excavators identified four phases of activity. The initial phase consisted of two “ring ditches” generally interpreted as the remains of round houses associated with a range of pits, post hole and gullies. The round houses appear to have been abandoned as they were cut by a series of linears which represent the next phase of activity at the site. A further round house was the focus of the third phase, it contained a number of internal features including a hearth. The final phase of the settlement appears to have again seen the abandonment of the round house to be replaced by another phase of linear ditches on a different alignment to those of the second phase.

A number of different activities were identified at the site. It was suggested that some of the features within the third phase round house may have represented a food preparation area or a loom frame. There was also evidence of metal working in the form of a crucible and slag. Plant remains showed evidence of cultivating wheat and barley and the small animal bone assemblage included cattle, sheep/goat, horse and red deer.

By its nature the excavation, limited to the pipeline easement, can only provide a small window on the settlement. There is no information on its full extent and we cannot know how representative the excavated portion is of the whole site, for instance it is not known whether the site is enclosed or unenclosed. However, the picture it presents is of a dynamic settlement subject to radical changes of layout, perhaps reflecting changes in the use of space and internal organisation through time. The economy of the site appears to be a typical combination of mixed farming with industrial/craft activities furnishing the immediate needs of the settlement.

Another investigation on a pipeline at Ruxox Farm (HER 918) found evidence of a Late Iron Age settlement, probably dating to the first half of the 1st century AD (Dawson 2004). It represents the first phase of occupation that continues until the 4th century AD. A low density scatter of features were found throughout the excavated area. They comprised two groups of pits, part of a drip gully from a round house and series of field enclosure ditches that had been recut on more than one occasion. The limited extent of the excavation again makes it difficult to interpret what was found but the results hint at habitation (round houses and pits) set within or close to field systems (enclosures).

A more extensively excavated site is the asset at Hinksley Road, Flitwick (HER 573 and Luke 1999), A Middle Iron Age settlement, comprised groups of round houses and isolated pits. This arrangement shows some similarities with the Ward End site although they are not exactly contemporary. The next phase at Hinksley Road saw the creation of an enclosed farmstead on the site of one of the earlier habitation sites, associated with a series of field enclosures whose morphology suggest they may have been used in stock control. The enclosed settlement was abandoned and the site occupied by a field system, unfortunately this change in activity is not dated any more closely than the 5th to 1st century BC. It has been suggested that the focus of settlement shifted beyond the limits of excavation (Luke 1999, 83), although no location for a new settlement has been identified.

It is possible to make, some admittedly tenuous, points of comparison; for instance the apparent proximity of habitation indicated by round houses and field enclosures. The dramatic reorganisation of settlement layout and structure at Hinksley Road is similar to that seen at Ward End. It also suggests that cropmark sites may only provide evidence for some phases of a settlement's life, particularly where enclosed settlements and field enclosures form significant elements in the settlement pattern. Unenclosed settlements without substantial patterns of linear features will be much more difficult to detect from aerial photography and we might expect assets such as that to the north of Barton-le-Clay (HER 7998) are likely to be more complex than HER information suggests.

Evidence for economic activity from Hinksley Road is unfortunately limited but it has been suggested that the lack of pits in the early phase means that grain storage was not an important part of the economy of the site (Luke 1999, 82). The later phase shows evidence of both stock management and crop production, representing a mixed agricultural economy. There is also evidence for metalworking at the site. This evidence is comparable to that found at the excavated Iron Age settlement/occupation sites in the AS-SA.

Ritual/Ceremonial/Burial Evidence

There are two assets in this category for the AS-SA and both relate to burials (HERs 918 and 2775); one of the assets is also contains evidence of settlement (HER 918). In fact both come from the same area (Ruxox Farm – Maulden) and could be related. Unfortunately they found at different times and in different circumstances so there is no evidence available that could substantiate any link.

The pipeline excavation at Ruxox Farm (HER 918 and Dawson 2004) produced three Late Iron Age urned cremation burials, two of which were accompanied by accessory vessels. They were found in an area which also produced evidence of contemporary settlement activity. The other burial asset (HER 2775) is an inhumation burial found during road building not far from Ruxox Farm. Unfortunately, information on the circumstances and context of this find are limited so it is not possible to say much about it. The cremation burials are common in the county in the Late Iron Age although the inhumation is rarer (Dawson 2007, 68-69).

Industrial Evidence

There is a single asset representing Iron Age industrial activity from the AS-SA, this is a group of kilns at Dolittle Farm to the south west of Ampthill (HER 6743). They were subject of salvage excavation during the construction of the Ampthill Bypass. The kilns were mainly Roman in date but were said to have “Belgic” i.e. Late Iron Age origins. The available evidence for this asset is sparse so it is not possible to corroborate the date of the earliest phase of kilns. In Bedfordshire Late Iron Age pottery types continue in use well into the Roman period so it is possible that what is thought to be Late Iron Age pottery production at Dolittle Mill may actually be early Roman production of Late Iron Age types. It also suggested that the kilns were part of a settlement. There is evidence from elsewhere in the county at Stagsden for late Iron Age pottery kilns from within a contemporary settlement (Dawson 2000) but no evidence available from Dolittle Mill to support this suggestion.

Conclusion

The evidence for the Iron Age in the River Flit AS-SA is largely derived from excavated remains of settlements, burials and industrial activity. They are concentrated around Flitwick and Ampthill in the centre of the AS-SA, this is likely to reflect the distribution of archaeological investigations in the AS-SA rather than be an accurate picture of Iron Age activity in the Flit Valley.

Generally the excavated settlement remains within the AS-SA conform to the character of Iron Age settlement observed elsewhere in the county (Dawson 2007). It is interesting to note that both Ward End and Hinksley Road date to the Early – Middle Iron Age and go out of use by the Late Iron Age, while the settlement at Ruxox Farm only comes into existence in the Late Iron Age. There are few sites in Bedfordshire that are occupied in throughout the Iron Age, it s much more common for Early Iron Age sites to have been abandoned by the Late Iron Age and for Late Iron Age settlement sot be founded at new and unoccupied locations (Dawson 2007). Other than to observe this phenomenon it is not possible to say much more about the dynamics of the settlement pattern and whether there is an intensification of settlement in the Late Iron Age as has been observed elsewhere (Dawson 2007, 68). Both Hinksley Road and Ward End exhibit radical internal reorganisation of the settlement over time, showing that Iron Age settlement was far from static, though the causes of these changes are not apparent from existing evidence.

The burial evidence from Ruxox, although from two locations, may well belong to the same cemetery and relate to the excavated settlement. They are also typical of funerary activity ion this period. The evidence of industrial activity at Dolittle Mill is poorly documented and it is difficult to be certain whether the pottery kilns are actually Iron Age in date. Until the investigation is fully published it is probably unwise to try to use it to characterise potential Iron Age industrial activity in the AS-SA.

Because of the concentrated distribution of most of the Iron Age assets in one small part of the River Flit it is difficult to use them as a basis for characterising the whole of the AS-SA for this period. However, the density of sites around Ampthill and Flitwick does suggest that the AS-SA was settled at similar densities to the other river valleys (Great

Ouse and Ivel) in the county. The sites appear to occupy locations within the valley but off the floodplain. We should, therefore, expect a similar distribution of Iron Age sites and features throughout the rest of the central and eastern parts of the AS-SA. This potential should be borne in mind when considering proposals for aggregate extraction elsewhere in the River Flit. Elsewhere in the county many iron Age sites have been identified from cropmark evidence. The River Flit has not been subject to much aerial photographic survey, a programme of flying or an NMP project might help to identify more Iron Age sites throughout the whole AS-SA.

Late Prehistoric Assets

Within the Bedfordshire and Luton HER there is a category referred to as “Prehistoric 500000 BC – 42 AD”, it is something of a catchall for assets that are clearly or likely to be prehistoric but cannot be confidently assigned to one of the prehistoric periods. Typically these assets represent lithic assemblages or unexcavated cropmark sites. For the purpose of this report and because none of the objects recorded for this AS-SA can be described as Palaeolithic the timespan covered by the Late Prehistoric assets is approximately 10,000 BC to 42 AD. There are seven assets within this category for the River Flit AS-SA. Four of the assets represent cropmarks (HERs 562, 578, 1785, and 9078), two assemblages of undiagnostic artefacts (HERs 2569 and 2572), and the final asset represents a single flint arrowhead (HER 14845).

The Later Prehistoric cropmark assets are located within the central and eastern parts of the AS-SA. Three of them (HERs 562, 578, and 1785) include enclosures of various sizes and shapes while two comprise of or include linear features (HERs 9078 and 16590). The cropmarks at New Road Farm (HER 578) are located very close to the Late Iron Age and Roman site at Ruxox Farm (HER 918). They are likely to be associated as part of the same landscape as the dated sites and thus contemporary with them. Generally the Later Prehistoric cropmark assets are located on the terraces above the watercourses.

Conclusions

The cropmark assets recorded within the Later Prehistoric category present an interest interpretative challenge. Locally it is generally assumed that that most of these undated sites represent Late Iron Age/Roman rural settlements. This assumption is based on morphological comparisons with excavated sites. In the River Flit the only excavated site that was initially identified from cropmarks was Hinksley Road (HER 573). The way this site appeared as cropmarks, comprising linears and enclosures, certainly provides parallels for some of the undated Later Prehistoric cropmark sites. The distribution of the Later Prehistoric sites also mirrors that of both the Iron Age and Roman assets in the AS-SA. Therefore, the suggestion that the undated cropmarks do in fact represent Iron Age and/or Roman rural settlements is probably valid, and also supports the idea that remains of these periods are more extensive in the AS-SA than existing, dated evidence suggest. The attribution to these periods can only be confirmed by investigation, but the existence of undated cropmarks in potential aggregate extraction site should be seen as an indicator that they contain substantial archaeological remains probably of Iron Age and Roman date.

Roman Assets (43 – 409 AD)

There are a total of fifteen Roman assets from within the River Flit AS-SA. They have been divided into the following categories: settlement/occupation, land use/agriculture/land boundaries, industrial, communications/transport and findspots.

Settlement/Occupation Evidence

There one asset for the Iron Age in this category, Ruxox Farm (HER 918). It is a large and complex one located on the river floodplain and the first terrace. The site was first recognised in the 1950's by T H Gardner who undertook trial excavations on the sites of concentrations of Roman pottery found during field survey. This work demonstrated the existence of an extensive Roman settlement in what are now marshy areas of the River Flit (Simco 1984, 31-32). In subsequent decades a series of further small scale investigations and surveys have been undertaken in the area recognised as containing the settlement. These investigations have produced an impressive array of finds dating from throughout the Roman period, they include not only pottery but coins, a range of jewellery painted wall plaster, tesserae, walls and an assemblage of pipe clay figurines of the goddess Venus. The Flit Valley contains a number of peat deposits and some of the Roman archaeological deposits have been found underneath the peat demonstrating an increase in flooding during the period. The various Ruxox Farm investigations are difficult to interpret, in some cases the level of recording are minimal and generally the archives are not available and the results unpublished. The richness (e.g. jewellery and coins) of the finds assemblage and recovery of painted wall plaster and tesserae all suggest a high status site. But although fragments have wall have been reported from several locations there is no direct evidence for buildings of that status. It has been suggested that there are two villas within the broader area of the site (Dawson 2004, 33) but there is no specific evidence to corroborate this suggestion. Some of the finds, particularly the pipe clay Venus figurines have been seen as evidence of ritual activity and possibly a temple (see below).

On the northern edge of the area originally defined as the Ruxox Farm asset the route of a water pipeline was excavated in advance of construction (Dawson 2004). This produced evidence of a settlement or occupation from the 1st to 4th centuries AD. The earliest phases of Roman settlement grows out a Late Iron Age settlement (see above) and with evidence of structures, including round houses, pits and enclosures. In the 3rd century AD the focus of settlement appears to shift away from the excavated area and a cemetery is established in the southern part of the area investigated. In the 4th century the cemetery continued in use and evidence of metalworking was found within the northern part of the excavated area. The results of the excavation of such restricted area are difficult to interpret but the report suggests that Ruxox Farm bears comparison with other sites in Bedfordshire: Warren Villas (HER 3527) and Eastcotts (HER 1623). These comparisons suggest that Ruxox may have been a periodically or seasonally occupied with the settlement having a linear arrangement along a common alignment. The evidence also suggests that the sites were occupied by small populations who repeatedly reformed the site, creating new enclosure/habitation areas through time (Dawson 2004, 26). The economy of the site based on mixed agriculture with an element of secondary processing. The later Roman burial and industrial use of the site

demonstrates the dynamic and shifting nature of the settlement as the excavated area was put to a new and very different use.

Excavation at Ruxox Farm also produced on the northern edge of this asset produced a small inhumation cemetery dating to the 3rd – 4th century on the northern edge of the site. The cemetery was created in an area of earlier settlement and was initially defined by a ditched enclosure, possibly part of an existing field system (Dawson 2004, 26). Most of the burials respected the alignment of the cemetery enclosure ditch. The full extent of the cemetery was not defined in the excavation.

The ritual aspect of this asset is represented by the finds of pipe clay Venus figurines. Two figurine fragments came from the pipeline excavations and may have derived from a domestic shrine (Dawson 2004, 27). However, the large number of figurines from elsewhere in the Ruxox site suggests that a more organised and public religious activity was taking place at the site. The best parallels for the use of such figurines as votive offerings at temple sites comes from the continent (Dawson 2004, 27) where in Gaul there is an association with water cults. Certainly the proximity of the River Flit would support the possible existence of a water cult but so far there is no evidence of a temple or shrine structure.

Land Use/Agriculture/Land Boundary Evidence

As single asset represents this category for the Roman period and takes the form of excavated evidence for a field system at Hinksley Road, Flitwick (HER 573 and Luke 1999). A system of regular fields incorporating a trackway was established in early 2nd century AD at the same location as the Iron Age field system; there is no evidence to suggest that there was any continuity of use between the Iron Age and Roman field systems. The fields continued in use until the 4th century AD, with perhaps a reduced level of activity later towards the later end of its life.

Industrial Evidence

There are two assets for Roman industrial activity in the AS-SA. Excavated evidence for metalworking at Ruxox (HER 918) has been discussed above and formed part of a larger settlement. The other asset represents a group pottery kilns from Dolittle Mill, Ampthill (HER 6743). Detailed information on this asset is not available so little can be said about it. A suggestion that it formed part of a settlement cannot be confirmed, although pottery kilns are often found within Roman settlements elsewhere in the county.

Communication/Transport Evidence

There are nine assets relating to Roman roads within the River Flit AS-SA. However this is a misleading number as all the assets relate to roads and associated features such as aggers identified by the Viatores study group. Further information on the problems with the Viatores data can be found in the methodology section of this document ([VSGD](#)). Many of these routes were created by linking modern features such as hedgerows, trackways and roads or by the misinterpretation of later earthworks such as medieval

headlands. Although none of the “true Roman roads cross the AS-SA there would undoubtedly have been a network of roads and tracks connecting settlements and other sites both within and the AS-SA, however these features have yet to be identified.

Findspots

There is one asset that relates to a Roman findspot within the AS-SA. It is the findspot of the base of a Roman jar (HER 16021).

Conclusions

The assets representing the Roman period in the River Flit are relatively few and present what must be skewed picture of the AS-SA in this period. The evidence of industrial activity at Doolittle Mill is poorly understood because it remains unpublished. Until the evidence from the site is made available it is difficult to determine what the site actually represents. Although apparently crossed by a number of Roman roads none of the assets for roads recorded in the HER are in fact genuine Roman routeways.

The substantive evidence for the Roman period in the River Flit comes down to excavated evidence from Hinksley Road (HER 573 and Luke 1999) for an Early Roman field system and trackway established on the site of an Early – Middle Iron Age settlement and the site at Ruxox Farm (HER 918). This site covers an extensive area and has produced a range of unusual finds and deposits over a long period, from the 1950's onwards. The investigations range from small scale excavations carried by amateur archaeological groups and individuals, various episodes of fieldwalking and development related excavations, there have also been a series of “chance” finds of material. Other than the publication of the most recent investigation (Dawson 2004) none of the finds or investigations have been published, although many of the finds are in Bedford Museum, it is, therefore very difficult to give a categorical answer about what the Ruxox Farm site actually represents. The recently excavated site suggests that it contains a settlement element in existence until the 4th century AD. Finds from elsewhere within the area defined by HER 918 suggest that this settlement may have been extensive and contained substantial buildings. These remains have sometimes been referred to as belonging to a villa but as with much of this site there is no evidence available to corroborate this assertion. The other intriguing and unusual aspect of this site are the finds of pipe clay Venus figurines in sufficient numbers to suggest that these votive objects were being deposited at some sort of temple or other religious site. Little is known about the context in which the figurines were found so it is not possible to say what the nature of any religious site might be. What is clear is that HER 918 represents an extensive asset for the Roman period, it is likely to contain either a large settlement or series of settlements. It also appears to contain a significant ritual or religious element which is likely to be associated with a temple or some other type of religious site or focus. The settlement(s) may be linked in some way to the religious site. The site has also produced a number of well preserved deposits of organic material. On the available evidence Ruxox Farm is an extensive and important multi-faceted Roman site which may well be important at a regional level. It needs to be understood better before it can be managed appropriately. A first step to understanding the site would be to review and analyse the existing information from the site, including the quite extensive collections in

Bedford Museum. This would form the basis for developing programmes of research and investigation aimed at further defining and understanding the site.

Although Ruxox Farm is little understood it does represent the only substantial Roman asset in the AS-SA. It is difficult to believe that it existed in isolation in an empty contemporary landscape. Such a large and extensive site, with potential ritual elements is far more likely to have formed part of a widespread landscape of settlement and economic activity within and beyond the AS-SA. Certainly the other river valleys in the county do contain remains of well populated landscape for this period. Although there is very little other evidence for the Roman period in the AS-SA, another excavated site which lies only just outside the area supports the idea that the River Flit was densely occupied in the Roman period. At Ampthill Road, Shefford (Luke et al 2010) Roman remains were first found in the 1840's during gravel digging, one of the earliest archaeological investigations in the county. Further finds have been made over the intervening years and there have been a number of excavations in advance of development in the last twenty years. Although there have been a number of interpretations of this site, the most recent evidence, including a large aisled building, indicate that the site was a large and wealthy settlement. As the River Flit AS-SA will have formed part of the hinterland of this site this argues for it forming part of a well developed contemporary landscape.

In spite of there being only few known Roman assets for the River Flit, they and sites from adjacent areas suggest that there is a huge under representation of the resource for the AS-SA. It is likely that an extensive Roman awaiting discovery in the AS-SA. The, as yet unrealised, potential for this period in the River Flit should be born in mind when considering proposals for aggregate extraction within the River Flit AS-SA.

Saxon Assets (410 – 1065 AD)

There are three Saxon assets for the River Flit AS-SA. One represents excavated evidence for settlement at Hinksley Road, Flitwick (HER 573 and Luke 1999). The evidence for occupation at this site is very limited consisting of a well, a pit and two ditches. The only dating evidence is in the form of two loom weights which date no later than the end of the 7th century AD.

The other two assets both represent place name evidence. At Worthy End, Flitwick (HER 782) place name evidence indicates that this was the site of Saxon occupation during the 5th to 7th century, as 'Worthy' may indicate 'The people of the *woro* or enclosure' (Morris 1962, 66). Place name evidence for Wadlowes Manor, Toddington (HER 788), suggests that the name is possibly derived from Wada's Hlaw, the burial mound of an Anglo-Saxon called Wada; this might suggest the presence of a high status burial in the proximity of the later medieval Manor site. However, the interpretation of the two place names is purely conjectural and no physical evidence of Saxon date has been found at either location.

Conclusions

In effect there is no evidence for the Saxon period in the River Flit AS-SA. This is a circumstance that reflects the county (and in some sense southern England) as a whole. Despite the increasing number of Saxon sites being recorded in the county it is the least understood of all periods.

We believe that the landscape of Saxon Bedfordshire was a largely rural one. There is a local assumption that many of the county's villages have Saxon origins, some have more cohesive evidence than others and small scale local developer funded archaeological investigations are producing more traces of this all the time, these assets are however excluded from the present study because they are within "urban areas" and therefore unlikely to be subjected to aggregate extraction. Elsewhere in the county the Great Ouse and Ivel valleys have produced evidence of Saxon settlement.

Research into the Saxon period is a local and regional research priority (Wade 2000, 24-25, Oake 2007, 14 and Medlycott and Brown 2008, 96). Despite the lack of Saxon assets from the AS-SA, the parallels from the other main river valleys suggest that it has considerable potential to contain assets from this period that could be affected by proposals for aggregate extraction.

Medieval Assets (1066 – 1539 AD)

There are forty four assets that relate to the medieval period within the River Flit AS-SA. They are broadly distributed throughout the AS-SA and can be divided into evidence for the following: settlement/occupation, land use/agriculture/land division, industry and religious houses and buildings.

Settlement/Occupation Evidence

Seventeen assets relate to medieval settlement/occupation evidence for the AS-SA. This category includes deserted and shrunken settlements recorded from earthworks cropmarks and excavations, moated sites, extant settlements and sites identified from documentary sources.

Seven of the settlement/occupation assets relate to evidence for medieval villages within the AS-SA. These assets comprise deserted medieval settlements such as Lower Gravenhurst (HER 724) which is known from earthworks and cropmarks; shrunken settlements for example Segenhoe (HER 753), which survived as earthworks until it was ploughed in the recent past and Fancott (HER 16982) which is also known from earthworks and shifted settlements such as Stanford (HER 1665). Lodge Farm, Chicksands has been identified as a small medieval settlement (HER 17103), possibly associated with the nearby Chicksands Priory. An excavation in the 1930's found what is described as cottages and a kiln dating to the 13th – 14th centuries (HER 458). Unfortunately no details of this excavation are now available so it is difficult to confirm what was found, an evaluation in 2005 400m to the east of the location of 1930's investigation did not produce any evidence of medieval settlement suggesting that the settlement may have been quite small. There are also two assets for of surviving settlements, both of which are "Ends": Wood End, Maulden (HER 17001) and Wood End, Westoning (HER 17010).

The medieval settlement pattern of Bedfordshire is varied with some areas of mainly nucleated settlement and some of predominantly dispersed settlement. It is not clear what determines what the character of the settlement pattern. Geology and topography must have some influence on the settlement pattern but as adjacent parishes with similar topography can have different settlement patterns other factors must be at play. Edgeworth (2007, 99) suggests that the individual style of the land owning classes may also have had a significant affect on how the settlement pattern developed in any given area.

The medieval settlement assets in the River Flit AS-SA are all located on the upper reaches of tributary streams rather than in the main valley. This means that they relate to the settlement pattern of the surrounding area, the Greensand Ridge (see the Woburn Sands Formation AS-A). Certainly the two assets representing "Ends" fit into the Greensand Ridge pattern. There is only one asset for a deserted settlement in the AS-SA but this reflects the situation for the county as a whole. . This does not suggest that the factors such as economic decline and plague epidemics of the 14th century did not have an impact in Bedfordshire, but that there is little archaeological evidence for their effects. The greater number of shrunken or shifted settlements in the AS-SA suggests

that partial abandonment of settlements was a more common response to these external factors.

There are six assets within this AS-SA that relate to moated sites mainly surviving as earthworks. In Bedfordshire medieval moated sites are generally date from the 12th and 13th centuries AD and comprise a rectangular or square central platform surrounded by a water filled ditch, access to the central enclosure being by a causeway or bridge. The circular moat at Westoning Manor (HER 233) is a rare example of a non-rectangular enclosure; this is thought to represent an early form of moat. The interior of moated sites would have contained houses and ancillary buildings such as barns and stables. In some cases, e.g. Westoning, moated sites represented manorial residences, but more frequently they were built by wealthy landowners to express their wealth and status. The earthwork remains of a large D-shaped medieval moat at Ruxox Farm (HER 919) was the possible site of a medieval grange associated with Dunstable Priory and may have been used as a monastic cell (Edgeworth 2007a, 104).

None of the moated sites within the AS-A have been the subject of comprehensive archaeological investigation, however where both intrusive and non-intrusive investigations have taken place elsewhere within the county these types of sites have shown several phases of re-modelling, including the widening of the retaining ditches. In some cases such as at Tempsford and more recently at Houghton Conquest there is evidence to such the re-occupation of Saxon sites (Maul and Chapman 2005 and Northamptonshire Archaeology 2010a).

Two of the medieval settlement assets relate to manorial sites identified from documentary sources: Wadlowes Manor (HER 788) and Segenhoe Manor (HER 34). Segenhoe is associated with a deserted settlement. Although the location of the two sites is known nothing is known about what archaeological remains survive at the sites.

Land Use/Agriculture/Land Division Evidence

There are twenty two medieval assets for the River Flit AS-SA that relate to the management of the landscape. They include ridge and furrow earthworks, ancient woodlands (in existence before 1600AD), deer parks, ponds and other pre-enclosure boundaries.

Bedfordshire's medieval agricultural system was based on the open field system. In this system, originating in the Saxon period, each parish or township had a series of cultivated open fields, common land and meadows. Each of the open fields was subdivided into furlongs which were further subdivided into strips or lands, these were tenanted out to members of the local community. Frequently, though not exclusively, each community had three open fields that were cultivated in rotation with every third year the field left fallow to help restore soil fertility. The rotation also included growing cereal crops (wheat, barley and oats).

The most common evidence of the open field system in Bedfordshire, in common with much of midland England is ridge and furrow. This was created by a particular and repeated pattern of ploughing that produced a characteristic corrugated earthworks with blocks of ridges and furrows defined by headlands that were created were the plough

was turned at the end of the furrow. Ridge and furrow covered much of the Bedfordshire landscape and survived the enclosure of the open fields which started in the 16th century reaching its climax in the Parliamentary Enclosures of the 18th and 19th century which saw the end of the open field system. Although enclosure imposed a whole new network of boundaries and land ownership on the rural landscape the earthwork remains of the medieval system survived substantially intact until the middle of the 20th century when the pressure for increased agricultural production during the Second World War and immediately after saw most of the ridge and furrow earthworks destroyed by ploughing as arable cultivation became a priority to feed the nation. Today less than 4% of the original stock of ridge and furrow earthworks that once existed in the county survives as earthworks and many parishes only retain small fragments and pockets of earthworks of the once extensive open field systems.

Ridge and furrow earthworks survive throughout the River Flit AS-SA, though generally they only represent fragments of even the surviving earthworks. They tend to be distributed along the tributary streams rather than the main river. This is because the floodplain of the main river was subject to flooding which made it unsuitable for cultivation but more importantly it was used as meadows for grazing, a very valuable resource in the medieval agricultural economy. The tributary streams did not provide sufficient floodplain to develop extensive meadows so they were subsumed into the overall open field systems; although these largely lay outside the confines of the AS-SA as defined in this project

There are three assets that relate to medieval ponds or water management. One is the suite of ponds at Chalgrave (HER 91), a complex of three fishponds fed by a natural stream. The ponds belonged to Chalgrave Manor and are referred to in late 14th century documents. The earthworks suffered some damage in the 20th century in attempts to but still retain their status as a Scheduled Monument. The other two assets relating to water management are at Westoning (HERs 8563 and 14651), both are close to Westoning Manor moated site (HER 233). The earthworks have not been systematically described or surveyed so it is difficult to assign them to a specific function but the HER suggests that the earthworks to the north of the Manor (HER 8563) are ponds and those to the south (HER 14651) are the remains of works to manage a stream to facilitate fishing.

Three of the assets relate to ancient woodlands (present prior to 1600 AD) and their associated woodbanks. These assets are all located on the upper reaches of tributary streams and their location is a function of land use patterns in the surrounding areas rather than anything specifically related to the River Ouzel AS-SA. This is clearly shown at Pedley Wood and Chicksands Wood (HER 9142) which are located within the Greensand Ridge which has the largest number of ancient woodlands in the county (see Woburn Sands Formation AS-A).

Two of the assets in this category represent deer parks or probable deer parks: Beckerings Park (HER 8763) and Toddington Park (HER 8760). Little is known about these deer parks and neither of them retains the characteristic park pale earthwork built to ensure that the deer did not escape the confines of the park. The deer park at Beckerings Park went on to form the basis for a post-medieval designed landscape.

Industrial Evidence

There are three assets representing medieval industrial activity in the River Flit AS-SA, they are all earthwork remains of watermills located on the upper reaches of tributary streams, two are in Gravenhurst (HERs 3036 and 15529) and the other at Harlington (HER 15529). These assets probably under represent the number of watermills that existed in the AS-SA in the medieval period.

Religious Houses and Buildings

There is a single asset representing a religious house for the Medieval period in the River Flit, it is Beaulieu Priory, Beadlow (HER 813). The Priory was founded between 1140 and 1146 AD by Henry d'Albini as a Benedictine cell of At Albans Abbey. It was never a large or wealthy house, an inquisition of 1433 records that it should have had sufficient resources to sustain a community of five monks. In the 14th century the Priory was partially destroyed by fire and by the beginning of the 15th century it was so poor that it could barely support two monks. At this point it was decided that the Priory could no longer sustain an independent existence and the cell would be joined to St Albans Abbey. This process was completed in the early 1460's. Although it ceased to be a Priory it survived as a farm, becoming Top Farm, the centre of the Manor of Beaulieu. A lease of 1568 mentions a number of buildings including a hall, kitchen, stable, barn, chapel and mill; most of the buildings will have originally formed part of the Priory. Small scale archaeological investigation in 1963 (Fadden 1966) showed that substantial sub-surface remains of the Priory survived in the fields around the present Top Farm.

Conclusions

The medieval assets for the River Flit give only a partial picture of what the AS-SA was like during that period. The assets relating to medieval villages are mainly located on the tributary streams rather than the main river and may in part reflect the settlement pattern of the surrounding areas rather than relating specifically to the Flit Valley. There is a relative lack of assets relating to villages in the central and eastern parts of the AS-SA, this may be because the villages have been excluded as "urban areas" from this study or because they lie just outside the AS-SA within the Greensand Ridge. The valley floor may not have been an attractive place to settle because of the threat of flooding and the value of that area as meadowland for grazing. Another aspect of the medieval settlement pattern, moated sites, shows the typical location and distribution found in the rest of the county.

Although there is ridge and furrow within the AS-SA, remains of the medieval open field system, only small parts of the open field systems existed within the AS-SA, mainly being located outside it and relating to the agricultural patterns of surrounding areas. The same environmental and topographical reasons that affected the distribution of settlement may also have affected medieval agricultural pattern in the AS-SA with the river valley being unsuited to arable cultivation, with the valley land being a more valuable grazing resource. Meadowland does not seem to have left many archaeologically visible remains on the landscape, though there is one possible example in the AS-SA at Pulloxhill (HER 1488). The three assets representing water

management in the AS-SA, as river valley area it is to be expected that there is likely to have been more of this sort of activity in the AS-SA even it has not been identified and recorded.

Woodlands were a very important resource in the medieval period. The fact that there are only three assets representing ancient woodland in the AS-SA does not mean that it was a scarce resource because the surrounding areas, particularly the Greensand Ridge contained a significant number of ancient woodlands which would have supplied the river valley as well as the Ridge.

The only religious house within the River Flit, Beaulieu Priory, was small, short lived and poor. It is unlikely to have had a significant impact on the landscape and economy of the area, probably functioning little differently from other manorial settlements at the centre of the estate. Other, much larger religious houses located just outside the AS-SA such as Chicksands Priory and Woburn Abbey and their estates are likely to have been a much more important influence of the economy and society of the River Flit.

