



Historic England

# Tracing their Steps: Predictive Mapping of Upper Palaeolithic and Mesolithic Archaeology

Catherine Barnett, Martin Bell and Michael Grant

Discovery, Innovation and Science in the Historic Environment



# Middle Kennet Valley

## Berkshire

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## SUMMARY

The project attempted to produce a model capable of predicting the occurrence of early prehistoric land surfaces and remains, using the Middle Kennet Valley, Berkshire as a case study. Work targeted deep Late Upper Palaeolithic and Mesolithic floodplain and wetland edge archaeology and associated sedimentary sequences.

The key aims were to contribute, in conjunction with a number of other Historic England projects, towards the further advancement and implementation of the National Heritage Protection Plan for wetland regions throughout England generally; to raise awareness of the finite and significant Late Upper Palaeolithic and Mesolithic archaeology of the Middle Kennet Valley specifically; and to provide guidance to West Berkshire Council in identifying appropriate mitigation measures in response to development proposals.

In fulfilment of these aims, the project produced a comprehensive database of all known Upper Palaeolithic and Mesolithic archaeology, lithology and palaeoenvironmental data in the Study Area, and a general predictive sedimentary model arising from that database. The model was tested and refined by targeted field investigations and dating at Thatcham and Victoria Park, Newbury, alongside case studies at Ufton Bridge and geoarchaeological investigations at Wawcott. A development control leaflet was produced, providing guidance on methodologies and approaches, based on the results of the model.

## CONTRIBUTORS

Stephen Allen, Dan Alyward, Rowena Banerjea, Stuart Black, Alex Brown, Leon Fern, Jennifer Foster, Will Foster, Roy Froom, Alex Godden, Phil Harding, Lorraine Higbee, Ross LeFort, Neil Linford, Carol Mansfield, Peter Marshall, Simon Maslin, Richard Milwain, Nicky Mulhall, Sarah Orr, Richard Payne, Chris Speed, Tom Walker, Kev Williams and Sarah Wyles.

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## PART 1: THE PROJECT

### Project background

In July 2012 English Heritage (EH; now Historic England) issued two *Calls for Proposals* under the National Heritage Protection Plan (NHPP): 6394 – Review of the Mesolithic of the Wetland/Dryland Edge (4G1.301); and 6396 – Palaeolithic and Mesolithic Historic Environment Record (HER) enhancement (4G1.401). These related to Measure 4 of the NHPP, and specifically to Topic 4G: Sedimentary and wetland archaeology; Activity 4G1: Pleistocene and Early Holocene Archaeology.

Wessex Archaeology, the University of Reading and West Berkshire Council Archaeology Service submitted a joint funding proposal which formed the basis of this project. The proposal was to take a multi-faceted approach to predicting early prehistoric land-surfaces and remains using the Middle Kennet Valley, Berkshire as a case study (**Figure 1**). The subsequent work targeted deep Late Upper Palaeolithic and Mesolithic floodplain and wetland edge archaeology and associated sedimentary sequences. The key aims were:

- **Aim 1** - to better inform awareness of the finite and significant Late Upper Palaeolithic and Mesolithic archaeology of this region by synthesising published and unpublished early prehistoric archaeological and geoarchaeological data for the Middle Kennet Valley; providing and adding to a reliable dataset through the construction of a predictive model; and using geophysical survey, boreholing and excavation in order to better understand and anticipate the distribution of sites in the wetlands and wetland margins and their relationship to particular strata;
- **Aim 2** - to provide guidance to West Berkshire Council in identifying appropriate mitigation measures in response to development proposals; and
- **Aim 3** - to contribute, in conjunction with a number of other English Heritage projects, towards the further advancement and implementation of the National Heritage Protection Plan (for similar wetland regions throughout England).

These aims having been successfully fulfilled, the project has added substantially to the understanding of the nature and use of the Late Upper Palaeolithic and Mesolithic landscape of the area and has enabled the creation of a predictive sedimentary and archaeological model which provides a flexible and robust curatorial tool to help manage and mitigate the early prehistoric resource in this area.

Alongside this report, a guidance document has been produced (**Appendix 1**) to inform the development control process. That document highlights the importance of combining the range of techniques employed here and encourages their application elsewhere. The suitability and practicality of the suggested predictive

techniques was shown by the discovery of a well-stratified site at Victoria Park, Newbury, the existence of which was suggested by various elements in the model.

This end of project report draws together the key methods and findings, summarising the agreed project outcomes, which were a comprehensive database of all known Upper Palaeolithic and Mesolithic archaeology, lithology and palaeoenvironmental data; a predictive sedimentary model arising from that database; tested and refined by targeted field investigations and dating; a development control leaflet providing guidance on methodologies and approaches; and a full case study report of the Ufton Bridge investigation and a short case study of geoarchaeological investigations at Wawcott.

Both case studies, and the related field investigations at Thatcham and Victoria Park, have contributed significantly to an understanding of the Middle and Lower Kennet sedimentary sequence and its relationship to Mesolithic finds, and have also enabled us to refine appropriate methodologies for investigation.

### **The case study area**

Thirty kilometres of the Kennet Valley between Avington and Ufton Bridge in West Berkshire were selected as the case study area (**Figure 1**). The study area was deliberately restricted in order to achieve the level of specificity required to model and predict the occurrence of deeply buried and waterlogged sites and sequences often 2m or more below the modern ground surface. The zone is particularly significant as an area recognised as having high nature conservation and archaeological value in which development and aggregate extraction pressure is particularly high.

The project was focused on the floodplain and low Beenham Terrace (a member of the Woolhampton Gravel Formation: Collins 1994), which lies at up to 5m above the floodplain or 50–90m above Ordnance Datum (aOD), and on the rich Upper Palaeolithic and Mesolithic resources that lie in this zone of the Middle Kennet Valley. The Lower and Middle Palaeolithic periods are not as well represented in the area, in part due to the dominance of more recent terrace deposits: most finds dating to these periods have been included within previous reviews (Wymer 1999; Hosfield 2007).

### **The early prehistoric archaeological resource and potential**

The Lower and Middle Kennet Valley contains one of the greatest concentrations of Late Upper Palaeolithic and Early Mesolithic hunter-gatherer sites in Britain (Barnett 2007; Ellis *et al.* 2003; Ford 1992; Fromm 1963a–c, 1965, 1970, 1972a–b, 1976, 2012; Fromm and Cook 2005; Fromm *et al.* 1993; Healy *et al.* 1992; Wymer 1958, 1959, 1960, 1962, 1963). Closely associated sediments include thick late glacial transitional and early Holocene floodplain deposits containing a high quality palaeoenvironmental record for the period of 9700–7550 cal BC (Barnett 2009).