Most of the medieval assets of the River Flit AS-SA are common to the rest of the county, though the topography, particularly the relationship to the river and floodplain, were an important influence on the management and development of this area in the period. The medieval landscape of the AS-SA was highly organised, aimed at making the best advantage of the natural resources that it had to offer.

Post-Medieval Assets (1540 – 1900 AD)

There are eighty assets for the post medieval period in the River Flit AS-SA. They can be divided into evidence for the following: settlement/occupation, land use/agriculture/land division, industry, communications/transport and designed landscapes.

Settlement/Occupation Evidence

There are seventeen assets representing this category for the post medieval period. Three of the assets are earthwork remains of now abandoned settlements. One of them, Lower Gravenhurst (HER 724) is also recorded as a medieval settlement showing that the process of settlement abandonment that began in the medieval period was in some cases lengthy. The other two, at Cowbridge and Harlington (HERs 12114 and 3565 respectively), are both outside the main settlement cores and probably represent small settlements founded on marginal land. In neither case is the date of foundation known but it would appear that they were never more than hamlets, known as “Ends” in other parts of Bedfordshire. A marginal location would make it difficult to sustain these settlements in harsh economic conditions which may have led to their abandonment.

The other fourteen assets in this category represent existing buildings or documentary evidence for buildings. Most of the eleven surviving building assets are listed buildings which accounts for their presence in the HER, the others are not formally designated assets and the reasons for inclusion in the HER is obscure. These assets include a typical range of vernacular buildings but do not include buildings in villages or other substantial settlements which are excluded from this study. Therefore, the assets for buildings cannot be used to characterise the stock post medieval buildings for the AS-SA.

Land Use/Agriculture/Land Division Evidence

Twenty one assets represent this category of evidence in the River Flit AS-SA; they include field boundaries, farm buildings and woodland.

The Enclosure Acts of the late 18th and 19th centuries saw a radical reorganisation of Bedfordshire’s landscape; it saw the decline and final demise of the open field system. The new land divisions created by enclosure were superimposed on the open fields and the ridge and furrow earthworks. The physical remains of enclosure are represented by five assets related to boundary features such as those recorded at Maulden (HERs 3213 and 3214), Chalton (HER 12119) and Clophill (HER 14642).

Farm and agricultural buildings are represented by eight assets. They are generally surviving buildings such as barns at Speeds Dairy Farm, Beadlow (HERs 15152 and 15153) while others are earthwork or cropmarks of farm sites, for example the site of a farm at Silsoe (HER 7794) and another at Greenfield (HER 8343). One particular group of buildings is, however, worthy of particular mention: onion drying sheds of which there are three in the AS-SA. In later 18th and early 19th centuries Bedfordshire began to

establish itself as one of southern England's market gardening areas and onion were one of the principal crops. Onion drying shed developed a specific form, they are timber framed structures with slatted walls and floors to create the air flow needed to dry the onions before they are transported to market. The sheds can be small stand alone structures or the upper floors of barns or cart sheds. The River Flit AS-SA has three examples of this type of asset all of them in Maulden (HERs 13389, 13390 and 13402). Because onion drying sheds have a very function which is strongly reflected in their structure they are difficult to find alternative uses for and as a result are going out of use and falling into decay, slowly disappearing from the landscape.

Industrial Evidence

Evidence of industrial activity is represented by twenty six assets. Eight of the assets are for earthwork or cropmark evidence of sand or gravel pits distributed throughout the central and eastern parts of the AS-SA. This distribution is in the wider parts of the Flit valley where there are more likely to be exploitable deposits of aggregates than is likely to be found in its upper reaches or in the valleys of tributary streams. These sand and gravel pits all represent small scale aggregate extraction designed to meet local needs. Their relatively small number reflects the fact that the River Flit has not been a major source of aggregates. Whether this is because the quality or accessibility of the aggregates does not make them worth exploiting, the land was too valuable for agriculture to sacrifice it for mineral extraction or there were ready sources of sand in particular from the Woburn Sands Formation is not known.

Mills represent ten of the assets in this category and include sites where there are still standing buildings such as Toddington (HER 1142), ruined structures (Shefford, HER 2633), earthworks at Beadlow (HER 9130) or the evidence is from documentary sources (HER 14545, Southill). The mills are located both beside the main river and on tributary streams throughout the AS-SA. There is also a windmill at Shefford (HER 939). The number of mills reflects the importance of cereal production in the AS-SA in the post medieval period. This is also shown by documentary evidence for a maltings at Clophill (HER 9133).

HER 1521 is an asset representing an unusual type of industrial activity: mineral water production at Flitwick Moor. The supposed healing powers of the water from mineral springs on Flitwick Moor were first "discovered in the 1870's. A long campaign by the owner of the site, Mr Stevens, to gain the support of the medical profession for the beneficial properties of the waters finally succeeded in 1891 and the sale of the waters to the public began. Production continued until the 1930's by which time demand had declined with site being sold in 1938. There are very few physical remains of this industry surviving today other than remains of the pump house.

Designed Landscapes

There are seven assets relating to post medieval designed landscapes in the River Flit AS-SA. The creation of landscape parks around the residences of the aristocratic or wealthy families is a major feature of the post medieval period and had a very significant impact on the landscape. The Greensand Ridge through which surrounds the central

and eastern parts of the River Flit is noted for the concentration of major designed landscapes it contains such as Woburn and Ampthill (see Woburn Sands Formation AS-A). Only one of these designed landscapes in the Flit Valley can be considered a major parkland: the Registered Park at Chicksands (HER 6992). Although the bulk of the designed landscape at Chicksands lies outside the River Flit AS-SA it did have a significant local impact on it. The site of the medieval Gilbertine Priory (HER 375) was turned into a residence by the Osborne family after the Dissolution in 1539. In the 18th and early 19th century the house was reworked and the park and gardens developed, notably by James Wyatt. The main impact on the AS-SA was the creation of lakes by widening the River Flit and the creation of cascade within the river

The other parks in the AS-SA are much smaller and tend to be later in origin. They represent the desire of landowners to express their wealth and status by creating appropriate landscape settings for their country residences. They tend to be significantly smaller in scale than aristocratic parks, but are locally significant features in the landscape. This sort of designed landscape is typified by Flitwick Manor Park, a Grade II listed on the English Heritage Register of Parks and Gardens (HER 7026). The designed landscape was created as the setting for Flitwick Manor which is 17th century in origin. The earliest designed elements of the landscape date to the mid 18th century when the owner Dr Humphrey Dell remodelled both the house and grounds including the creation of Flit Water and a ha-ha. Flit Water was created by damming a tributary stream of the Flit, a number of sluices and drains are associated with the Water as is an 18th century brick cascade. Further developments were undertaken in the mid 19th century by J T Brook. Today the part of the Park around Flitwick Water is in public ownership and used as a public open space.

Communications/Transport Evidence

There are nine assets representing evidence of communications and transport in the AS-SA. Three of the assets relate to documentary evidence for roads and track, part of a local network that have now gone out of use. Three more of the assets are bridges two of which still exist and form part of the local road network at Beadlow Bridge (HER 15190) and Cow Bridge (HER 17737), the third bridge asset is based on documentary evidence for a now demolished bridge at Clifton (HER 1897).

The Ivel Navigation is represented by three assets. The Navigation itself (HER 14539), a bridge (HER 1988) and a lock (HER 8348). Work began on the Ivel Navigation in 1758 linking Biggleswade with the Great Ouse, which was also navigable, at Tempsford. An extension southwards from Biggleswade as far as Shefford was begun in 1822. The Navigation was never commercially very successful and could not compete with the new railways. It was wound up in 1876.

The final asset in the category relates to the Bedford to Hitchin railway the route of which runs through the AS-SA at Shefford. It formed part of the expansion of the railway network to serve smaller communities beyond the mainline network. It opened in 1857 and finally closed in 1964.

Conclusions

The post-medieval period saw a substantial period saw a wholesale reorganisation of the landscape in the River Ouzel AS-SA, however as with medieval period this has to be seen in the context of the surrounding areas. The influence of Enclosure is seen in the overwriting of the remains of the open field system and grazing meadows with a new pattern of land division with a very different and more regular character. The impact of Enclosure was increased where the Dukes of Bedford and other improving landowners organised their estate to improve production by adopting new agricultural techniques, often being in the forefront researching and developing the. Woburn Estate of the Dukes of Bedford was at the centre of this movement and although it lies outside the AS-SA in the Woburn Sands Formation.

There is very little evidence of industrial activity in the post-medieval period in the River Flit AS-SA. What there is tends to represent the processing of agricultural produce in the form of mills distributed throughout the AS-SA, emphasising the importance of agriculture to the local economy. There were specialist elements to the agriculture, exemplified by the presence of onion drying sheds which are particular to areas of market gardening. The small number of quarries for this period shows that aggregate extraction has not been an important feature of the River Flit in the past, other than to serve small scale local demand. A specifically local industrial activity was the bottling of mineral water at Flitwick Moor. This short lived industry exploited a locally occurring resource and able to develop because of fashionable demand. Such industrial development that did occur is likely to have been in the towns of Shefford and Ampthill, and in the 19th century Flitwick which are outside the AS-SA as defined in this project, though they are likely to have exerted a considerable influence on the economy and society of the AS-SA.

Designed landscapes had quite a significant impact on the landscape of the AS-SA. Although the major designed landscapes of the Greensand Ridge, with the exception of part of the Chicksands estate, lay beyond the confines of the AS-SA, what might be described as the second rank of landscapes created in the post medieval period were quite common. They often exploited the picturesque and landscape qualities inherent in a river landscape, even if these qualities were subject to improvement by the landscape designers.

The major transport developments of the post medieval period had little direct impact on the AS-SA. A railway branch line crosses it at its eastern end, providing a typical local service to communities inside and outside the area. The short lived and unsuccessful Ivel Navigation is the only other example of a major type of transport asset in the AS-SA.

The post-medieval assets of the River Flit demonstrate that the importance of agriculture established in the medieval period continued into the post-medieval period. It was, however, modified by the reorganisation and to some degree specialisation of the landscape and rural economy brought about by the reorganisation of the countryside through Enclosure.

Modern Assets (1901 – 2050 AD)

There are four assets from within the River Flit AS-SA assigned to the modern period. They can be divided into evidence of industrial and military activity. There is also one asset that relates to a former smallpox isolation hospital at Steppingley (HER 7853). It is a corrugated iron building constructed in a rural area of Steppingley in 1901 (HER 7853) which was subsequently moved down the road to a purpose built hospital nearby but outside the AS-SA. At the end of the Post-Medieval period infectious diseases were rife within the county. Slum housing and lack of fresh water supply in rural period fed the infection rate (Godber 1969, 557-558). Isolation hospitals including the Steppingley Smallpox Hospital were constructed in the 19th and early 20th centuries by local authorities to fight the spread of infectious diseases.

Industrial Evidence

The evidence of modern industrial activity comprises the cropmark of a quarry at Toddington (HER 12107), there is no evidence for what material was quarried at this site. The other asset is a gasworks at Amphill (HER 6797), which supplied the town. This noxious process was located on the edge of the town, outside the built up area.

Military Evidence

There is a single asset for military activity in the AS-SA. It is for a World War I rifle range located in a former quarry at Chalgrave (HER 11794).

Conclusions

The modern assets for the River Flit AS-SA are very few and cannot be used to describe this period even in broad outline. Rather they represent sporadic episodes of specific activity that have left material remains that have been recorded in the HER. This does not mean that there are not important remains of the modern period in the AS-SA, but they have yet to be identified and recorded.

The River Ouzel Aggregate Study Sub-Area

The Archaeological Resource

The River Ouzel Aggregate Study Sub-Area (AS-SA) covers approximately twenty five square kilometres and includes both the river terrace deposits and the glacial sands and gravels. A search of the Bedfordshire HER identified one hundred and forty five assets which lay either entirely or substantially within the AS-SA. The table below illustrates the breakdown of assets by chronological period. In Appendix 2e there are chronological tables listing the assets by which category they have been assigned to and information on whether the assets have been subjected to archaeological investigation, are designated or relate to aggregate extraction.

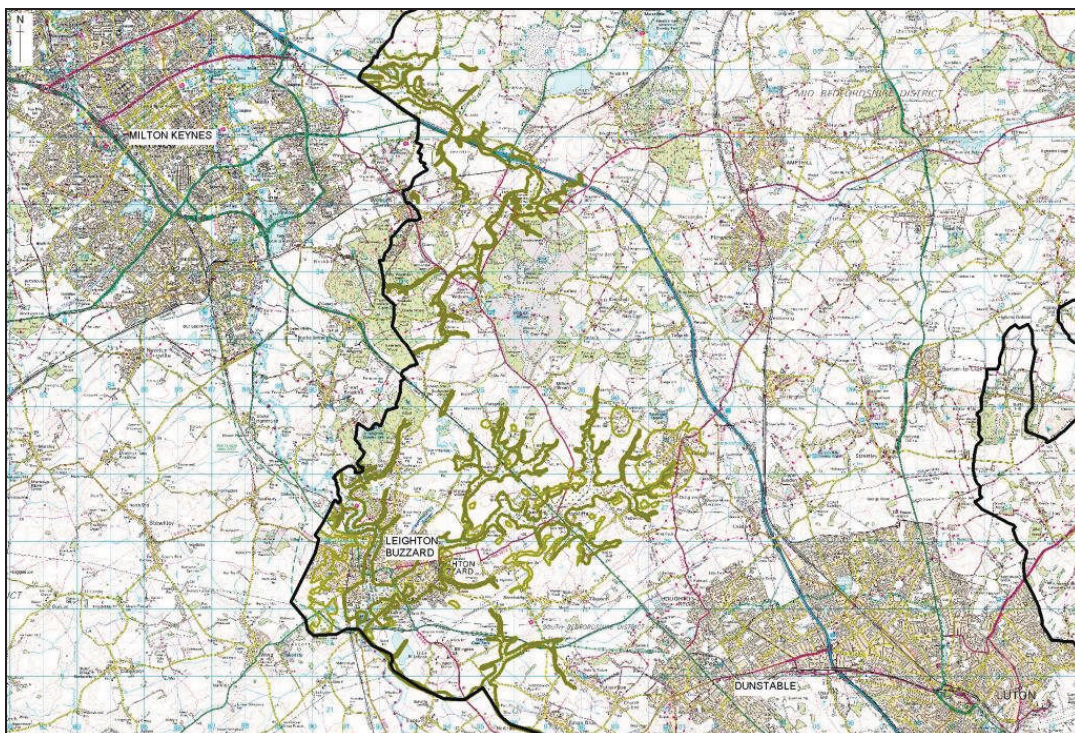


Figure 6: River Ouzel AS-SA Location Map

Table 13: River Ouzel AS-SA Assets

Type of Assets	Number Recorded	Number per sq km
Palaeolithic Assets	2	0.1
Mesolithic Assets	1	0.04
Neolithic Assets	3	0.1
Bronze Age Assets	5	0.3
Iron Age Assets	4	0.2
Later Prehistoric Assets	4	0.2
Roman Assets	10	0.6
Saxon Assets	5	0.3
Medieval Assets	36	1.2
Post Medieval Assets	72	2.8
Modern Assets	3	0.1
TOTAL	145	5.8

Palaeolithic Assets (900,000 – 10,000 BC)

There are two Palaeolithic HER assets recorded within the River Ouzel AS-SA. Both assets represent findspots lithic material. The first asset represents a boring tool was recovered from the now redundant Tiddington Hill gravel pit at Linslade (HER 10725) during the 19th century. The second asset represents a Palaeolithic flake or flakes reputed to have been found close to Stanbridgeford (HER 14697). There is no information on the context of either asset.

Conclusions

As there are only two Palaeolithic assets for the River Ouzel AS-SA, both of uncertain provenance, it is difficult to define its character for this period. Evidence from the rest of the county indicates that Palaeolithic remains are primarily found either from within the river sands and gravels or the brickearths and clay with flints deposits. The county wide evidence also relates almost exclusively to Lower and Middle Palaeolithic material which given the hostile environment during the early stages of the Devensian Glaciation is not uncommon elsewhere within the region. Topographically, with the exception of the discoveries made within the brickearth deposits on the Chilterns the majority of the Lower and Middle Palaeolithic artefacts within the county have been found within the river valleys and this is a situation generally reflected elsewhere within the region (Austin 2000, 5-8 and Luke 2007, 21).

The general absence of Palaeolithic remains from the River Ouzel AS-SA may in part be due to glacial and periglacial erosion activity. It has been suggested that natural processes during the Anglian and Wolstonian Glaciations would have effectively scoured and re-deposited the underlying geology, thus impacting upon hominid occupation evidence. (French 2003a, 26-28). This would have been compounded even when the glaciers were not present because the frozen ground and steppe like nature of the vegetation would have left the surface of the geology vulnerable to ice cracking and wind erosion (French 2003b, 39-43).

However, in spite of these factors the two assets known from the AS-SA suggest that the aggregate deposits of the River Ouzel do have the potential to contain Palaeolithic material. The present sparseness of Palaeolithic material in the AS-SA should be treated with caution and treated as an area for additional study.

Mesolithic Assets (10,001 – 4,000 BC)

There is one Mesolithic asset recorded within the River Ouzel AS-SA. This represents a collection (over 10 objects) of lithic material recovered from excavations at Salford Quarry undertaken as a consequence of aggregate extraction (HER 15146). The assemblage, consisting of sixty five pieces, was all found as residual material in later contexts (Neolithic – Iron Age). Dated to the Mesolithic – Early Neolithic, the assemblage comprised a number of diagnostic tools including backed blades, microdenticulate, truncated blade, notched flakes and a microlith as well as evidence of blade production. It is suggested that the assemblage represents the “accumulated losses of hunting forays and the general movement of people” (McSloy 2004, 143). It is likely that base camps occupied on a semi-permanent or seasonal basis would have existed nearby.

Conclusions

The single Mesolithic asset for the River Ouzel AS-SA makes it difficult to characterise the period, more so because the lithic assemblage the asset represents appears to be evidence of general use of the landscape rather than more concentrated use of a specific location on a seasonal basis or semi-permanently as been found in other AS-As such the River Great Ouse. The context of the asset: a scatter of flints without associated sub-surface features located overlooking a river valley is typical of Mesolithic sites in the county (Luke 2007, 27). Although the Salford Quarry asset represents off-site activity in the landscape it does hint that more substantial occupation and activity sites are likely to exist in the vicinity.

It is also unusual that the only evidence for Mesolithic activity in the Rive Ouzel comes from, admittedly residual material, from an excavation. Excavated evidence for the Mesolithic has been found throughout the county, but a more common form of evidence is from surface collections of flint artefacts either the result of systematic survey or chance finds. The absence of such evidence in the Rive Ouzel reflects the fact that little if any such fieldwork has been done in the AS-SA and may create a false impression of the actual level of Mesolithic activity in the valley.

On the limited basis of the single Mesolithic asset from this AS-SA it is possible to suggest that the River Ouzel has the potential to contain the remains of a network of temporary or seasonal hunter-gather sites. These sites should be looked for in the appropriate river valley locations or at vantage points overlooking the river valley. It must be recognised that they are only likely to exist as artefact scatters appropriate survey and investigation techniques have to be employed to detect the.

Neolithic Assets (4,001 – 2,350 BC)

There are a total of three Neolithic assets from the River Ouzel AS-SA. They are all located on adjacent sites in a small area at the northern end of the AS-SA and can be categorised as settlement/occupation evidence derived from archaeological investigations resulting from aggregate extraction.

Archaeological investigation at Salford Quarry (HER 15146) produced evidence of Neolithic occupation in the form of two groups of features c.150m apart. One group comprised three pits and the other nine pits and a tree throw, all the pits were shallow and bowl-shaped. Finds from these features include pottery, lithics and a single grain of barley. It is argued that these pit groups represent a class of Neolithic special deposit containing pottery vessels forming part of a ritual process rather than evidence of domestic occupation. They are seen as indicating a population prepared to clear land for cultivation (Dawson 2005, 161).

The other two Neolithic assets are collections of lithic material (over 10 objects) from Whitsundoles Farm Quarry (HERs 7721 and 16477), both were found with Bronze Age material. They were recovered during fieldwalking at the Quarry and comprise a total of twenty three flints found throughout the area of the quarry. The assemblage includes two reworked flakes, interpreted as a blade/knife and a possible scraper, the rest being cores and debitage. A sparse spread of burnt flint was also recovered from the same area possibly suggesting the existence of fire pits or hearths. These assets indicate low level, probably sporadic activity rather than semi-permanent or permanent occupation on gravel terraces on a tributary of the River Ouzel.

Conclusions

The Neolithic assets from the River Ouzel demonstrate a presence at the northern end of the AS-SA. All the finds made during archaeological investigations undertaken as a result of aggregate extraction so this distribution is a reflection of planning led archaeological activity rather than a true representation of the extent and nature of Neolithic occupation of the AS-SA.

The two types of evidence for Neolithic assets in the River Ouzel: surface scatters of flint artefacts recovered in fieldwalking, with no apparent related sub-surface features and small groups of pits containing a range of domestic or ritual material are typical of the non-monumental remains of the Neolithic are manifested in Bedfordshire. This would suggest that we should expect there to be further evidence of Neolithic settlement/occupation in the AS-SA. But there are the attendant problems of identifying it through conventional evaluation strategies, particularly where surface scatters do not appear to represent sub-surface features (Luke 2007, 39-40).

The location of the Neolithic assets in the River Ouzel is also interesting. They have been found on the upper reaches of tributary overlooking the streams, whereas elsewhere in the county they have generally been found in the larger river valleys where they are at their widest (Luke 2007). At the county level this suggests that we should be looking for Neolithic settlement in the vicinity of tributaries away from the main valleys. In

the River Ouzel it suggests that Neolithic activity is likely to be found in the AS-SA where it includes the main river around Leighton Buzzard in the south. Given the limited extent of the AS-SA, particularly in the north, we cannot understand the Neolithic settlement in isolation without thinking of it in the context of the surrounding areas which will provide the hinterland for any sites located by or close to the river.

The other major element of the Neolithic landscape are the large ceremonial or ritual monuments, they are a manifestation of the development of the first settled and organised communities in this period. Elsewhere in the county such monuments have been found in valleys of the River Great Ouse and River Ivel (Malim 2000). On that basis there might be an expectation that such monuments should also be found along the River Ouzel. However, the majority of these monuments are initially identified as cropmarks. There is no tradition of aerial photography in the Ouzel valley so it perhaps not surprising that no Neolithic ceremonial monuments have been identified in the AS-SA. Another factor in the apparent absence of monuments may be that much of the River Ouzel AS-SA comprises tributary streams rather than the main river valley; the prime location for monuments elsewhere. With evidence that Neolithic communities were living in and around the River Ouzel, we should expect the existence of monuments to serve those communities in the AS-SA, they are likely to be found in the main river valley, for instance in the south of the AS-SA. It is also possible that the monuments used by the communities in the AS-SA lie in the Ouzel valley outside Bedfordshire.

The close proximity of Whitsundoles Farm and Salford Quarries mean that it may be possible to develop a wider understanding of the Neolithic landscape when Whitsundoles Farm is published to the same level as Salford (Dawson 2005).

Bronze Age Assets (2,351 – 700 BC)

There are a total of five Bronze Age assets within the River Ouzel AS-SA. They can be divided into two categories: evidence for settlement/occupation and evidence of ritual/ceremonial/burial. The assets are located in two areas of the AS-SA, at the northern end and north and east of Leighton Buzzard in the south.

Settlement/Occupation Evidence

There are three assets within the AS-SA representing Bronze Age settlement/occupation evidence, one of which is associated with ritual evidence (HER 15146). Two are from the Whitsundoles Farm Quarry (HERs 7721 and 16477). As they are both from the same Quarry they will be dealt with together as part of the same archaeological entity. These assets include a collection of lithic material (over 10 objects) recovered from fieldwalking, the collection was also found with Neolithic material. The lithic collection has been interpreted as evidence of sporadic activity or activity peripheral to an unidentified permanent occupation site (BCAS 1995, 10). During excavations at Whitsundoles Farm Quarry two Early Bronze Age pits were recorded (HER 16477). The pits contained Early Bronze Age pottery including Beaker sherds. It is not clear whether the pits are domestic or ritual in function as Beaker pottery occurs in both types of context. The third asset represents a scatter of Bronze Age lithic material from the excavations at Salford Quarry (HER 15146). The assemblage is dominated by debitage and contains few diagnostic tools it is interpreted as evidence of short stay episodic or seasonal domestic activity (Dawson 2005, 161).

Ritual/Ceremonial/Burial Evidence

There are three assets in this category for the Bronze Age and all of them relate to burial evidence. Two of the assets are cropmarks of ring ditches (HERs 3244 and 14687) and the third (HER 15146) is excavated evidence for ring ditches. Ring ditches are generally interpreted as the remains of Bronze Age burial mounds or barrows, where the central mound has been reduced as the result of later agricultural practices such as ploughing. The ring ditches in the AS-SA appear either singly or small groups.

In excavations at Salford Quarry (HER 15146) three ring ditches were recorded. They were constructed on a gravel terrace overlooking a tributary of the River Ouzel, in the same area as two groups of Neolithic pits which may have had a ritual function. None of the ring ditches contained primary burials and there was only limited and equivocal evidence for secondary burials in the form a sherd of collared urn which could come from a cremation inserted into the barrow mound (Dawson 2005, 161). Dating evidence from the ring ditches is limited and what there is suggests that they are Late Bronze Age in origin which is unusual as ring ditches in Bedfordshire typically date from the Early Bronze Age and in some cases the Late Neolithic. If the dating is accurate it might call into question the location of the ring ditches in an area which had ritual significance in the Neolithic on the basis of the two pit groups thought to be evidence of ritual activity.

The two assets representing cropmark evidence for ring ditches are in the south of the AS-SA. A series of ring ditches are known from aerial photographs at Double Arches Farm, Heath and Reach. They are located near a tributary of the River Ouzel. The other ring ditch asset is also located close to a tributary of the Ouzel at Stanbridge (HER 3244). However, these features have recently been reinterpreted and are likely to represent modern equestrian activity rather than Bronze Age ring ditches and can, therefore, be discounted.

Conclusions

The best evidence for the Bronze Age activity in the River Ouzel comes from adjacent sites at the northern end of the AS-SA and is provided by archaeological investigations undertaken as a consequence aggregate extraction. Therefore, our understanding of this period is an artefact of the late 20th century planning process as a reflection of the true nature of the archaeological resources of the period.

The evidence for settlement/occupation is not substantial but generally consistent with that found elsewhere in the county such as Biddenham Loop (Luke 2008). At Whitsundoles Farm there is a suggestion that the core of the settlement may be outside the area that was investigated. At Salford Quarry the domestic activity was taking place in an area dominated by three ring ditches giving it a primarily funerary function. Finding Bronze Age domestic and funerary activity in close proximity is known elsewhere in the county, for example at Roxton Quarry (Taylor and Woodward 1985) and Broom Quarry (Cooper and Edmonds 2007). However, the location of the Bronze Age assets in the north of the AS-SA, overlooking a tributary, is unlike the location of similar assets in the rest of the County: the main river valleys. We should expect evidence for Bronze Age settlement/occupation to be found in the rest of the River Ouzel. The fact that it has not been identified to date is a product the lack of systematic archaeological investigation beyond the northern part of the AS-SA.

Typically in Bedfordshire ring ditches are first identified first as cropmarks. The funerary monuments, ring ditches, from the AS-SA are known from cropmarks, though those from the Salford Quarry have also been subject to excavation. The lack of extensive or systematic aerial photography in the AS-SA may explain the general dearth of such monuments recorded in the HER. It is very likely that ring ditches and possibly other contemporary ceremonial monuments that known from other river valleys in the county will also exist in the AS-SA. It has been suggested that the round barrows at Salford Quarry were constructed in an area that had also seen Neolithic ritual activity. Although Neolithic and Bronze Age ritual and burial monuments are often found in the same area with clear evidence of continuity of function at the locality, for example Octagon Farm (HER 1480), the evidence from Salford does not provide more than circumstantial evidence for continuity.

The limited evidence there hints that Bronze Age communities were living in and exploiting the River Ouzel. These communities were certainly active in the upper reaches of tributary streams and are likely to have been present in the main river valley too. What evidence there is also suggests that these Bronze Age communities followed similar patterns of settlement, subsistence and ritual activity to that which has been observed and more extensively investigated in the River Great Ouse and Ivel Valley AS-

As. Using models developed in these areas it should be possible to predict where Bronze Age assets will be found in the River Ouzel and suggest strategies for identifying them.

The close proximity of Whitsundoles Farm and Salford Quarries mean that it may be possible to develop a wider understanding of the Bronze Age landscape when Whitsundoles Farm is published to the same level as Salford (Dawson 2005).

Iron Age Assets (701 BC – 42 AD)

There are four Iron Age assets for the River Ouzel AS-SA. There are three assets concentrated in the north of the AS-SA and a fourth in the south. They all represent excavated evidence for settlement/occupation.

Settlement/Occupation Evidence

The asset in the south of the AS-SA is from Clipstone (HER 11123) where trial trenching on an area of cropmarks found evidence of a Late Iron Age to Roman settlement on a gravel terrace on the north bank of the Clipstone Brook a tributary of the River Ouzel.

The other three assets represent Early Iron Age settlement on river terrace gravels on tributaries at Salford Quarry (HER 15146) and Whitsundoles Farm Quarry (HERs 7721 and 16477). At Salford Quarry an enclosed settlement was founded in the 9th century BC in the transitional period from Late Bronze Age to Early Iron Age on a gravel terrace beside a tributary of the River Ouzel in an area previously occupied by a Late Bronze Age round barrow cemetery. This represents a radical change of use of the site as the settlement appears to have completely overwritten the cemetery in the landscape suggesting that the founders of the settlement did not value the barrows, even though they were only relatively recently constructed and were likely to have still be clearly visible. The enclosure had four elements including, unusually, a ditch with parallel pit alignment, possibly containing a palisade, elsewhere the enclosure was defined by ditches, in some places a double ditch. The full circuit of the enclosure was not found within the limits of the excavation. Although contemporary enclosed settlements are known from the county the mixture of elements in the enclosure is unusual. The core of the settlement was formed by nine round houses indentified as circular drip gullies or arrangements of post holes. One of the round houses was attached to a sub-rectangular enclosure and another had an approach defined by an avenue defined by two lines of post holes. There were also a rectangular post built structure, four-post structures one of which had a central pit with a possible ritual function and eleven isolated pits (Dawson 2005, 161–165)

In the 5th century BC (Middle Iron Age) the settlement underwent a radical restructuring. Although the settlement remained in the same physical location and comprised round houses much else changed. It was no longer enclosed and the number of round houses increased to twelve, laid out in a sinuous line on a north – south alignment. With one exception there was no continuity in the location of individual round houses. This phase of the settlement also included four-post structures and several pit groups, the pits were all found in the south west corner of the excavated area and their size and form suggests that they were watering hollows or quarries rather than storage or rubbish pits (Dawson 2005, 70).

The Iron Age settlement at Salford appears to have declined and been abandoned in the 2nd century BC. The pollen evidence indicates that the site open with rough pasture vegetation (Dawson 2005, 169). A small cremation cemetery was established on the northern edge of the former settlement area during the second half of the 1st century BC. It comprised four cremation burials all accompanied by grave goods. The cemetery is

typical of a tradition of small groups of burials that becomes established in the east of England in the Late Iron Age. There is no evidence for a settlement contemporary with the cemetery but generally settlements of this date are found some distance from cemeteries. It is likely that the settlement associated with the burials lies elsewhere, possibly shifting northwards when the Middle Iron Age settlement was abandoned (Dawson 2005, 170).