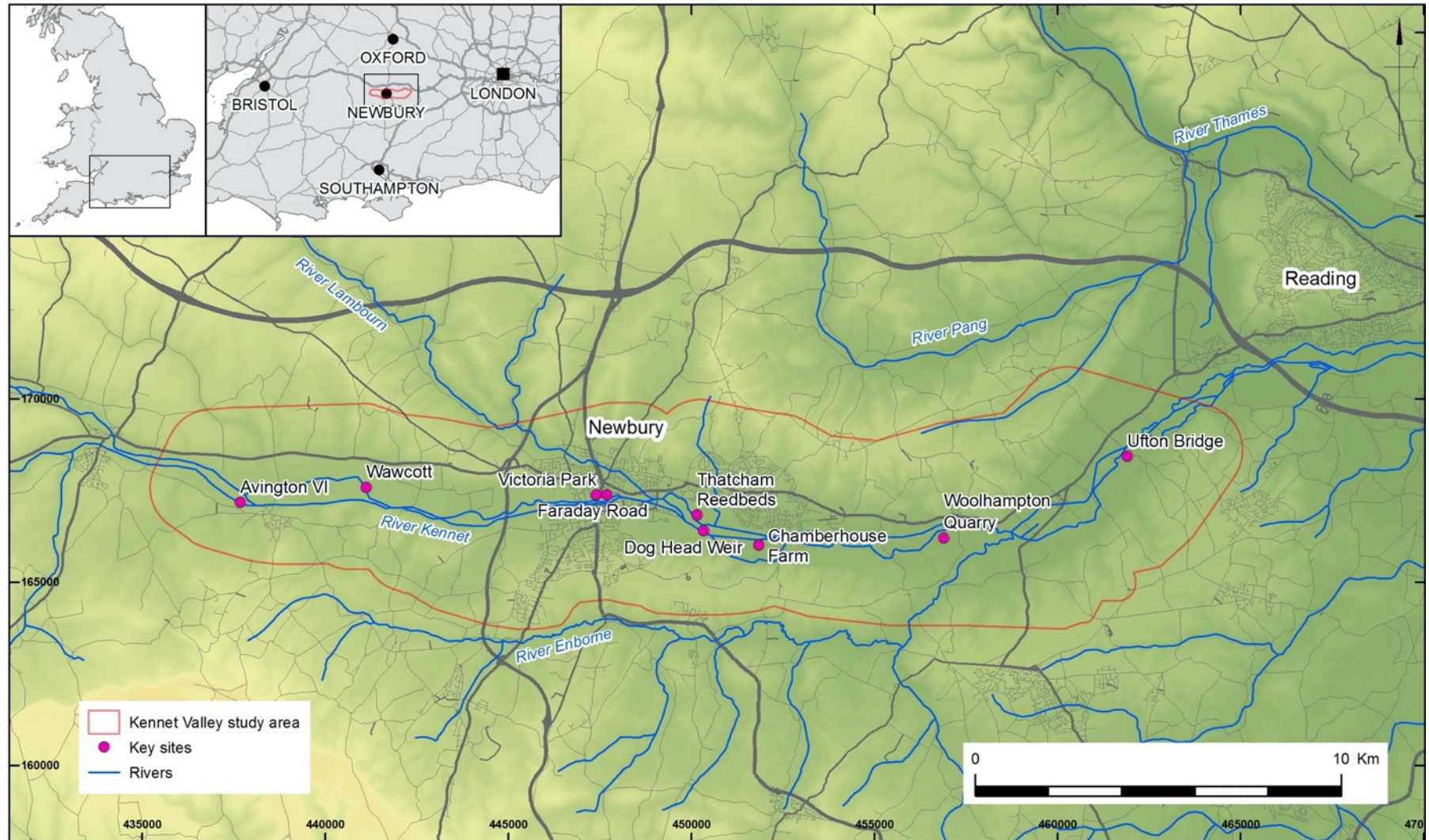


Figure 1: The case study area

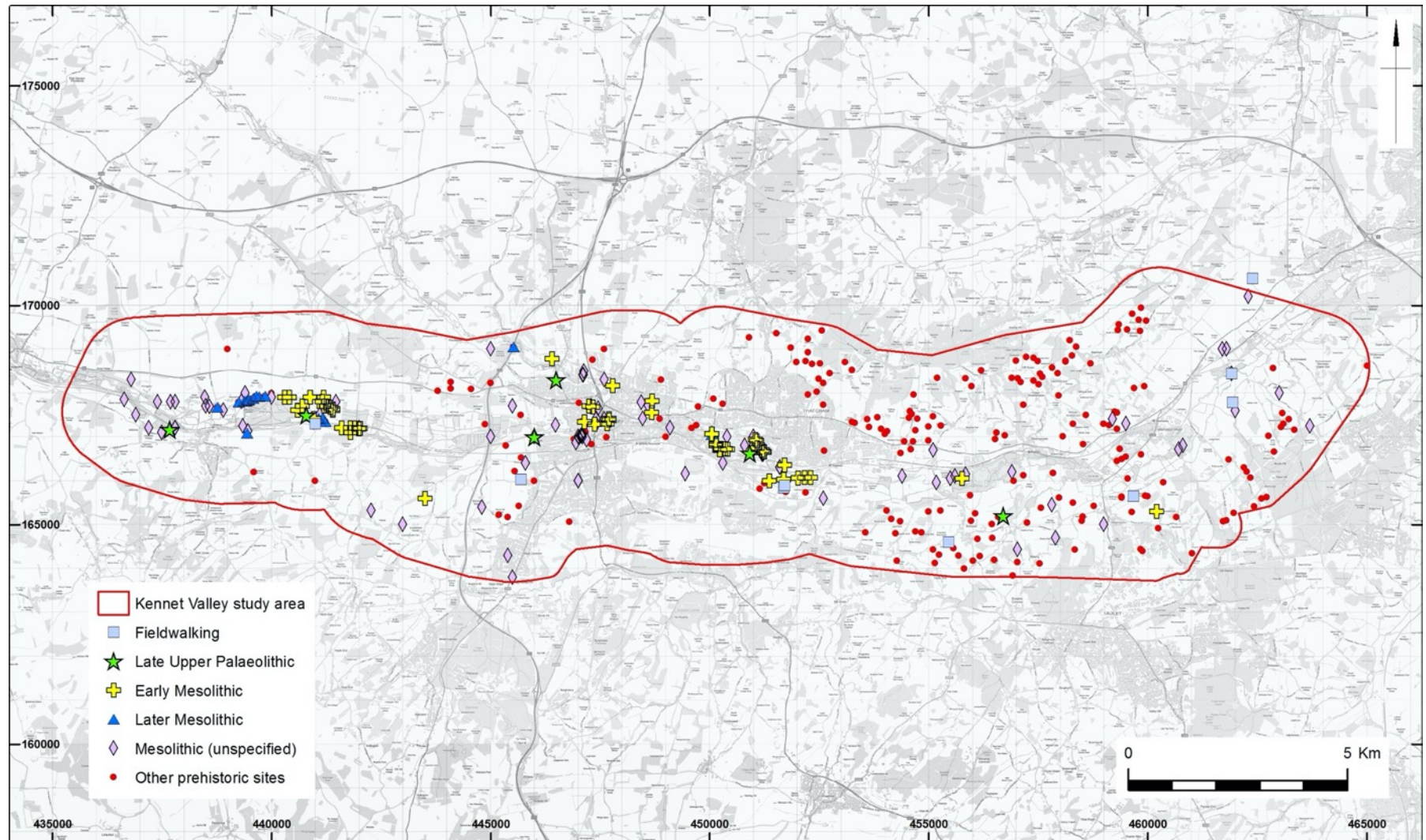


Figure 2: All known sites and find spots

Comprehensive fieldwalking and lithic distribution studies have been undertaken by Stephen Allen, Roy Froom and Steve Ford (Ford 1992), and the Kennet Valley Fieldwalking Survey (Lobb and Rose 1996). The area has been far better served by these efforts than most other regions: gaps in the distribution of findspots in the area tend to be real, due to removal of deposits (for instance, by peat cutting), deep burial or genuine gaps in activity. **Figure 2** shows all known find-spots and sites, drawn from the HER, from the results of this project, and from the archives of Roy Froom and Roger Jacobi (Wessex Archaeology and Jacobi 2014).

The Long Blade sites at Avington VI and Crown Acres and the Early to Late Mesolithic sites around Wawcott have been published (Barton and Froom 1986; Froom *et al.* 1993; Froom and Cook 2005; Froom 2012; Reynier 2011). Froom, for instance, discovered over 100 late glacial and Mesolithic sites in the area, about 30 of which have been subjected to excavation of varying extents. Wawcott was revisited during this project, with a targeted coring and limited dating programme undertaken in order to place two of the most important Wawcott sites (one Early and one Late Mesolithic) in a wider stratigraphic context.

The project also built on continuing research in the Kennet Valley by the University of Reading and other organisations and individuals, much of which is unpublished. This includes extensive coring and examination of exposures at Thatcham Reedbeds and Woolhampton and in the environs of Ufton Bridge (this last brought to publication through this project). In these cases, substantial palaeoenvironmental analyses, coupled at Thatcham with AMS radiocarbon dating, has demonstrated a direct relationship to Mesolithic archaeology (Chisham 2004; Barnett 2009). Evidence for early Holocene burning at Thatcham complements evidence from Star Carr and, to a degree, Three Ways Wharf, Uxbridge, in demonstrating environmental manipulation from the onset of the Mesolithic in these lowland riverine contexts (Barnett 2009; Day and Mellars 1994; Grant *et al.* 2014). A programme of targeted coring, geophysical survey and radiocarbon dating was undertaken at Thatcham, which has physically and chronologically tied the floodplain sequences to the sites excavated by Wymer (1958, 1959, 1960, 1962, 1963). Wessex Archaeology has also previously excavated and established the environmental sequences of Mesolithic sites at Faraday Road (Ellis *et al.* 2003) and Newbury Sewage Works, Thatcham (Healy *et al.* 1992).

The combined body of recent work, along with that of Holyoak (1980), Collins *et al.* (1996; 2006) and Cheetham (1975, 1980), has demonstrated the importance of the early Holocene environmental record of the floodplain and wetland-dryland edge, and the preservation of a wide range of remains including wood, charcoal, pollen, plant macrofossils and molluscs. This preservation potential, the concentration of artefactual remains and sites, the quantity of existing investigations and the availability of numerous commercial boreholes taken in advance of aggregate extraction and development made the study area an ideal testing ground for the methods and techniques of mapping, prediction and prospection.

## Vulnerability and risk

Local planning authorities have consistently encountered difficulties explaining the international significance of the Late Upper Palaeolithic and Mesolithic archaeological resource of the Middle Kennet Valley to developers generally, and the aggregate industry specifically, due to the ephemeral nature of many sites and their lack of visibility.

Some archaeologically important areas of the valley have suffered from extraction activities including peat digging, marl digging and extensive aggregate (gravel) removal (**Figure 3**), the latter intensively in the 20<sup>th</sup> century, notably between Newbury and the western edge of Reading: reserves between Newbury and Thatcham are largely worked out. A substantial potential holding exists at Chamberhouse Farm to the immediate south of (and on the opposite terrace to) the known Thatcham sites, and this may well contain sites of comparable importance. Recent gravel workings have been concentrated to the south of Woolhampton, around Beenham and Aldermaston and to the south and west of Theale. Quarry sites have been included within the project GIS to highlight where removal has occurred and archaeological potential consequently lowered.

There is currently no gravel-working west of Newbury, but extraction has occurred previously, notably at Barton Court near Kintbury. The current West Berkshire Minerals and Waste Plan is still evolving (see <http://info.westberks.gov.uk/index.aspx?articleid=29081>): it is unclear where extraction will be located in the future, but indications are that future sites will be focused east of Newbury/Thatcham. Protecting the North Wessex Downs Area of Outstanding Natural Beauty (AONB) from major extraction does appear to be a key part of the emerging policy, which discounts areas west of Newbury. Permission has recently been granted for large-scale sand and gravel extraction at Lower Farm Wasing, south-east of Woolhampton within the zone of high Mesolithic potential. That this permission was granted demonstrates that risk from extraction will continue to be high for the Lower and Middle Kennet Valley for the foreseeable future.

In addition to the direct impact of extraction, associated lowering of water tables is detrimental to the preservation of archaeological and environmental material outside extraction footprints, as well as to the nature conservation interest of these areas. Other negative impacts include dumping of spoil, while at Thatcham Reedbeds there is a disused local authority tip on part of the archaeologically sensitive area, and quarry upcast elsewhere.

There is therefore a profound need to identify areas of the valley floor where key sediments remain, and to characterise how they may most effectively be investigated, preserved, or both. Such identifications would serve both archaeological and nature conservation interests, and inform the aggregates extraction planning process.

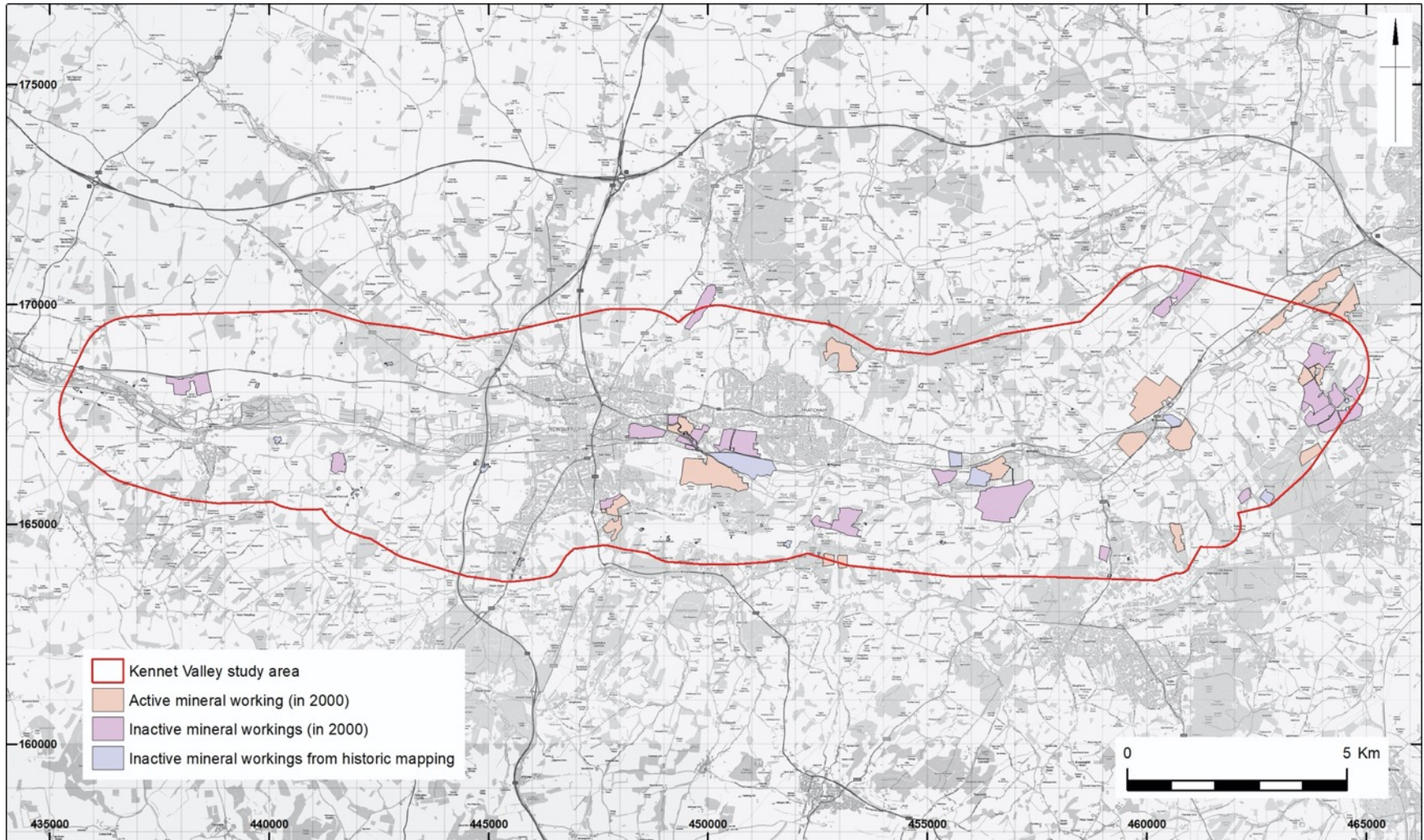


Figure 3: Areas of active and former extraction

For instance, it is apparent that the designation of part of the Thatcham site (the 'reedbeds') as a Site of Special Scientific Interest (SSSI) has allowed preservation of high quality early Holocene floodplain sequences directly associated with Early Mesolithic sites (Chisham 2004; Barnett 2009). This is despite extensive past quarrying at the site, as the reedbeds have deliberately been kept wet and relatively undisturbed for nature conservation purposes. Consequently, as an addition to this project, a Statement of Significance was prepared on behalf of English Heritage under 6240 *Exceptional Waterlogged Heritage. Stage 2: Statements of Significance*, in recognition of the importance of the wetland area of Thatcham and its environs.