Pollen samples were obtained from a single feature, a pond, at Salford Quarry and although the deposits were not closely dated they seem to span the Iron Age and give a picture of the environment and economic activity around the site. From the very beginning the settlement appears to have existed in an open grassland environment with some trees and scrub, though not large areas of woodland. This broad picture did not seem to change throughout the Iron Age, though the amount of woodland does appear to have reduced through time. There is evidence that what trees and woodland did exist around the site were managed. Grassland and pasture, some of it wet, possibly meadow, was the dominant vegetation around the settlement. The preponderance of grazing around the site suggests that stock rearing and management was a major element of the settlement's economy. Cattle and sheep dominate the animal bone assemblage but there is only limited evidence for butchery suggesting the dairying may have been more important than meat production. There is evidence for cereal cultivation, which looks like it increases in importance through time, but no evidence of substantial crop processing was found in the excavation. There was some evidence for iron smithing found in the hearths in a small number of the round houses in both phases of the Iron Age settlement, it has been suggested that this distribution may be evidence of a craft skill being had down between generations within one family rather than a skill being generally available throughout the community.

The other to Iron Age settlement assets from this AS-SA come from Whitsundoles Farm Quarry (HERs 7721 and 16477) and were found during archaeological investigation in advance of quarrying. The two assets at Whitsundoles can be treated as part of the same area of settlement. It is characterised by a low density spread of settlement features including pits, post holes, water pits, wells, four-post structures and boundary ditches. The relationship between the boundary ditches and other features is not clear but it has been suggested that the settlement was unenclosed (Luke et al 2004, 7). However, a substantial ditch on the eastern side of the quarry, which had been recut several times, may have enclosed part of the settlement (Preece et al 2006, 7). The settlement dates from Early to Middle Iron Age and had been abandoned by the Late Iron Age.

Conclusions

Evidence for the Iron Age in the River Ouzel is limited to the excavated remains of settlements. This means that our understanding of this period is entirely biased towards areas that have seen archaeological investigations as a consequence of various developments or proposed developments and, therefore, can only provide a limited basis for developing a broad understanding of the period.

In general the character of the settlement at Salford conforms to Early to Middle Iron Age settlements found elsewhere in the County (Dawson 2007). The nature of the settlement with round houses and four post structures is typical of this period as is the reorganisation of the settlement, including the change from enclosed to open, in the Middle Iron Age, although the multiple elements forming the Early Iron Age enclosure is unusual. However, the circumstances of the excavation at Salford meant that quarrying had removed part of the circuit of the enclosure before open area investigation began; this makes it difficult to be certain of the chronology and character of the enclosure and, to some degree, the relationship between the enclosure and settlement within it. The environmental evidence suggesting that the settlement was set in an open, grassland environment with stock rearing as the dominant part of the agricultural economy is different; elsewhere there is evidence for a greater reliance on crop production, possibly as part of a more mixed economy.

Although Whitsundoles Farm and Salford Quarry are located next to each other, they present a very different. The settlements are contemporary but Whitsundoles Farm has dispersed remains contrasting with the more nucleated and intensively occupied site at Salford Quarry. The relationship between the assets is not presently clear; publication of the Whitsundoles Farm site will allow comparison with Salford (Dawson 2005) and analysis of their relationship to explore what they tell us about the contemporary use of the landscape. One possibility is that Whitsundoles Farm represents limited, perhaps temporary occupation or activity in the agricultural landscape which was exploited from the settlement site at Salford Quarry.

The location of the Iron Age assets in the River Ouzel, on valley sides above the floodplain, is consistent with the rest of the County (Dawson 2007, 63); although the Clipstone site is very close to a tributary stream may only be just beyond land that is liable to flooding.

Overall the evidence for the Iron Age in the River Ouzel, although limited but detailed in certain respects, suggests that the settlement and use of the landscape is similar to that in the rest of Bedfordshire (Dawson 2007). Therefore, we should expect there to be a significant number of settlement sites set within field enclosure systems throughout the AS-SA, both within the main valley of the Ouzel and along the valleys of its tributaries. Aerial photography may be an effective initial tool in identifying the location of some of these sites, although geophysical survey was the means by which the Clipstone site was identified.

Late Prehistoric Assets

Within the Bedfordshire and Luton HERs there is a category referred to as “Prehistoric 50000 BC – 42 AD”, it is something of a catchall for assets that cannot be confidently assigned to one of the prehistoric periods. Typically these assets represent unexcavated cropmarks or lithic assemblages and for the purpose of this report the date period they cover can be said to be approximately 10,000 BC to 42 AD. There are four assets in this category in the River Ouzel AS-SA. All the assets relate to cropmarks and they are evenly distributed across the AS-SA. All four assets are located close to streams and comprise enclosures of various forms and sizes and one also contains linear features. None have been subject to detailed analysis or interpretation to provide a more detailed description.

Conclusions

Interpreting the Later Prehistoric category is generally challenging and possibly more so in the River Ouzel AS-SA as there are so few of them. It is generally assumed that many of the of the undated cropmark sites represent Later Iron Age/Roman rural settlements on the basis of morphological comparisons with investigated sites. The Later Prehistoric assets are all in locations that are similar to those occupied by the Iron Age and Roman assets. The only excavated asset that provides a relevant comparison is at Clipstone (HER 11123) which has only been subject to evaluation rather than extensive excavation. However this did produce evidence of Iron Age and Roman settlement suggesting that the four Later Prehistoric assets do indeed represent similar site. If this is the case, even the four assets assigned to this period would significantly increase the number of sites for these periods.

Roman Assets (43 AD – 410 AD)

There are ten Roman assets within the River Ouzel AS-SA. The assets have been divided into the following categories: rural land use/agriculture/land division, communication/transport and findspots.

Settlement/Occupation Evidence

There is a single asset that relate to settlement in the AS-SA. It is from an excavated site at Clipstone in the south eastern part of the AS-SA. Trial trenching in area of cropmarks to the north east of the hamlet of Clipstone (HER 11123) identified a small Late Iron Age to Roman settlement. It is located on gravels overlooking Clipstone Brook a tributary of the River Ouzel. The limited extent of the investigation makes it difficult to say anything about the character of this settlement.

Rural Land Use/Agriculture/Land Division Evidence

There are two assets that relate to Roman rural land use/agriculture/land division within the AS-SA, both are excavated sites. They are located close together at the northern end of the AS-SA at Whitsundoles Farm (HER 7721) and Salford Quarry (HER 15146).

At Salford Quarry a low level of Roman activity was found at the same location as the Early to Middle Iron Age settlement. It comprised of the poorly preserved remains of a rectangular timber framed building, four large pits and a dump of domestic hearth material (Dawson 2005, 81). Pollen evidence indicates that the site continued to be grazed in the Roman period with the timber framed building possibly being a field barn. The generally low level of activity in the Roman period suggests that the focus of Roman settlement may be some distance away with the excavated site being part of the agricultural landscape (Dawson 2005, 170).

A Roman field system at Whitsundoles Farm was first identified from cropmarks and was dated on morphological grounds by its association with another excavated field system immediately across the Buckinghamshire border at Broughton (Petchey 1978). Excavation in advance of aggregate extraction confirmed the existence of the field system identified from a series of ditches and included a ditched trackway. Dating evidence is provided by small quantities of Roman pottery and the Whitsundoles Farm field system is on the same alignment as that from Broughton; this suggests that the two identified assets actually form part of the same process of land division and management and although there is no evidence for where the location of the settlement to which they belong, it is possible that they form part of the same agricultural estate.

Communication/Transport Evidence

There are five assets that relate to Roman roads with the River Ouzel AS-SA. However, this number is unfortunately misleading as five of these assets relate to roads and associated features such as aggers identified by the Viatores study group. Further

information on the problems with the Viatores data can be found in the methodology section of this document ([VSGD](#)). Many of these routes were created by linking modern features such as hedgerows, trackways and roads or by misinterpretation of later earthworks such as medieval headlands. Watling Street (HER 5508) one of the “true” Roman roads within Bedfordshire runs through the AS-SA.

Findspots

A single asset relates to a Roman findspot in the AS-SA. It represents finds of a two lead spindle whorls and a possible bronze military fitting. No information is available on the circumstances of the find, although it should be noted that finds of Roman military fittings are rare in Bedfordshire.

Conclusions

The Roman assets in the River Ouzel AS-SA are very limited extent. With the exception of Watling Street (HER 5508) findspot, they are entirely the product of archaeological investigations undertaken as a result of aggregate extraction or development proposals. This means that the distribution of assets reflects 20th century development and the archaeological response to it rather than a genuine distribution of sites from this period.

It is also difficult to characterise the period within the AS-SA on the basis of one partially investigated settlement at Clipstone (HER 11123) and evidence of field systems containing remains of farming activity such as barns and water pits (Whitsundoles Farm and Salford Quarry). Although there is little evidence, on the basis of what is known about the period on the rest of the county (Dawson 2007), it is to be expected that there will be remains of Roman settlement and activity within the River Ouzel AS-SA. It is likely to comprise a range settlements set within field systems. The site at Clipstone does suggest that there may be some continuity between Late Iron Age and Roman settlement. There is no evidence that there are any “villa estates” within the AS-SA, nor is there any evidence that Watling Street provided a focus for settlement in the Roman period.

Saxon Assets (411 AD – 1066 AD)

There are five Saxon assets within the River Ouzel AS-SA and they can be divided into evidence for the following categories: settlement/occupation, ritual/ceremonial/burial and communications/transport. Although there are very few assets for the Saxon period they are distributed throughout the AS-SA.

Settlement/Occupation Evidence.

The two assets representing Saxon settlement/occupation within the AS-SA both come from excavations at its northern end, Whitsundoles Farm Quarry (HER 16477) and Salford Quarry (HER 15146). Whitsundoles Farm produced two sunken floored buildings which are securely dated by pottery to the Early to Mid Saxon period. To the north of these buildings remains of two post built structures were found. One of them is clearly a rectangular building, some of the original posts appear to have been replaced suggesting the building was partially repaired or rebuilt during its life. To the north of this structure are a number of other post holes, their layout does not clearly form a structure but they are on a different alignment suggesting that they are form part of another structure. The post built structures are not securely dated but are assumed to be Saxon through their proximity to the dated sunken floored buildings (Albion Archaeology 2004, 17-18). The combination of sunken floored buildings and rectangular timber framed buildings is well known from Early to Mid Saxon settlement sites (Hills 2009) and is seen within the county at Stratton (HER 518).

At Salford Quarry (HER 15146) the only evidence for Saxon activity is a single watering hollow containing pottery dated to the late 5th century AD. Although this feature also contained well preserved wood this was not retained or described so it difficult to say anything more about the function of this feature (Dawson 2005, 93). If this feature is a watering hollow its isolation suggests that the site was not part of a settlement but located in an agricultural landscape possibly one used for stock grazing; a continuation of the landuse observed for the Roman period. It is possible that this area was exploited from the settlement found c.400m to the west at Whitsundoles Farm

Ritual/Ceremonial/Burial Evidence

There is a single asset representing ritual/ceremonial/burial evidence for the Saxon period within the AS-SA. It represents Saxon cemetery has been recorded within the AS-SA. On the south-west fringes of Toddington adjacent to an upper tributary of the Ouzel a 5th to 6th century cemetery containing both inhumations and cremations was found during gravel quarrying in the early 19th century (HER 2857). Although the finds from the cemetery seem to have been dispersed in the 19th century they are reported to include an iron shield boss, numerous swords, daggers and spears, a gilded copper alloy cruciform brooch and four gold saucer brooches, and a large number of glass and stone beads. The date and circumstances of the discovery of this site make it difficult to characterise it with any certainty.

Communications/Transport Evidence

There are two assets representing communications/transport evidence for the Saxon period in the River Ouzel AS-SA. They are both at the southern end of the AS-SA. The two assets are intimately link, they relate to a Saxon long distance routeway known as Thiodweg or Theedway (HER 10843) and Yttingaford (HER 18) a ford where the Thiodweg crosses the River Ouzel. The Thiodweg crosses the AS-SA very close to the point where it enters Bedfordshire from the west. It traverses the southern part of the county linking to the Icknield Way to the north of Luton. It is recorded in charters of 926 and 966 AD and appears to have been significant feature in the landscape, outside the AS-SA it is preserved in ancient parish boundaries such as that between Chalgrave and Houghton Regis. No physical remains of Thiodweg are known from the SA-SA. Part of its function as a long distance routeway appears to have been the transport of salt from East Anglia (via Icknield Way) to the west of the country. The evidence for this is in a number of "salt" names associated with it in the medieval period.

Yttingaford (HER 18) represents the fording point on the Thiodweg where it crosses the River Ouzel. It is named in a charter of 966 AD which describes the boundaries of Leighton Buzzard. A watching brief undertaken during the road widening in 1984 noted rubble on a raised area next to the river and stonework on the opposite bank. This may represent remains of the ford, but this cannot be confirmed.

Conclusions

The small number of Saxon assets within the AS-SA reflects the general circumstances observed within the county as a whole. Although there are an increasing number of Saxon sites being identified in the county it is still a period that is not well understood.

The limited evidence for settlement from Whitsundoles Farm is typical of the Early to Middle Saxon period on several counts. It consists of a sunken floored buildings and rectangular post built buildings located within or close to an area of Roman activity (Edgeworth 2007, 89). However, the general absence of Roman settlement evidence makes it impossible to use them as a possible predictor of where Saxon settlements might be found.

The Early Saxon cemetery at Toddington (HER 2857) is part of a group of Saxon cemeteries around Toddington (HERs 99, 101 and 11954). Although no settlements are known from the area to compliment the cemeteries it does suggest that there was a significant population in or around Toddington in the Early to Mid Saxon period and that we should be aware of the potential for this area to contain significant Saxon settlement evidence.

There are no known physical remains of the Thiodweg, other than where it is said to be preserved in modern boundaries, and it is difficult to know what impact a long distance routeway would have had on contemporary communities and the landscape. It is possible that if its purpose was the rapid transit of salt across the country it may have had little impact because it did not connect with the local transport network and the destination of the traded goods was outside the AS-SA. However, the ford at Yttingaford (HER 18) the crossing point of a major river on an important long distance routeway

could lead to the development of some sort of occupation beside the river either to meet the needs of travellers or as part of measures to control or profit from passage along the route on behalf of local elites.

Although evidence for this period is limited from within the AS-SA, evidence from immediately outside it may indicate that it is set within a more extensive settlement pattern and that more sites and features from this period will exist than is presently known. Excavations at Grovebury Quarry on the site of an alien Priory (HER 1870) produced evidence of a previously unknown settlement; it included remains of at least one sunken-featured building and a possible timber-framed hall (Slowikowski 2010, pers comm.). Between Leighton Buzzard and Heath and Reach there are two assets relating to Saxon cemeteries at Deadman's Slade and Chamberlain's Barn (HERs 1 and 3); they date from 6th to early 7th century AD. No settlements are known that can be associated with these cemeteries but they must have existed somewhere close, possibly in the Ouzel Valley and certainly close to it; again part of a wider settlement pattern suggesting that the AS-SA was more densely occupied than the evidence presently indicates.

The town of Leighton Buzzard (BCC 2003), topographically within the Ouzel Valley but outside the AS-SA as defined for this project has its origins in the Late Saxon period. Although its character in the Saxon is ill defined and there is no archaeological evidence to help define it, the embryonic town must have been a major settlement in this period and have had a significant impact on the Saxon communities in the area, providing an economic, administrative and social centre.

The Saxon period has been identified as a local and regional research priority (Wade 2000, 24-25, Oake 2007, 14 and Medlycott and Brown 2008, 96). Despite the lack of Saxon assets from the AS-SA the context of the immediately surrounding area means that it has considerable potential to contain assets from this period that could be affected by proposals for aggregate extraction or other development proposals.

Medieval Assets (1066 AD – 1539 AD)

There are thirty six assets from the medieval period in the River Ouzel AS-SA. They are distributed throughout the AS-SA and have been divided into the following categories: settlement/occupation, rural land use/agriculture/land division, industrial, communications/transport, and findspots.

Settlement/Occupation Evidence

Medieval settlement/occupation evidence is represented by six assets in the AS-SA and they are all to be found in its southern part. Four of the assets represent deserted (HER 10000) or shrunken (HERs 10001, 10797 and 11639) medieval settlements, one a possible moat and associated earthworks (HER 3416), the final asset is a village green (HER 10841).

The deserted settlement to the west of Hill Farm, Battlesden (HER 10000) is part of the same complex as one of the assets defined as a shrunken settlement (HER 10001) and can be considered together. There is little information about the nature of the remains at Battlesden, the southern part of site (HER 10001) is described only as the earthwork remains of a medieval village. The northern part (HER 10000) contains six narrow ditched enclosures which could tofts and a number of rectangular enclosures. On this basis it is difficult to discuss the form of the settlement, the site clearly requires detailed survey and description in order to define the nature of the assets.

At Hockliffe the AS-SA contains part of a complex of medieval settlement remains that survive as earthworks (HER 11639). The features that are within the AS-SA cannot be seen in isolation from the rest of the complex that lies outside it. This settlement focused on Church End represents the original settlement of Hockliffe and comprises a substantial area of settlement earthworks (HERs 11639 and 16880) around the parish church (HER 5386) and includes Church Farm moated site, a Scheduled Monument. The earthwork remains clearly show that the settlement is greatly reduced in size since its medieval heyday. The original settlement was located on the southern end of a ridge overlooking the valley of a tributary of the River Ouzel to the south and west. Watling Street (HER 5508) lies to the east of Church End and the fact that the early village was founded off the line suggests that while it was probably in use as a routeway in the Saxon period, it was not a major factor in siting the village. However, during the medieval period traffic along Watling Street must have increased and a settlement grew up at the foot of the ridge where Watling Street bridges the tributary stream. This location had economic advantages because the new settlement gradually took over from the original Church End core causing it to shrink to its present size as the new village expanded along the line of the Roman road.

The asset at Clipstone (HER 10797) is another shrunken settlement which may also represent the decline of an original settlement as another later or satellite settlement grew in importance. In this case the settlement that grew to dominance is Eggington, with the modern village built around a green which is partly within the River Ouzel AS-SA (HER 10841). The green extends beyond the AS-SA along the valley of a tributary of the Ouzel and so topographically, if not geologically, is part of it. The actual area of

settlement at Eggington lies on the northern side of the green, outside the AS-SA, on a south facing slope overlooking the stream's valley. Both settlements are in the same parish and early medieval documentary sources suggest that Clipstone was at least of equal importance to Eggington. Both settlements had chapels, although that at Clipstone had disappeared by the mid 16th century leaving Eggington's chapel to serve as the parish church. The dynamics between the two settlements and the dates of the decline of Clipstone and the growing dominance of Eggington are not known. It has been suggested (HER 10841) the green at Eggington was a planned feature laid out alongside the Thiodweg, taking advantage of the economic benefits of being on a major cross country route. This would certainly have provided a stimulus for the growth of Eggington at the expense of the more isolated and inaccessible site of Clipstone.

The final asset in this category is HER 3416 represents a possible moat and associated earthworks Totternhoe. The asset comprises a series of rectangular and sub-rectangular enclosures formed by ditches and set within an area of ridge and furrow earthworks (HER 8553). The largest and central enclosure was identified as "Hulyam's Moat" in the early 20th century and although it has been described as "deep and dangerous" (Smith 1904, 124) in its present form it is difficult to be certain that it is actually a moated site or just a more substantial enclosure. There are a number of other moated sites in the surrounding area including to that at Park Farm, Eaton Bray (HER 531) which, although outside the AS-SA, is in a similar topographical location.

Rural Land Use/Agriculture/Land Division Evidence

There are a total of twenty seven assets relating to this category for the River Ouzel in the medieval period. The bulk of these assets, twenty in number, relate to remains of ridge and furrow or other features associated with field systems, the remainder comprising three ancient woodlands (in existence before 1600 AD), two deer parks, a pond, and a complex of flood plain water management features.

Bedfordshire's medieval agricultural system was based on the open field system. In this system, originating in the Saxon period, each parish or township had a series of cultivated open fields, common land and meadows. Each of the open fields was subdivided into furlongs which were further subdivided into strips or lands, these were tenanted out to members of the local community. Frequently, though not exclusively, each community had three open fields that were cultivated in rotation with every third year the field left fallow to help restore soil fertility. The rotation also included growing cereal crops (wheat, barley and oats).

The most common evidence of the open field system in Bedfordshire, in common with much of midland England is ridge and furrow. This was created by a particular and repeated pattern of ploughing that produced a characteristic corrugated earthworks with blocks of ridges and furrows defined by headlands that were created were the plough was turned at the end of the furrow. Ridge and furrow covered much of the Bedfordshire landscape and survived the enclosure of the open fields which started in the 16th century reaching its climax in the Parliamentary Enclosures of the 18th and 19th century which saw the end of the open field system. Although enclosure imposed a whole new network of boundaries and land ownership on the rural landscape the earthwork remains of the medieval system survived substantially intact until the middle of the 20th century when

the pressure for increased agricultural production during the Second World War and immediately after saw most of the ridge and furrow earthworks destroyed by ploughing as arable cultivation became a priority to feed the nation. Today less than 4% of the original stock of ridge and furrow earthworks that once existed in the county survives as earthworks and many parishes only retain small fragments and pockets of earthworks of the once extensive open field systems. Some areas of ploughed out ridge and furrow can be detected from aerial photographs and the furrows are often found in excavations, for example Whitsundoles Farm Quarry (HER 7721).

Ridge and furrow earthworks survive throughout the River Ouzel AS-SA, though generally they only represent fragments of even the surviving earthworks. They tend to be distributed along the tributary streams rather than the main river. This is because the floodplain of the main river was subject to flooding which made it unsuitable for cultivation but more importantly it was used as meadows for grazing, a very valuable resource in the medieval agricultural economy. The tributary streams did not provide sufficient floodplain to develop extensive meadows so they were subsumed into the overall open field systems. Although the remains of ridge and furrow are typically fragmentary, particularly in the south western part of the AS-SA belong to some of the most extensive and best preserved areas of ridge and furrow earthworks in Bedfordshire; this can be seen at Hockliffe (HER 3279), Battlesden (HER 3278) and Eggington (HER 5462). They form a group with parishes outside the AS-SA including Tebworth (HER 3516) Potsgrove (HER 3317) and Tilsworth (HER 5073). Although the extent of survival of ridge and furrow in this part of the county is exceptional, there is no clear explanation as to why agricultural practices favouring grazing dominated in the area, meaning that the earthworks were not ploughed up. At settlements such as Hockliffe and Battlesden the ridge and furrow earthworks are associated with the earthwork remains of shifted or shrunken settlements forming well preserved relict landscapes.

Three of the assets relate to ancient woodlands (present prior to 1600 AD) and their associated woodbanks. These assets are all located on the upper reaches of tributary streams and their location is a function of land use patterns in the surrounding areas rather than anything specifically related to the River Ouzel AS-SA. This is clearly shown at Home Wood, Battlesden (HER 13508) and Bushy Common Wood, Potsgrove (HER 13064) which are set within the Greensand Ridge which has the largest number of ancient woodlands in the county (see Woburn Sands Formation AS-A).

Two of the assets in this category represent deer parks or probable deer parks: Battlesden (HER 1370) and Gladley Wood (HER 10872). Little is known about these deer parks and neither of them retains the characteristic park pale earthwork built to ensure that the deer did not escape the confines of the park. The deer park at Battlesden went on to form the basis for a post-medieval designed landscape. A rabbit warren existed within the deer park at Gladley Wood, a common association of two forms of husbanding wild food resources in the medieval period.

At Hulcote there are the remains of medieval fishponds (HER 3423), they relate to a medieval manorial site that lies outside the AS-SA (HER 28). The final asset in this category is the earthworks at Old Linslade representing a floodplain water management system (HER 4425). The specific function of these features is not known, they may relate to the control of the inundation of meadowland in the flood plain, though they do not appear to have the characteristic morphology associated with water meadows,

alternatively they could have been for the control of flooding to protect the settlement of Old Linslade immediately downstream.

Industrial Evidence

There is a single asset for the medieval period relating to industrial activity in the River Ouzel AS-SA, a watermill at Old Linslade (HER 1002). The lack of industrial assets within the AS-SA is not surprising given its predominantly rural nature. Medieval industrial activity was generally located within specific areas in towns or on the margins of settlements. The expansion of urbanised areas through time absorbed areas of industrial activity and urban areas are excluded from this study.

Communications/Transport Evidence

A single asset represents this category, the Thiodweg (HER 10843). During this period it may have been a long distance routeway used for the transport of salt from the East Coast to the west. Although there is no evidence for other communications/transport related assets in the HER a network of local routes linking settlements and feeding into long distance routes must have existed and may be reflected in elements of the present road and footpath network.

Conclusions

Few of the assets for the River Ouzel in the medieval period are located exclusively within the AS-SA. They extend beyond the area of the AS-SA as defined by the project and have to be seen within the context of the settlement and activity in the surrounding area. While this is true of the River Ouzel for most periods, it is more apparent and significant for the medieval period. The context for the southern part of the AS-SA is largely the Greensand Ridge (see the Woburn Sands Formation AS-A) and in the northern part it is the Oxford Cays and Boulder Clays of the Marston Vale and county's northern clay plateau.

The medieval settlement assets represent shifted or deserted settlements; this includes the moated site at Totternhoe (HER 3416). Modern settlements which will generally have medieval or possibly Saxon origins have been excluded from this study because they are classified as urban areas which have no potential areas for aggregate extraction. The assets recorded in the HER may reflect particular sets of circumstances where the history of a settlement has involved episodes (shift or desertion) that leave archaeological remains that can be identified as assets and recorded in the HER. What these assets do show is a degree of fluidity and dynamism in medieval settlements. The explanation for this is not always clear, for instance at Battlesden, while it is possible to advance economic arguments for the shifts in settlement at Hockliffe and the changes in relative importance between Clipstone and Eggington.

The extent of ridge and furrow shows that the River Ouzel and its surrounding area were fertile and well suited to arable cultivation. An unusual facet of the area, though is the greater than average survival of ridge and furrow earthworks. The reasons for this are

not clear but the extent and coherence of the earthworks make them strong candidates for preservation *in situ* in the face of development proposals. The value of the land for agriculture is also reflected in the relatively small amount of woodland in the AS-SA and the fact that there are only two deer parks. One element of the medieval rural landscape that is not very visible in the identified assets for this period is meadowland. This was an important part of the medieval agricultural economy and was usually found in river valleys. The tributary valleys were probably too narrow to furnish meadowland and there is some evidence that they just formed part of the open field systems. However, the main river valley would have been able to support meadows and the water management earthworks at Old Linslade (HER 4425) may be an example of this.

The town of Leighton Buzzard grew and developed during this period has been excluded from this study must have had significant impact on the AS-SA providing a focus for the local economy and society as well as an administrative centre. Also outside the AS-SA is the Royal Manor at Grovebury and its estate (HER 1870) which will also have exercised a considerable local influence on the AS-SA.

In general, the medieval assets for the River Ouzel are common to the surrounding area and more broadly the county as a whole. They represent an organised and regulated landscape which was influenced by the natural resources of the area tempered by economic and social factors.

Post Medieval Assets (1540 – 1900 AD)

There are seventy two assets within the River Ouzel AS-SA assigned from the post medieval period. They can be divided into evidence for settlement/occupation, land use/agriculture/land division, industrial, communications/transport and designed landscapes.

Settlement/Occupation Evidence

There are sixteen assets representing evidence for settlement activity within the River Ouzel. Seven of the assets are for domestic buildings built in the 18th and 19th centuries. Public houses represent three of the assets, two of which: The Globe Inn (HER 4688) and The Bell (HER 6644) are associated with the major communications routes. The Globe Inn is an 18th century inn built beside the Grand Union Canal and The Bell is beside Watling Street at Hockliffe. Watling Street, the modern A5, was turnpiked in the 18th century and was a major route from London to the north-west and in particular Holyhead in north Wales, an important port for sailings to Ireland. Both these public houses represent developments created to serve travellers on long distance transport routes.

Surviving settlement earthworks form the other three assets in this category. In all three cases the earthworks can be demonstrated to relate to post medieval rather than medieval settlement because there is documentary evidence that buildings stood at the sites in the 18th and 19th centuries. Two of these assets though, at Hulcote and Salford (HER 8385) and Battlesden (HER 10002) are associated with shrunken or deserted medieval settlements. This shows that the process of settlement decline and abandonment could be gradual and take several centuries and not always be the result of a cataclysmic event such as outbreaks of plague or depopulation of settlements by landowners for economic reasons.

Land Use/Agriculture/Land Division Evidence

Ten of the post medieval assets for the River Ouzel AS-SA are related to evidence for rural land use. They include farms and agricultural buildings, land boundaries, woodlands and water related features.

The Enclosure Acts of the late 18th and 19th centuries saw a radical reorganisation of Bedfordshire's landscape; it saw the decline and final demise of the open field system. The new land divisions created by enclosure were superimposed on the characteristic ridge and furrow earthwork remains of the open fields. The physical remains of enclosure can be seen in the boundaries that have been recorded at Hockliffe (HERs 11651, 11653 and 11657).

Restructuring of the agricultural landscape and advances in agricultural practices also resulted in the creation of new farm complexes and construction of new farm buildings to accommodate the regime. This was particularly prevalent on some of the larger estates which were in the forefront of the agricultural improvements movement in the 18th and

19th centuries. The Dukes of Bedford on their Woburn Estate, on the eastern edge of the River Ouzel AS-SA, were key players in this movement and their activities had a profound impact on the character of the rural landscape (Edgeworth 2007, 124). An example of this within the AS-SA is the Experimental Farm at Woburn Road, Husbourne Crawley (HER 16368) the buildings of which have a particular form reflecting the needs of scientific experimental farming and are unlike typical commercial farm buildings. However, although this asset is within the River Ouzel AS-SA it relates to agricultural activities outside the AS-SA in the Greensand Ridge.

Industrial Evidence

Industrial activity in the AS-SA is represented by twenty four assets. Mineral extraction variously described as quarry pits, sand pits, gravel pits and clay pits, represent seventeen of the assets. The mineral being extracted from the quarry pits at Chalgrave (HERs 11787 and 11789) and Clipstone (HER 11122) is likely to have been sand and gravel putting them in the same group as those assets that are specifically identified as sand and gravel pits. These pits are distributed throughout the AS-SA and generally represent relatively small scale extraction of aggregates to serve local needs. The evidence for these assets in the majority of cases (nine) is in the form of surviving earthworks, sometimes with more specific information on what was being extracted coming from cartographic sources (e.g. 1st and 2nd edition Ordnance Survey maps), others have been identified solely from documentary sources (HERs 11135, 11142 and 11143), in one instance though, Whitsundoles Farm, the evidence comes from excavation (HER 7721). The two assets for clay pits (HERs 7107 and 7108) are not errors in the data, they represent the exploitation of localised outcrops of clay which occur in the Greensand Ridge though which the tributary streams of the River Ouzel flow and which underlie the sand and gravel deposit lain by the streams. One of the clay pits at Gladley Wood is associated with a 19th century brickworks (HER 7108) and there is another brickworks asset at Husbourne Crawley (HER 7113).

Four of the other industrial assets are mills, three watermills and a windmill. The watermills, all surviving buildings, are spread throughout the AS-SA and it is no surprise to find them within it. The windmill is in the northern part of the AS-SA at Hulcote (HER 935); the mill now converted to a house, is located on the edge of the AS-SA on slightly higher ground overlooking a tributary of the River Ouzel.