Knowledge of the early Holocene archaeology of the Kennet Valley has a strong ecological emphasis, with a great deal of our understanding of the period stemming from palaeoenvironmental investigations. There is, therefore, a high potential for presentation and education alongside nature conservation. In this way, an integrated approach to heritage can ultimately be presented (Bell 2004). Partnership and close collaboration with Historic England and other agencies is felt to be crucial in tackling these themes.

It is of particular note that Wessex Archaeology and West Berkshire Council were granted funding by the then English Heritage Designation Team to use the Middle Kennet Valley Case Study Area as a pilot project for investigating methods to map, define and protect "structureless sites", in this case Mesolithic hunter-gatherer sites, otherwise poorly served under the current designatory system (EH project MAIN 7032: Wessex Archaeology 2015).

The results presented here highlight the exceptional potential of this area, with more sites with well-preserved associated environmental sequences clearly still to be found, as exemplified by the site at Victoria Park, Newbury. These findings provide strong evidence for the need for enhanced mechanisms of protection on archaeological and palaeoenvironmental grounds, and give curators in West Berkshire Council and Historic England a more robust and predictable basis for requesting detailed and appropriate investigation and mitigation in advance of development and extraction.

## PART 2: RESEARCH AIMS, OBJECTIVES AND PROJECT METHODS

### Aims

The aims of the project were to develop a predictive modelling framework through comprehensive research and the application of appropriate technology, in order to better inform awareness of the finite and significant early prehistoric archaeology of this region; to assist the local authority in identifying appropriate mitigation measures in response to development proposals; and to create systems that can be applied to similar archaeological landscapes throughout the UK.

These aims (formalised in the Project Design as above) were addressed through a number of project objectives and associated methods.

### Methods

#### **Objective 1: Data compilation, assimilation and modelling**

*O1a - To create a comprehensive database of known Upper Palaeolithic and Mesolithic sediments, land surfaces and artefacts for the case study area.*

#### **Archaeological data collection and filtering**

Site and artefact data were obtained from a number of sources to ensure that all known relevant sites were included. Alongside the West Berkshire HER (WBHER), data was also obtained from the Jacobi Archive-derived *Palaeolithic and Mesolithic Lithic Artefact* database (English Heritage ref. 2738 MAIN: Wessex Archaeology and Jacobi 2014) and Froom's work in the area (Froom 2012 and including elements from his extensive personal archive).

Sites (defined here as any stray find or collection of artefacts, whether stratified or not) of Late Upper Palaeolithic and Mesolithic date were extracted from all sources; prehistoric flint finds of unspecified date were also extracted from the WBHER. Sites and find-spots clearly falling outside the scope of the study (pre-Late Upper Palaeolithic, including a number of Acheulean hand axes) were removed. Other sites with low-precision spatial data were also flagged for consideration during the filtering stage. The resulting data were combined into a single dataset with associated event records from the WBHER.

Likely duplicate sites in the initial combined dataset were flagged by way of their site name or their spatial relationship; the ArcGIS 10 'Near' analysis tool was used to identify those sites with identical or similar locations. The flagged sites were then manually compared in order to confirm whether or not they represented the same site. Data was combined for those sites considered duplicates, with the extra records then being removed from the dataset. The low-precision data flagged previously was also considered at this stage, with records being replaced by, or merged with, more precise records. Lastly, additional information was assigned to the final collection of sites, including the method of discovery and the confidence of a site being of Late Upper Palaeolithic or Mesolithic date. The filtering process resulted in

a total of 381 sites being carried forward, ranging from excavated sites demonstrating evidence of occupation to flint artefacts recovered during fieldwalking.

### **Sedimentary data**

A wide range of data sources were consulted to construct a deposit model covering the study area. The initial dataset was derived from data held within the BGS onshore GeoIndex. Initial screening of the full available dataset (1,924 separate entries) was undertaken to identify records suitable for deposit modelling – this resulting in a final usable dataset of 1,205 data points.

An additional 1,563 data points were obtained from other sources. These included archaeological investigations within the study area; PhD theses (notably Chisham 2004; Collins 1994; Holyoak 1980; Cheetham 1975); geotechnical datasets associated with planning applications; and results of coring and excavation associated with the current project (added during the deposit model revision during Stage 2). Data points were concentrated in the floodplain in areas where either aggregate extraction has taken place or which have been identified as containing suitable sources (**Figure 4**). Other data clusters include the sites of Thatcham Reedbeds (Chisham 2004; Holyoak 1980; Wymer 1960; 1962) and Ufton Bridge (Chisham 2004; this report), the latter containing 198 separate borehole logs obtained across two fields as well as detailed geophysical survey data (Mansfield 2007). A notable cluster of data points was also found around Newbury town centre, centred around a number of sites of known Mesolithic archaeology, and along the north-south alignment of the A34 Newbury Bypass to the west of Newbury. To the west of the A34 data points were sparse on the floodplain and although they incorporated results from extensive studies at Wawcott (Froom 2012) only a limited amount of stratigraphic data suitable for inclusion within the deposit model was available. Other areas with poor coverage included the lower Lambourn Valley to the north of Newbury; the centre of the Kennet floodplain between Chamberhouse Farm and Thatcham; the lower Enborne valley; and to the north-east of Padworth (**Figure 4**).

Away from the floodplain, data coverage was very uneven. As a result, it was necessary to introduce control points to limit the effects of over-interpolation within the deposit model. OS Terrain 50 data from the study area was also used to constrain the upper surface of the deposit model and limit data interpolation across topographic features such as tributary valleys. A total of 528 control points were introduced into the dataset to constrain the margins of the floodplain and visual representation of the main geological and Pleistocene gravel terraces within the resultant study area-wide deposit models. These were determined using the Geological Sheets 267 (Hungerford) and 268 (Reading). Each data point was given an arbitrary sequence depth of 0.3 m and assigned to the mapped superficial or geological unit encountered. Altitudes for each of these points were extracted in ArcGIS 10.1 from OS Terrain 50 data. The resultant deposit model, as it currently stands, was constructed from a total of 3,296 data points (including the 528 control points).



The dataset is contained within an Access (MDB) database. All elevation data is related to Ordnance Datum Newlyn (m ODN) with locations stated using a British National Grid numeric 12 digit reference. Each of the 3,296 data points was individually interpreted by Michael Grant, who recorded individual lithology units and subsequently defined these units within a broader stratigraphic framework (below). By assigning each lithology unit to a stratigraphic unit it was possible to model the stratigraphy for the entire study area within the program Rockworks 15, using the interpolation method of Inverse Distance Weighting. Due to the large size of the model and uneven data distribution, the modelled surfaces were at a pixel resolution of 50 x 50m. The model was used to understand the nature of the topography and thickness of each stratigraphic unit, as well as the spatial distribution of each stratigraphic and lithological unit. For the lithological model, an interpolation distance threshold of 500m was applied to each data point. This was to ensure that the model did not generate false or unsubstantiated predictions of the distribution of key lithological units (eg peat or marl) within areas where no data was available.

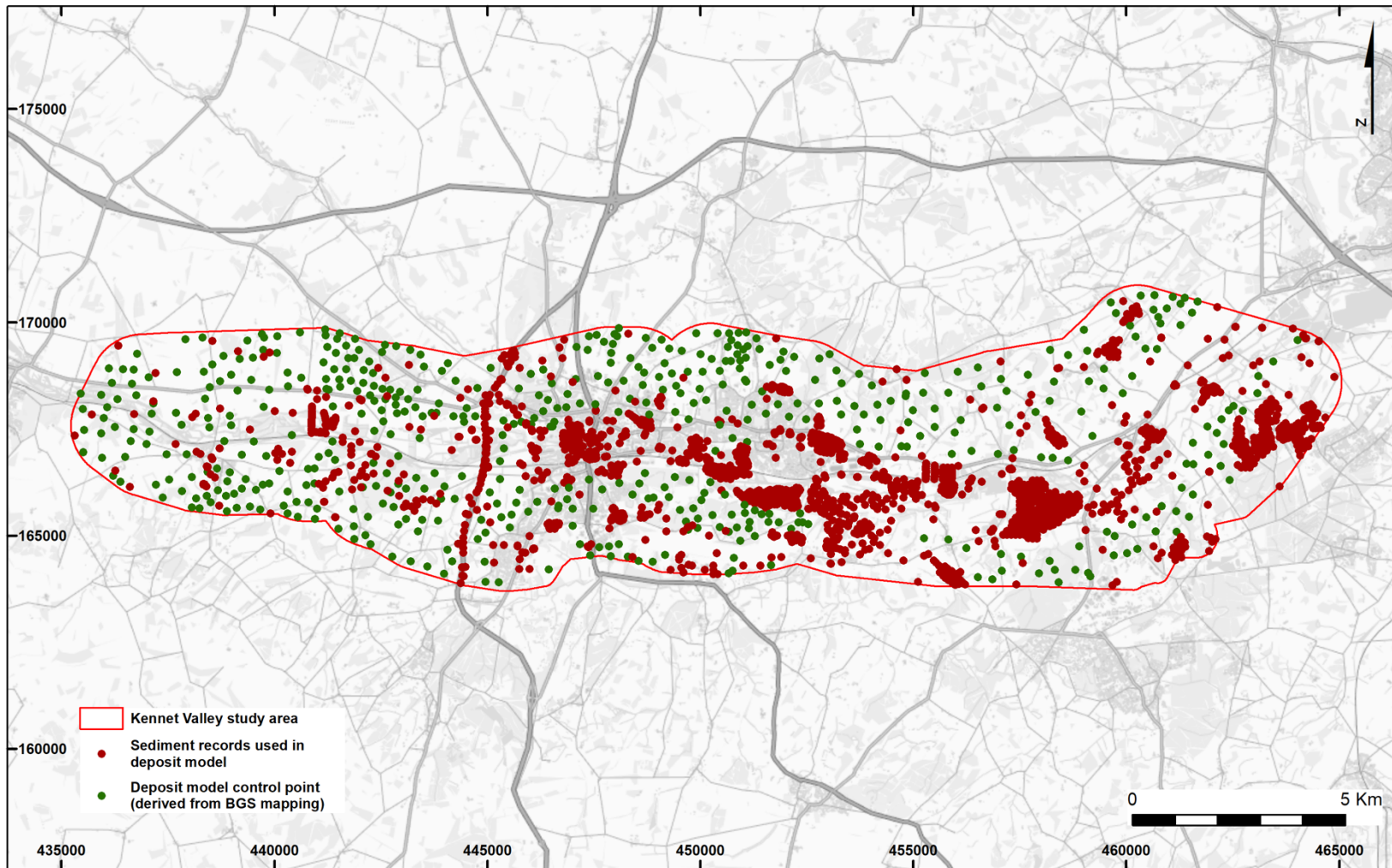


Figure 4: Sedimentary datapoint distribution

## Aerial photography and LiDAR

Aerial photography, LiDAR data and Ordnance Survey mapping (both historic and modern) were consulted as a means of establishing both the distribution of earlier channels and evidence of topographic change within the study area, alongside episodes of quarrying and peat cutting which help to highlight land-use history within the area.

These datasets complemented additional sources used to establish earlier gravel extraction activities within the area. Focus was placed on those test sites forming the most detailed element of the study (the Thatcham, Ufton Bridge, Wawcott and Victoria Park areas), although areas of gravel extraction were recorded for the entire area.

The consulted datasets proved most useful in helping to establish those areas which have been subject to quarrying and which, as a result, lack the same potential for deeply stratified deposits as those areas which have not seen extensive extraction. Alongside aiding in the identification of areas of past quarrying, the historic mapping and aerial photography helped to demonstrate some evidence of earlier channels in the Thatcham, Wawcott and Ufton Bridge areas.

Alongside the aerial photography and historic mapping, Ordnance Survey OpenData mapping was used to help establish areas of extraction and made ground for the model. LiDAR data was also scrutinised although, due to recent extraction and some modern development, it added little further insight to the evidence already obtained through the study of the other datasets.

## Palaeoenvironmental data

A database of palaeoenvironmental material was compiled from the Historic Environment Record (HER) and divided into five broad categories:

- Macro – where waterlogged deposits such as peat or palaeochannel deposits were located and may contain preserved plant macrofossils, etc.
- Pollen – deposits from which pollen samples had been taken.
- Wood – deposits within which wood had been preserved.
- Charred – deposits within which charcoal was found.
- Neutral – deposits with a neutral pH based on preserved bone or mollusc shells found within them.

Each category was assigned a symbol and each find-spot plotted in ArcGIS with its HER id and a brief description of the type of find (**Figure 5**).

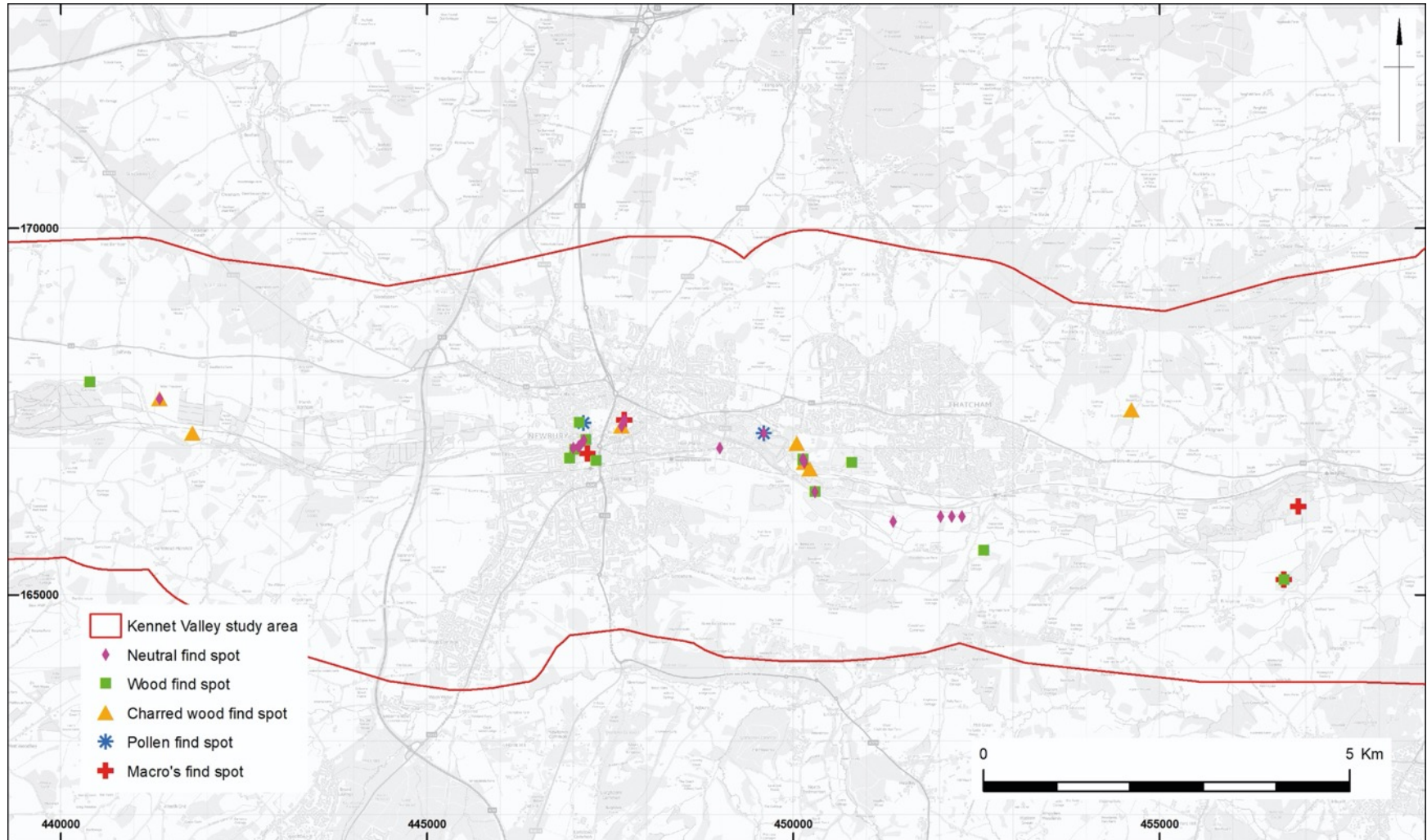


Figure 5: Known preserved ecofact distribution

*O1b To conduct data and deposit modelling to identify spatial and chronological variation across the study area and the distribution of known facies associated with archaeological finds.*

### **Stratigraphic data and geological constraints**

The study area-wide stratigraphy formed the baseline for the construction of a deposit model, with the assignment of 12 separate units. Definition of the superficial deposits (Pleistocene and Holocene) has followed the scheme of Collins (1994, table 2.2) with six distinct members identified. These are listed below in order of altitude (highest to lowest) and age (from oldest to youngest):

- Cold Ash Gravel Member;
- Bucklebury Common Gravel Member;
- Silchester Gravel Member (includes the Hamstead Marshall Gravel Member);
- Thatcham Gravel Member (includes Upper and Lower Thatcham Gravel Members);
- Woolhampton Gravel (includes the Beenham Grange Gravel Member, River Terrace Deposits 1 to 2 and 2 to 4; Heales Lock Gravel; and the Brimpton Sandy and Silty Gravels); and
- Midgham Member (floodplain deposits overlying gravels, mainly of Holocene age. These include peat, tufa and marl deposits).

Other notable superficial deposits mapped by the BGS in the study area, but not included in the deposit model, were “head” deposits or solifluction material, commonly occurring along the valley sides, along with Clay-with-Flint formations commonly capping the exposed solid Chalk in the west of the study area. These superficial deposits were often poorly recorded within the available site investigation reports and in many cases it was not possible to identify these with any certainty. It was therefore decided to omit them from the model rather than run the risk of either over-interpolation between dispersed data points, or relying upon BGS mapping to introduce an artificial layer showing the anticipated distribution of each deposit type.

The top of many stratigraphic sequences comprised topsoil or, when in urban areas, made ground. The thickness and composition of the latter is highly variable. In aggregate extraction areas the available stratigraphic sections often show that these upper two units have been stripped off prior to recording. Similarly, where control points were used in the model, the presence of topsoil and made ground was not included. As a consequence these two units have an uneven spatial distribution and the generated distribution and thickness maps should be regarded as minima.

The solid geology of the study area consists of four distinct units (oldest to youngest):

- Cretaceous Chalk Group (Seaford and Newhaven Chalk Formations; Upper Chalk);
- Palaeogene Lambeth Group (principally Reading Bed Formation);
- Palaeogene Thames Group (London Clay Formation); and

- Palaeogene Bracklesham Group (Bagshot Formation, though these may form the topmost part of the London Clay Formation (Mathers and Smith 2000)).

Chalk is exposed at the surface in the west of the study area, gradually giving way to Lambeth Group deposits in the valley bottom east of Newbury (though present on the surrounding hills capped by Pleistocene gravels) which in turn gradually gives way to the Thames Group between Thatcham and Colthrop, before finally returning to Lambeth Group deposits west of Papworth. To the north and south of the floodplain Bracklesham Group deposits are found underlying the Cold Ash, Bucklebury and Silchester Gravel Formations (**Figure 6**).

In addition to three-dimensional modelling of the study area's superficial and geological strata, the spatial variation in deposit thickness of key units was also examined.

Thick Woolhampton Gravel Formation deposits are most notable in the west of the study area, around Avington and Wawcott, and also in the east, centred on Woolhampton, Brimpton, Wasing, Aldermaston and Lower Padworth (**Figure 7**). Previous investigations within the study area have identified important late Pleistocene (including Windermere Interstadial) deposits consisting of organic and fine-grained lithologies within the gravel bodies (Cheetham 1975; Holyoak 1980; Collins 1994; Worsley and Collins 1995). Many of the areas of thick gravel deposits were associated with a late glacial palaeochannel preceding the final gravel aggradation stage in the floodplain and provided a rare record of late glacial river dynamics and vegetation cover in the area. The modelled thickness of deposits in the west of the study area should be treated with caution given the limited number of data points obtained.

The surface topography of the Woolhampton Gravel Formation provides an indication of the Kennet Valley floodplain during the late glacial/early Holocene prior to the deposition of the Midgham Member deposits. The modelled landsurface clearly shows the presence of topographic highs and lows across the floodplain, including the main early Holocene palaeochannel course. The undulating gravel surface inherited from the Pleistocene is especially evident from the geophysics and borehole surveys at Ufton Bridge and Wawcott. This gravel surface provides the main reference point upon which an archaeological predictive model can be generated.