The final industrial asset from this AS-SA is a gasometer at Battlesden (HER 9945) which was built in 1868 to supply Battlesden House and its estate. Nothing now survives of the gasometer.

Communications/Transport Evidence

There are seventeen assets from the River Ouzel relating to evidence for communications and transport. They can be divided into three groups of assets associated with major transport infrastructure: canals, roads and railways. There are also two assets representing individual bridges on local transport networks.

The Grand Junction Canal (HER 11015) was built in the valley of the River Ouzel and passes through Leighton-Linslade. The construction of the canal began in 1792 and opened in 1800 to connect London and Birmingham. Within the AS-SA there are two bridges built to take local roads across the Canal at Old Linslade (HER 4695) and a swing bridge at Leighton-Linslade (HER 13770). There is also a lock on the canal at Leighton-Linslade (HER 13771). The canal had an impact beyond the confines of the tow path, stimulating the growth of industrial and commercial activity alongside to take advantage of the easy access it provided for the importation of raw materials and export of finished products to major centres of population (BCC 2003). Two assets at Linslade represent this: Canal Wharf (HER 7883) and Charity Wharf (HER 10974).

The three assets representing evidence for road transport in the AS-SA are all to do with turnpike roads, part of 18th century attempts to improve and maintain the road network. They include the turnpike road between Leighton–Linslade and Eggington (HER 10793) designated as such between 1810 and 1868. The other two assets represent infrastructure associated with the turnpikes, a tollgate at Chalgrave (HER 11800) identified from documentary sources and a milepost at Hockliffe on the turnpike that followed the line of Roman Watling Street (HER 9941).

The railway related assets represent two types of a railway. The London and North West Railway runs through Linslade (HER 11091), it was open for use in 1838 and is part of the main phase of mainline development in Britain. Post dating the Grand Union Canal and ultimately supplanting it, the railway required the construction of a bridge to cross the canal at Linslade (HER 14840). The other two lines are from the expansion of the rail network in the later 19th century as it developed to provide a local network serving local communities and. The two lines are the Bedford – Bletchley Line (HER 11594) in the north of the AS-SA which still provides a local service and the Linslade to Dunstable Line (HER 2436) in the south which was shut in the 20th century. The route of this line can still be traced in the landscape, particularly where it survives as an embankment or cutting which it does most obviously outside the AS-SA to the east.

Designed Landscapes

The River Ouzel contains four assets representing post medieval designed landscapes. Two of them are conventional country parks surrounding a large house: Battlesden Park (HER 9427) and Aspley House (HER 7015). Battlesden Park, an English Heritage registered Park, does not appear to have been in existence before the early 19th century. Although Humphrey Repton and Thomas Paxton are both reputed to have had some involvement with park, there is no evidence of who actually designed and built it. The landscape is likely to have been constructed in the 1860's as the house, owned by Sir Gregory Page-Turner, for which it formed the setting was rebuilt at that time. Little is known about the grounds of Aspley House, although they appear to retain elements of a 17th-18th century formal structure with 19th century alterations. The other asset representing designed landscapes is Parson's Close (HER 17748). Parson's Close was created before 1848 when it appears on a map described as an "allotment for recreation", clearly it was originally created for public access and benefit. It was designed and superintended by Frederick Gotto, with some of the features being funded by public subscription. The site was purchased by Leighton Urban District Council from the Church Commissioners and has remained in public ownership since then. It is an

early example of the provision of recreational open spaces for growing urban populations in the 19th century.

Conclusions

The post-medieval period saw a substantial period saw a wholesale reorganisation of the landscape in the River Ouzel AS-SA, however as with medieval period this has to be seen in the context of the surrounding areas. The influence of Enclosure is seen in the overwriting of the remains of the open field system (ridge and furrow earthworks) with a new pattern of land division with a very different and more regular character. The impact of Enclosure was increased where the Dukes of Bedford and other improving landowners organised their estate to improve production by adopting new agricultural techniques, often being in the forefront researching and developing the. Woburn Estate of the Dukes of Bedford was at the centre of this movement and although it lies outside the AS-SA in the Woburn Sands Formation, the influence of the estate's activities is seen in the River Ouzel, most obviously at the experimental farm at Husbourne Crawley.

The settlement pattern largely reflects that of the medieval period. The presence of assets representing earthwork remains of post-medieval settlement at Battlesden and Hulcote and Salford show that the processes of change that started in the medieval period could be long lived and continuing for several centuries. There are relatively few designed landscapes which impinge on the AS-SA, especially compared with the adjacent Greensand Ridge. This partly reflects the status of the landowners of the estates but also the agricultural value of the land and to some extent the different historical background that saw the development of large estates with their designed landscapes on the Greensand Ridge.

18th and 19th century communications and transport assets had a considerable impact on the AS-SA. The building of the Grand Junction Canal had a very direct influence of the AS-SA, for a short while in the first half of the 19th century the Canal would have made the Ouzel Valley, notably at Leighton Buzzard within the AS-SA, a nationally important transport corridor and focus for industrial development. Locally Leighton Buzzard would have provided one of points where goods could be transferred to and from the canal network, providing an economic stimulus for the town and area and stimulating the development of other industrial activity. A slightly earlier but parallel development was in the road network with the turnpike movement which promoted the development and maintenance of road networks to facilitate both passenger travel and trade. From the mid 19th century the coming of the railway provided another element in the transport network. The railway largely superceded canals by the beginning of the 20th century, providing a network of national mainlines such as the LNWR at Leighton Buzzard with local branch lines connecting to the surrounding area. All these transport development brought their own associated developments which are reflected in the post medieval assets for the AS-SA such as canal locks and bridges, toll houses and inns.

Modern aggregate extraction has been concentrated at the northern end of the AS-SA, a reflection of the availability of aggregate resources that have been seen as economically viable for exploitation by modern methods. However, the evidence for post-medieval aggregate quarrying occurs throughout the AS-SA, representing small scale production to serve local needs.

The post-medieval assets for the River Ouzel AS-SA clearly demonstrate substantial changes to the landscape society and economy, with a growing contrast between areas that remains largely agricultural and areas where industry and commerce where stimulated by developments in the transport network.

Modern Assets (1901 – 2050 AD)

There are three assets assigned to the modern period within the River Ouzel AS-SA. They can be divided into evidence for land use/agriculture/land division and industry.

Land Use/Agriculture/Land Division Evidence

The single asset for this category is a wind pump at Hill Farm, Battlesden (HER 10004).

Industrial Evidence

There are two assets representing evidence of industrial activity. A 20th century lime kiln at Charity Wharf, Linslade (HER 10974) on the Grand Union Canal shows that although the canal system was in decline in the 20th century it could still attract industrial development in some certain circumstances. The attraction of this location for the establishment of a lime kiln must have been ready access to the transport system rather than the availability of the raw material (limestone) which would have to have been imported for processing from outside the area; probably from the Chilterns to the south. The importation of fuel for the kiln on the canal may have also been an attraction.

The Leighton Buzzard Narrow Gauge Railway (HER 11090) crosses the AS-SA. It was built in 1919 to transport sand from Double Arches quarry, outside the River Ouzel AS-SA, to Grovebury for transfer to the standard gauge railway network. It was closed for commercial use in 1967 but has subsequently been reopened and restored by a group of railway enthusiasts and now operates as a recreational attraction.

Conclusions

The modern assets for the River Ouzel are very few and present only a very partial view of this period. Most significant are the industrial remains which are exemplars of the industrial development of Leighton Buzzard, itself just outside the AS-SA as defined by the project but a significant influence on it and the light railway linking major sand quarries outside the AS-SA to transport nodes within it. This emphasises the inter-relationship between the AS-SA and its surrounding areas.

THE RESEARCH AGENDA AND STRATEGY

By Hannah Firth and Martin Oake

Research Agenda and Strategy

This research agenda and strategy has been prepared by chronological period, and where they are applicable to more than one period some of the agendas and strategies are repeated. This format is in line with the East of England regional and the Bedfordshire frameworks (Brown and Glazebrook 2000, Medlycott and Brown 2008 and Oake et al 2007).

Background to the Bedfordshire Research Framework

The geographical location of Bedfordshire historically meant the county has been on the margin of the England Heritage and ALGAO East of England and South Midlands regions. Whilst the county became involved with the already established East of England region (with Hertfordshire; Cambridgeshire Essex, Suffolk, Norfolk) in the 1990s by the time Bedfordshire became a full member of this group work on the regional Resource Assessment (Glazebrook 1997) was already at such a stage that the integration of Bedfordshire into the document would not have been possible. As a consequence it was agreed with English Heritage that Bedfordshire would prepare a separate county specific research framework and this would be supplementary to framework prepared for the other counties (Brown and Glazebrook 2000). The Bedfordshire research Framework was published in 2007 (Oake et al 2007). The first revision of the East of England research framework was completed in 2008 (Medlycott and Brown 2008) and Bedfordshire has been included in this work.

Lower and Middle Palaeolithic

The Lost Palaeolithic of the Ivel, Ouzel and Flit

The River Great Ouse AS-A has produced some of the county's most significant Palaeolithic archaeological remains and yet there is nothing comparable in the other three river valley AS-SAs (the Ivel, Flit and Ouzel). Is this a function of the history of gravel extraction in the AS-SAs or is there actually a difference in the archaeology? Is there a genuine difference between the four valleys, if so why? It might also be asked are the sites around Bedford typical of the Ouse Valley?

Strategy Options

- Re-assessment of antiquarian collections including re-investigation of prolific antiquarian sites to provide context and help understand their character. Some work has already begun on sites such as Deep Spinney, Biddenham (HER 328) in the River Great Ouse AS-A (Harding et al 1991) which re-located the deposits in which the palaeoliths had been discovered and established that the Deep Spinney material had recovered from the highest gravel terrace of the Great Ouse.
- *The English Rivers Palaeolithic Project* (Wymer 1999) which commenced in 1991 represented a groundbreaking survey that sought to identify and verify Lower and Middle Palaeolithic artefacts, to chart the extent of the relevant Quaternary deposits and to create deposit models to allow identification of areas of high potential. A continuation of this work on a local level may help to provide a corpus of information that could be used both for academic research and to help inform future minerals planning determinations.
- As a result of the development of the Government's Growth Areas the Archaeology Team of Central Bedfordshire Council are working on the creation of strategies to effectively evaluate and mitigate the impact of development on the brickearth deposits in the south of the county. These deposits (which are excluded from this study), particularly around Caddington have produced the highest quantity of Palaeolithic artefacts in the county. This work, which is in its infancy could, if successful be used to develop similar strategies which could be applied to the AS-As and AS-SAs.

Upper Palaeolithic

Where is the Upper Palaeolithic?

There is an almost total lack of evidence for this period within the AS-As, AS-SAs and the county as a whole. This may in part be because during this period settlement was sporadic as a result of the environmental conditions and because traditionally most evidence of this period has been associated with uplands and in particular subterranean locations. However it has recently been acknowledged (Scott, 2010 pers comm.) that there may be some Upper Palaeolithic tool types amongst lithic material recently

recovered from the Greensand Ridge. Consequently should we be looking at the existing collections from the Woburn Sands Formation AS-A and the Greensand Ridge as a whole in a new light?

Strategy Options

- The paucity of Upper Palaeolithic remains within the county means that identifying areas of high potential is very important. Regional data could be used to help provide models from which we could characterise evidence for Upper Palaeolithic human activity.
- There are a number of lithic collections from the Greensand Ridge that have been broadly dated to the Mesolithic (with smaller Neolithic and Bronze Age elements). A small number of lithics recovered from the upper slopes of the Ridge may contain Upper Palaeolithic material, as a consequence expert analysis may assist us to identify whether the other collections also contain earlier material.

Mesolithic

How to identify hunting and gathering: the Mesolithic resource

The river valleys and the Greensand Ridge are recognised as favoured locations for the recovery of Mesolithic artefacts (Oake 2007 9 and Luke 2007, 25) and all of the AS-As and AS-SAs contain Mesolithic HER assets, with the largest number being recorded within the Woburn Sands Formation AS-A. Most of the lithic assemblages collected from the AS-As and AS-SAs have been recovered as a result of surface collection and yet few have undergone detailed analysis, as a result we still only have a basic understanding of the Mesolithic resource for the county's aggregate areas.

Strategy Options

- Detailed analysis of existing collections for the AS-As and AS-SAs in order to help develop models for identifying areas of high potential (see also Oake 2007, 9 and Medlycott and Brown 2008, 14)
- Given that the majority of the lithic assemblages have been recovered from the plough zone the development of strategies to ensure adequate recording of lithic assemblages within this area should be seen as a key priority. In particular adopting strategies that focus on systematic recording methods and smaller collections units.

A significant place?

Of the forty-four Mesolithic lithic HER assets recorded across the AS-As and AS-SAs 61% comprise assemblages that contain either Neolithic or Neolithic and Bronze Age material, yet we have very little understanding of what this means. Do these collections represent special places that retained their significance so that communities were returning to them far beyond the reach of living memory? Or do these mixed lithic assemblages simply tell us that these favoured locations provided specific and highly valued natural resources?

Strategy Options

- Topographical analysis combined with the assessment of available environmental data would aid in establishing the potential significance of the natural resources during the Mesolithic period.
- Detailed analysis of these mixed assemblages to try and identify specific tool types would help to establish the significance of the Mesolithic elements and to identify whether specific resources were being utilised.

Neolithic and Early Bronze Age

The potential of the plough zone?

The potential of plough zone lithic assemblages has been demonstrated at Roxton and Biddenham Loop (HER 617 and 1476) within the River Great Ouse AS-A. However, that potential has not been fully or extensively realised either in identifying sites during evaluation or the significance of sites that survive only as plough zone distributions of artefacts.

Strategy Options

- Analysis of surface lithic assemblages collected by both amateur collectors and within the development context needs to be undertaken in order to characterise the assemblages, understand their significance and develop appropriate mitigation strategies (see also Medycott and Brown 2008, 22).

A significant place?

Of the ninety-four Neolithic and Bronze Age lithic HER assets recorded across the AS-As and AS-SAs 94% comprise assemblages that contain mixed date material and yet we have very little understanding of what this means. Do these collections represent special places that retained their significance so that communities were returning to them far beyond the reach living memory? Or do these mixed lithic assemblages simply tell us that these favoured locations provided specific and highly valued natural resources?

Strategy Options

- Topographical analysis combined with the assessment of available environmental data would aid in establishing the potential significance of the natural resources during the Neolithic and Bronze Age periods.
- Detailed analysis of these mixed assemblages to try and identify specific tool types would help to establish the significance of the Neolithic and Bronze Age elements and to identify whether specific resources were being utilised.

“Ephemeral” pits or significant settlements?

The resource assessment for AS-As and AS-SAs has demonstrated that settlement remains dating to these periods are rare and where they have been identified the surviving remains appear to consist of a small groups or isolated occurrences of small, shallow pits, sometimes accompanied by post holes and/or hearths. On occasion these deposits are quite rich (for example Warren Villas, HER 3527 in the River Ivel AS-SA and Salford Quarry, HER 15146 in the River Ouzel AS-SA), in some cases leading to the suggestion that they may have ritual significance (Dawson and Maull 1996, 61 and Dawson 2005, 161). They are difficult to detect through standard evaluation techniques and are usually found during large open area excavations.

Strategy Options

- The potential for the so-called “ephemeral” features to represent settlement is now more widely accepted and as a consequence a detailed topographical analysis of their known locations may help to define areas of potential which could be targeted during evaluations and open area excavations.

A landscape of mystery and death?

Ceremonial landscapes occur in several of the AS-As and AS-SAs and they are locally, regionally and nationally significant. They are a resource at great risk from aggregate extraction. One of the big problems at present is aerial photographic data is only patchy and the true extent of these landscapes may not be known. It must also be recognised that there a number of smaller ceremonial sites that are not detectable through aerial photography, they can only be recorded using intrusive methods. As a result we need to look at developing our existing methodologies for the mitigation of these types of landscapes.

These complexes often contain a range of larger and smaller monuments and yet their relationships are not well understood (for example cursus monuments and ring ditches). There are also a number of unusual forms or variations in form of ceremonial monument that occur in the AS-As and AS-SAs (such as Octagon Farm HER 1480 in the River Great Ouse AS-A and Broom, HER 9093 in the River Ivel AS-SA).

There is also an association between these monuments, the modern courses of the rivers and ancient watercourses, one which has led some to suggest (Abrams, forthcoming) that these monuments were deliberately constructed within riverine or wetland locations because the communities who built them were largely pastoral and relied heavily on cattle which would have found ample fodder within the river valleys. Thus the communities who built them chose their locations based on areas which provided vital resources for their subsistence strategies.

Strategy Options

- NMP to improve aerial photograph data in order that the full extent of the ceremonial landscapes can be recognised.
- Critical analysis of existing evaluation techniques and mitigation strategies in order to improve our methodologies used for identifying and investigating these landscapes.
- Research into the morphology and chronology of the ceremonial monuments is vital to our understanding of these landscapes and the relationships between monuments. Radiocarbon dates from Biddenham Loop (HERs 1476, 1863 and 7357) have indicated some of the monuments are Early Neolithic in date, thus raising questions about our previous assumptions regarding the accepted chronology (Luke 2010 pers comm.). Requesting scientific dating as a matter of course during development led investigations where datable deposits survive may assist in establishing a local chronology for these monuments (see also Medlycott and Brown 2008, 21).
- Full publication of some of the major monumental landscapes associated with aggregates extraction, such as Octagon Farm (HER 1480)

- The association between these monuments and water is undeniable and clearly of significance. However as result of later modifications to our waterways we do not have a full understanding of the locations of ancient watercourses. The Environment Agency amongst others has used Lidar to map ancient hydrology and palaeochannels to a high degree of success. A similar project focussing on the river valley AS-As and AS-SAs may help us to gain a better understanding of both ancient topography and its relationship to these monuments.

What of the living?

Archaeological investigations at Roxton Quarry (HER 617) and Biddenham Loop (HERs 1476, 1863 and 7357) in the River Great Ouse AS-A suggest that although settlement and ceremonial activity occur in the same broad geographical locations, they are in fact mutually exclusive. The relationship between settlement and monuments needs to be investigated and it has already been explored at Broom Quarry in the River Ivel AS-SA (Cooper and Edmunds 2007) to great success, in order to understand the development of both landscape and society.

Strategy Options

- This could be achieved by synthesising the results of a number of large scale investigations that have produced both settlement and monumental sites. (see also Oake 2007, 10, Medlycott and Brown 2008, 21)

Bronze Age

Where are all the fields?

The resource assessment suggests that field systems first appear in the Middle Bronze Age for example Biddenham Loop (HER 1476) and Dairy Farm (HER 594) in the River Great Ouse AS-A and Broom Quarry in the River Ivel AS-SA (HER 9093) and yet we know very little about their origins or their relationships with monuments (which they often appear to respect) or associated settlements. By their very nature these features tend to be best recorded as a result of large open area excavations, which mean that they are at risk from aggregate extraction.

Strategy options

- Evaluations often identify undated linear features, in some cases (such as at Broom Quarry) when reinvestigated within open area excavation these linears have proved to relate to Middle Bronze Age field systems. As a consequence the potential of these undated features must be recognised and appropriate mitigation strategies developed to identify their potential.
- Whilst evidence of Middle Bronze Age field systems and their associated settlements is rare in the county there is a wide corpus of undated and “Late Prehistoric” cropmarks. Research into the topographical locations of the known sites and comparisons between the excavated examples and the undated cropmarks in similar locations may help to produce models by which areas of potential can be identified.

Iron Age

Settlement variation: keeping up with the Jones'?

The settlement pattern of the Iron Age within the AS-As and AS-SAs is extremely varied with examples of nucleated, dispersed, enclosed and unenclosed settlements evident across the study areas. A full understanding of the significance of this variation is required.

Strategy Options

- Characterisation of settlement patterns based on topographical locations and variations could be used to identify areas of potential and create models for the identification specific types of site.
- Full publication of a number of sites for example Warren Villas in the River Ivel AS-SA, Harrold/Odell and Octagon Farm in the River Great Ouse AS-A should be seen as a priority. These are three aggregate related projects and they have produced significant evidence of settlement development and adaptation. Their publication would greatly aid our understanding of the Iron Age period.
- Synthesis of excavated sites and analysis of aerial photographs to NMP standard in order to create a baseline of data from which to understand the development of Iron Age settlement patterns. This is particularly relevant to recognising the potential locations of unenclosed settlements that are difficult to detect in evaluations (see also Oake 2007, 11).

A divided landscape?

Land division including field systems, linear boundaries and pit alignments are all a feature of the Iron Age landscape within the AS-As and AS-SAs and yet our understanding of their significance, chronology and relationships to settlements is patchy.

Strategy Options

- Synthesis of existing excavated sites combined with aerial photographic analysis to NMP standard would assist in understanding the ways in which the landscapes functioned.
- Future investigations should target these features, not just concentrate on settlement foci.
- Field systems are not always prominent in the Iron Age (for example Biddenham Loop within the River Great Ouse AS-A). As a consequence we need to develop better methodologies to identify these features from evaluation stage through to mitigation.

Sacred places? (Ritual deposits and watery locations)

There is little known about Iron Age sacred places within the study areas, despite the riverine nature of one of the AS-As and all three of the AS-SAs. The recovery of the

Felmersham bronzes (HER 67) in the River Great Ouse AS-A suggests that they do exist. However given density of settlement where are they?

Strategy Options

- A re-assessment of the Felmersham bronzes (HER 67) and other 'unusual' deposits (such as the Roxton artefacts, HER 2025) may assist us gaining a better understanding of the resource and predicting areas of potential.

Later Prehistoric

Approximately 83% of the Late Prehistoric assets for all the AS-As and AS-SAs represent cropmarks (and a small number of earthworks) that are undated. On broadly morphological grounds these features appear to be consistent with Iron Age and Roman settlement and agricultural activity. It is not the purpose of this study to assess the effectiveness of this HER category however these features need to be more accurately dated and characterised.

Strategy Options

- A comprehensive analysis of aerial photographic records to NMP standards would help to refine the characterisation of these cropmark and earthwork assets.
- A programme of detailed morphological comparison with excavated sites and selective trial investigation could be used to confirm dating and character.

Roman

Iron Age and Roman transition, continuity or change?

The AS-As and AS-SAs contain a large number of sites which span the transition between the Iron Age and Roman periods as well as late Iron Age sites that do not survive into the Roman period and others that are founded in the early Roman period. As a consequence this demonstrates that the aggregate producing areas within the county provide a good opportunity for the study of the transition from the Iron Age to the Roman, the speed and impact of Romanisation.

Strategy Options

- In order to fully understand the body of evidence for the transition period the synthesis of existing investigations that have identified this period (or lack of it) should be seen as a key priority.
- This period should be seen a key objective in the future investigation of those extraction sites where evidence of the transition has been identified.

The road to nowhere?

It is now acknowledged that the extensive road network postulated by the Viatores in 1964 was misleading and a critical reappraisal of this work has now largely discounted the majority of these features (Simco 1986). However, two of the major Roman roads, Watling Street (HER 5508) and the Baldock to Godmanchester route, (HER 505) and the prehistoric Icknield Way (HER 353) pass through the River Ouzel and the River Ivel AS-SAs. These routes were clearly interconnected and therefore there is a real need to focus on the true nature of the Roman communications system.

Strategy Options

- Excavations along the line of the Icknield Way (HER 353) within Dunstable have demonstrated the existence of sub-surface features associated with the known Roman roads. Additionally the line of agger associated with the Baldock to Godmanchester road (HER 505) between Biggleswade and Sandy is clearly visible from the air. Minor roads and trackways have also been identified during some of the large scale archaeological investigations, such as at the Broom Quarry south extension. An appraisal of all known road evidence would present an updated baseline of data from which areas of potential could be identified.
- The Late Prehistoric HER assets within the AS-As and AS-SA include a number of linear cropmarks and earthworks which may relate to the Roman road network. Aerial photographic analysis to NMP standard may assist in identifying whether any of these features relate to known Roman roads or indeed represent them.

The rich list?

It has been suggested that most of the AS-As and AS-SAs contain villa assets or estates but much of the evidence is based on poorly recorded 19th century work or partial

excavation of more complex sites, such as Ruxox Farm (HER 918) in the River Flit AS-SA. As a consequence it must be acknowledged that the existence of a supposed network of villa estates and their hinterlands has not been confirmed.

Strategy Options

- In order to understand the character of the proposed villa assets a detailed assessment and re-analysis of the excavated sites is required.
- Where large scale landscape destruction will result from aggregate extraction we need to formulate investigation strategies that can identify villa/estates and their hinterlands. This could be achieved by looking at securely identified examples from the wider locality and region and comparing their morphology and topographical locations.

Sandy, Bedfordshire's Verulamium?

Sandy Roman town (HERs 444, 1897, 11309, 11311, 11313 and 13407) is located in the Woburn Sands Formation AS-A but on the edge of the River Ivel AS-SA. The natural landscape clearly influenced both the development of the pre-Roman activity (as demonstrated by the proximity of the three hillforts at Caesar's Camp, Galley Hill and Sandy Lodge, HERs 442, 445 and 1164) and the Roman town. Additionally the excavated evidence suggests whilst it may have been small it was nevertheless important. As result the significance of the town and its hinterland should be considered in greater detail.

Strategy Options

- The excavations undertaken at the Sandy Roman town have yet to be fully published. This must be seen as a priority, in terms of disseminating information, establishing the town's significance and aiding in the understanding of the town's hinterland.

Ruxox Farm, a Roman religious centre?

Ruxox Farm (HER 918) is located within River Flit AS-SA and it represents one of the most enigmatic Roman sites within the county. It has been identified both as a villa (with an associated settlement) and temple. The subject of a series of amateur (and in some cases poorly recorded) investigations it has produced a large quantity of high status material including several fragments and partially complete pipeclay Venus figurines. Whatever it's true nature this site is regionally and possibly nationally important and this should be recognised through detailed assessment of the archives and artefacts.

Strategy Options

- A full appraisal of the known archives for the various investigations at Ruxox Farm. Complemented by targeted fieldwork in order to locate, and characterise surviving sub-surface remains.
- Ruxox has the potential for waterlogging and the preservation of organic remains. Fieldwork should also target locations with the potential to contain this sort of preservation. This could be used to increase awareness of the potential

for ritual wetland or other deposits within the riverine AS-A and AS-SAs and thus aggregate extraction sites. This could also be used to develop strategies that would increase the recovery of organic and palaeoenvironmental remains.

Settlement variation: keeping up with the Jones'?

In similarity with the Iron Age the settlement pattern of the Roman period within the AS-As and AS-SAs is extremely varied with examples of nucleated, dispersed, enclosed and unenclosed settlements evident across the study areas. A full understanding of the significance of this variation is required.

Strategy Options

- Characterisation of settlement patterns based on topographical locations and variations could be used to create areas of potential and models for the identification specific types of site.
- Full publication of a number of sites for example Warren Villas in the River Ivel AS-SA, Harrold/Odell and Octagon Farm in the River Great Ouse AS-A should be seen as a priority. These are three aggregate related projects and they have produced significant evidence of settlement development and adaptation. There publication would greatly aid our understanding of the Roman period.
- Synthesis of excavated sites and analysis of aerial photographs to NMP standard in order to create a baseline of data from which to understand the development of Roman settlement patterns. This is particularly relevant to recognising the potential locations of unenclosed settlements that are difficult to detect in evaluations (see also Oake 2007, 11).

Industrious and civilised

Evidence of industrial activity, particularly pottery making and metal working is commonly found on Roman sites in the AS-As and AS-SA. This does not seem to be specialist activity; rather the industrial activity appears to be small scale but integrated within the overall structure of the settlements. A greater understanding of these sites is required.

Strategy options

- Existing data should be used to develop methodologies for recovering information relating to industrial production on aggregate extraction sites.
- Where apparently “dedicated” industrial sites in the AS-As and AS-SAs, such as the Doolittle Mill pottery kilns (HER 6743) in the Woburn Sands Formation AS-A exist, their topographical locations and relative proximity to contemporary settlements should be explored.

Saxon

The Roman and Saxon transition, dark times indeed?

There is an emerging correlation between Roman settlements and evidence of Saxon occupation such as Octagon Farm South (HER 586) in the River Great Ouse AS-A. This is either in the form of a small number of sunken floored buildings within or immediately adjacent to Roman settlements or more substantial Saxon settlements in proximity to Roman sites. This relationship has considerable potential to address issues relating to the chronology and character of the transition between the Roman and Saxon periods.

Strategy Options

- Wherever relationships between Roman and Saxon settlement are identified they should be targeted for investigation.
- It may be possible use of aerial photographic analysis to try and identify sites as suggested by Medlycott & Brown 2008, 79.
- Field survey could be undertaken to identify early Saxon settlements and compared to evidence from excavated sites so try and establish where there was continuity with the Roman period and change. This should include analysis of topographical locations.

Death and burial in the Saxon world

Saxon cemeteries and burials are also known from a range of locations within the AS-As and AS-SAs, including those clustered around towns such as Leighton Buzzard (HER 1 and 3) in the Woburn Sands Formation AS-A and Toddington (HER 2857) in the River Ouzel AS-SA. In addition they have been found in the context of late Roman settlements such as Norton Road, Stotfold (HER 74) in the River Ivel AS-SA. This relationship can provide important insights into the process of transition between Roman and Saxon periods. Although both settlements and cemeteries of Saxon date are known from the AS-As, the relationship between the two is not well understood.

Strategy Options

- Saxon cemeteries are known from the periphery of some of the towns and settlements within the AS-As and AS-SA, yet these settlements are excluded from this study. Analysis of the known evidence for the foundation of these settlements and the topographical locations of their associated cemeteries could be used to identify potential cemetery locations.
- Wherever relationships between Roman settlements and Saxon cemeteries or burials are identified they should be targeted and should be investigated.
- Research into the relationships (or lack of them) between known and investigated settlement and cemetery sites. Should a cemetery that is demonstrably contemporary with and related to a settlement be identified in an AS-A it should be a priority for investigation.

Late Saxon landscape organisation – nearly medieval?

The resource assessments for a number of the AS-As and AS-SAs, such as Beeston Bury (HER 1495) in the River Ivel AS-A and Tempsford (HER 9726) in the River Great Ouse AS-A suggests that in several cases the precursor of the medieval rural landscape was in place by the end of the Saxon period. Whilst this apparent re-organisation is acknowledged it is not well understood.

Strategy Options

- Where evidence for continuity between the Late Saxon and medieval periods is identified it should be considered a priority for additional research.

Medieval

Settlement variation: environment, economy or society?

Medieval rural settlement demonstrates an extraordinary diversity across the AS-As and AS-SAs. There are a range of settlement types including; nucleated, dispersed, “Ends”, moated manors and church/manor complexes. In order to understand and create models for predicting areas of potential it is necessary to characterise and date all the disparate elements of the settlement pattern. Aggregate extraction sites are likely only to be able to address those features that have been deserted but they have produced remains, for example Broom Quarry in the River Ivel AS-SA, and therefore potentially the smaller types of site. However, sites such as South of Stotfold (overlooking the Ivel valley) demonstrate the potential to find large landscapes and previously unknown medieval settlements.

Strategy Options

- Characterisation of settlement patterns based on topographical locations and variations could be used to identify areas of potential and create models for the identification specific types of site.
- Synthesis of excavated sites and analysis of aerial photographs to NMP standard in order to create a baseline of data from which to understand the development of medieval settlement patterns.