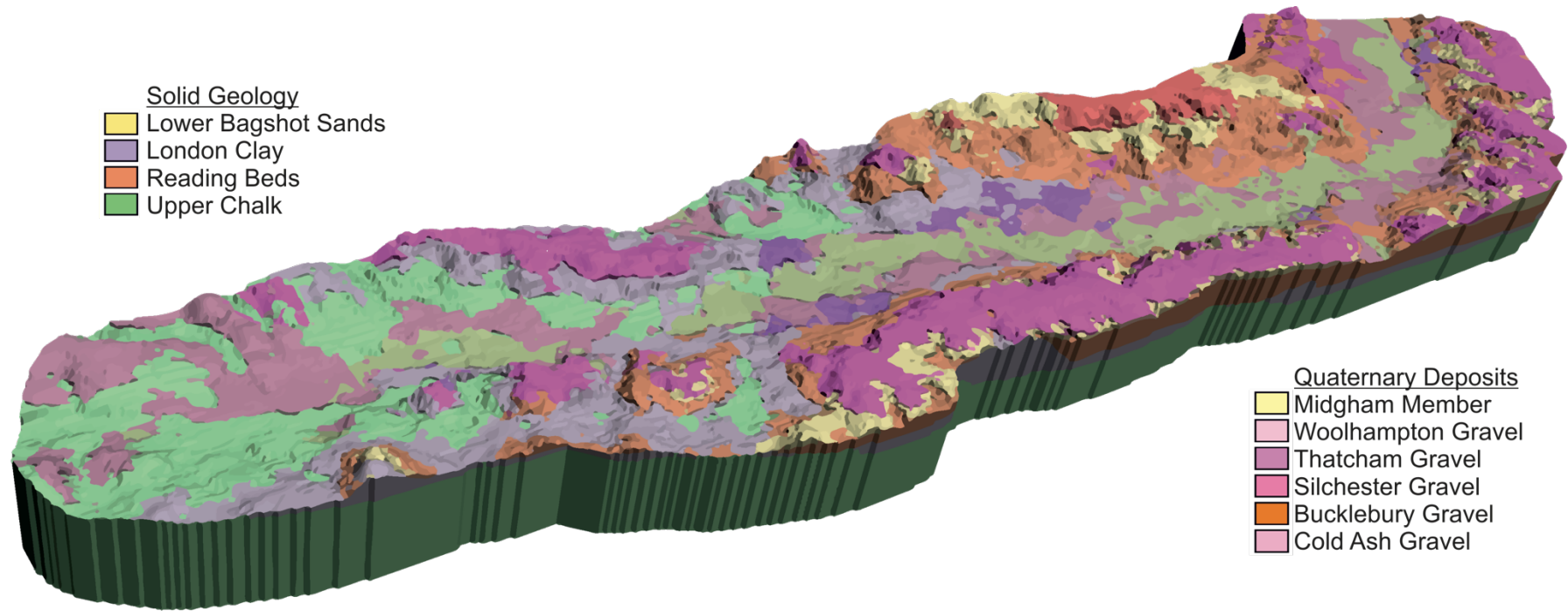


Figure 6: 3D geology

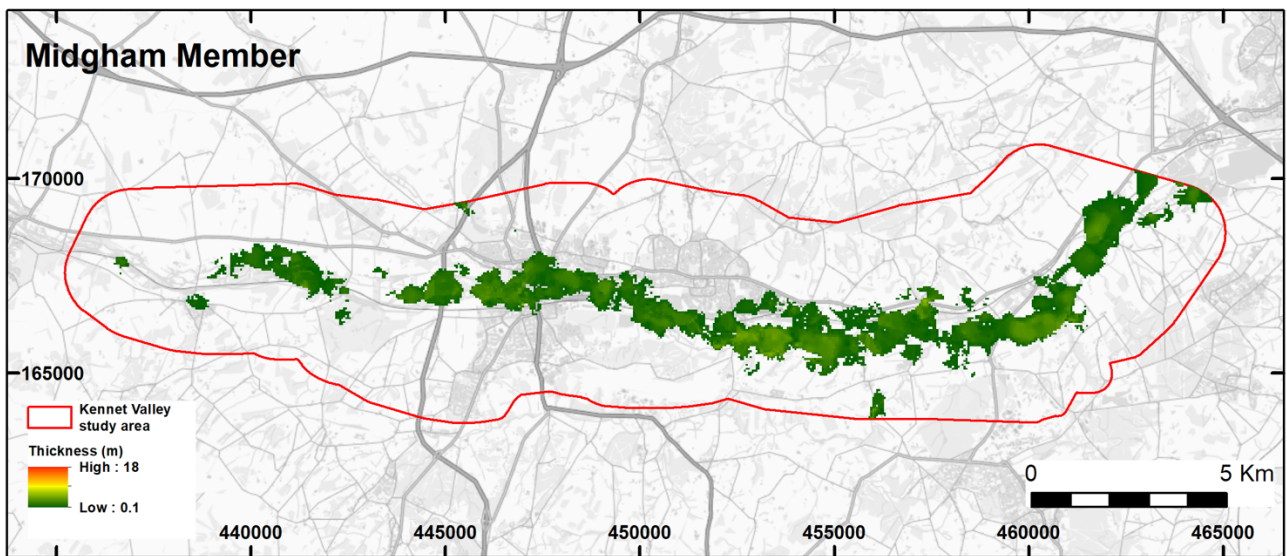
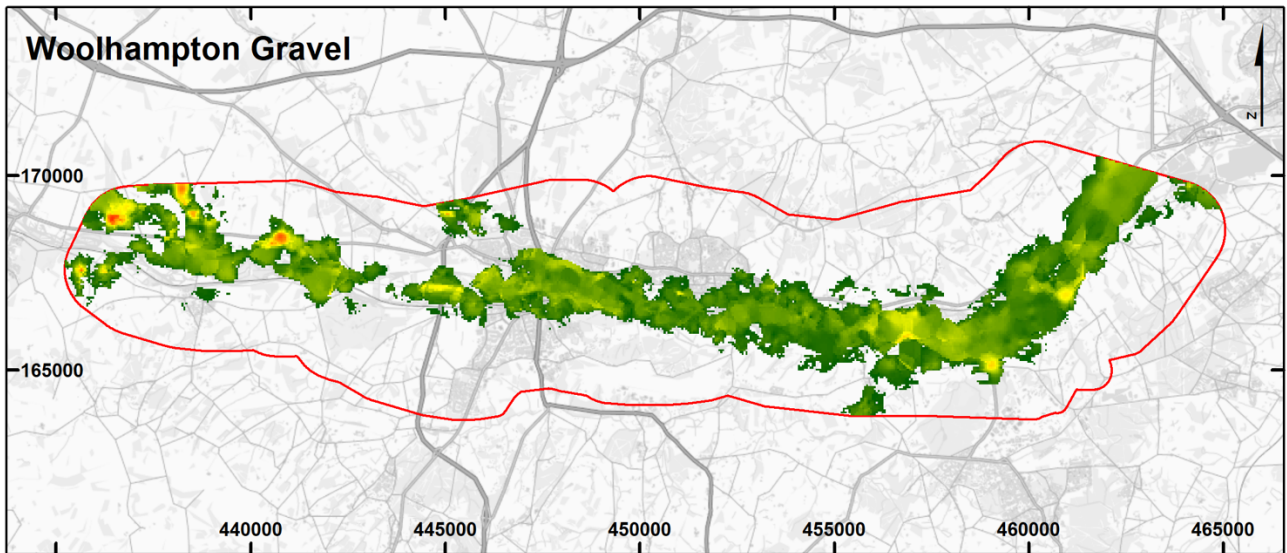


Figure 7: Formation thickness for Woolhampton Gravel and Midgham Member



The thickness of the Midgham Member deposits (**Figure 7**) is variable across the study area but does show some consistent patterns with areas of notably thicker deposits, particularly in the centre and east of the study area around Chamberhouse Farm, Woolhampton, Lower Padworth and Ufton Bridge. Thick deposits are also encountered in some areas around Newbury. However, these thicknesses should be seen as minima due to truncation by construction or (particularly west of Newbury but noted throughout the study area) peat cutting (Holyoak 1980; Froom 2012; Worsley 2009, 119; Blake 1903, 82). The patchy coverage of Midgham Member deposits west of Newbury is due to both extensive peat cutting and poor data coverage, although due to the work of Froom (2012), Fern (2004) and the present project (below) the complex sequence at Wawcott is becoming clearer. The lower reaches of the rivers Lambourn and Enborne are poorly represented, due to paucity of data coverage, so may therefore considerably under-represent the thickness of Midgham Member deposits within them.

### Lithological data

The Midgham Member was sub-divided into six distinct lithologies to enable mapping of their spatial distribution and thickness across the study area:

- calcareous marl;
- calcareous tufa;
- minerogenic deposits (clays, silts, sands and gravels);
- organic clays and silts;
- peat; and
- undifferentiated (often where borehole description was simply “alluvium”).

These basic lithological units were deemed sufficient to understand the broad distribution and uniformity of the floodplain sequence (eg models presented by Chisham 2004; Collins *et al.* 1996; Holyoak 1980) as well as identifying areas likely to contain good palaeoenvironmental preservation potential (eg peats for plant remains, calcareous deposits for molluscs) and possible large water bodies (indicated by lake marls: Worsley 2009). The use of more detailed lithological categories would have been unworkable across the large dataset due to considerable variation in the level of sediment description between different studies. Mapping of key geoarchaeological features, such as palaeosols, would have simply led to a distribution of these deposits in areas where specific types of site investigations (such as archaeological excavation or geoarchaeological coring) had already taken place. Consequently, it was felt necessary to use simplified lithological units that would be recorded, if present, during most types of site investigation and therefore permit a more meaningful, and representative, lithological model of the study area. However, the case studies investigated in this project provide guidance as to how former land surfaces may be recognised, particularly from the presence of a highly organic silty top which is associated with Mesolithic artefacts on many Kennet Valley sites. Details of site-specific lithologies, and their relationship to archaeological contexts, are highlighted by the specific case studies and are discussed further later in this report.

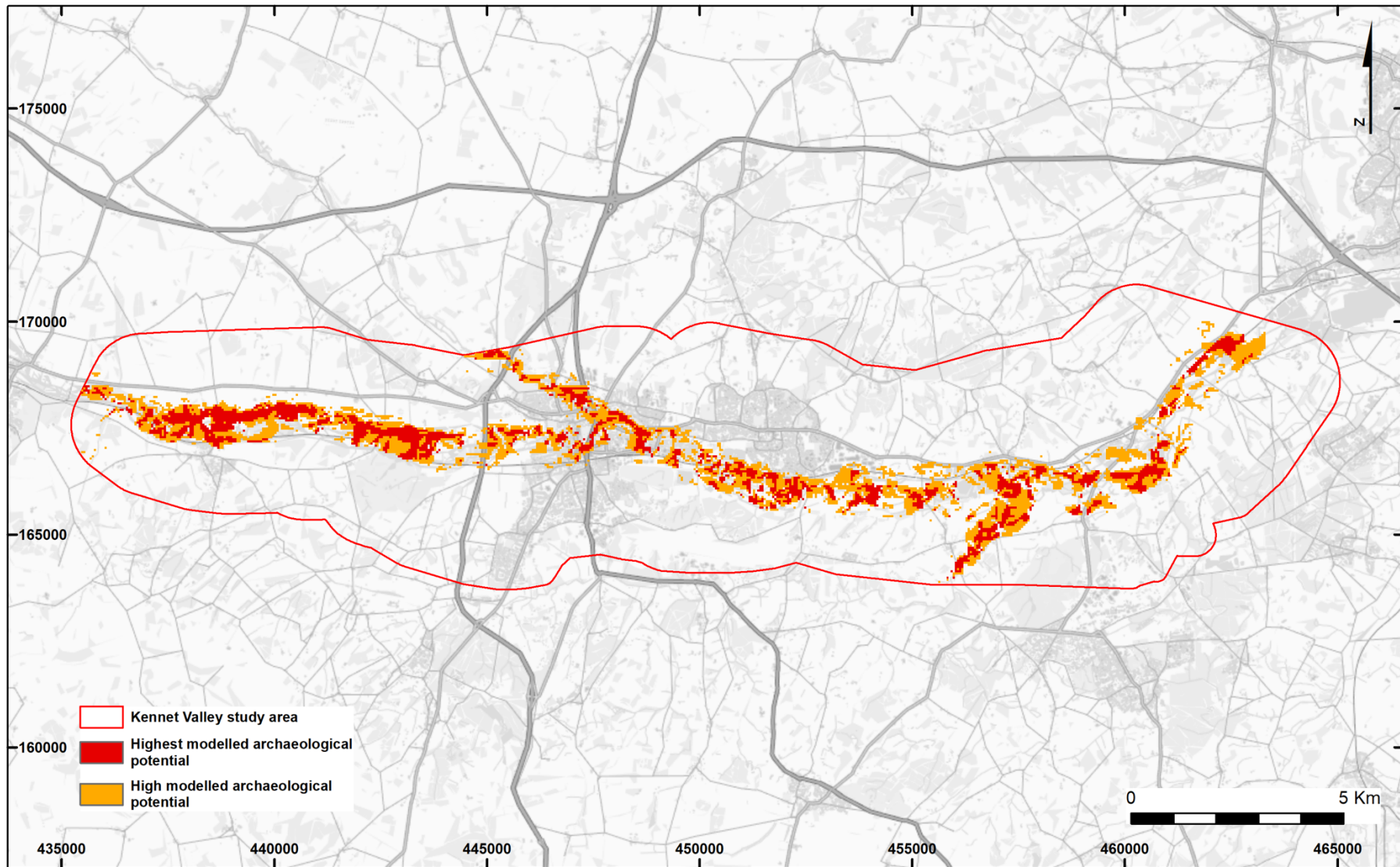


Figure 8: Areas of high modelled archaeological potential within the Kennet Valley

Due to the necessary interpolation limits imposed upon the model (cut-off at >500m from a data point) there is an uneven distribution in the modelling results of the Midgham Member deposits and lithologies, notably west of Newbury. This has resulted in a “bull’s-eye” effect over the data concentration at Wawcott. Taking the biases of data distribution into account, there are some clear spatial trends within the resultant datasets, which are discussed below.