The rich list (medieval style)

Excavation of moated sites such as Tempsford (HER 9726) within the River Great Ouse AS-A and the Stratton within the River Ivel AS-SA (HER 518) have demonstrated the complex nature of the relationship between the existing Saxon and early medieval settlement landscapes and the imposition of new settlement and enclosure patterns.

Strategy Options

- Aerial photographic analysis to NMP standard may help to identify relevant sites.
- Documentary research and field survey of these areas would also help to identify sites and develop understanding of the settlements and how the different elements articulate.

Who's the King of the Castle?

There are a number of castles within the AS-As and AS-SAs such as the Biggleswade ringwork (HER 468) in the River Ivel AS-SA and Cainhoe Castle (HER 225) in the Woburn Sands Formation AS-A. Despite the potential for supporting documentary evidence the origins and development of both individual assets and their associated landscapes is not known. They appear to be relatively short lived yet clearly had a significant impact on the landscape.

Strategy Options

- Most of the castles within the AS-As and AS-SAs are designated and protected as Scheduled Monuments; their hinterlands are not however, such as that around Cainhoe Castle (HER 224). As a result research including field survey and aerial photographic analysis to NMP standards of their surrounding landscapes should be considered a priority particularly of those sites in proximity to aggregate extraction sites.

The Greensand Ridge: A very holy place indeed

The Woburn Sands Formation AS-A has the highest concentration of religious houses of all the AS-As and AS-SAs and it includes the rare and sizeable Gilbertine Priory at Chicksands (HER 375). Whilst in some cases there is a good corpus of existing data about these sites less is known of their relationships with the surrounding landscape, which included mills, warrens and woodlands.

Strategy Options

- In most cases the religious houses are protected (as Scheduled Monuments), however their associated landscapes are not. As a result research including field survey and aerial photographic analysis to NMP standards of their surrounding landscapes should be considered a priority particularly of those sites in proximity to aggregate extraction sites.

Making the most of what we've got: rural landscapes, organisation, specialisation and adaptation

The most commonly recognisable aspect of the medieval rural landscape is ridge and furrow cultivation. This resource is in danger from modern agricultural practises, aggregates extraction and small-scale development around the periphery of historic villages.

In addition the resource assessment highlighted the presence of concentrations of specific rural practises related to the natural resources of the AS-As and AS-SAs, such as rabbit warrens; (for examples Seacotts Warren, HER 14159, Warden Warren, HER 14170 and Rowney Warren, HER 14565) and woodlands (including Chicksands Wood, HER 9142 and Maulden Wood HER 13232) within the Woburn Sands Formation AS-A and watermills (such as to the north of Old Linslade HER 1002 or Upper Gravenhurst HER 15529) in the River Ouzel and River Flit AS-SAs. Many of these relate to the religious houses and manorial complexes that controlled the landscape but a greater understanding of their significance as specialist adaptations within these landscapes is not well understood.

Strategy Options

- Ridge and furrow cultivation is a fast diminishing resource in Bedfordshire, with less than 4% surviving. Some work to map the surviving resource has been undertaken; however it is acknowledged that this is rapidly becoming out of date. In addition ridge and furrow in Bedfordshire is often slight making it difficult to

recognise using only one detection method. As result a systematic approach using aerial photographic and cartographic analysis combined with field survey should be undertaken. Where possibly good examples of surviving ridge and furrow should be preserved *in situ*.

- Specialised rural practises are identified in most of the AS-As and AS-SAs. Their relationships with the wider landscape, for example manors, religious complexes and settlements should be explored in order to investigate the full extent of the medieval landscape and to develop appropriate methodologies for dealing with their investigation.

Post-medieval and Modern

The Aggregate Industry

The Bedfordshire and Luton HER record three hundred and twenty-seven entries for quarries and the MPAs hold data (based on Ordnance Survey mapping) for the location of a number of historic quarry sites, however little is known about the historical development of quarrying and its impact on the early post-medieval landscape. Given that some of the county's historical aggregate quarries impacted on the development of archaeology within Bedfordshire a greater understanding of this resource is required.

Strategy Options

- Analysis and synthesis of cartographic, aerial photographic, MPA, BGS, BLARS (Bedfordshire and Luton Archives and Records Service) and HER could be undertaken to create a baseline of quarry data.
- A re-analysis of archaeological archives recovered as a result of 19th and early 20th century aggregate extraction would assist in understanding the significance of the archaeological resource and could also be used to create models for areas of potential associated with quarry extensions or ROMPS.

A lost industry: Bedfordshire's Market Gardens

Market gardening was a significant and lucrative industry during the latter half of 19th century and 20th century and had an impact on Woburn Sands Formation AS-A and the river valley AS-A and AS-SAs. However, as the industry has declined so many of the characteristic buildings associated with market gardening have been destroyed or converted. There is a real need to identify and protect both the characteristic landscapes (for example the Land Settlement Association) and their associated structures and buildings such as the greenhouses and onion drying sheds.

Strategy Options

- Aerial photographic and cartographic regression exercises to identify the locations of greenhouses and associated buildings. Many of these buildings have disappeared without being recorded, thus effectively removing the physical traces of these important local agricultural industries.

The Aristocrats and the advance of agricultural progress

The AS-As and AS-SAs contain elements of the estates owned by the Dukes of Bedford and the Whitbread family, and during the late 18th and 19th centuries Bedfordshire's first families were amongst the first to experiment with new mechanised agricultural techniques. This led to the development of the model farms and their associated buildings. This is most evident within the Woburn Sands Formation AS-A such as Park Farm, Woburn (HER 14217). This is an important part of Bedfordshire's history and detailed research should be undertaken into the development of these estates.

Strategy Options

- Cartographic and aerial photographic regression could be undertaken to chart the development (and in some cases decline) of the model farms and their associated landscapes.
- These landscapes also included accommodation for farm workers. In some cases these properties no longer remain part of the original estates. Collation of all available information on these properties should be undertaken, this would enhance the HER information for the AS-As and AS-SAs and contribute to an improved understanding of the landscape as a whole.

Canalisation: A short lived innovation

The canalisation of the River Great Ouse and River Ivel in the late 17th and 18th centuries respectively was undertaken to ease the pressure of transporting bulky goods along the poorly maintained Turnpike roads. This involved the creation of navigation locks on the Ivel (HER 15181 and 15297) and Great Ouse (HER 8805, 9423, 9514 and 12895), wharves including one at Tempsford (HER 9861) and a staunch (HER 8016) between Roxton and Cople within the River Great Ouse AS-A. Unfortunately this innovation was short-lived and the Ivel Navigation was abandoned by the 1870's following creation of the rail network.

Strategy Options

- A number of the navigation features are well recorded and preserved, however it is known that some of the wharves and locks were fairly quickly dismantled and this means that the exact stretches and compositions of these locally important waterways is not fully known. A review of historical documentation, cartographic and aerial photographic analysis and field survey could be used to identify and record these features.

Over-arching issues

The research agenda has highlighted a number of strategies or issues which are broadly relevant across a number of periods, AS-As and AS-SAs and research objectives. These strategies or issues can be developed either as specific projects or applied to all aggregate related archaeological investigations.

Air Photographs

For all periods from the Neolithic onwards aerial photography is one of the primary sources of information for assets recorded in the HER. In spite of the wealth of information derived from this source and its importance in identifying and characterising archaeological sites and features that are likely to be affected by aggregate extraction and other developments there has never been any systematic programme of mapping and analysis within the county. Cropmarks have been recorded in the HER and there are often, though not always, sketch plots at a scale of 1:10,000 included in the record. Any detailed mapping and analysis that exists is site specific, undertaken in relation to the demands of specific development proposals; they have not been done to a consistent methodology or standard. To address this issue a programme of air photograph analysis to NMP standards should be undertaken for the whole county and would provide the baseline information needed to address a number of research topics identified in the research agenda.

Fieldwalking and surface artefact scatters

Surface artefact scatters, particularly lithic scatters, are a critically important part of the resource, particularly for the prehistoric. For the Mesolithic and Neolithic it is possible that many settlement/occupation sites now only exist as lithic assemblages in the plough soil with no surviving sub-surface features, they are also important in the Bronze Age. While fieldwalking has been successful in identifying sites or activity areas in some places, such as Biddenham Loop, at others (for example Broom Quarry) it has not been productive. A number of strategies should be adopted to improve the baseline information provided by artefact scatters and understand which are the most effective techniques for investigating them:

- Develop a programme of extensive field survey throughout aggregate producing areas of the county. This would increase the baseline information on the distribution of artefact scatters and greatly enhance our understanding of settlement in the Mesolithic, Neolithic and Bronze Age. Rather than attempting to survey all the aggregate producing areas such a programme could be based on sampling the landscape targeting geological, topographical or other factors. It is also the type of project that could be undertaken using volunteer or amateur groups within a countywide project framework.
- Research needs to be undertaken into the most effective survey strategies. It is possible that one reason that fieldwalking has not been effective in some locations may be that the collection strategy adopted was too coarse grained and not able to identify small, low density scatters. Alternative methods of

- investigating artefact densities in the plough soil, such as test pitting and bucket sampling in conjunction with trial trenching need to be looked at.
- Research also needs to be undertaken into the meaning of surface artefact scatters. Present evidence suggest that there is rarely if ever a relationship between scatters and subsurface features. Is this generally the case or in certain circumstances is there a correlation between the two types of evidence? If artefact scatters are the sole surviving remains of certain types of activity or for certain periods research needs to be undertaken to improve our understanding of what the scatter actually represent.
 - A more consistent approach needs to be adopted towards the use of fieldwalking or other techniques for the investigation of the plough soil in both field evaluations and post-determination mitigation strategies.

Publication and synthesis

It has been noted in the resource assessment and the research agenda that a number of excavated sites key to our understanding of the archaeology of aggregate producing areas have not been published. It is a matter of urgency that these sites are published as they form the framework for the interpretation and understanding of the wider resource and the development of research strategies. A programme for post-excavation analysis and publication of the key sites identified by this project should be put together and funding sought.

There are other collections of archaeological material that contain important information. They include antiquarian collections such as the Palaeolithic material from Deep Spinney (HER 327) and material collected by amateur fieldworkers that have not been analysed or published (Laurel Wood HER 18269 and Ruxox Farm HER 918). These are collections are generally held by the county's museums. In order to release the information locked up in these collections so that they can contribute to our understanding of the archaeological resource of aggregate producing areas a programme should be developed to identify the relevant collections together with a programme of analysis and publication.

The only major work of synthesis that has been undertaken on the archaeology of Bedfordshire is the Research Framework (Oake et al 2007). The level of synthesis in this document is, of necessity fairly broad. The research agenda for this project has identified a number of period or subject specific topics where synthesis of existing information would greatly improve our understanding of the resource. This would help us to develop models of where certain types of sites and features were likely to occur and improve our ability to manage the archaeological resource in the face of proposals for aggregate extraction and other development proposals. Using the research agenda a series of synthesis projects should be identified and project proposals developed.

Environmental Data

There is a lack of good quality environmental data for all periods in the aggregate producing areas and the county as a whole. This should be remedied by ensuring that the description of the significance of heritage assets required by Policy HE6.1 of PPS 5 and pre-determination evaluations take fully into account the need to acquire information on the environmental potential of proposed development sites. Any archaeological investigations required to mitigate the impact of aggregate extraction and other developments must also include comprehensive programmes of environmental sampling and analysis as part of the approved schemes.

Historic Environment Record

The Bedfordshire and Luton Historic Environment Record was the key source of information for this project. The detailed and critical analysis of HER information required by the project highlighted a number of issues relating to the quality of the information in the HER and the way it is recorded and managed; they make handling, interrogating and understanding HER data difficult and can affect analysis and decision making. The issues relate to both parts of the HER, the physical and digital records, and include:

- Quality of information – the HER contains a significant number of records where the quality of the source information or the inferences drawn from the information are poor and sometimes misleading. Much of this information has not been verified by the HER staff. A programme of critical validation by professional staff would remove records of dubious origin or unfounded interpretation.
- The summary information in both physical and digital records has generally not been updated in the light of further investigation or changing interpretation. This can present a very misleading impression of the nature of a site.
- The detailed description of sites is basically an accretion of information added to the record as it is acquired; there is no clear objective description of the site or asset based on the latest interpretation or information. A consequence of this is that the description created in the digital record is often confused and inadequate because of the difficulty of isolating the key elements of a site from the description in the physical record.
- Events have been inconsistently added to the digital record making it difficult to identify where archaeological investigations have taken place.
- There is inconsistency in the allocation of record numbers to assets. In some cases large areas of cropmarks or other assets containing what could be considered to be multiple assets are allocated a single number with later additional information within the area being given new numbers. When new information becomes available, particularly as a result of investigations, these catchall numbers are not revised to reflect the new situation when it may be more appropriate to renumber sites, splitting them into smaller but discrete entities. There needs to be a consistent policy for the allocation of HER numbers and for the reallocation or subdivision of numbers when new information is available.
- There is poor linkage between description and sources, particularly in the digital record.

At its core the Bedfordshire and Luton HER contains a substantial and important body of information which is the basis for managing and understanding the county's historic environment. However, to make the HER a really effective and efficient tool steps need to be taken to address the issues outlined above on a systematic basis.

MITIGATION STRATEGY

By Martin Oake

Introduction

In this section mitigation strategy is taken to have a wide definition. It will look at how the archaeological resource within aggregate quarries is identified, managed and in particular the impact of mineral extraction on archaeology mitigated.

The value of HER as an indicator of the actual archaeological resource and the effectiveness of field evaluation strategies in identifying and characterising the resource at specific aggregate extraction sites are examined. The success of archaeological investigation strategies used to mitigate the impact of aggregate extraction is also explored and the preservation of archaeological remains *in situ* within aggregate quarries is reviewed.

Four quarries were identified as case studies to explore these issues (BCC 2009, 17):

Case Study 1 – Broom Quarry (Glacial Sands and Gravels AS-A)

Case Study 2 – Octagon Farm, Willington (River Great Ouse AS-A)

Case Study 3 – Warren Villas/Ivel Farm (River Ivel AS-SA)

Case Study 4 – Sandy Heath (Woburn Sands Formation AS-A)

The case studies were selected to cover the main aggregate producing geological formations in the County and address a range of issues.

For each of the four case studies the HER information available at the time of the planning application is reviewed in order to understand the information base on which initial decisions about applications were made. Where field evaluation was required as part of the application process each stage of the evaluation is examined to see how it advanced or changed understanding of the application site's archaeology.

In each case study the planning consent required some form of archaeological mitigation for the impact of the development. In all cases this involved varying degrees of archaeological investigation in advance of aggregate extraction. The effectiveness of the investigation strategy in recording the remains that were identified during the planning application process and fulfilling research objectives is examined. The investigations also provide an important control in looking at how successful field evaluation was in identifying the location, extent, range and character of the archaeological resources within each quarry.

In three of the case studies archaeological remains were preserved *in situ* within the quarry. In some cases the decision to preserve was made at the planning application stage and enshrined in the planning consent. On other occasions the decision was made

during quarrying, usually as an economic consideration where the value of the aggregates beneath the archaeological remains was significantly less than the cost of investigation. The timing of decisions to preserve is examined as are preservation strategies.

Case Study 1 – Broom Quarry

Introduction

Broom Quarry is located 1.5km west of Biggleswade between the villages of Broom (immediately to the south) and Upper Caldecote (750m to the north). It is centred at TL 1730 4414. The area covered by this case study was a new quarry created in an open agricultural landscape. It covers an area of c.240 ha. It is located in the Glacial Sands and Gravels AS-A. Topographically the site is in the Ivel Valley at a point where it cuts through the Greensand Ridge. The site is gently undulating and is bisected by a small north – south orientated valley. The northward flowing stream is a tributary of the River Ivel and has now been canalised as a drainage ditch. A planning application for gravel extraction was submitted in 1991.

HER Information

The HER records of fifteen assets for the area covered by the planning application (see Appendix 3).

The application area is dominated by assets known from cropmarks (HERs 623, 3576, 6741, 9093, 9094 and 9095) which lie wholly or partly within it. The cropmarks are generally densely distributed across the site and included a wide range of features. Some of the cropmarks could definitely be identified as of archaeological origin and include ring ditches, linear features and enclosures. With the exception of ring ditches which are ascribed to the Bronze Age, none of the cropmarks were dated but it was generally assumed that they were later prehistoric or Roman.

It has been suggested that the line of a Roman road running from Biggleswade to Old Warden (HER 706) lay along the northern boundary of the quarry. However, later research discounted this route as entirely conjectural (Simco 1984).

At the northern end of the site, to the east of Hill House, is a complex of earthworks (HER 464). This asset comprises of rectangular moat, a smaller enclosure to the north and a fishpond to the south all of medieval date.

The western boundary of the quarry (the present B658) is on the line of an 18th century turnpike road (HER 8246) and the site of two tollhouses associated with the turnpike lie within the quarry.

HER information from the area surrounding Broom Quarry is also dominated by cropmarks (HER 621, 631, 3202, 3532, 3536, 9095 and 15099). Typical features include ring ditches and enclosures, of particular note is a sequence of substantial enclosures on the western side of the River Ivel located on the edge of the terrace overlooking the river (HER 631 and 9095).

A cropmark complex also on the west side of the Ivel (HER 468) contained sites from several periods: a possible Neolithic enclosure, Bronze Age round barrows, a Roman enclosure and a medieval ringwork and bailey. It is a Scheduled Monument.

Post-medieval and modern features include an 18th century landscape park at Broom Hall (HER 9428) and the Ivel Navigation (HER 14539). There is also evidence of gravel extraction (HER 2877 and 14573).

Pre-determination Evaluation

The Fenland Archaeological Trust was commissioned to undertake an Archaeological Assessment of the application site as part of Environmental Assessment to accompany the planning application (FAT 1990). The Archaeological Assessment had two phases with the first phase was done before the planning application was submitted and the second phase being completed before the planning application was determined.

The earthworks of the medieval moated site were considered as an absolute constraint because they were of national importance. At the time the planning application was submitted the asset was undergoing the process of designation as a Scheduled Monument. The Assessment accepted that the moat was an absolute constraint on development (FAT 1990, 3).

First Phase

The first phase of the evaluation had a number of elements:

- An analysis of the features surrounding the moated site to identify those features that related to it with a view to extending the area of absolute constraint around the moat so that it could be preserved within its immediate contemporary landscape.
- Mapping and analysis of existing air photographic evidence.
- Geophysical survey of most of the major sites identified from air photographs.
- Limited trial trenching of archaeological sites and features identified in the air photograph analysis and geophysical survey as well as cropmarks thought to be of geological origin and areas of the site that appeared to be devoid of archaeological features.

The Assessment was also to include a proposal for an archaeological response to the proposed development.

Second Phase

The second phase of evaluation was agreed after the planning application had been submitted to provide additional information. It comprised:

- Systematic field walking of the whole applications site.

- Trial trenching of any new sites identified in the fieldwalking.
- Geophysical survey of three previously unsurveyed ring ditches.

The archaeological response was to be revised in the light of the results of the second phase of evaluation.

Commentary on Pre-determination Evaluation

The planning application was submitted shortly before PPG 16 *Archaeology and Planning* was adopted. Although the principals of PPG 16 were known it was not formal government guidance and was not reflected in the policies of the Mineral Local Plan. Also at the time there was no background of accepted practice for how pre-determination evaluations should be conducted. It is in this context that the proposals for evaluation were negotiated and agreed.

Earthworks

No detailed survey or analysis of the earthworks was undertaken as part of the Assessment. It appears that it was assumed that the known area of earthworks as identified in the HER and the description of them was sufficient to define the constraint. In fact the Assessment did not even contain a detailed description of the moat and its associated earthworks.

Three areas of features (FAT 1990, 5) were described as being associated with the moat. Site 7, an area of rectilinear field system to the south of the moat and Site 10 a series of rectilinear enclosures partly surviving as earthworks to the north of the moat were identified from air photographs. There was also an area of ridge and furrow earthworks to the east of the moat.

All these features were described as forming “an integral part of the former earlier medieval agricultural landscape”.

Commentary on Earthworks

The assessment and definition of the moated site earthworks was undertaken solely on the basis of HER information with no critical appraisal of it. Nor was there an attempt to refine or enhance the information through detailed earthwork survey.

It is reasonable to assume that the ridge and furrow was medieval in date and, therefore, formed part of the moated site’s contemporary landscape. However, the cropmark features to the north and south of the moat appear to have been included in moated site’s contemporary landscape on the basis of proximity rather than by being firmly dated on morphological grounds or through trial excavation.

Air Photographs

The Assessment does not describe the air photograph analysis that was undertaken other than to say that “a major task of the field assessment was to evaluate their (*the cropmarks*) archaeological or geological origin.” It goes on to identify a number of sites which were believed to be of archaeological origin or interest (FAT 1990, 6 and Fig 1):

- Five ring ditches and a possible sixth distributed across the site (Sites 1-6)
- Rectilinear enclosures north of the moat (site 10, see above)
- An extensive rectilinear field system to the south of the moat (Site 7, see above)
- A large “U-shaped” enclosure at the northern end of the quarry (Site 9)
- A small field system on the central eastern side of the quarry(Site 8)
- Elements of a field system and possible pit groups on the northern edge of the quarry(Site 11)
- An area of former stream channels in the north eastern corner of the quarry(Site 12)

Commentary on Air Photographs

The HER information for the quarry site records an extensive and complex series of cropmarks. It was clear that they were not all archaeological in origin but the HER does not differentiate between features of archaeological and geological/natural origin. Because the Assessment does not describe the methodology it is not possible to understand the basis on which individual cropmarks were determined to be of archaeological origin.

Geophysical Survey

A magnetometer survey was undertaken at seven locations within the quarry (GSB 1990). They were all targeted at sites identified from air photographs.

Three ring ditches were surveyed (Sites 4, 5 and 6). Sites 4 and 6 were identified in the geophysical survey, although Site 6 was found to be at a slightly different location to that plotted from cropmarks. No features that could be ascribed to Site 5 were identified in the survey. It was suggested that this was a result of the small size of the monument and the dry soil conditions. At Site 6 a number of pits outside the ring ditch were also identified.

The results from the other four areas examined were at best inconclusive. At Site 9 and 11 there were no clear anomalies that might suggest the existence of archaeological remains. There were no anomalies at Site 7 which could be correlated with the linear boundaries suggested by the cropmarks. The survey did hint at a scatter of individual pits across the area surveyed but it was thought that they did not represent “habitation-type anomalies” (GSB 1990, 5). A final area on the northern edge of Site 10 was

surveyed and did produce some evidence for linear anomalies as suggested by the cropmark evidence.

Commentary on Geophysical Survey

The geophysical survey was restricted to examining a limited number of sites identified from cropmarks. Four of the survey blocks sampled parts of larger features or areas of cropmarks while the other three looked at ring ditches. The objective appears to have been to confirm the existence of archaeological features or sites first identified from cropmarks. It succeeded in confirming the existence of two of the ring ditches; the other sites produced little geophysical evidence for archaeological features.

This technique was not used to examine all the features identified from cropmarks. Nor was it used to survey large areas to identify sites or features that may not have been visible as cropmarks.

Trail Excavation

Twenty Six trenches totalling 2115 square metres were excavated. They were mainly targeted on features identified from cropmarks although four apparently blank areas were also investigated.

The existence of five of the six ring ditches was confirmed in the trail trenching (Sites 1-4 and 6). Four of the five confirmed ring were simple monuments enclosed by a single ditch. They produced only limited dating evidence in the form of a small number of flint artefacts associated with some of the ring ditches. These ring ditches were dated to the Early Bronze Age.

The trench across Site 3 described as a "C-shaped" ring ditch produced two cremation burials in small pits from within the ditch. It was not confirmed that they were human burials but it was said that they might represent a small Early Bronze Age cemetery. At Site 6 a number of large pits, first identified in the geophysical survey, were also found in the trial trench.

Site 5, the sixth possible ring ditch, was not found in the trenching. It was suggested that adverse soil conditions and the narrowness of the trial trench might have made identification of the ring ditch difficult. The Assessment did not suggest that the ring ditch did not exist but that a wider area of investigation would be needed to identify it.

Four areas of possible field systems were trenched (Sites 7, 8, 10 and 11). Three of the sites (7, 10 and 11) did not produce any subsurface remains of field systems. A scatter of Neolithic and Bronze Age flints was said to indicate some sort of prehistoric activity in the area. Two trenches at the northern end of the quarry and one on the eastern side produced evidence of linear features, although they were undated. A ditch, possibly belonging to a double ditched trackway on the northern end of the quarry was found and dated to the 19th century in the basis of finds of brick rubble.

The “U-shaped” enclosure at the northern end of the quarry (Site 9) was not found in the trial trenching. It was suggested that the cropmark only survived in the topsoil.

Five trenches were located to investigate the north - south stream to the east of the moated site; in particular they were designed to examine colluvial/alluvial deposits in the valley bottom. The existence of this type of deposit was confirmed by the trenching. No archaeological features were found in any of these trenches. However, this area was identified as having high archaeological potential as a focus for earlier prehistoric settlement and for the preservation of waterlogged deposits.

A large number of geological features were found in the trial trenches said to be the result of periglacial action. Their distinctive fills contrasted with the natural which was thought to account for density of such features visible as cropmarks.

A total of twenty one later Neolithic and Bronze Age flints were recovered from the trial trenching. No pottery was found and a few modern metal objects were recovered from the plough soil. It was suggested that the sparse scatter of flints represented casual prehistoric activity in the area.

Commentary on Trial Excavation

The trial trenching had limited objectives: to test cropmark sites and the nature of colluvial/alluvial deposits in the stream valley. Within these limits it was successful in that it confirmed where archaeological features existed at locations suggested by the cropmarks and where they did not. It also succeeded in confirming that the stream valley contained colluvial/alluvial deposits. Trial trenching also identified geological features that were interpreted as accounting for many of the features visible as cropmarks.

Trial trenching was not used extensively across the whole of the application site to test whether other archaeological sites existed that were not visible as cropmarks nor whether the cropmarks gave a true reflection of the full extent of the archaeological remains. This appears to have been based on the assumption that the cropmarks were a very accurate reflection of the archaeological remains the site contained.

Fieldwalking

Phase 2 of the pre-determination evaluation, a programme of fieldwalking covering the whole application site was undertaken in the winter of 1990-1991 (French 1991). Only two fields were not available for fieldwalking. The collection strategy was based on parallel transects spaced at 30m intervals with the finds recorded to the nearest 30m sector of every 100m grid within each field. It was recorded that conditions during the survey were only moderate.

A total of 165 flint artefacts were collected, ranging in date from later Mesolithic to Late Neolithic - Early Bronze Age (Cooper and Edmonds 2007, 13). Generally the density of finds was very low. The relatively higher densities of artefacts, most notably to the east of the stream were in areas that had not produced cropmark evidence and were taken to suggest Late Neolithic occupation (French 1991).

Commentary on Fieldwalking

Fieldwalking was the only fieldwork technique that was applied over the whole of the application site. The low density of finds did not allow the identification of any new sites though it did suggest that there might be Late Neolithic occupation to the east of the stream. The relatively coarse grained collection strategy may have made it difficult to identify small scale prehistoric activity or occupation within the general low density of surface artefact distributions.

Although there was provision for further trial trenching to characterise any sites identified by fieldwalking it was not required as no sites were identified nor was additional geophysics undertaken.

Investigation

The Assessment submitted as part of the Environmental Statement included proposals for a mitigation strategy (French 1990). This comprised:

- Exclusion of the medieval moated site to the east of Hill House with an additional area to the north containing associated features from the quarry in order to preserve them *in situ*.
- Areas defined as “limited constraint”, mainly the five Bronze Age ring ditches identified as cropmarks and the area of colluvial/alluvial deposits around the stream would be subject to excavation in advance of development.
- The rest of the quarry was defined as being of “nominal constraint”. A mitigation strategy based on an extensive programme of sample excavation and a comprehensive recording brief during topsoil stripping was proposed.

Implementation

The area of the medieval moated site and associated features was excluded from the development and preserved *in situ*. A condition placed on the planning consent required works to the water supply for the moat to be undertaken in order to maintain water levels in the moat. This work was undertaken and successfully maintained water levels in the moat throughout the life of the quarry.

Before the site investigation part of the mitigation strategy began a detailed air photographic assessment was undertaken (Cox 1995) which was supplemented with further assessment when a new set of photographs became available (Cox 1996). This extended the understanding of the cropmark evidence for the site, adding several new sites and features, increasing the area of sites identified in the pre-application assessment of 1990 and adding new elements to them. It is worth noting that the bulk the photographs were available at the time of the 1990 assessment and only one wholly new site was added from photographs that were not available in 1990.

Each extraction phase was investigated one year in advance of quarrying. The investigation was based on a landscape sampling strategy designed to characterise the

“broad distributions and densities of materials across the study area” (Cooper and Edmonds 2007, 11). It was based on a strategy that had been used by the Cambridge Archaeological Unit, the archaeological contractor, elsewhere in the region (e.g. Haddenham, Cambridgeshire). Initially the sampling took the form of fieldwalking, limited geophysical survey and trial trenching. Substantial sites and features were then subject to open area excavation.

On completion of the first two phases the investigation strategy was reviewed. A more tightly gridded fieldwalking strategy had only confirmed the results of the survey done as part of the pre-application assessment, showing that there was a generally low density distribution of prehistoric flint artefact across the site. Geophysical survey had also proved to be of little value in identifying sites and features. As neither of these techniques proved effective in characterising the archaeological resource it was decided to modify the overall strategy for the rest of the project.

The landscape sampling strategy became standardised as a programme of trial trenching with bucket sampling of top and subsoil for artefacts from within the trenches. Areas that did not contain cropmarks were sampled at the same intensity as those that did. The trial trenches were generally aligned on the National Grid on a staggered array. Trench lengths varied from 25m to 100m and in some areas 5m x 5m boxes were also employed as part of the trial trenching. In some cases where archaeological features were identified additional trenches were excavated either as extensions to existing trenches or at new locations in order to clarify the characterisation of the remains or define their extent. There was no standard amount of trial trenching though the initial amount generally lay in the range of 2% - 3% of the area of each phase.

The bucket sampling for artefacts started as a 90 litre sample taken every 50m along each trench. This was increased to a sample every 25m because of the low artefact densities. Results from the bucket sampling reflected those from the earlier fieldwalking. All the finds were flints distributed at very low densities. The assemblage was mainly debitage with a notable absence of retouched tools (Cooper and Edmonds 2007, 14). Distributions of artefacts across the site did show some correlation with areas that contained sub-surface archaeological features. They also seem to be located in a zone just above the valley floor and below the higher ground on either side of the stream valley. Both techniques for sampling the surface/topsoil distribution of artefacts produced similar results indicating that the low density distribution of these artefacts was real and reflected the nature of human use of the landscape (Cooper and Edmonds 2007, 18).

The landscape sampling resulted in open area excavation at thirteen locations throughout the quarry ranging in size from 625 square metres to more than four hectares. In a departure from open area excavation trial trenches were used to investigate the Bronze Age boundary system on the western side of the valley.

A wide range of sites and features were investigated (Cooper and Edmonds 2007). The sequence of activity/occupation begins in the Neolithic with isolated pits found at several locations and residual material in later features. The Bronze Age was represented by settlement sites and funerary and ritual monuments, boundary systems and isolated features. There were Iron Age settlements and burials but the Roman period was only visible through a small number of linears and trackways. A small Saxon cemetery was found close to a contemporary post built structure and there were several isolated late

Saxon pits. A medieval enclosure was found to the south of the Hill House moated site as well as medieval and later boundary features and quarrying.