### Chronological data

A database of existing scientific dates (radiocarbon, Optically Stimulated Luminescence (OSL) and Thermoluminescence (TL)) covering the Late Palaeolithic to Mesolithic periods was compiled. Dates that are post-Mesolithic in age but derived from material in a Mesolithic or Palaeolithic context were also included (**Appendix 2**). This resulted in a total dataset of 99 radiocarbon, three OSL and two TL dates. These included published dates, unpublished dates (for Thatcham, made available to the project by Chantal Conneller (University of Manchester)), and dates generated during this project. Dates were obtained from seven principal areas upon the floodplain (totals for area stated in brackets):

- Avington: Avington VI (three OSL dates);
- Wawcott: Wawcott I, III, XXIII, XXX and Marsh Benham (eight radiocarbon dates and two TL dates);
- Newbury: Faraday Road; Greenham Dairy Farm; Victoria Park, Newbury Flyover and Kennet Centre (21 radiocarbon dates);
- Thatcham: Thatcham Reedbeds; Thatcham I, II, III, IV and V excavations; Newbury Sewage Treatment Works; and Avenell’s Cottages (45 radiocarbon dates);
- Woolhampton Quarry (14 radiocarbon dates);
- Brimpton (two radiocarbon dates); and
- Ufton Bridge (also called Ufton Green) (nine radiocarbon dates).

All published radiocarbon dates were checked against the original laboratory reports where possible and/or against reporting in the journal *Radiocarbon*. This included the re-issuing of four dates originating from measurements made by the British Museum during the 1980s (see Bowman *et al.* 1990). A number of other dates were found to have been misquoted within site publications. Dates were calibrated against the IntCal09 Northern Hemisphere radiocarbon curve (Reimer *et al.* 2009) using the program OxCal 4.2 (Bronk Ramsey 1995; 2001). Calibrated dates are quoted as calibrated years BC/AD, with date ranges quoted using the 2 $\sigma$  calibrated range (95.4%) with end points rounded outwards to 10 years (Bayliss *et al.* 2008) except for dates >20kya which are rounded outwards to 50 years.

In total the table contained 104 dates (including three OSL dates) of which nine could be excluded as they fell significantly outside the period under research. In terms of quality almost a quarter of these dates were on unidentified wood charcoal with unknown age offsets and a few were on bulk animal bone/mixed charcoal. In terms of precision approximately one third had radiocarbon errors that exceeded  $\pm 100$ , some significantly. A small number were accepted as too young due to low collagen yields. In addition, about a fifth of the dates could be considered problematic for a variety of reasons (noted in the footnotes to the table).

These shortcomings reflect the fact that the dates had been obtained over a period of nearly 50 years, and the subsequent developments in sampling, pretreatment, measurement and precision. At face value they do appear to cover the Late Upper Palaeolithic and early Mesolithic in particular (see **Appendix 2**: c.12000–8000 cal BC).

Subsequently, a radiocarbon dating programme was undertaken by Peter Marshall *et al.* (2015). The results have been incorporated into the relevant sections of this report.

*O1c To use the outputs from O1a and b to predict areas and deposits where LUP/Mesolithic archaeology may be present, as well as where in situ land surfaces and preservation of organic material is likely occur.*

### **Sedimentary modelling, identifying and filling the gaps**

The modelling assimilated all available datasets (such as borehole, section/elevation and geophysical records) into a single entity. Examination of this record enabled identification of significant gaps in the dataset which helped direct ground-truthing and geophysical surveys.

The data also allowed the identification of areas where truncation of the record exists, such as through quarrying. These gaps were identified through the sources outlined below and the use of historic and present-day gravel extraction data in the *Assessment of Archaeological Resource in Aggregate Areas of West Berkshire* (Featherby 2013), obtained through West Berkshire Council. Featherby considered both active and inactive mineral workings, with historic extraction recorded through the identification of gravel, sand and chalk pits recorded on historic Ordnance Survey mapping; the datasets therefore provided further evidence of gaps in the sequence of deposits across a wide area.

### **Predictive mapping, setting of parameters**

The predictive model was generated from datasets generated in Stage 1 of the project, and updated with new data collected in Stage 2. The model was generated using the outputs from the deposit modelling and synthesised Late Upper Palaeolithic and Mesolithic HER record. All predictive modelling was undertaken within ArcGIS 10.1 by Michael Grant based on parameters suggested by Catherine Barnett and Martin Bell. The model is based upon the assimilation of five principal data levels:

- stratigraphic surfaces and unit thicknesses;
- lithology type, distribution and thickness;
- hydrological modelling of the study area and wider region;
- topographic modelling of the study area; and
- spatial data analysis of the HER data against the above generated datasets.

Stratigraphic data was used to generate the topography of the pre-Holocene (Woolhampton Gravel Formation) surface – this was used as the main template

from which the predictive model was generated (output PD1). This is based upon the assumptions that the gravel topography controlled the distribution of watercourse, wetland, and elevated dryland zones during the early Holocene and that the distribution of Late Upper Palaeolithic and Mesolithic activity upon a floodplain is, to an extent, determined by the position of different wetland-dryland ecotones.

Thickness and altitude of the main stratigraphic units was modelled to identify areas of Holocene sediment losses, such as through aggregate extraction or urban/industrial development. This consisted of identifying areas of former (and current) aggregate extraction upon the floodplain, and areas (within the deposit model) where made ground impacted directly upon the underlying pre-Holocene deposits (Quaternary gravels or geology). These areas were compiled into a single layer to display areas of likely sediment (and archaeological potential) loss (output PD2).

To model the distribution of early Holocene palaeochannels upon the floodplain, topographic model PD1 was nested within OS terrain 50 data for the Kennet Valley drainage catchment area. ArcGIS was then used to model the hydrological catchment of the Kennet and identify the drainage pattern (main channels) upon the Woolhampton Gravel Formation surface. The drainage courses of the Kennet, Lambourn and Enborne palaeochannels were then calculated (output PD3). These drainage courses were also used to detrend the drainage gradient of the study area – this process resulted in the length of the channel courses being reduced to 0m with the adjacent gravel terrace now reduced to an elevation measured in height (m) above the floodplain (as opposed to m ODN) (output PD4).

Lithological models from Rockworks were also imported into ArcGIS and the extent and thickness of both individual units and grouped deposits (eg thickness of organic/calcareous units) was calculated (output PD5).

The existing HER data (output PD6) was then applied to the above model outputs (PD1–5) to identify if any spatial patterns (and traits) were present within the existing archaeological database that could be used to identify areas of archaeological potential which exhibited similar traits (**Figure 8**).

The following seven principal traits were identified for incorporation into the predictive model:

#### *Proximity to water*

Output PD6 was tested against output PD3. This demonstrated that over 50% of archaeological sites lay within 400m of the modelled palaeochannels, with 85% within 1km of these channels.

#### *Floodplain elevation/topographic highs*

Output PD6 was tested against output PD4. This demonstrated that 50% of archaeological sites were at no greater than 3m elevation above the ‘floodplain’

(palaeochannel surface). A second cluster of sites (13%) were also found at elevations of 45–50m above the floodplain. These were sites on the periphery of the study area that might be associated with upland activity or adjacent to the upper reaches of streams within other drainage catchments. Topographic highs on the floodplain or at its edges (such as gravel islands and bars on the inherited Devensian gravel surface) were particularly considered. These are often subtle, as found at Thatcham, with a now buried gravel top at >1m above the rest of the floodplain. A rise of only 0.75m above the average gravel surface in that area was therefore set as a possible indicator.

The original concept that Mesolithic groups particularly favoured the low Beenham Grange River Terrace was rapidly discounted. The idea stemmed from the way the sites excavated at Thatcham by Wymer (1962) seemingly hugged a raised terrace edge. However, the coring undertaken within this project (reported below) showed that (at least in the area of Wymer's site II), rather than being an earlier terrace edge, relatively thin fluvial gravels are underlain by marl formed in a system of (probably late glacial) lakes. The gravels are in this case therefore merely a raised island on the floodplain overlying a former dried-out lake area. This direct use of a stabilised floodplain for activity and settlement is also borne out by the excavations at Ufton Bridge and Victoria Park (below).

### *Topographic traits*

Output PD6 was tested against output PD1 by calculating the slope and aspect of the PD1 layer. This demonstrated that 45% of archaeological sites were located on slopes with a southern aspect, compared to 8% which faced northwards. Analysis of the slope gradients demonstrated that 56% of archaeological sites were located on slopes with a gradient of  $\leq 1^\circ$ , with 95% of sites on slopes with a gradient of  $\leq 4^\circ$ .

The identified traits were then used to create a model of archaeological potential across the study area. The correlation of each trait against the PD6 dataset was used to assign a value (0 to 5) to each dataset, with 5 indicating best match (eg shallow slope gradient) and 0 showing poorest match (eg very steep slope gradient). Each trait had equal weighting and all traits were summed to generate a map of archaeological potential (output PD7). The model, based upon the traits used to construct it, clearly had a bias towards the floodplain but this was acceptable as the project aims were focused upon the Kennet Valley floodplain (and floodplain edge) sequences.

Areas of archaeological potential were defined based upon the sum of the assigned values within each of the four principal traits (providing a maximum score of 20). Very high potential was defined as areas with a combined score of >18, with high potential defined as areas with a combined score of 16–18. Output PD2 was subsequently applied to PD7 to exclude geographical areas where sediment loss has occurred (eg old gravel pits) and where, therefore, archaeological potential no longer exists.

Finally the outputs from PD7 and PD5 were combined to provide a predictive model of areas of high archaeological potential coinciding with the presence of

organic and/or calcareous deposits. Again this was compared to output PD2 to demonstrate areas where potential might have been lost and to constrain the prediction of likely future discoveries.

### *Stratigraphic indicators*

The occurrence of particular early Holocene strata was found to be a better guide than broad landscape characteristics in terms of potential for presence, preservation and association with environmental remains. The key layers identified as being chronologically and physically associated with early prehistoric remains are detailed later in this report. These deposits (which include algal marl, organic silts and clays, peat and tufa) represent the terminal late glacial/transition and early Holocene sedimentary environments and the occurrence of these layers should be taken to indicate a high potential for associated remains until proven otherwise.

It should be noted that the project has mapped potential for the occurrence of Late Upper Palaeolithic and Mesolithic strata and sites, with a site defined as any occurrence of stratified or stray artefactual material. Only locations with direct evidence have been targeted; we have excluded sequences where the only evidence is burning (eg Woolhampton), although this is perhaps an arguable point which has been considered further under EH project 7032 (Wessex Archaeology 2015).

A number of factors lower the potential of any given area for preservation of early prehistoric remains, as follows:

### *Extraction and Development*

There is significant and apparently widespread evidence for the removal of Pleistocene and Holocene sediments in the Kennet Valley having had a major effect on topography and the relationship of later Palaeolithic and Mesolithic finds to the present ground surface. The effects of gravel extraction are obvious, although it is not known when this began. It is possible that episodes of extraction in the Romano-British period may have had a significant effect on the local topography in the vicinity of roads and other sites. Peat digging (at least partly of post-medieval date) was recorded in the sections of Woolhampton Pit where trenches with clear spade marks were widely observed. Extensive peat digging is also thought to have taken place at Wawcott and there is historical evidence for this in the mid-19th century (Froom 2012). In addition there is evidence for marl digging at Thatcham (Churchill 1962). The extraction of peat and perhaps to a lesser extent marl may account for the fact that sediments of late Pleistocene and early to mid-Holocene date together with associated Late Upper Palaeolithic and Mesolithic archaeological sites often occur in the Kennet Valley at no great depth, sometimes in the subsoil of the present cultivated soil as in the case of the Long Blade site at Wawcott XII (Froom and Cook 2005), more commonly below relatively thin tufa and/or the desiccated remains of peat horizons where overlying Holocene deposits may have been removed. However, only areas where removal of the entire late glacial and Holocene sequence can be demonstrated have no potential. Generally this occurs only in quarried-out areas, and even then potential can remain between and sometimes within individual quarry workings. It is rarely demonstrable in large

building developments (for instance Parkway in Newbury where deep basements have been created). The footprints of the latter are such that they have not been included in the broad scale model. The former have been accounted for using both the aggregate extents datasets (as used during the *Assessment of Archaeological Resource in Aggregate Areas of West Berkshire* assessment (Featherby 2013) and detailed elsewhere), and the Ordnance Survey OpenData, aerial photography and historic mapping detailed above.