The majority of archaeological features within the quarry were excavated in advance of mineral extraction. However, at three locations it was decided to amend the extraction area to exclude features. These were the medieval enclosure to the south of the moated site, a ring ditch and a Middle Bronze Age settlement in the south eastern part of the quarry. The ring ditch was known from air photographs and had been identified in the 1990 Assessment; the other two sites were only identified during the trial trenching programme. The medieval enclosure clearly belonged to the complex of features related to moated site which had been designated a Scheduled Monument by the time the enclosure was found and could therefore be considered to be part of a nationally important heritage asset; although it was not itself designated. On this basis combined with the low economic value of the mineral beneath the enclosure it was decided to preserve the site *in situ* with a 10m buffer around the outer limits of the archaeological features. Preservation of the other two sites was based solely on economic arguments, where the cost of archaeological investigation was greater than the value of the underlying minerals. In all three cases the sites were trenched and therefore partially exposed before it was decided to preserve rather than excavate them.

Commentary on Investigation

The archaeological investigation carried out in advance of quarrying at Broom was generally successful. Given the restricted nature of the pre-application Assessment it had to serve a dual purpose of identifying sites and features that required detailed and extensive excavation as well as actually investigating those sites and features.

The bucket sampling of plough soil artefact distributions worked in that it confirmed the results of the 1990 fieldwalking. Because of the low density of finds with no obvious concentrations it was not useful in identifying sites or activity areas requiring further detailed investigation. It did, however, provide background information about the use of the landscape particularly for the Neolithic and Bronze Age which was useful context for the excavated evidence, and was more easily understood in the context of the excavated evidence.

Trial trenching was very successful in identifying substantial sites and features requiring further investigation or that would be preserved *in situ* depending on circumstances. Where sites were known from cropmarks trial trenching allowed their extent and complexity to be better understood before open area excavation began, for example the ring ditch and associated Iron Age settlement in Phases 1 - 2 and the Iron Age settlement in Phase 8. Perhaps more importantly trenching also identified sites that were not and probably never would be visible as cropmarks such as the Late Bronze Age settlement in Phase 4 or the Bronze Age occupation in Phase 9A. Isolated features such as Neolithic, Bronze Age and Saxon pits were also identified and by extending the trial trenches around these features it was possible to confirm that they were isolated and not part of larger areas of settlement or activity.

A Bronze boundary system was identified in the trial trenching which was often fragmentary or discontinuous in character. Trenching was also used to investigate the

boundary system, identifying its layout and alignments. In some cases the boundaries were identified not by ditches but by alignments in other features. Only in Phase 7 was there any attempt to investigate a larger area specifically to understand the boundary system.

Assessment of Mitigation Strategy

The pre-determination evaluation was very restricted in its objectives. It assumed that the cropmark evidence provided a comprehensive indication of the archaeological remains that the site might contain. It concentrated on assessing and characterising those remains with only limited investigation of other areas. The only technique applied across the whole site was fieldwalking which did not substantially add to the understanding of the archaeology of Broom Quarry.

The significance of the medieval moated site and its associated features was apparent from the outset. This allowed an early decision to preserve it *in situ* and the evaluation allowed additional features to be protected as part of the contemporary landscape; although none of this was tested during the evaluation.

Planning consent was given on the basis of the information gathered by the field evaluation. This allowed archaeology to be identified as a significant constraint in the development part of which was mitigated by preserving the medieval moated site and associated features undisturbed. A condition requiring the implementation of a scheme of archaeological investigation was included in the planning consent to mitigate the impact of the development on the archaeology of the rest of the site.

The information from the pre-determination evaluation also had to form the basis for the scheme of investigation. From the outset the investigation was conceived of as a landscape scale project. However, because the evaluation had been so restricted there was insufficient information available to frame a scheme of investigation without further assessment of the archaeology of the site. So, in effect, the first part of the investigation for each phase was a continuation or completion of the evaluation through trial trenching and sampling of artefact distributions. This proved effective in identifying sites and features that required further investigation including a number that had not been identified in the pre-determination evaluation.

By present standards the quality and extent of the pre-determination evaluation was not adequate. However, if the trial trenching that was ultimately done as part of the post-consent investigation had been included in the evaluation there would have been a much better information base for decision making both in terms of the planning application and the programme of investigation. It is difficult to say whether if the trial trenching had been undertaken pre-determination more sites would have been excluded from the extraction areas at the time of the planning consent. The small medieval enclosure to the south of the moat would probably have been a candidate for preservation because it formed part of the moat's contemporary landscape, identified as worthy of preservation in the original application. The complexity, character and state of preservation of some of the sites identified in the evaluation was not fully appreciated until the later phase of work. For example it was said, at the evaluation stage, that at Site 4 the round barrow mound was not preserved under the headland when in fact it was.

The complexity and rarity of the “C-shaped monument” (Site 3) was also not recognised until the post-consent investigation, the evaluation still considered it to be a ring ditch even though it was recognised that the ditch did not form a complete circuit. It is possible to see that as both these sites were significant either because of the quality of their preservation or their rarity as a type of monument that a case could have been advanced for their preservation *in situ*.

The range of sites identified in the trial trenching, particularly the more ephemeral Neolithic and Bronze settlements and occupation sites and the Bronze Age field system may have produced a different investigation strategy had they been known about at the outset of the investigation. If the existence of these features, which form an important part of the archaeological landscape, had been known before the investigation strategy was put together a programme of observation of topsoil stripping could have been included in the scheme of investigation. This has proved a successful technique for investigating wider landscapes around the foci of settlements and ritual monuments for example at Octagon Farm (this volume) and Biddenham Loop (M Luke pers com).

Case Study 2 – Octagon Farm, Willington

Introduction

There has been a long history of 20th century and early 21st century quarrying between the eastern edge of Bedford and the village of Willington. This case study deals with an area that lies north of Elstow Brook and south of the River Great Ouse. East to west it runs from the foot of Summer House Hill to the former Plantation Quarry. It is centred at TL 0912 5014. There have been several phases of quarrying within this area under more than one planning permission. However, as there was a consistency of approach to evaluation and mitigation and the various developments affect the same archaeological landscape it was felt that it is possible to deal with the area as a single case study.

Octagon Farm covers an area of c.136ha. Although there were a number of quarries in the immediate vicinity it was developed as a new quarry in an open agricultural landscape that was crossed on a south west – north east alignment by the Bedford Southern Bypass. It is located in the River Great Ouse Sands and Gravels AS-A. Topographically it is in the flood plain of the Great Ouse and its tributary the Elstow Brook.

Planning applications for gravel extraction was submitted in 1995 and 2001.

HER Information

The HER contains information on two assets (HERs 1480 and 15009). HER 1480 is an extensive cropmark complex containing a large number of what could be defined as individual sites or monuments. They fall in to two main groups: a Neolithic and Bronze Age ritual landscape and a series of Iron Age and Roman settlements set in an agricultural landscape.

The Neolithic and Bronze Age ritual landscape comprised a range of funerary and ritual monuments. There were numerous ring ditches, mainly simple single ditched monuments but also examples with double and triple ditches. Throughout the site there were also a number of enclosures with a range of rectangular forms and an unusual form described as “paper clip enclosures”. There was also a probable cursus monument. One element of this landscape, on its western edge, had a separate HER record (HER 15009) and comprised a ring ditch and sub-rectangular enclosure. The Iron Age and Roman settlement landscape was characterised by enclosed settlements.

Before the Octagon Farm area was allocated for gravel extraction in the Bedfordshire Minerals and Waste Local Plan and a planning application for the development submitted, the Highways Agency constructed a dual carriageway (Bedford Southern Bypass) across the future quarry. HER information indicated that the Bypass would have a significant impact on the important archaeological remains. The proposed road route crossed a number of features belonging to both main phases known to exist in the Octagon Farm area. To provide information to assess the impact of the proposed road a programme of field evaluation of the route was undertaken in 1991 and 1992 comprising fieldwalking, geophysical survey and trial trenching. This evaluation confirmed the nature

of the archaeological remains first identified from cropmarks. As a result the features belonging to the Neolithic and Bronze Age ritual landscape were deemed to be of national importance and were designated as Scheduled Monuments. Cropmarks also showed an extensive series of palaeochannels across the site representing former courses of both the Great Ouse and Elstow Brook.

The area surrounding Octagon contains archaeological remains from the earliest periods onwards. Finds of Palaeolithic hand axes were made during the 19th century at Summerhouse Hill on the western edge of Octagon Farm.

The complex of Neolithic and Bronze Age ritual features within the Octagon Farm site represents the core of a contemporary landscape that spreads over a much wider area north of the Great Ouse and south of Elstow Brook. These sites include the Cardington causewayed enclosure (HER 585) to the south, a Neolithic rectangular enclosure containing a central burial in Plantation Quarry (HER 15222) to the east and Neolithic henge monuments at Goldington north of the Great Ouse (HER 1905). Distributed throughout the landscape are ring ditches (e.g. HERs 302, 1618 and Dawson 1996).

The Iron Age and Roman settlement landscape is as extensive. It incorporated a series of settlement complexes known from cropmarks containing enclosures, trackways, boundary systems and other features (HERs 302, 585, 985, 1861 and Dawson 1996). The size and complexity of these sites suggests use over long periods and many phases of development.

There is little evidence of Saxon activity in the area around Octagon Farm although Middle Saxon pottery was found during the excavation of some ring ditches to the south east (Dyer 1994).

The medieval period is represented by a number of assets in the area around Octagon Farm. To the east are two moated sites Pump House Moat (HER 768) and Danish Dock, Willington (HER 769). In spite of its name there is no evidence of any Danish connection or remains, all the excavated evidence indicates that it is medieval in date (Edmondson and Mudd 2004). To the north west on the north side of the Great Ouse are two medieval earthwork castles Risinghoe Castle (HER 335) and Howbury Ringwork (HER 3098) both are located to over look the river valley. The villages of Willington (HER 17123) and Cople (HER 17123) are medieval settlements and are likely to have origins in the Saxon period. Other evidence of medieval settlement and activity include the site of a medieval mill at Castle Mill (HER 336), a windmills at Willington (HER 3178) and Renhold (HER 6606), ridge and furrow at Renhold (HER 3325), a short lived Saxo-Norman settlement was excavated at Water End, Renhold (HER 13409 and Timby et al 2007)) and a manorial site at Goldington (HER 14509).

In the early post-medieval period a manor was founded at Willington to the west of Octagon Farm (HER 434), a 16th century dovecote (HER 435) and stables (HER 995) still survive at the site. There are the remains of 18th century parkland at Howbury Hall (HER 7004). Extensive evidence of sand and gravel extraction is known from around Octagon Farm dating from the 18th century onwards (HERs 124, 794, 1358, 3098, 6716-18, 8249, 14769-70). There are three 19th and early 20th century brickworks in the area (HERs 1328, 7200 and 14499) and clay pits (HERs 8114 and 8115). The River Great Ouse was made navigable in the mid 17th century and remains of the navigation can be found in the 19th century staunch at Castle Mill (HER 8016).

The Great Ouse Valley around Bedford has been recognised as a source of nationally important Palaeolithic remains since the mid 19th century. Hand axes associated with faunal remains were found during railway construction at Summer House Hill on the western edge of the area (HER 572). The potential for finding significant Palaeolithic remains within the development site was acknowledged during consideration of the planning applications but it was not thought possible to include the identification of Palaeolithic remains or areas of potential as part of the evaluation process.

Aggregate extraction is covered by two planning permissions, 1995 and 2002, and several phases of evaluation and archaeological investigation. Rather than look at the planning permissions and various phases of archaeological intervention separately in this case study as they are all dealing with the same archaeological landscape each evaluation technique and evaluation strategy will be dealt with across the whole of the quarry area.

The field evaluations and the investigations in advance of construction undertaken for the Bedford Southern Bypass are not considered as part of this case study. Because they occurred before planning permission was sought for aggregate extraction they effectively formed part of the HER background information. However, the results of this work informed the overall strategy for archaeological work at Octagon Farm Quarry. The designation of a number of features as Scheduled Monuments as a result of this work had a significant effect on the management of the archaeological resource within the quarry.

Evaluation

Following the evaluation strategy established for the Southern Bypass that adopted for the Octagon Farm Quarry was multi-staged with each stage informing subsequent ones, though there was some adaptation of the strategy through time as an understanding of the archaeology of the area developed.

Air Photograph Analysis

The evaluation for the 1995 application used the rectified air photograph plots and analysis done for the Bedford Southern Bypass evaluation in 1991 as the basis for identifying features that could be detected from air photographs (Tempus Reparatum 1995, 12). This was done on the basis that there had been no new air photographs taken in the intervening period. This identified and plotted the features described.

In 2001 - 02 the evaluation of the part of the site known as Castle Mill Airfield, the northern part of the Octagon Farm area, also included an assessment of aerial photographic information (Albion Archaeology 2002). This identified a possible pit alignment and the northward extension of an Iron Age and Roman settlement at the eastern edge of the site the southern part of which had been investigated in advance of an earlier phase of quarrying. It also suggested that the northern arc of one of the ring ditches that formed part of a Scheduled Monument located just to the south of the extraction area extended north across the line of a drainage ditch. This put part of the ring ditch outside the Monument's designated constraint area. It had been assumed at

the time the Monument was designated that digging the drainage ditch had destroyed its northern.

Commentary on Air Photograph Analysis

In 1995 use of aerial photograph information was restricted to the reuse plots and analysis derived from the HER and created for another project. This did not enhance the understanding of the proposed development site but formed the basis for mapping the site's archaeological remains as a means of targeting further stages of evaluation. It was also used for locating the Scheduled Monuments in order to define areas for preservation *in situ*.

The 2001-02 evaluation's use of aerial photographs did provide new information. It identified a new feature: the pit alignment. It also identified extensions to existing sites and features. In particular it highlighted a flaw in a designated area that had implications for the definition of a Scheduled Monument and for its management within the quarry.

Fieldwalking

This technique was only used in the 1994 evaluation. The land had not been ploughed for agricultural purposes before fieldwalking to take place. In order to expose sufficient of the topsoil to allow fieldwalking to take place 2m – 3m wide strips were ploughed across the site at 20m intervals aligned on the national grid. The ploughed areas were allowed to weather for between one and two weeks before the fieldwalking. Artefacts were bagged every 20m along each ploughed strip.

A low density scatter of artefacts was found across the site with no significant concentrations. Worked flint was the most numerous artefact class. The assemblage was dominated by debitage: flakes, cores and blades; with very few retouched tools. There was a small Mesolithic – Early Neolithic element to the assemblage with the bulk of it dating to the later Neolithic – Bronze Age.

A very low density scatter of Roman pottery was found in the south west corner of the site. A small quantity of medieval and post-medieval pottery was found distributed across the site with a comparable distribution of late medieval to post-medieval building material.

Commentary on Fieldwalking

Fieldwalking produced very little information which was of no assistance in either identifying new sites and features or characterising sites known from aerial photography. Given the range and extent of sites known from aerial photography it is perhaps surprising that so few worked flints and so little Iron Age and Roman pottery was recovered during the fieldwalking. Although conditions were not ideal during the fieldwalking the results reflected those from the fieldwalking done on the line of the Southern Bypass across the same area.

Geophysical Survey

The 1995 evaluation used a two phased approach to geophysical survey. The whole of the application area was subject to a magnetic susceptibility survey. This was used to target detailed magnetometry over 50% of the area (Bartlett 1995). A number of anomalies were identified comprising pit like features, clusters of pit like features and linear features that were thought to be of archaeological origin. There were also a number of linear trends which were thought to represent cultivation, probably of medieval or later date. It was concluded that the anomalies recorded were likely to be evidence of possible occupation or other activity. However, they did not present coherent or well defined sites or activity areas.

In 2001 a geophysical survey of the northern, Castle Mill, part of the site was undertaken (WYAS 2001). It followed the same strategy as the earlier survey of blanket magnetic susceptibility followed by smaller targeted sample areas of detailed magnetometer. This surveyed confirmed the location of features known from aerial photographs at the eastern end of the site. There was tentative though not conclusive evidence for archaeological features on the western part of the site. There was also evidence extensive modern landscaping next to the river on the northern edge of the site and palaeo-channels were identified across the site.

Subsequently the results of the geophysical survey from the western part of the site were reviewed. It became apparent that the anomalies recorded in that area were likely to indicate the existence of later prehistoric to Roman settlement. A further phase of detailed magnetometry was commissioned in the area and this revealed the remains of a substantial settlement that had never been visible as a cropmark.

Commentary on Geophysical Survey

Magnetic susceptibility survey did identify “hot spots” that warranted detailed magnetometry to provide further information. Over much of the site geophysics confirmed what was known from the cropmark evidence. No substantive new sites or features were identified although, particularly in the southern area, there was evidence of possible occupation between the known cropmark sites. In the north east corner of the site geophysics confirmed the existence and extent of a site known from aerial photographs. However, in the north western part of the site the initial survey did identify a new settlement site. This was not, in the first instance, recognised for what it eventually turned out to be. Although magnetic susceptibility scanning had suggested this was an area of interest the sample magnetometry survey was a relatively small area which made it difficult to interpret the results and recognise the significance of the remains. Subsequent detailed magnetometry over a larger area produced unequivocal evidence that a substantial settlement did exist at this location.

This calls in to question the validity or effectiveness of a staged approach to geophysical survey using blanket magnetic susceptibility scanning followed by targeted blocks of detailed magnetometry. The scanning only provides a broad indication that archaeological remains may exist in an area, detailed magnetometry is required to identify and provide some characterisation of any remains. From the situation that arose in the north west corner of the site it is clear that this process may not provide sufficient

information to be able to identify extensive and substantial remains. Here the importance of a previously unrecognised site only became apparent when magnetometry was undertaken over a large area; in fact the initial small area of magnetometry had been at best equivocal. On this basis it is possible to suggest that where geophysical survey is employed as part of a field evaluation that it is more effective to do detailed magnetometry across the whole of the site rather than a staged approach of scanning and targeted detailed magnetometry. Although the staged approach may appear, in the first instance, to be more cost effective, ultimately the higher level of information provided by blanket detailed magnetometry is much more effective in providing information about the location, extent and character of potential archaeological remains which can be used in targeting further, intrusive evaluation and in the development of a management strategy for the archaeological remains. It provides greater certainty about the archaeological resource which is of benefit to both the mineral operators and archaeologists.

Trial Trenches

In the 1995 evaluation a series of trial trenches were excavated. They were between 1.8m and 2m in width and a variety of lengths but generally between 20m and 50m. They were targeted on features identified by earlier stages of the evaluation and in areas apparently devoid of archaeological features.

Extensive alluvial deposits associated with palaeo-channels were identified in the trial trenches. There was no evidence that the alluvium masked any archaeological features or deposits.

The trenches produced Mesolithic – Early Neolithic worked flints comparable to the finds made in the fieldwalking. None of them came from stratified deposits. A number of scattered Neolithic - Bronze Age pits were identified in the trenches along with a number of undated pits that were probably contemporary.

The most substantial find was a small ring ditch found in a trench located to investigate anomalies found in the magnetometer survey. The trial trench was expanded to ensure the remains could be fully characterised. There was evidence for an internal mound or bank associated with the ring ditch. The ditch of the ring ditch silted up and was refurbished by the construction of a timber palisade along its line. The ring ditch and palisade were not dated but they were cut by pits containing Beaker material. It was thought that the pits could also represent ritual activity focused on the ring ditch. The monument was identified as belonging to the wider Neolithic and Bronze funerary and ritual landscape that is known to exist in the Octagon Farm area.

The trial trenching found only a few Iron Age and Roman features. A droveway known from cropmark evidence was identified and a small scatter of pits. The remains of ridge and furrow from the medieval period were found in the trenches, confirming the evidence of the geophysical survey.

At the Castle Mill part of the site trial trenching was also used. The trenches were targeted on features identified from cropmarks, geophysical anomalies and apparently blank areas. Further contingency trenching was excavated during the evaluation to

provide additional information on features found in the initial trenching. The trenches were all 2.4 wide and 30m or 50m long except for one square trench measuring 10m by 10m.

An extensive network of palaeo-channels were identified across the site. This was seen as showing that the site was once largely covered by water or marshland with islands of gravel between the watercourses or wet areas.

The dryer land in a generally wet environment represented by the gravels islands had been a focus of settlement from the Early Iron Age to the Roman period. An Early to Middle Iron Age settlement was identified on one of the gravel islands to the western part of the area. It was represented by ditches, pits and post holes. This was the site that required additional magnetometer survey to identify and define it (see above). A later Iron Age – Roman settlement was identified at the eastern end of the area, this was an extension of a settlement that had been partially excavated during an earlier phase of quarrying.

One trench was specifically located to investigate whether a ring ditch which formed part of a Scheduled Monument lying to the south of the ditch which forms the southern boundary of the Castle Mill part of the site actually extended to the north of the ditch as suggested by cropmark evidence. This trench did find remains of the northern arc of the ring ditch in question showing that it did survive north of the drainage ditch and beyond the designated area of the Scheduled Monument.

Commentary on Trial Trenches

Trial excavation was an effective means of characterising the archaeological resource at Octagon Farm. It generally confirmed the nature of the archaeological resource as identified through aerial photography and geophysical survey both where sites and features had been identified and areas that were largely blank or contained low density spreads of features. In some cases, as in that of the newly discovered ring ditch in the southern part of the site, trenching was good at characterising otherwise enigmatic geophysics anomalies.

Mitigation

Aggregate extraction at Octagon Farm was clearly going to have a significant impact on nationally and regionally important archaeological remains. This was recognised from the very outset in the Minerals Local Plan that allocated the land for development. This Plan took in to account the fact that the land contained Scheduled Monuments when the site was allocated. It said that the Scheduled Monuments had to be preserved *in situ* within any quarries that were permitted.

This had the consequence that the Scheduled Monuments were excluded from the evaluation as they were going to be preserved. It also dictated part of the mitigation strategy. The evaluations indicated that other important archaeological remains would be adversely affected by the development. In order to secure appropriate mitigation for those remains that were not preserved *in situ* conditions were included in the various

planning consents that required the investigation or management of the archaeological resource.

The overall mitigation strategy had three main elements:

- The preservation of nationally important remains *in situ* within the development.
- Investigation of archaeological remains that were not preserved *in situ*.
- A programme of observation and investigation aimed at identifying and recording Palaeolithic remains within the gravel deposits themselves.

The post-excavation analysis and publication of the investigations are currently in progress so it is not possible to base the description of the mitigation or an assessment of it on published results. This part of the case study is based on observations made during the monitoring of the mitigation works on behalf of the Minerals Planning Authority.

Preservation *In Situ*

Following the policy in the Minerals Local Plan the Scheduled Monuments were excluded from the area of permitted mineral extraction. The ring ditch identified during the evaluation in the southern part of the site which is part of the Neolithic and Bronze Age funerary and ritual landscape which to which all the other Scheduled Monuments belonged was also preserved *in situ*. Although they were excluded from extraction they were all wholly within the quarry. It was agreed that there would be a 10m stand off from the outer edge of the scheduled area. This line was surveyed in by an archaeological contractor and the protected area was fenced off to prevent accidental incursion in to them.

The result of this process was that the Monuments were preserved as islands of archaeology within the quarry. Mineral extraction took place all round the preserved monuments leaving them standing proud of the reduced ground level, a depth of several metres. Parts of the site were restored back to the original ground level around the preserved monuments by importing inert waste capped with topsoil and ultimately reverted to an agricultural land use as the land had been prior to mineral extraction. In other parts of site the restoration was to areas of lakes with biodiversity objectives. In these areas the monuments were left exposed as islands with no additional protection for the exposed faces of the islands. No evidence recovered during the evaluation suggested that any of these sites contained waterlogged deposits so the preservation of the sites on islands of gravels was not perceived as being likely to cause problems through dewatering.

Commentary Preservation *In Situ*

The preservation of nationally important designated archaeological remains conformed to the local and national planning policy and guidance in operation at the time of the planning permissions. Given their locations within an area allocated and then permitted for mineral extraction it was inevitable that the monuments would end up as islands of archaeology within former quarries.

No monitoring of the Monuments has taken place to assess how effective preservation has been but a number of issues about the process should be considered. Because preservation conformed to planning policy and followed the precedent of preserving the monuments set by the design of the Southern Bypass, this is not the place to consider whether preservation was the right mitigation strategy to adopt.

One of the issues that did come to light through the process of archaeological evaluation and investigation at Octagon Farm was the problem of accurately locating the Monuments that were to be preserved. The extent and location of the scheduled areas were defined on the basis of plotting aerial photographic information. When the location of features plotted from this source was tested through geophysical survey and excavation it was clear that there were inaccuracies in the location of sites and features, often up to a 10m discrepancy. Because none of the preserved monuments were included in the evaluation the only information available on which to basis the definition of the protected areas was that derived from cropmarks or the limited evaluation undertaken for the Southern Bypass. This must leave some doubt about whether the location of the preserved areas actually coincides with real location of the Monuments. As the standoff around the protected area was 10m, a 10m discrepancy in the location of the monument in relation to the preserved area could mean that the archaeological remains are located far closer to the edge of the preserved area than is desirable. However, there is no evidence from the programme of archaeological observation and investigation undertaken during quarrying that the preserved areas were so inaccurately located that the nationally important remains extended beyond the limits of the preserved undisturbed within the quarry.

The Monuments that are now in areas restored to agriculture have been placed back in an environment where no further erosion can take place so the impact of erosion on the edges of the gravel islands will be restricted to the period between mineral extraction and restoration a matter of a few years. On the observed evidence this was relatively small and should not have affected the archaeological remains. The material imported to restore the ground level was inert waste and so should not have changed the chemical and hydrological environment of the Monuments sufficiently to have a detrimental impact, although there is no monitoring evidence to confirm this. By restoring the land to agricultural use the protected monuments are being subject to erosion through agricultural activity in much the same way as they were before quarrying. Although this is allowed under the 1979 Ancient Monuments Act and was in part dictated by other policies in the Minerals Local Plan it may represent a missed opportunity to have sought additional benefit or planning gain by taking the monuments out of cultivation and putting them in to a more sympathetic management regime.

The monuments protected as islands in areas of lakes and scrapes designed to enhance habitats and biodiversity interest are potentially at greater risk of erosion in the long term with the sides of the islands exposed to the elements and therefore, subject to erosion.

Archaeological Investigation

Where archaeological remains were not preserved *in situ* within the development the mitigation strategy was for them to be investigated and recorded in advance of development. There were two parts to this programme:

- Open area excavation on sites and features identified through the evaluation of the site.
- A programme of observation of topsoil stripping and investigation of any sites and features that were encountered in this process.

The open area excavation was concentrated in the northern part of the site where an Early to Middle Iron Age settlement and a later Iron Age and Roman settlement were fully excavated.

Top soil stripping over the rest of the site was not subject to continuous observation but regular visits by project archaeologists to inspect areas as they were stripped. This produced a number of sites and features: several small ring ditches, burial pits and linears belonging to a Bronze Age field system. It did not reveal any substantial features or sites that had been missed by the evaluation and a number of the features that were found would have been difficult to detect consistently in an evaluation.

Commentary on Archaeological Investigation

The open area excavation of the most substantial sites was a straight forward piece of mitigation. The full extent of the two settlements were investigated and these largely fulfilled the expectation of what they would be from the evaluation.

The observation of topsoil stripping was successful in that it allowed the investigation and recording of features that had not identified in the evaluation and of landscape scale features such as a Bronze Age field system. Although an archaeological presence on site was not continuous it worked as a process because of local circumstances. The archaeological contractor and quarry staff developed a good working relationship over a number of years which allowed for the effective communication of the requirements of archaeologically sensitive topsoil stripping. With experienced machine drivers site stripping to the right level for the observation of archaeological remains could be achieved without continuous archaeological presence. This was aided by the geological conditions which meant that the needs of the archaeology and quarry usually coincided in terms of the depth of material to be removed. As a model for dealing with large areas of low density but important archaeological remains which provided the context for nationally and regionally important remains this approach proved both cost-effective and efficient. However, it does require the conjunction of a number of factors to succeed which may not exist on all occasions and could be difficult express or secure through a Brief or Written Scheme of Investigation.

The Palaeolithic

It was decided to deal with the Palaeolithic through the post-planning consent scheme of investigation and a specification was produced to cover this particular aspect of the investigation (Phoenix Consulting 2001). The aims of the investigation were to identify and record finds of Palaeolithic artefacts and faunal and other environmental remains within the gravels at Octagon Farm and their context. The method identified for achieving this was regular visits by suitably experienced specialists to observe and record quarry faces and bases in order to identify the contexts likely to contain Palaeolithic material, particularly *in situ* remains. Spoil heaps were also scanned to try and find artefacts and faunal remains.

This programme of work was carried out during the life of the quarry. It did not record any Palaeolithic artefacts and though some faunal remains were found they were not in substantial or *in situ* deposits. Nor were any gravel deposits that were considered to have the potential to produce *in situ* deposits observed.

Commentary on the Palaeolithic

The programme of Palaeolithic investigation was not successful in identifying Palaeolithic finds or *in situ* sites. Because of the difficulty of evaluating the site for Palaeolithic remains there was no specific information available to direct or target the investigation strategy. Trying to identify Palaeolithic deposits from finds of artefacts or faunal remains during periodic visits to the site is in part a matter of luck and it can be difficult to tie the finds back to their context. Greater understanding of the geological context and more input from geologists would appear to be a way forward to improving the identification and recording of Palaeolithic remains in quarries. Increasing the pool of archaeologists with the appropriate skills to be able to identify Pleistocene deposits would also improve the .

Assessment of Mitigation Strategy

It was clear from the outset that mineral extraction at Octagon Farm would have a significant impact on archaeological remains of national and regional importance. It was also clear that decision making could not be based on HER information alone so additional information would be required from field evaluation.

The field evaluation strategy built on that devised in response to the building of the Bedford Southern Bypass and involved the deployment of a range of techniques in sequence to identify and characterise the site's archaeological resource. The broad strategy was used over the whole quarry although it was modified in later work in the light of earlier experience. The evaluation was successful in identifying archaeological remains. Cropmarks provided the core HER information, identifying a range of prehistoric and Roman sites and features. In this case further evaluation in the field did identify two substantial sites that were not visible as cropmarks, but otherwise confirmed the cropmark information.

The value of a two staged approach to geophysical survey can be questioned. Magnetic susceptibility scanning did identify hot spots but provided little useful interpretative information which had to be supplied by detailed magnetometry. In at least one instance the scanning did identify what eventually turned out to be a large Early to Middle Iron Age settlement but without sufficient clarity so that the significance of the site was not fully appreciated and only became apparent when the initial results were reviewed and further detailed geophysical survey was undertaken. This suggests that magnetic susceptibility scanning should be dispensed with and the geophysical survey should concentrate on detailed magnetometry over the whole site as a way of both identifying sites and features and providing a basic level of characterisation.

Fieldwalking did not provide any significant information on either the location of sites or activity that may only exist as distributions of artefacts in the plough zone. This does not invalidate the technique as the results reflect the composition of the archaeological resource of the site.

Trial trenching done at a densities of between 2% and 4% were largely effective in characterising the remains identified by other techniques and confirming that areas that did not appear to contain archaeological remains were indeed largely blank.