### ***Effects of drainage and oxidation***

A further factor which is likely to contribute to the relatively shallow stratigraphy over Mesolithic sites (for instance at Wawcott) is drainage and agriculture leading to oxidation of peat. This cannot be directly tested at the model-wide scale but is rather considered at a local, test site scale.

### ***The Kennet Navigation and the Kennet and Avon Canal***

The development of these waterways in the post-medieval period had a major effect on the landscape and topography. Organic gravels with tile which may be material dumped from works associated with the making of the Kennet Navigation (opened 1723) or the later canal (opened 1810) were found in some boreholes in Victoria Park. There is evidence of extensive waterworks at Wawcott, some associated with the canal, some with drainage of areas lower than the River Kennet, apparently as a result of peat digging (Froom 2012). It is likely that the intensity of activity on the floodplain (including peat, marl and gravel extraction but also including drainage and cultivation) increased markedly following the creation of the canal.

Results from the predictive model were exported as a series of raster and shapefiles, within a Geodatabase, and have been integrated into the WBHER, as described below.

### **Objective 2: Testing the model/validation**

*O2a To identify key sites which can test, through geophysical survey and boreholing/auger survey, various key aspects of the model.*

### **Gap analysis and selection of test sites**

The preliminary modelling of archaeological datasets derived from Stage 1b was reviewed by the project team in order to identify key areas for further investigation. The results of this process were presented in the Stage 1 Report (Wessex Archaeology 2014). To summarise, variation in deposits across the study area and the distribution of known artefact-bearing facies or those preserving palaeoenvironmental material were examined and comparison made between the distribution of the archaeology and deposit types (distribution, thickness and topography) using Rockworks and ArcGIS. Areas of poor geoarchaeological data coverage were identified (areas where the borehole descriptions were of low quality: eg single description of alluvium for the whole Holocene fill), and locations where the archaeological dataset does not coincide with the geoarchaeological dataset (eg flints recovered but no geoarchaeological data nearby).



The data was then integrated to highlight significant correlations in the datasets but also gaps in the data, thus enabling the design of an appropriate sampling strategy for testing during Stage 2c with primary aims being:

- to add site scale detail to the model;
- to test and validate the database;
- to fill gaps in data;
- to identify true gaps in occurrence and preservation of strata and remains;
- to identify areas of known or high potential for preservation of Late Upper Palaeolithic and Mesolithic remains and associated palaeoenvironmental materials;
- to consider gaps in the chronological understanding of activity in the area; and
- to map a combination of archaeological sites and fieldwalked areas, highlighting those areas where no finds were recovered or reported.

Fieldwalking results are dependent not only on the presence of archaeological material, but also on the amount of alluvial overburden in that area of the floodplain. Lack of finds should therefore not be interpreted as an absence of archaeological material, as fieldwalking areas of deeper alluvium will have provided little archaeological information from the Late Upper Palaeolithic and Mesolithic periods.

These findings were used to choose four sites for further investigation in order to test the model, fill knowledge gaps, and test the key field methodologies against each other. During their selection, sites were favoured where there were known artefact scatters or excavated remains but no information concerning the presence or absence of adjoining Holocene sediment sequences which may preserve wet phases. Within these sites, in addition to deliberately seeking remains, portions of the site which were modelled as being of lower potential were investigated (through geophysics and coring) to test whether the lower potential areas could also be refined. The four sites chosen were as follows (**Figure 1**):

### *Ufton Bridge*

This site (also called Ufton Green in the literature) was selected due to the availability of a large body of geoarchaeological, geophysical and archaeological data (Chisham 2004; Bell pers. comms; Mansfield 2007; Allen and Allen 2002; Alyward 2008). This enabled a detailed account of the Mesolithic archaeology within a sound geoarchaeological framework and also a clear demonstration of how different techniques (ERT and GPR geophysical surveys; coring; palaeoenvironmental analyses) enhance interpretation, as well as highlighting their own intrinsic value. Requirements for new work were therefore limited to the creation of a chronological framework for the analyses already undertaken and to drawing together the existing evidence for publication.

The remaining three sites (Wawcott, Victoria Park and Thatcham Reedbeds) were selected because of their known archaeology; the potential for preservation of further archaeological and palaeoenvironmental remains; and the depth and

complexity of their sedimentary sequences. Further reasons informing the choices varied between sites.

### ***Wawcott***

At Wawcott a series of discrete and artefactually-prolific sites span at least the Early to Late Mesolithic and possibly also the Late Upper Palaeolithic. The artefact assemblages have been thoroughly studied by Roy Froom; the depositional and chronological framework was limited to the sites excavated and to results from a geoarchaeological project by Fern (2004). Discussion with Froom and visits to the area suggested the potential to clarify the stratigraphy and allow comparison with the other test sites regarding the relationship of key strata to the known remains. There was the opportunity to recover material suitable for dating and to survey part of the known area using geophysics to test whether the sites and strata are detectable remotely. Possible locations were suggested by Froom, providing the opportunity to incorporate his 50 years research on the site (Froom 2012) into the project, and to enhance knowledge of the wider sedimentary context around the sites he had excavated.

Geophysical surveys were planned along two transects at a near right angle and parallel to the River Kennet as detailed below. This was followed by sampling using a close interval coring exercise, for description and recovery of dateable material.

### ***Thatcham Reedbeds***

A great deal of archaeological work has already been undertaken at Thatcham. A series of terrace edge sites were excavated as sites I–V (Wymer 1960, 1962) and Newbury Sewage Works (Healy *et al.* 1992). The sedimentary context was described by Churchill (1962) and Holyoak (1980), although inconsistencies in description, interpretation and proposed chronology occur. In addition, extensive coring has since been undertaken by Barnett and Bell on the adjacent floodplain, which has allowed the construction of a very detailed environmental and chronological context for the sites (Chisham 2004; Barnett 2009). However, due to conditions at the sites (including aggregate extraction; the presence of a railway line; dumping of quarry spoil and landfill material) it had not previously been possible to examine the link between the wetland and dryland edge: coring in this area failed due to the impenetrability of the overburden. Further targeted work was therefore proposed in order to trace the strata most suitable for clarifying settlement and activity (notably in the form of repeated burning activity from the earliest Mesolithic: Chisham 2004), and to link these with the shallower, more truncated sequence excavated by Wymer.

Electrical resistivity tomography (ERT) and Ground Penetrating Radar (GPR) geophysical survey was recommended in the few portions of the site still accessible, in order to identify any areas in which coring might be feasible. In addition, it was hoped to determine whether sites (previously excavated or otherwise unidentified) were visible remotely.

Geophysical survey was also undertaken on the floodplain where the results of coring had been of the greatest quality and significance, in order to test whether these techniques were capable of identifying key layers, including the more ephemeral immature Early Mesolithic palaeosol identified in that area. Targeted coring was followed by sedimentary description; dating of key layers was then undertaken on the basis of these results.

### *Victoria Park, Newbury*

Victoria Park represents one of the few green spaces within Newbury on and adjacent to the floodplain where access to the sedimentary sequence was possible. That there was potential for Late Upper Palaeolithic and/or Mesolithic remains was hinted at by Wymer's observations of the opening of foundation trenches and review of historical records (at, for instance, nearby Bartholomew Street, where he noted a pile structure with possible Mesolithic flints within the peat (Wymer 1958)). In addition, Mesolithic flints had been noted in the West Berkshire Museum archives as arising from construction of the shallow boating lake in the park made in the 1930s (Froom 2012, 124) and the construction of the adjacent A339 flyover in the 1960s.

Given that this is an area of ongoing development pressure, clarification of the degree of preservation of potentially early prehistoric strata and palaeoenvironmental remains, along with the ability to trace potentially artefact-bearing layers into the urbanised areas adjacent to the park, would be of great help to West Berkshire Council in judging planning applications in this area.

ERT and GPR surveys were undertaken around the boating lake and the results used to guide sampling by coring. Ten boreholes were put down round a 60m square surrounding the boating pool (**Figure 89**). At this previously less well-known and understood site, it was felt particularly important to further clarify the sequence encountered both stratigraphically and chronologically using trial pitting, as described below.

### **Geophysical Surveys**

Programmes of geophysical survey were undertaken at three of the four sites with the methods employed adapted to site access, size of survey area, differing ground conditions and expected depth and extent of deposits. Ufton Bridge was surveyed previously as one of three case studies in a project designed to examine the contribution of combined geophysics and geoarchaeological investigations to an understanding of archaeological sites in alluvial and coastal sedimentary contexts (Mansfield 2007). Electrical Resistivity Tomography (ERT) was undertaken at Wawcott, Thatcham and Victoria Park by the Terrestrial Geophysics team from Wessex Archaeology and GPR transects collected at Thatcham Reed beds by Neil Linford of the English Heritage (now Historic England) Geophysics team. These two techniques provide varying levels of resolution and depth of investigation dependent upon, for the former, the probe spacing, and for the latter on the frequency of antenna employed.

The ERT data were acquired using a Campus Tigre System using 32/64 electrodes arranged at variable separations depending on the site conditions. All electrode positions were surveyed using a GPS system. The ERT system was controlled via a laptop running ImagerPro 2006 which automatically selects the electrodes required for each reading. The system used all the available electrodes at ever increasing electrode spacing to acquire a complete data set. The Wenner alpha array was selected as it is robust, generates a stronger signal compared to other arrays and has good vertical sensitivity.

GPR Transects were acquired using a Sensors and Software Pulse Ekko 1000 GPR console together with a combination of a 250 MHz and a 450 MHz centre frequency antenna at Thatcham. At Ufton Bridge two centre frequencies of GPR antenna were used (200 MHz and 400 MHz) coupled to a SIR-20 GPR system.

The location of geophysical transects was influenced by previous research in the Kennet Valley, in particular work undertaken by Chisham (2004) and Froom (1963–2012). The positions were planned in consultation with Roy Froom to target sites of interest and also to allow correlation between the locations of known stratigraphy. The results of the geophysical surveys were used to highlight points of interest for borehole and augering transects the results of which, in turn, fed into the interpretation of the geophysics allowing the identification of stratigraphic sequences seen in the ERT and GPR data.

### **Coring at the four test sites**

New programmes of coring were undertaken at three of the four sites, Ufton Bridge having been cored previously over many years (an additional 20 boreholes were put down to link two survey areas). The methods employed were adapted to specific possibilities for access, differing ground conditions, and encountered depths, but all included the use of powered vibrocoring using a Cobra for collection of sleeved cores; a powered gouge for examination of the upper portion of stony sequences; and hand-held gouge augering. Further details are given in the sections on specific site results. All cored locations were surveyed and the georeferenced position recorded. Sleeved cores were removed and split for recording under laboratory conditions, while other recovered sequences were recorded in the field by a geoarchaeologist (Barnett, Bell or Payne). The cores were cleaned prior to recording and standard descriptions used, following Hodgson (1997) and including Munsell colour, texture, structure and nature of boundaries. The detailed logs are available by site in the digital project archive and have been used to construct the detailed site logs and transects using Rockworks, which are presented by site in this report.

### **Trial pit excavation and post–excavation evaluation at Victoria Park**

The coring at Victoria Park, Newbury informed a decision to open a trial pit to retrieve samples for radiocarbon dating. The strata recorded in coring and the depth indicated by geophysical survey in the vicinity of boreholes 3 and 4 in the north-west of the cored area surrounding the boating pool indicated particularly high potential for the preservation of Mesolithic artefactual and palaeoenvironmental remains. Detailed methods are given within the Victoria Park narrative below.