The extent of quarrying was dictated by archaeological remains because of the need to preserve nationally important remains undisturbed. This was dictated by national designation and national and local planning policy and resulted in islands of archaeology being preserved within the quarry. The issue of the accuracy of locational information and translating that into physical areas of preservation as been discussed above. Where cropmarks provide the basic information for defining areas for preservation *in situ* there needs to be confirmation of the location on the ground either through geophysical survey or trial trenching. The effectiveness of preserving archaeological remains as islands has not been confirmed, a programme of monitoring is required to ensure that the remains have not been damaged in the process.

The programme of investigation and recording was effective. The largest and most complex sites were subject to open area excavation which provided the opportunity to record the remains fully within an adequate research framework. The observation and recording of the rest of the quarry did allow the investigation of features that were not, nor were likely to be, detected in the evaluation. This helped to confirm the effectiveness of the evaluation as no substantial sites were identified during this process. It also provided information that helped to fill in the landscape context for the sites that were preserved *in situ* and for the larger excavated ones.

The programme of observation and recording Palaeolithic remains did not produce significant results and there is no control to enable the assessment of whether this was because there were no remains to find or the strategy was at fault and they were missed. Further consideration needs to be given to the possibility of examining the potential for Palaeolithic remains as part of the evaluation process; this is likely to focus on developing a better understanding of the geology of the gravels in order to identify contexts that have the potential to contain important remains. This might allow resources to be concentrated on those areas during quarrying. A programme of observation during the quarrying may also need to concentrate more on the geological context in order to identify potential for the survival of Palaeolithic archaeological remains. Achieving this may need greater integration of specialist geological input in to the project.

Case Study 3 – Ivel Farm/Warren Villas Quarries

Introduction

The Warren Villas and Ivel Farm quarries occupy immediately adjoining sites on the west bank of the River Ivel between Biggleswade and Sandy in eastern Bedfordshire. They were quarried under separate planning permissions between 1988 and 1998 with Warren Villas being developed first followed by Ivel Farm. Exploiting the same mineral resource their impact was on part of a wider archaeological landscape that has been recognised in the Ivel Valley. Treating the two quarries as part of one case study allows the examination of the impact of quarrying on a large area of the archaeological landscape and to explore the development of evaluation and mitigation strategies for that landscape over time.

Warren Villas and Ivel Farm quarries cover an area of c.80ha and is centred at TL 1828 4669. It is located in the Ivel Valley Aggregate Study Sub Area. Topographically the quarries are in the floodplain of the River Ivel where it cuts through the Greensand Ridge.

A planning application for Warren Villas was submitted in 1988 and one for Ivel Farm in 1998 when the mineral resource at Warren Villas was running out so that there could continuity of aggregate supply in the area and in the use of the processing plant site established at Warren Villas. Both quarries were created in open agricultural land.

HER Information

There were two assets recorded for the area of Warren Villas Quarry (see Appendix 3). A group of cropmarks (HER 3527) which on morphological grounds probably dated to the Iron Age and/or Roman periods and represented settlement and associated field systems. The cropmarks also included a feature consisting of two concentric circles probably representing a Neolithic or Bronze Age ritual or funerary monument. The other asset was a series of earthworks identified as a water management system associated with the River Ivel (HER 9835). It was undated but likely to be post-medieval in origin.

Ivel Farm has four assets recorded in the HER (see Appendix 3). There were two groups of cropmarks (HER 1814 and 13974) comprising a series of enclosures, linear features and field systems probably representing Iron Age and Roman settlements and associated agricultural landscape. A single, undated gold coin was found at the northern end of the site (HER 16189). Manor Farm, on the northern edge of the site has been recorded from the mid 19th century, it is possible that the name derived from a medieval manor on or near the site (HER 2985).

The archaeological context for both quarries was the same. The earliest evidence for human activity in the immediate area is in the form of finds of Mesolithic flint artefacts on the Greensand Ridge to the north east (HER 1165).

There is extensive evidence for Neolithic and Bronze Age funerary and ritual use of the landscape. A Neolithic oval barrow is known from south of New Road, Sandy (HER

1495). On the east side of the River Ivel a cursus is known from cropmarks (HER 644) with ring ditches clustered around its ends (HER 10138). There is another group of ring ditches at New Road (HER 1495), possibly representing a dispersed barrow cemetery

There are a number of cropmark sites throughout this part of the Ivel Valley including a range of enclosures, linear features and trackways and field systems. They were generally undated but probably belong to the Iron Age and Roman periods. There are three Iron Age hillforts on the Greensand Ridge to the north east of the Warren Villas – Ivel Farm: Galley Hill (HER 445), Caesar's Camp (HER 442) and Sandy Lodge (HER 1164).

The Roman landscape is dominated by the small town at Sandy to the north (HER 444 and Bedfordshire County Council 2003). A Roman road running from Baldock to Godmanchester via Sandy (HER 505) is on the east side of the River Ivel.

There is little evidence for Saxon occupation in the area surrounding the quarries except for excavated remains of late Saxon occupation at New Road (HER 1495). Other than a moated site known from cropmarks (HER 1495), there was also little evidence for the medieval and early post-medieval periods in the immediate area. The River Ivel was made navigable in the 18th century as the Ivel Navigation, continuing in use to the mid 19th century. Remains in the area include locks (HER 15297) and wharfage (HER 15181).

Warren Villas Mitigation

An application for planning permission for mineral extraction at Warren Villas was submitted in 1988. The archaeological sensitivity of the application area was identified from HER information. The cropmarks (HER 3527) were said to represent a late prehistoric or early Roman farming settlement and the double ring ditch to be of Neolithic date (Bedfordshire County Council 1989).

It was recommended that the double ring ditch should be excluded from the extraction area. The quarry boundary was duly amended to remove this monument from the quarry area. The subsequent permission included a condition requiring access for archaeological monitoring of topsoil stripping and salvage excavation if required. A subsequent permission for a westward extension of the quarry in 1990 contained conditions requiring the continuation of the mitigation strategy.

A routine visit undertaken by Bedfordshire County Council staff as a consequence of the planning condition in 1989 identified a series of features on the west bank of the River Ivel that contained well preserved wooden remains including hurdles. The identification of these, unexpected, features led to a review of the archaeological mitigation strategy. It was decided that the exposed waterlogged features would be excavated and the rest of the most sensitive areas would be excluded from the quarry with a strategy of maintaining water levels in order to preserve the waterlogged deposits. The remainder of the archaeological features would be excavated in advance of mineral extraction. As part of this process a ground penetrating radar survey of the quarry was commissioned. No report on this survey seems to exist but it appears from file notes (HER 3527) that it did identify an extensive distribution of archaeological features.

The excavation revealed a complex sequence of occupation and activity in the area dating from the Mesolithic to the post-medieval period (Dawson and Maull 1996). The Mesolithic was represented by dispersed spreads of lithic material across the site. Several truncated pits contained Neolithic pottery and lithic material. In the early Bronze Age a penannular ditch described as a “possible funerary monument” (Dawson and Maull 1996, 61) was found on the eastern edge of the excavated area. A pit and some post holes may have been associated with this monument.

Occupation of the area intensified in the Iron Age with the development of a settlement based on a large enclosure with drainage ditches, pits, post holes and post built timber structures. To the south of the settlement small rectangular fields were established, plough marks cut into the subsoil were found within these enclosures.

A farmstead was established at the site in the Roman period set in a landscape of small fields. The settlement seems to have been occupied throughout the Roman period. The enclosure contained remains of structures and rubbish pits. A number of burials were found associated with the enclosed settlement including a small inhumation cemetery. A kiln was found just beyond the northern edge of the settlement.

The site was abandoned at the end of the Roman period. A small number of pits and post holes suggest limited short term activity in the area in the Mid Saxon period, a prelude to more extensive activity on the Saxo-Norman period. In this period settlement was re-established at the site. It took the form of a small farm comprising post built structures and a range of other features. The features containing waterlogged wood remains belong to this phase of activity. A date range in late 11th century and early 12th century was provided by dendrochronology. The scale of occupation declined throughout the medieval period largely representing remains of agricultural activity. The final archaeologically identified phase of activity were remains created by the construction of the Ivel Navigation in the 18th century.

Although investigation was the main means of mitigating the impact of quarrying the archaeology of Warren Villas parts of the site were preserved *in situ*. The double ring ditch was preserved by excluding it from the extraction area before quarrying began. Some of the area of waterlogged deposits was preserved after discovery. An area on the southern edge of the main area of Iron Age and Roman settlement was identified during topsoil stripping adjacent to the haul road; it contained dense archaeological remains. After discussion with quarry company it was agreed that this area would be preserved *in situ* by replacing any material that had been removed and excluding the area from extraction.

Commentary on Warren Villas Mitigation Strategy

Planning permission at Warren Villas was granted before PPG 16 had been published. The response was typical of its time and the context of the contemporary planning framework in that a decision on the planning application was made on the basis of HER information alone and there was no attempt to acquire more detailed information to inform the decision making process or the development of a mitigation strategy. The planning consent required access to observe and record archaeological remains as they

were revealed. An innovative aspect of the consent was the exclusion of some features from the extraction in order to preserve them undisturbed.

A consequence of the decision making process was that there was no clear understanding of the nature and extent of the archaeological remains that would be affected by quarrying before work began. It was only understood that the site was likely to contain remains of Iron Age and Roman settlement and that the remains were likely to be more extensive than was apparent from the cropmarks. There was not provision for an approved scheme of investigation before development began so the archaeological response was of necessity *ad hoc* developed as features were identified when they were observed during sporadic visits to the site.

The strategy of allowing archaeologists access to the site to observe topsoil stripping was effective in that it did allow the identification of features containing waterlogged wood. However at that point there was no structure in place for dealing with the consequences of the find; this had to be developed rapidly. The result was a revision to the way the archaeology of the quarry was dealt with. Some of what were deemed the most significant remains were preserved *in situ* within the quarry and a more structures programme of investigation was put in place for the other archaeological remains.

The revised investigation strategy appears to have been effective as the main concentrations of archaeological remains, representing a range of occupation, settlement and other activity over several millennia were identified and investigated. Although an interim statement of the results was published soon after fieldwork finished (Dawson and Maull 1996) the site has never been fully published. This is a reflection of the circumstances of the discovery of the remains dictated by the parameters of the planning context of the time and the lack of an appropriate funding structure for the investigation which did not include an adequate element for post-excavation analysis and publication from the outset, and which could not be secured after the event from any of the partners in the project.

Part of the mitigation strategy involved preserving remains *in situ*. The double ring ditch was identified from the start as being worthy of preservation, although this was solely on the basis of air photograph information without the character and state of preservation of the monument being tested by evaluation, particularly trial trenching. Other parts of the site were preserved after they had been identified during the investigation. This is not ideal as it involved at least partial exposure of the remains before the decision to preserve could be made. Such exposure undoubtedly leads to detrimental changes in the depositional environment of the remains, accelerating their decay. While the subsequent protection of the remains will retard this process some damage, at least, will have occurred. There was no provision for monitoring the preserved remains so we do not know how effective the preservation strategy has been.

Ivel Farm Evaluation

When the mineral operator at Warren Villas was exploring the possibility of extending its operations around the existing quarry they commissioned an archaeological desk-based assessment of the area (OAA 1993). This was updated in 1997 (Guildhouse Consultancy 1997) and concentrated on the land to the south of Warren Villas quarry.

The Assessment also contained an air photograph assessment (APS 1997). These documents formed the basis of discussions with the Minerals Planning Authority where it was established that archaeology would be a significant constraint on the development of a quarry to the south of Warren Villas and that any planning application for such a development would have to be accompanied by additional information on the site's archaeology. This conformed to Minerals Local Plan policy and the guidance in PPG 16 *Archaeology and Planning*. An evaluation strategy of fieldwalking followed by trial trenching was identified as appropriate.

Desk-Based Assessment

The 1993 (OAA 1993) desk-based assessment covers the Ivel Valley between Biggleswade and Sandy, concentrating on the area between the west bank of the Ivel and the A1 road. It describes the geological and topographical background to the area. It also reviews the archaeological information for the study area and its wider context, although there is no comprehensive presentation of information from the wider area. There is also a consideration of how archaeological information has been acquired.

The document draws a number of conclusions. It identifies two main geomorphological zones important to archaeology: the alluvial central floodplain and the adjacent gravel terraces. It suggests that archaeological remains have been identified through two main sources: aerial photography and field observation by archaeologists and that aerial photography are the main source of information. Cropmarks are seen as being relatively comprehensive for the gravel terraces but it is acknowledged that further sites exist that had not yet have been identified. It is noted that information from the floodplain is lacking except where there have been interventions as a result of modern development.

The cropmarks were said mainly to represent Iron Age and Roman settlement and could be used as the basis for proposing a settlement model for those periods. Settlement extends longitudinally right along the river valley with weak foci shifting frequently through time; this may have the effect of making settlement appearing continuous along the valley. Transversely across the valley Iron Age and Roman settlement is concentrated on the inner edge of the gravel terrace with field systems beyond them further away from the river. Industrial and other specialist activities are located closer to the river. Neolithic and Bronze Age funerary and ritual monuments can also be identified as cropmarks and may occur in loose cemetery groups; they may occur in the floodplain and be masked.

It was noted that certain classes of sites or periods are unlikely to be represented by cropmarks and therefore could be difficult to detect. These included Neolithic, Bronze Age and Saxon settlements. It was also noted that the accumulation of alluvium in the floodplain may mask important sites belonging to any period from the latest Upper Palaeolithic onwards.

The 1997 desk-based assessment (Guildhouse Consultancy 1997) updated the 1993 document with newly recorded sites from the HER and the interim publication of Warren Villas (Dawson and Maull 1996). This confirmed and expanded upon the main conclusions of the 1993 assessment but did not substantially alter them. A programme of fieldwalking and trial trenching was identified as an appropriate strategy for evaluating

the site in order to provide information on the archaeology of the application to accompany a planning application.

Commentary on Desk-Based Assessment

The main value of the desk-based assessments particularly that from 1993, was that archaeological information derived from the HER was put into the context provided by the excavations at Warren Villas and the geology and topography of the Ivel Valley. This helped to provide an understanding of the way archaeological sites and features had been identified and where in the landscape they might be expected to occur. It also looked at the relationship between settlements and other parts of the landscape and types of human activity. This provided a predictive model that could be used to identify potentially archaeologically sensitive areas where sites and features might be expected to occur which would be helpful in developing an evaluation strategy and understanding its results. The assessment was also clear that there was a high potential that known sites were more complex than appeared on the basis of HER information and that there was also a strong likelihood that other sites and features existed within the propose quarry that were not detectable through aerial photography or chance finds.

Aerial Photograph Assessment

The aerial photographic assessment (APS 1997) was included in the 1997 desk-based assessment (Guildhouse Consultancy 1997) but is dealt with separately as part of this case study.

In the Ivel Farm area the cropmark complex recorded in the HER (13974) was plotted in detail. This provided greater accuracy and a clearer understanding of the nature of the cropmark but did not extend its area or the range of features present within it. The cropmarks comprised a small curvilinear enclosure and parts of a system of tracks and rectilinear enclosures. Extensive deposits of alluvium or deep soil could have masked parts of this site. It was suggested that these features may date from the Iron Age and/or Roman periods. The alluvial deposits were extensive and showed a former water course running north – south in the western part of the site. A parallel was drawn with a palaeochannel identified in the excavations at Warren Farm and it was suggested that they may be part of the same channel. There were also spreads of alluvium closer to the west bank of the Ivel on the eastern part of the site. In the north west corner of the site areas of former quarrying were identified close to the A1. No date was suggested for the quarrying but it was thought that it was likely to be hand dug.

Commentary on Aerial Photograph Assessment

In terms of adding to our understanding of the archaeological features known from aerial photography this assessment only confirmed what was known from information contained in the HER. It also provided a rectified plot of the cropmarks. The additional information it produced was about the extent of the alluvial deposits and their possible relationship to channels observed elsewhere in the area and the existence of earlier quarrying at the site.

Fieldwalking

A programme of fieldwalking was carried out at Ivel Farm in January 1998 (Guildhouse Consultancy 1998). The survey was carried out using transects 20m apart aligned on the National Grid with the finds bagged every 20m along each transect. A band 2m wide was examined along each transect giving a 10% sample of the whole area. Surface visibility was recorded as good during the survey.

The fieldwalking produced very few finds that date before the 18th century. These included seven worked flints (six flakes and one end scraper), three sherds of Late Iron Age/Roman pottery, two sherds of undated though possibly Roman pottery and three sherds of medieval ceramic building material.

For the post-medieval period there were sixty two pieces of ceramic building material and three hundred and seventy six sherds of pottery and a few other finds such as clay pipe and glass.

No significant distributions could be identified in the distribution of these finds, although it was noted that most of the finds came from the gravel terrace in the centre of the site. The lack of material dating from the late Iron Age and Roman periods from the area of the cropmarks was noted.

Commentary on Fieldwalking

Fieldwalking contributed very little to the understanding of the archaeology of Ivel Farm. It did not provide any information that would aid interpretation of the cropmarks, identify activity that might not be visible the air photograph evidence or identify possible targets for trial trenching.

Trial Trenching

Two phases of trial trenching were undertaken at Ivel Farm as part of the pre-determination evaluation of the site (BCAS 1998a and BCAS 1998b). A total of fifty trenches were excavated, they were two metres wide and either fifty metres or twenty five metres long.

A range of archaeological periods from several different periods were identified as well as natural features significant to understanding the use of the landscape:

Natural features – Palaeochannels were identified in a number of trenches on the eastern side of the site (BCAS 1998b, Fig 19). They occurred either in the modern floodplain or cutting through the gravel terrace. A variety of subsoils, described as overbank alluvium were found, they both sealed and were cut by archaeological features. To the north and east of the site peat deposits were found associated with palaeochannels.

Late Mesolithic to Early Bronze Age – A number of unstratified flints were found in the central part of the site. They could represent a focus of activity but the evidence was dispersed and inconclusive.

Early to Middle Iron Age – A concentration of pits and ditches of this period were found on the western part of the site. It was suggested that they represented a settlement.

Late Iron Age to Roman – This period produced the bulk of the features found during trial trenching. They were located in the centre of the site and correlated with the cropmarks. They were generally aligned on a north-south axis and were confined to the gravel terrace bounded by palaeochannels. Settlement features were concentrated in the centre of the site with extensive linear boundaries representing trackways and fields to the south. Late Iron Age features were dispersed throughout the whole site and Roman activity was concentrated in the middle of the site. Roman settlement continued into the 3rd century AD.

Recent Activity – Extensive recent quarrying was identified in the north western part of the site, confirming the results of the Aerial Photographic Assessment.

Commentary on Trial Trenching

Trial trenching was successful in identifying and characterising the archaeological remains that existed at Ivel Farm. To a large extent they confirmed the information that existed prior to the trenching, particularly that from the air photograph assessment. It clarified the nature and extent of the archaeological features across the site and located some features which did not appear as cropmarks, extending the areas of archaeological interest. Further information on natural deposits such as palaeochannels and alluvial deposits was provided as well as the identification of previously unrecognised peat deposits. In the north western part of the site areas of recent quarrying were found which would have removed all evidence of archaeology. Areas that did not contain archaeological remains were also identified, especially in the south eastern corner of the site. It was noted that where cropmark features were found in the trial trenches there was often a discrepancy between the location predicted by the air photograph plots and the actual location on the ground. The difference in location was frequently between five and ten metres.

The evaluation made it possible to identify core areas of archaeological remains based on evidence of settlement and what were described as “subsidiary areas” that contained more dispersed features identified as belonging to field systems (BCAS 1998, Fig 20).

Mitigation at Ivel Farm

The evaluation demonstrated that Ivel Farm contained important archaeological remains of regional significance. It was decided that none of the remains were of sufficient merit to warrant preservation *in situ* but that a programme of archaeological investigation would provide adequate mitigation for the impact of mineral extraction on them. This

was secured by including a condition based on paragraph 30 of PPG 16 in the planning consent for the quarry.

On the basis of the results of the evaluation (BCAS 1998b) a programme of investigation was developed. It comprised three levels of investigation:

- A low level watching brief in areas of low archaeological potential.
- An intensive watching brief in areas known to contain a low density of archaeological features.
- Open area excavation in the core areas of densest archaeological features as defined in the evaluation.

The evaluation had identified a series of palaeochannels, peat and alluvial deposits indicating that Ivel Farm had substantial potential to produce important environmental information. However, it was difficult to define that potential because the results of previous environmental sampling, particularly at Warren Villas, were not available. In order to provide a framework for environmental sampling and analysis at Ivel Farm that did not duplicate work already done at Warren Villas at the same time as building on that work and addressing new or significant research questions the mineral operator commissioned a review of the existing environmental evidence for the middle Ivel Valley. This document *Middle Ivel Valley Environmental "Benchmark" Documentation* (Guildhouse Consultancy 2001) was accepted by the Minerals Planning Authority as the basis for environmental sampling at Ivel Farm and informed the investigation strategy.

An area of about eleven hectares was investigated using the various methods outlined above. The results can be summarised as:

Neolithic – Two large pits associated with a cluster of smaller pits and an isolated pit on the north eastern part of the site.

Early Bronze Age – A single pit containing Beaker pottery also in the north eastern part of the site.

Late Bronze Age to Middle Iron Age – Clusters of pits and other features including a possible structural slot at three discrete locations across the site.

Late Iron Age to Early Roman – Ditched enclosures with some pits, gullies and structural remains. There were also two small groups of cremations, an isolated cremation and inhumation. These features were mainly concentrated in the centre of the site.

Roman – A series of rectilinear enclosures in the centre of the site originating in the Late Iron Age and continuing in to the 2nd or 3rd centuries AD. Associated with a series of other features including pits, ditches, gullies and post holes.

Saxon – A total of six sunken feature buildings associated with pits all in the western part of the site.

Medieval – Possible furrows were found.

Post-medieval to modern – Boundary ditches and drainage dykes found across the site.

An area in the centre of the site identified as the part of the core area of Iron Age and Roman settlement was ultimately not excavated because it was found that the mineral resource in that area was minimal and the cost of archaeological investigation would be far greater than the value of the mineral beneath it. Although some of the archaeological remains around the edge of the settlement were investigated before the decision to leave it undisturbed within the quarry was made the bulk of the settlement remains *in situ* with its integrity intact. There was no evidence that it contained any waterlogged remains so de-watering was not identified as a problem.

Commentary on Mitigation at Ivel Farm

The investigation strategy at Ivel Farm was successful in identifying and investigating archaeological remains that would be destroyed by mineral extraction. Although areas identified in the evaluation were targeted because the whole site was subject to some form of observation during topsoil stripping, except in areas where the evaluation had shown no remains survived or existed, remains outside the core or subsidiary areas were identified and investigated.

Assessment of Mitigation Strategy

There is a very distinct contrast between Warren Villas and Ivel Farm, between an application dealt with in a pre-PPG 16 context (Warren Villas) and the other dealt with following the guidance in PPG 16 (Ivel Farm).

As was typical before PPG 16 the planning decision was taken on the basis of information contained in the HER, the mitigation strategy was developed on the same basis. At one level this information was sufficient to identify a feature that should be preserved *in situ*. However, generally the HER information was a poor indicator of the site's archaeological resource, under representing the range of both date and type of remains present at the site as well as its extent and complexity. Undoubtedly if it had been possible to undertake an evaluation as part of the planning application process much more of the true character of the archaeology of Warren Villas would have been revealed and this would have informed the decision making process and management of the impact of the development.

Once the boundary of the quarry had been amended to exclude a ring ditch the basic mitigation strategy was investigation of the archaeological remains based on sporadic visits to the quarry during stripping – a watching brief. This was not an unusual response in the context of the time. What it meant, though, was that when extensive, substantial and unexpected remains were identified during the watching brief there was no investigation strategy in place or adequately resourced to deal with the evolving situation. One result of this was that two areas of the site were set aside for preservation *in situ* but only after they had been exposed, at least in part, through topsoil stripping. This certainly compromised the integrity of the remains and must call in to question the quality of preservation that could be achieved.

If a pre-determination evaluation had been done it is to be expected that the potential for well preserved waterlogged material would have been identified as well as the extent and complexity of the site's archaeology. This would have made it possible to decide if the waterlogged remains were of sufficient merit to require preservation before they were comprised by partial exposure. It would also have been possible to put together a comprehensive investigation policy from the outset rather than develop one as quarrying progressed, which of necessity was *ad hoc* in nature. One part of the site was eventually preserved because the cost of investigation outweighed the value of the underlying mineral. With better information at the beginning of the process that type of decision could have been made before the archaeology was exposed. Better information at the inception of the investigation programme would also have allowed the development of a fuller set of research objectives rather than them being developed reactively.

In contrast, at Ivel Farm the archaeological constraint was identified early, as was the process of data gathering in preparation for a planning application. Initial desk-based assessment formed the basis for discussions with the County Archaeologist which identified the need for field evaluation to provide information to inform the planning decision.

The staged approach to the evaluation helped to build up a picture of the archaeology of the quarry but it was trial trenching that provided the detailed characterisation of the resource that formed the basis of the planning decision and for the development of the mitigation strategy. The evaluation allowed the identification of areas within the site of differing archaeological character. This made it possible to put in place a scheme of investigation that varied the strategy according to density and complexity of the archaeology. Except for where the evaluation had shown that later landuse had removed any archaeological remains or that they were otherwise unlikely to survive the whole quarry was subject to some level of archaeological investigation. This provided a useful control which generally confirmed the effectiveness of the evaluation strategy. It also allowed the discovery and investigation of types of occupation that are very difficult to detect consistently in evaluation, namely Neolithic and early Bronze Age settlement features and Saxon settlement, clearly indicating the value of making provision for same level of archaeological investigation over the whole of a quarry site even where core sites and areas have been located in the evaluation.

Ultimately one of the core areas of archaeological interest identified in the evaluation was not investigated because of the low value of the underlying mineral. Because the area had been accurately defined in the evaluation it was possible to make the decision not investigate but to preserve the site in a timely fashion and with adequate information on its location and extent, without compromising the sites integrity.

The creation and use of a framework for environmental sampling (Guildhouse Consultancy 2001) based on a wider understanding of the environmental context of the wider middle Ivel Valley was very helpful. It provided a clear set of research objectives built upon earlier work in the immediate area which allowed for a targeted approach to environmental sampling to answer specific questions and obviated the need to blanket sample deposits that superficially appeared to have environmental potential. This approach was both efficient and cost-effective for the archaeologists and minerals operator.

Case Study 4 – Sandy Heath

Introduction

Sandy Heath Quarry is located between Potton (2.3km to the east) and Sandy (2.5km to the west) in eastern Bedfordshire. It is centred at TL 1990 4950 and is located within the Woburn Sands Formation Aggregates Study Area.

The area covered by this case study represents an extension to an existing quarry on land immediately to the south. The extension covers an area of 39.2 ha. The existing quarry did not have any archaeological investigations done as a consequence of the development. Topographically the site is located in the Greensand Ridge. It is on the plateau of the Ridge with the scarp slopes c.1km to the south, west and north. The site itself slopes west to east, from c.65m AOD to c.60mAOD.

A planning application for the quarry extension was submitted in 1996. The extension was located within an archaeologically sensitive area and consequently further archaeological information was requested prior to the determination of the planning application. The subsequent programme of archaeological investigation comprised; a Desk Based Study (Tempus Reparatum 1996), aerial photographic assessment (Air Photographic Services 1996), fieldwalking (BCAS 1996), geophysical survey (Bartlett 1996), trial trenching (BCAS 1996) and observation, monitoring and recording (Heritage Network 2003).

HER Information

The HER contains information on three assets for the area of Sandy Heath Quarry (see Appendix 3). Two are wholly contained within the quarry area (HERs 13679 and 13735) and it contains part of HER 1658.

The archaeology of the quarry and the surrounding area around are dominated by cropmarks. Prior to the investigations at Sandy Heath the cropmarks were described as comprising a range of rectangular, sub-rectangular, circular and oval enclosures (including HER 1658), also noted were linear features and possible hut circles. In some cases the enclosures appear to have been arranged in linear alignments. For one asset (HER 13735) the HER suggests that the features may not be archaeological in origin. In all the cases the cropmarks are undated.

There are no dated prehistoric finds from the immediate vicinity of the quarry. A late 1st - 2nd century AD cremation cemetery was excavated at Deepdale to the south east of the quarry (HER 14045) and it has been suggested that the line of a Roman road running from Bedford to Cockayne Hatley via the Roman town of Sandy (HER 738) lay along the present Potton Road to the south. However, later research discounted this route (Simco 1984).

The HER does not record any Saxon or medieval sites or finds from the surrounding area. To the north is the 18th century Hazells Hall Park (HER 6999), an area of designed landscape surrounding Hazells Hall. There were several post-medieval and early

modern sand pits in the area (HER 3030 and 10672). There is extensive evidence of World War II activity in the area around the quarry ranging from pill boxes (HER 17968 and 17970) to an ammunition dump (HER 17969) and a petrol dump (HER 17982).

Desk-Based Study

A Desk-Based Study (Tempus Reparatum 1996) was submitted with the planning application. It examined the historic environment of the application site and its place within that wider context of the surrounding area. It used the following sources: Bedfordshire HER, original documents from the Bedfordshire County Record Office, geological information including borehole data and published sources.

The Study discussed the HER information, describing it as a “confusing array of apparent cropmarks” (Tempus Reparatum 1996, 7) and acknowledged that some sites, including HER 13735, might have been of non-archaeological origin. Consequently only those cropmarks definitely recorded as of archaeological origin in the HER were mapped in the Study. On morphological grounds the cropmarks in and around the application site were ascribed to Iron Age and Roman settlements, which were said to fit in to a wider contemporary landscape. It was also suggested that some of the cropmarks may be post-Roman in date without specifying what they related to. The lack of earlier prehistoric finds or sites in the area was noted.

Landscape and land use history was examined largely through documentary and cartographic sources, these were said to be sparse. From the 13th century to the mid 19th century the Sandy Heath area was largely open heathland. In the medieval period the heath had been extensively used as a rabbit warren. From the 17th century the heathland was progressively reclaimed for arable agriculture and from the 19th century there was also extensive tree planting. By the early 20th century heathland had almost completely disappeared from the area.

The archaeological potential of the site was described using the cropmark and documentary evidence. It was considered that there was the highest potential for prehistoric and Roman activity, followed by evidence for medieval rabbit warrens. A number of factors that could reduce the site’s archaeological potential were identified including the effects of rabbit burrows, arable cultivation and tree planting. It was noted that there was a lower density of cropmarks within the quarry area but this point was not explored further.

On the basis of the information presented in the Study it was suggested that the site did not contain any archaeological remains of sufficient quality to require preservation *in situ* and it was unlikely that such remains existed within the site.

Commentary on Desk-Based Study

The Desk-Based Study did not advance understanding of the archaeology of the proposed quarry much beyond the information contained in the HER other than suggesting that the cropmarks are of later prehistoric or Roman date. This is a common assumption for this type cropmarks even when not explicitly dated in the HER. The Study does contribute new information about the historic land use of Sandy Heath in

particular the suggestion that it contain extensive remains of medieval rabbit warrens which were not recorded in the HER.

Aerial Photograph Assessment

Given the quantity of cropmarks within the quarry area an aerial photographic assessment was undertaken (APS 1996) and photographs held by the HER and in national collections were consulted. The assessment covered an area of 130ha.

It was noted that under appropriate conditions the site's soils could produce "finely detailed cropmarks above archaeological, natural and recent sub-surface features" (APS 1996, 4).

A series of distinct cropmarks were mapped as archaeological features. These include a series of small, irregular enclosures in a broadly linear arrangement. Although many of the enclosures occurred in small groups there was little superimposition suggesting that they were of the same date. However, the relationships of some of the enclosures and the establishment of an associated track network did indicate that occupation may have been long term.

Among the features mapped as of archaeological origin were others which were less distinct that were mapped as possibly archaeological or possibly natural. They were very similar in character to those mapped as of archaeological origin, some of them appeared integrated into the main group of archaeological features, others were separate from it. The decision was taken to consider all mapped features as being archaeological in origin (APS 1996, 4-5).

RAF photographs taken in 1946 and 1947 show military activity in the area including tracks and a large number of huts, no traces of these features can be seen on later photographs indicating they had been short lived. Only features that could be ascribed to military activity from World War II were dated in the Assessment.

Commentary on Aerial Photograph Assessment

The air photographic assessment provided much more detailed interpretation of the cropmark evidence for the application site and its immediately surrounding area. It mapped the cropmarks in considerable detail identifying a range of enclosures and a network of tracks. It also came to the conclusion that although there were two groups of features of varying distinctiveness they should all be considered to be of potentially archaeological origin. While the assessment did not indicate a date or function for the cropmarks it suggested that many of them were contemporary and that the occupation they represented could have been long term. It also confirmed the location and nature of the World War II activity in and around the site.

Fieldwalking

A programme of fieldwalking was done in September and October 1996 (BCAS 1996). The whole of the application site was fieldwalked. The strategy was based on transects 20m apart aligned north-south on the National Grid. Finds were collected in 20m units along each line. As the site was not cultivated 2m wide strips were ploughed along each of the survey lines and allowed to weather for two weeks before fieldwork took place. Generally conditions were good for fieldwalking as was artefact visibility.

The quantity of material recovered in the fieldwalking was fairly small. There was a total of 67 pieces of humanly worked flint, including two tools; the rest being debitage; a small quantity of burnt flint was also recovered. Most of the assemblage was in poor condition having suffered plough damage. The material was dated to the later Neolithic – Early Bronze Age. The flint was mainly found in the western part of the site with a distinct, though low density concentration on the south western edge. These finds suggested low intensity later Neolithic – Early Bronze Age activity, perhaps a seasonally occupied temporary camp.

Twelve sherds of heavily abraded pottery were recovered and 3.5kg of ceramic building material, the pottery was all glazed and made in the same fabric and dated to the 17th-18th century. The building material included brick fragments and roof tile, dated 15th to 19th centuries. Both pottery and building material was found mainly in the centre and west of the site with no particular concentrations. It was suggested that the quantity and distribution of these artefact classes was consistent with manuring. The land use history of Sandy Heath suggests that manuring would not have been significant activity before enclosure in the later 18th century when cultivation replaced heathland as the dominant use.

Commentary on Fieldwalking

The fieldwalking identified a new element in the archaeology of Sandy Heath as represented by the later Neolithic - Early Bronze Age lithics. This phase of activity was not suggested by the HER information or previous phases of investigation.

A low level of distribution of late medieval – post-medieval artefacts suggesting manuring was to be expected from what was known of the land use history of the site from historical sources.

The fieldwalking did not produce any material that might be related to the later prehistoric or Roman settlements suggested by the cropmark analysis. Later prehistoric activity might be difficult to detect from surface artefact distributions, particularly pottery which is often rare in fieldwalking assemblages. But it would be expected that Roman settlement would be visible as concentrations of pottery and possibly building material as would industrial activity, particularly pottery production (kilns) which would produce concentrations of pottery, particularly wasters, and kiln debris.

Geophysical Survey

A first phase of magnetic susceptibility survey was done over the whole of the application site (Bartlett 1996). This identified high readings possibly indicating past occupation or industrial activity at a number of locations. Some of these features did correspond to cropmarks but generally they were more extensive.

Five trial areas for magnetometer and resistivity survey were identified on the basis of the cropmarks and magnetic susceptibility survey. Both techniques produced good results. Magnetometry identified anomalies which it was suggested represented hearths, pits or kilns. The resistivity survey did not identify this group of features, but it did show a number of linear anomalies that were not identified by the magnetometry. It was thought that these linear anomalies related to cultivation. Neither technique produced anomalies that could be related to cropmarks features.

It was concluded that the magnetometry was the most effective and appropriate technique for extending and complementing the cropmark evidence. As a consequence it was decided to survey seven blocks with detailed magnetometry. The blocks were defined on the basis of the cropmarks and preliminary phases of geophysical survey.

It was noted that the soil was strongly magnetic and that minor displacement of the soil could create detectable magnetic anomalies. It was also acknowledged that while some of the anomalies that were detected might not be of archaeological origin a large number of them appeared to represent subsurface features of potentially archaeological origin. They formed clusters that were clearly related to high magnetic susceptibility readings. It was suggested that some of the anomalies could represent kiln or hearth type features.

Commentary on Geophysical Survey

The geophysical survey produced significant results. In all stages it identified anomalies that were of potential archaeological origin in substantial numbers. However, geophysics did not find any features that could be related to the cropmarks that had been identified in the air photograph assessment. What it did do was indicate that there were a whole range of other features complimenting the cropmark evidence. It was suggested that a number of the anomalies were potentially kilns or hearths indicating the possibility that remains of settlement and/or industrial activity survived at the site.

Trial Trenching

Trial trenching was the final stage of the evaluation programme (BCAS 1996). Twenty six trenches were excavated, eighteen were targeted on cropmark or geophysical anomalies, one was located to investigate the possible concentration of prehistoric flint on the western edge of the site and the other seven were in areas that appeared to be blank on the basis of existing evidence.

Only three trenches contained man made features. None of them produced any dating evidence although their form or the nature of their fills suggested that they belonged to the military use of the site in the 1940's. There was also evidence of uncharacterised

ground disturbance probably dating to this period. Two flint blades of Mesolithic – Early Neolithic date were found in the spoil of another trench.

No subsurface features were found in the trenches located to investigate the scatter of prehistoric flints, nor were any found in the trench that produced the two flint blades. There were no features found in the trenches located to investigate cropmark features and geophysical anomalies. The desk-based assessment suggested that there had been extensive rabbit warrening on Sandy Heath in the medieval period but no evidence for features relating to this activity were found in the trial trenches; although there was extensive evidence of animal activity within the site.

In the trenches located to investigate features identified from cropmark evidence there were outcrops of ironstone or variations in the natural geology correlating with the cropmarks. It was suggested that the crops grown on the site were sensitive to concentrations of decayed ironstone/sandstone which produced cropmarks similar in character to those found over features of archaeological origin. The linear nature of these cropmarks resulted from the pitched formation of the geological strata (BCAS 1996, 12). There was a similar correlation between the geophysical anomalies and concentrations of ironstone/sandstone. Elsewhere within the site some of the anomalies could be explained by patches of burning probably representing the removal of trees and shrubs (BCAS 1996, 12).

Commentary on Trial Excavation

Trial trenching significantly altered our understanding of the archaeology of the Sandy Heath site and it demonstrated that the site did not contain any significant archaeological remains. No subsurface features were found in the area of the flint scatter, neither were there any features identified in the area of cropmarks or geophysical anomalies. In fact the trenching revealed natural geological phenomena which provided an explanation for the cropmarks and geophysical anomalies.

Investigation

A programme of archaeological observation, investigation and recording was undertaken on the eastern part of the site (Heritage Network 2003). This involved an intermittent archaeological presence during topsoil stripping and each area was inspected by an archaeologist and any archaeological features investigated and recorded before it was released for sand extraction.

The site conditions revealed by the trial trenches were confirmed by the archaeological investigation. Five archaeological features were identified. Three of these were parallel ditches forming a north west – south east aligned trackway. This feature corresponded to a trackway identified as a cropmark. Another ditch was interpreted as a possible field boundary contemporary with the trackway. A further short length of ditch was thought to be a modern trench associated with the military use of the area in World War II. A single unstratified flint scraper was the only artefact recovered from the site

Commentary on Investigation

Although the investigation only covered part of the site it confirmed the results of the evaluation. With the exception of a ditched trackway which did correlate with features identified from air photographs no evidence for features of potential archaeological origin suggested by cropmark evidence or geophysical survey. A single possible World War II trench was found similar to those found in the trial trenching. The paucity of artefacts found in the investigation also mirrored both the fieldwalking and the trial trenching.

Assessment of Mitigation Strategy

The HER information suggested that the quarry extension lay within an area containing archaeological remains as represented by a variety of cropmarks. This original assessment was, to a certain extent, supported by the aerial photographic assessment and geophysical survey both of which identified features of probable archaeological origin. Subsequent investigations ultimately demonstrated that, at Sandy Heath, the cropmarks were wholly of natural origin and did not represent archaeological remains. Elsewhere on the Greensand Ridge cropmarks have proved a reliable indicator of the existence of archaeological remains for example at Woburn Safari Park (HER 16507). The problem at Sandy Heath may be a localised phenomenon in the Greensand Ridge between the Ivel Valley and Potton. This may be because of particular geological conditions in the area which resulted in faulty interpretation of cropmark evidence. This suggests that there should be a critical re-examination of the cropmark information contained in the HER for the eastern end of the Greensand Ridge. This could be done as part of the enhancement of the HER. Certainly it would be required as part of any assessment and evaluation process undertaken to provide a description of the significance heritage assets (PPS 5 Policy HE6.1) of a proposed quarry site in this part of Bedfordshire.

However, the results of the air photograph assessment done as part of the Sandy Heath investigation need to be born in mind. This (APS 1996) was very positive about the existence of extensive archaeological remains on the basis of the cropmark evidence. To avoid this pitfall in the future there should be a review of the nature of cropmark evidence in this area in order to develop a strategy for distinguishing between those cropmarks that denote genuine archaeological features and those of geological origin.

The geophysical survey was also misleading in the extent, quality and character of the archaeological remains it suggested might exist at the site. The strength and nature of the anomalies may be the result of geological conditions at the site. The potential for misleading geophysics results on the Woburn Sands Formation must be recognised when using the technique at other sites. A more detailed understanding of variations in the geology the Greensand Ridge may help in interpreting geophysical survey results in that geological area.

It also interesting to note that the features identified from air photograph information and geophysics were almost completely mutually exclusive. None were identified by both techniques, so there was no confirmation of even broad distributions or types of feature between the two techniques. Normally it would be expected that the main trends found through one technique would also be seen in the results of the other, even if there was a

difference between the two at a detailed level. The lack of surviving archaeological remains at Sandy Heath suggests that where there is no correlation between air photographs and geophysics it should be expected that one if not both techniques is producing misleading results and they should be subject to critical assessment.

Air photographs and geophysics suggested that the site contained substantial archaeological remains. This evidence was not confirmed by trial trenching, proving that this technique is crucial in characterising and defining archaeological remains suggested by non-intrusive techniques. Without trenching it would have been possible to use non-intrusive techniques to suggest that Sandy Heath contained an Iron Age and Roman settlement landscape with a substantial industrial element.

The programme of archaeological observation, investigation and recording provided a useful control for assessing the results of the evaluation. The evaluation indicated that no significant archaeological remains existed at the site. This was confirmed by the programme of observation. It suggests that on the Woburn Sands Formation where evaluation does not produce evidence of archaeological remains this is a true reflection of the archaeological resource, or lack of it, and that further investigation or mitigation would not be required in those circumstances

MITIGATION STRATEGY CONCLUSIONS

By Martin Oake

The case studies highlight a number of issues concerning the identification and management of the archaeological resource in context of aggregate extraction.

The information contained in the Historic Environment Record is crucial in identifying where proposals for aggregate extraction will have an impact on archaeology. This is the case both in selecting sites for extraction through the LDF process and in considering site specific planning applications for aggregate extraction. We need to have confidence that the HER will provide an accurate indication of the archaeological resources and potential of any aggregate extraction site, and that the information can provide a sound basis for decision making.

Generally the case studies show that the HER provides a good indication that a site will contain archaeological remains. It is clear that the HER does not provide a comprehensive statement of what a site will contain but it does usually give a good indication of the main features of what will be there and a indication of the potential of the site.

The main source of HER information in all the case studies was aerial photography. At Sandy Heath aerial photography proved to be a poor indicator of the site's archaeology, completely over-representing the actual resource and potential. However, this can be attributed to a particular set of local circumstances to do with the way the HER information was compiled and the local geological conditions the effect of which was not appreciated at the time of the planning application but which is now better understood as a result of work at the site. It does not invalidate the value of HER information in the Woburn Sands AS-A as whole which has been shown to be an accurate indicator of presence of archaeological of archaeological remains and archaeological potential elsewhere in the AS-A. But it does indicate that the HER information for the Woburn Sands Formation to the east of the Ivel Valley needs to be subject to a critical reassessment particularly in respect of information from aerial photographs.

In the other case studies HER information was of sufficient quality to allow the identification that aggregate extraction proposals would have an impact on archaeological remains. At Warren Villas, before the adoption of PPG 16, HER information helped to identify a feature (a ring ditch) that should be preserved by excluding it from the extraction area. Otherwise the HER under represented the archaeological potential of the site which affected the implementation of a mitigation strategy. In the case of Broom Quarry the HER did indicate the existence of some of the main features of the archaeological landscape such as the ring ditches and some of the later prehistoric settlements but by no means all of them. At Octagon Farm and Ivel Farm the actual archaeological resource was much better represented in HER although in neither case did it present the whole picture.

The case studies show that the HER is an effective resource for identifying sites that contain archaeological remains or have the potential to contain them. It must be accepted that the HER does not record the totality of the archaeological resource for any

given location. What it does do is point out where there is an archaeological constraint that needs to be taken into account in the context of proposals for aggregate extraction. Its use in assessing sites for allocation in the LDF process is more difficult because on the whole unless the site contains Scheduled Monuments the quality of information in the HER does not make it easy to isolate sites where the archaeology is so important that sites should not be allocated. When it comes to site specific planning applications the HER is an effective tool for identifying where quarrying will impact on archaeology. It provides the basis for identifying requirements for additional information on archaeology to enable the planning application to be determined; in terms of PPS 5 what information is required to be able to describe the significance of the heritage asset and identify the impact of the proposed development. The HER also provides an adequate basis for developing a strategy for any field evaluation that may be required.

The case studies show that the HER does not provide all the information that is required to identify and characterise the archaeological resource of an application site or describe the significance of the heritage asset. In all cases the need for further information was identified and that this had to be acquired through an archaeological field evaluation. The results of the field evaluation justified this decision at all the sites. At Warren Villas where no evaluation was undertaken the pitfalls of not having adequate information at the planning application stage and the effect it has on managing the impact of aggregate extraction on the resource is quite clear. At Sandy Heath the value of the evaluation was that it ultimately provided evidence that that contrary to the HER information the site did not contain any significant or substantial archaeological remains. A decision based solely on HER information would have resulted in a very different outcome, potentially a refusal of the planning application or at least a condition requiring a major archaeological investigation.

On the basis of the case studies it is possible to say that any planning application for mineral extraction in Bedfordshire is going to require an archaeological field evaluation to identify and characterise the archaeological resource of the application area, describe the significance of the heritage asset and identify the impact of the development. A number of techniques can be applied to sites during the evaluation process and in the case studies a suite of techniques was usually applied. It is, therefore, possible to review the value and efficacy of these techniques across the range of sites.

At Sandy Heath a full range of techniques were applied, but as has been said elsewhere in this section particular local circumstances and conditions applied as this site. Although these are important in themselves and in a wider consideration of the Woburn Sands Formation their site specific nature means that they can generally be excluded from the discussion of evaluation techniques.

Desk-Based Assessments (DBAs) were produced for Octagon Farm, Broom Quarry and Ivel Farm. Both PPG 16 (paragraph 20) and PPS 5 (Policy HE6.1) suggest that such Assessments are an important first step in the process of identifying the impact of a development on archaeology. At its most basic the DBA is a simple presentation of information in the HER, Broom Quarry is an example. This approach does not provide much assistance in characterising the archaeology of a site as part of the development management process.

For a DBA to have any value it needs to take the HER information as a starting point for analysing the known archaeological resource of the site and identifying its potential to

contain other remains. This can be most effectively achieved not just by examining the archaeology from application site alone, but by looking at its wider context. This should enable a more comprehensive analysis of the remains within the site and better understanding of the context of the site and its potential. The DBA should also utilise information about the areas geology, topography and historic land use as part of understanding the resource and its context. Ivel Farm provides an example of this where analysis of the context enabled the DBA to increase understanding of the archaeology of the application site.

Aerial photography provides a significant source of information for the HER in the case studies and more widely in the AS-As. Therefore, understanding this information is likely to form a significant part of the evaluation process and did so at Broom Quarry, Ivel Farm and Octagon Farm. In some cases, notably at Broom, the cropmark complexes contain a significant element of features that are natural in origin. It is an important role of the assessment of aerial photographic information to differentiate between features of archaeological and natural origin. Generally this was successfully achieved in the case studies, with the exception of Sandy Heath.

Particularly in the riverine AS-As and AS-SAs aerial photography has a useful role in identifying palaeo-channels and alluvial deposits, for example at Ivel Farm and Octagon Farm. These features and deposits are important in understanding the environment and landscape in which archaeological sites existed. They are potential sources of environmental information and possible locations for the survival of well preserved water-logged remains (Warren Villas). Understanding their location can also help to predict where settlements may occur, as they seem to favour low gravel islands between former stream channels (Octagon Farm).

Examination of plough zone artefact assemblages features in all the case studies. Usually this takes the form of fieldwalking but at Broom Quarry also included sieved bucket samples of spoil from trial trenches. The results of these surveys in all the case studies have not been very successful in identifying archaeological sites and features. Very low densities of artefact densities characterised all the evaluations. This is surprising because in all the case studies (excluding Sandy Heath) there were archaeological sites represented by substantial and extensive sub-surface features and had been subject to long periods of cultivation. Whilst it may be expected that prehistoric pottery, up to and including the Iron Age, might not survive well in the plough zone, Roman pottery is more robust and should be more likely to be represented in plough zone assemblages. The same is true of flint artefacts, but they are equally sparse in the case studies. However, elsewhere fieldwalking has identified substantial surface scatters of flint artefacts (Taylor and Woodward 1985 and Luke 2008) within AS-As, which suggests that under certain circumstances prehistoric activity can be identified in plough zone artefact distributions. At present there is no explanation as to why fieldwalking is not very successful at identifying or characterising the archaeological resource in aggregate producing areas. This is a topic that would benefit from further research to find why this technique works sometimes and not in others and to identify if there are any specific circumstances of geology, topography or archaeological context which would indicate whether or not it is worth applying. It is interesting to note that at Broom where bucket sampling was used in the same area as blanket fieldwalking the results of the two techniques were very similar. Until further research has been undertaken the investigation of the plough zone as part of the evaluation process should not be

dismissed in the aggregate producing areas of Bedfordshire, but its value should be critically assessed before it is deployed.

Geophysical survey has not been used consistently in the case studies. It was used most extensively at Octagon Farm and Sandy Heath and in a limited way at Broom Quarry. Its use at Broom was restricted to very small areas, largely to confirm the existence of features first identified as cropmarks. At Sandy Heath and Octagon Farm programmes of extensive magnetic susceptibility scanning followed by targeted magnetometry were employed. At Octagon Farm this strategy did work in identifying some archaeological features. But magnetic susceptibility scanning is difficult to interpret and can be misleading (Sandy Heath). Targeted samples of magnetometry do not necessarily provide very useful information about the location and character of archaeological remains. However, the quality of results from detailed magnetometry do suggest that used at a larger, probably whole site, scale this technique will produce useful information which enhances understanding of the archaeological resource and contributes significantly to the evaluation process.

All the case studies used trial trenching as a means of identifying and characterising the resource. In all the case studies trenching was targeted on sites and features identified in earlier phases of evaluation. At Broom predetermination trenching was restricted and largely used to confirm the existence of cropmark sites. At the other sites there was extensive use of trenching to investigate what appeared to be blank areas. At Broom a second phase of trial trenching was undertaken as part of the mitigation strategy because of the inadequacy of the pre-determination evaluation. This also the only example in the case studies of where a programme of trial trenching was designed to sample a landscape systematically.

In all the case studies trial trenching proved to be an effective method of detecting archaeological remains that were not found through other methods and of characterising the remains. For example at Octagon Farm trenching confirmed the existence of sites first identified as cropmarks or geophysical survey and succeeded in characterising those remains as being either part of the Neolithic and Bronze Age ritual landscape or the Iron Age and Roman settlement landscape. It also identified a ring ditch that had not been found by any other technique that was part of the ritual landscape and because of its importance was preserved within the development. At Sandy Heath the information derived from various non-intrusive techniques suggesting an extensive and potentially rich archaeological landscape was not confirmed by trial trenching which proved that there were no significant archaeological remains at the site. Although the initial trial trenching at Broom had not been particularly productive, the second phase of systematic sampling proved that it is a valuable technique. It not only confirmed the existence of sites known from cropmarks but identified a number of small settlement sites that had not been and were unlikely to be detected by any other means. It also identified a Bronze Age field system which was fragmentary in nature and was not otherwise visible. In all cases after an initial programme of trenching additional trenches were required to provide clarification. The case studies show, unequivocally, that trial trenching is an indispensable part of the evaluation process. Whatever other techniques are utilised, the strategy has to include trenching. The most effective strategy will include an initial amount of trenching which can be targeted on the results of other techniques and to confirm that blank areas are genuinely blank. This needs to be backed up by a contingency provision of additional trenching to clarify the initial results as required. If trial trenching is the only appropriate or available technique a systematic sampling

strategy such as employed in the mitigation phase at Broom Quarry appears to be an effective way of both identifying and characterising the archaeological resource of a site, although it is likely to require a higher density of trenching than might be needed where trenching can be targeted on the basis of non-intrusive techniques.

The case studies show that the evaluation techniques available are quite adept at identifying some types and periods of sites. In the first instance these tend to be sites that are readily detected through aerial photography such as Neolithic and Bronze Age ritual and funerary sites and later prehistoric, Roman and medieval settlements. On the other hand there are other components of the archaeological resource which existing evaluation strategies are not very adept at identifying. These include Palaeolithic deposits, Mesolithic sites, Neolithic and Bronze Age settlements, particularly where they are characterised by very low density distributions of isolated pits or small groups of pits and Saxon settlements and cemeteries. It is also often difficult to identify landscape scale features such as field systems with any certainty. The remains of these sites tend to be ephemeral and difficult to detect, or where remains are found difficult to interpret in the context of an evaluation. In the case studies it appears that it was almost a matter of luck that such features were identified in evaluation. The systematic trial trenching programme at Broom was the most successful in identifying small scale prehistoric settlement activity and the fragmentary remains of a Bronze Age field system. DBAs may have a role to play in improving chances of identifying ephemeral sites. By examining the context of aggregate sites it may be possible to model likely locations for such sites to be found, for example their relationship to stream valleys or palaeo-channels, or in the case of Saxon settlements an apparent relationship to late Roman settlements and target evaluation on those locations.

Open area excavation of major sites and features is the main mitigation strategy employed in the case studies. This has proved successful in investigating and recording archaeological remains that will be destroyed as a result of aggregate extraction. It relies on the evaluation process locating these sites and defining their extent and character. This was generally achieved meaning that these sites were fully investigated. At Warren Villas where there was no evaluation it proved very difficult to develop a mitigation strategy because the location, extent and complexity of the archaeology were not known before the investigation began. A good understanding of at least the broad characteristics of the site is also needed to develop appropriate research objectives for the investigations.

However, open area excavation of clearly identifiable concentrations of archaeological features (sites) only deals with the impact at those foci. The scale of aggregate extraction means that the impact on archaeological remains is actually at a landscape scale. Therefore, mitigation by investigation and recording needs to be at that scale too. This was explicit in the investigation strategy at Broom (Cooper and Edmonds 2007) and while not clearly stated at the outset of the investigations at Octagon Farm was implicit in the whole strategy. By taking a landscape approach provision needs to be made for the investigation of those parts of the site outside the foci identified as a result of evaluation; to fill in the context of the main sites. It is also important that provision is made to identify and investigate the more ephemeral remains that are at best infrequently or inconsistently identified in evaluation (see above). Both these objectives can only be served by including a strategy for investigating the quarry area beyond the open area excavations. This requires the ability to observe areas as they are stripped of topsoil down to the horizon at which archaeology will be encountered with resources to

investigate any features or sites that are encountered. The research objectives for the project also need to provide a framework to enable this work to be done. It is an open question whether site stripping needs to be under continuous archaeological supervision or whether observation can be periodic such as at Octagon Farm. This is likely to depend on the nature of the archaeology that may be encountered, the geological conditions of the quarry and the relationship between quarry operators, their staff and the archaeologists doing the investigation. The value of such an approach can be seen at Octagon Farm and Ivel Farm. At Broom Quarry although an explicitly landscape approach was taken to the mitigation investigation it was based on a sampling approach, using trial trenching to identify sites for detailed investigation and to sample landscape features such as the field system. In only one area of Broom was an area opened up explicitly to investigate the field system at a wider scale. Although this confirmed the general character of the field system observed elsewhere over the site, the alignment, completeness and relationship to contemporary sites and its influence on later sites and activity is to an extent conjectural.

Preservation of remains *in situ* within the quarry was an option exercised in three of the case studies, the exception being Sandy Heath. In all cases specific sites or monuments were identified during the application process as requiring preservation *in situ*. At Broom and Octagon Farm the monuments were recognised as nationally important and were either already designated as Scheduled Monuments or in the process of designation at the time of the application. At Warren Villas a ring ditch was identified from the HER and the boundary of the quarry revised to exclude it. At Broom and Ivel Farm sites were also selected for preservation during the life of the quarry on economic grounds. Clearly decisions about preservation are best made as part of the planning application process because this allows proper provision to be made to manage the remains that are preserved. For example the condition requiring the maintenance of the water supply to the moat at Broom. Where decisions on preservation are made during the quarrying process they tend to be *ad hoc* making it more difficult to make adequate provision for preservation; particularly the long term management of the monument which is not covered by the planning consent.

The methods of preserving monuments also need to be considered. At its simplest it involves identifying the monument and ensuring that it is not quarried away. This usually involves defining a protective cordon beyond the identified boundary of the site which may be defined by statutory designation or on archaeological grounds. This area is then laid out on the ground and fenced off to make sure there is no encroachment on the preserved area. The monument is then left as an island of archaeology in the quarry. As part of the restoration process the ground level around the monument may be raised to the former ground level or it could be left standing proud of the restored ground surface if the restoration is based on landscape, biodiversity or recreational uses. There are a number of problems with this approach, exemplified by Octagon Farm. The difficulty of defining the real and exact location of the monument to be preserved means that a 10m cordon may not be within the margin of error that exists when monuments are located solely from aerial photographs. The location of the monument needs to be confirmed on the ground, preferably by non-intrusive methods, perhaps geophysics, before the area to be preserved is laid out. Leaving monuments on islands of aggregate within a quarry could have an impact on its depositional environment. Most obviously this situation could lead to rapid dewatering of waterlogged remains, but there could also be other changes to the environment. Restoring ground levels to those that existed before aggregate extraction may have a value in broad landscape terms but the material used in

restoration could also have an impact on the depositional environment of the monument even if it is inert materials. Were restoration is to an agricultural use with continued cultivation, as for some of the monuments at Octagon Farm, there is a question about whether there is much benefit to the long term protection and management of monuments because erosion from cultivation will continue after a brief hiatus for quarrying.

Under these circumstances some monuments can be left on gravel islands. The exposed, near vertical faces of the islands are subject to erosion which will reduce the protected area and potential start erosion of the archaeological remains. At some point the edges of the islands may attain a point of equilibrium but there is always a danger that without stabilisation and management erosion could continue and affect the survival and integrity of the monument. A better model for preserving monuments within a development is provided by the moated site at Broom. The location of the monument was such that it was easier to preserve a larger area, providing additional protection to the archaeology. It was also possible to identify an area deemed to be the contemporary landscape context for the moat which was also included in the area preserved. It was also possible to include provision to maintain the water levels in the moat in the planning consent. Broom represents a more sophisticated and holistic approach to the preservation and management of archaeological monuments within aggregate extraction sites. It is likely to achieve a better level of protection and management of the monument than can be obtained by merely excluding monuments from quarrying with a minimum provision for long term management, such as at Octagon Farm.

At none of case study sites where monuments were preserved *in situ* was there any provision for monitoring how successful the preservation has been or for remedial action if it was found that the monument was deteriorating. Both in terms of ensuring that specific monuments are properly managed and in the interests of developing strategies and techniques for preserving remains in situ it is important that monitoring of monuments is included in planning consents where this mitigation option is used.

The broad policy framework for dealing with the impact of proposals for aggregate extraction on the archaeological resources of Bedfordshire is provided by PPS 5 *Planning for the Historic Environment* (CLG 2010). This will form the basis for the historic environment policies in the emerging Bedfordshire Minerals and Waste Local Development Framework. Advice and guidance on how national and local policies can be implemented in the face of proposals for aggregate extraction is contained in *Mineral Extraction and Archaeology: A Practice Guide* (English Heritage 2008). This document provides a useful summary of the process for considering the allocation and determination of minerals applications. It also provides a review of the various archaeological techniques that can be used both to gather information on archaeological heritage assets to assist in understanding the impact of development proposals and the determination of planning applications. The various ways that the impact of approved schemes for mineral extraction can be mitigated are also examined in the document. It provides a useful overview, but the methods and techniques it describes cannot be applied uncritically; local conditions and constraints have to be understood so that techniques can be applied efficiently and effectively. Studies such as this begin to provide the local perspective on which techniques and strategies are most appropriate in the light of local conditions of geology, topography and land use and the character of the local archaeological resource.

PROJECT CONCLUSIONS

By Hannah Firth and Martin Oake

The Bedfordshire Aggregates Archaeological Resource Assessment Project has demonstrated that 37% of the archaeological resource for the historic county of Bedfordshire lies within areas suitable for the extraction of aggregates.

There are obvious variations in the character of the archaeological resource between the riverine study areas and the upland Woburn Sands Formation Study Area, the geological formations and topography having influenced the ways in which man has interacted with and shaped his natural environment. There are also significant differences amongst the river valleys themselves. The River Great Ouse AS-A and River Ivel AS-SA have some of the county's most significant prehistoric assets within them and large scale development both for aggregate extraction and housing have offered opportunities to study these resources on a landscape scale rather than on a site by site basis. Prehistoric periods for the valleys of the Rivers Flit and Ouzel are less well understood, partly because they have not been exploited for aggregates in the same fashion as the Rivers Great Ouse and Ivel. Nevertheless they have the potential to produce similar archaeological resources.

The baseline data for this project was derived from the Bedfordshire and Luton HERs and in some cases the limitations of the records created problems for identifying and interpreting the archaeological resource. Historic Environment Records are not static; by their very nature they are constantly evolving, however this evolution can only ever be a good as the resources put into them. They are multi-functional bodies of knowledge and therefore truly understanding and how they interact with the various the strands of archaeological resource management is vital for improving them and ensuring they present the most accurate picture of the historic environment possible.

It must also be acknowledged that there are a number of important projects derived both from the extraction of aggregates and residential developments that remain unpublished. These projects are not only important to the understanding of the historic environment within Bedfordshire but represent regionally significant archaeological assets. Publication of these sites must be seen as a priority; the longer they remain in stasis the greater the risk of the loss of the original expertise becomes and given these projects were originally supported by our national heritage body it is poor reflection on them that they will not honour their original commitments.

The differences and indeed similarities between the AS-As and AS-SAs demonstrate that Bedfordshire's aggregate producing geologies have some of the most complex and unique archaeological sites within the county and region. As a consequence the recognition of this significance is fundamental to ensuring their adequate protection and promotion.

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