## **Palaeoenvironmental evaluation, radiocarbon dating sample selection and chronological modelling**

Palaeoenvironmental material recovered during the selection of samples for radiocarbon dating from test site cores, and from samples recovered during trial pitting at Victoria Park, was evaluated. Selected samples, ranging from 10mm core slices to 5l bulk samples, were wet-sieved or processed by floatation to 0.25mm in order to recover waterlogged plant macrofossils, charred plant macrofossils, wood charcoal and bone suitable for dating. The flots and residues have been retained for further analysis if required, with the majority of the flots kept wet and the residues dried out after examination.

The relevant specialists (Barnett, Bell, Wyles, Higbee or Mulhall) examined and identified the material, and (with the guidance of Peter Marshall) suitable samples were selected for dating on the basis of context, secure stratification, species, size and sufficient carbon content. Assessment tables were produced for the sequences considered: these are reproduced below and in **Appendix 3**. In some cases, samples were processed or stabilised and stored, with recommendations made for their future analysis. A detailed molluscan analysis for Victoria Park was provided by Tom Walker and a micromorphological report has been prepared by Rowena Banerjea.

The case for radiocarbon dating individual events, samples and sequences was considered by the project team, Peter Marshall and Alistair Barclay. Radiocarbon dating of the test sites at Ufton Bridge, Victoria Park, Thatcham and Wawcott followed an agreed dating programme with the Historic England Dating Team. Suitable material (short-lived plant macrofossils) was submitted and the results presented below.

### **Artefact assessment**

Occasional small flint fragments were noted during assessment of the palaeoenvironmental samples. These were examined by Pippa Bradley and Phil Harding to establish whether they were microdebitage and are noted as such in the assessment tables (below). Most pieces were ambiguous in the absence of other material.

Artefact assessment largely concentrated on the Mesolithic struck flint and animal bone assemblages excavated during trial pitting at Victoria Park. These were undertaken by Phil Harding and Lorrain Higbee respectively. Their full reports including methods used are given in the site results (below). A summary of the Ufton Bridge artefact assemblage as excavated in 2002 has also been provided by Stephen Allen and is included in the site results (below).

### **Objective 3: Dissemination, HER enhancement, guidelines and publication**

*O3a To enhance the West Berkshire Council (WBC) HER by providing a guidance document fully outlining the available data from the study area (including the detailed case study from Ufton Bridge and site-specific syntheses of other sites within the study area), the predictive model of areas of high and low archaeological*

*and palaeoecological potential, and guidance on how to approach (and deal with) excavation of the Late Upper Palaeolithic and Mesolithic archaeology within the Kennet Valley.*

### **Transfer to HER and HER enhancement**

All spatial data were created to ensure compatibility with the West Berkshire HER system. Spatial depictions were captured using Esri ArcGIS 10 and were recorded with appropriate UK Gemini metadata. All supporting data were normalised and stored in a relational database structure to facilitate analysis and eventual digital archive deposition.

The relational database used for the project was an Esri ArcGIS version 10 personal geodatabase, a spatial database format allowing for the storage of both spatial and tabular data in a single file. The tabular data can be viewed and edited in Microsoft Access and the spatial data edited in Esri ArcGIS version 10 and higher; the format can also be opened for viewing in a range of GIS software. The database included data sourced from the West Berkshire HER, the *Palaeolithic and Mesolithic Lithic Artefact Database* and Froom's work, alongside model-specific data such as data points.

The creation of the deposit model resulted in the production of a number of vector and raster datasets. The data were transferred to the West Berkshire HER in ArcGIS 10-compatible formats and integrated into the GIS system as a means of informing the planning process; this stage included the transferral of the model layers predicting those areas of both high and the highest Late Upper Palaeolithic and Mesolithic archaeological potential within the West Berkshire Kennet Valley, providing WBC with a queryable dataset which helps to highlight those areas in which well-preserved deposits may exist.

Gaps, in terms of finds and sequences, within the West Berkshire HER database were identified following the archaeological data collection and filtering process. This allowed for a level of HER enhancement undertaken from the data generated. Mapping took the form of additional GIS layers (both vector and raster, in Esri ArcGIS 10-compatible formats) suitable for inclusion in the West Berkshire HER and supported by MIDAS-compliant records. Where multiple layers of empirical and interpretive data existed, these were set up in such a way as to facilitate the generation of profiles for particular locations, taken to represent sites of interest. In this way, these profiles could then be applied more broadly to identify areas of potential using both inductive and deductive processes of predictive modelling, enabling existing data layers, such as that from the English Heritage-funded digitisation of the Kennet Valley Fieldwalking exercise, to be fully integrated.

Inclusion of the GIS model into existing information assisted significantly in the day to day activities of the West Berkshire Archaeology Service. This not only included development control work, but also in responding to historic environment data requests. Importantly, it also fed into strategic planning objectives and contributed to wider outreach and education schemes.

### **Informing developers and the aggregate industry: best practice guidance**

A key part of this project was to ensure that the findings feed into better ways of predicting and mitigating impact on the Late Upper Palaeolithic and Mesolithic resource. This was achieved in part by the HER enhancement but, in addition, a best practice note was produced (Product 2), specifically aimed at aggregate extractors and developers in the area. Necessarily this is brief but more detail on the application of best practice methods to prospection and investigation of these sites is also expanded upon in this report. The leaflet (Appendix 1) was prepared by Matt Leivers, Catherine Barnett and the West Berkshire Archaeological Service for their use and has been produced in consultation with the Historic England Science Advisor, Jane Corcoran.

*O3b To produce an academic publication encompassing the detailed investigations at Ufton Bridge and broader methodology and results from the overall project.*

### **Publication**

A full report on the investigations at Ufton Bridge is incorporated in Part 3 of this document.

### **Outreach and education**

An attempt was made to incorporate outreach and education elements within the project wherever possible. Media interest was encouraged and public events took place in tandem with the geophysical surveys and trial pitting at Victoria Park.

### **Archive deposition**

The main part of the archive is the sedimentary model, its data, spreadsheets and outputs. This has been deposited with the West Berkshire HER. For Thatcham and Wawcott the archive comprises the borehole logs, survey data and detailed Rockworks logs, all of which have been incorporated into the project sedimentary model. The archive for Victoria Park is more complex: in addition to the sedimentary data, survey data and detailed model, there are a number of samples and excavated artefacts. Some have been fully processed and analysed (eg radiocarbon dating samples); others only evaluated or assessed within the remit of this project. It is proposed that all samples and artefacts be made stable and retained at Wessex Archaeology until such time as any further work is agreed and completed. At that point, or in the absence of any future work, all artefacts and any remaining stable ecofacts such as charcoal will be handed to the West Berkshire Museum (accession number NEBYM:2015.2). All other samples will be discarded at this point, their archive comprising the data sheets and any analysis reports that are generated; these too will be provided to the museum. The archive for Ufton Bridge predates this project and is held by the University of Reading.

## PART 3: RESULTS

### Results of field investigations at the test sites

The remit of this project was to use test sites to refine and inform the case study area predictive model. It should be noted therefore that (with the exception of Ufton Bridge, which is reported on in full) only key findings and a brief interpretation of the results of fieldwork are reported here; full details can be found in the project archives held at Wessex Archaeology.

### Ufton Bridge

by Martin Bell

Ufton Bridge, West Berkshire has been the subject of investigations by the University of Reading over the last 15 years. Due to this, and to its suitability as a defined, well-stratified floodplain Mesolithic site, the opportunity was taken to draw upon this extant body of work and use Ufton Bridge as one of the test sites. No new field investigations were necessary; instead, radiocarbon dating submissions were made and the body of existing work drawn together.

### *Research background*

The site of Ufton Bridge is in the Lower Kennet Valley, 12.5km upstream from the confluence with the Thames and 10–15km downstream from the major Mesolithic complex of sites in the Thatcham/Newbury area. **Figure 1** shows the relationship between Ufton and the other key Mesolithic sites in the valley. The site has been variously called *Ufton Nerve* after the parish, *Ufton Green* after the nearby hamlet and *Ufton Bridge* (the name adopted in this report) after the nearest place name.

The site was discovered by Stephen Allen in the early 1990s (Allen and Allen 2002) in West Meadows Field at SU 6192 6844 through fieldwalking at a time when the site was ploughed. A scatter of flints was identified extending over a few square metres. Stephen and John Allen excavated a 2 by 1m test pit at the point of greatest lithic concentration. This revealed ploughsoil (0.27m) below which was an uneven surface of undisturbed dark grey clayey silt and below this clean quartz sand with some pebbles (0.28+ m). The flint artefacts were in the uppermost part of the sand and the lowermost part of the silt and topsoil. A total of 270 pieces of flint were recovered, about half from the fieldwalking and half from the small excavation. No features or charcoal were found. The lithic artefacts included three cores, 70 blades or bladelets and six tools (five scrapers and a notched piece). The proportion of blades was said to be comparable with, or greater than, other excavated Mesolithic sites in the Kennet Valley, although the Ufton assemblage did not include any diagnostic Mesolithic artefact types.

In order to further investigate the potential of the site this small-scale excavation was followed up by borehole investigations by University of Reading MSc Geoarchaeology students in all but three years (2004; 2005; 2007) between 1999 and 2013. This showed that there was a Holocene sediment sequence up to 3m



deep around a gravel rise on which the original excavation had taken place. Further small-scale excavation led by Stephen Allen with Reading University staff took place in 2002 in order to clarify the stratigraphic sequence. Ufton was also selected as a study site as part of two PhD theses, that by Catherine Chisham (now Barnett) (2004) on Early Mesolithic human activity and environmental change, and that by Carol Mansfield (2007) on reconstructing buried alluvial landscapes using multiple geophysical and geoarchaeological techniques. A field immediately east of that originally investigated was the subject of a MSc Geoarchaeology dissertation by Dan Alyward (2008) which focused on a comparative investigation of geophysics and coring in the study of riverine sequences and associated archaeology. Alyward's work was followed by further boreholes in this field by MSc students in 2011. The work in this field by Alyward and others included four small test pits which provided a more detailed picture of the sediment sequence. The east field produced a few Mesolithic flints but more evidence was found for activity in the Iron Age and medieval periods.

### *Topographic and geological context*

The site is on the floodplain of the River Kennet. It is some 220m south-west of the point, just below Ufton Bridge, where the River Kennet and the Kennet and Avon Canal converge (**Figure 9**). The Geological Survey (Sheet 286; Mathers and Smith 2000) shows that the floodplain is 800m wide with the site 300m from its north side. On the north side is the Beenham Grange Terrace. The valley sides are of Eocene London Clay overlain on the north side by patches of Quaternary Beenham Stocks Gravel and Silchester Gravel. The south side of the valley rises more steeply from the floodplain with patches of Thatcham Gravel close to the floodplain edge overlying London Clay. The higher slopes and plateau are formed of Silchester Gravels overlying the Eocene Bagshot Formation. Given the calcareous sediments revealed by our investigations it is notable that, at this point in the Kennet Valley, chalk is not exposed on the valley sides, the nearest exposure being 14km upstream at Newbury. Concealed chalk underlies the Eocene strata and it is likely that spring waters of chalk derivation are discharged into the valley. On the valley edge and its southern side are many springs, several of which feed historic fish ponds. It is probable that this concentration of springs at the valley edge is related to early and mid-Holocene tufa and calcareous marl formation found in the present project. At the edge of the valley 400m south-east of the site is a pumping station for the public supply.

The present floodplain at the site is at 50m OD. There is significant visible topography with higher raised areas and some lower curvilinear depressions which are thought to represent palaeochannels, a number of which have been investigated by coring and geophysics. The soils of the floodplain are classified as Thames Series which are poorly drained calcareous groundwater gleys (Jarvis 1968).

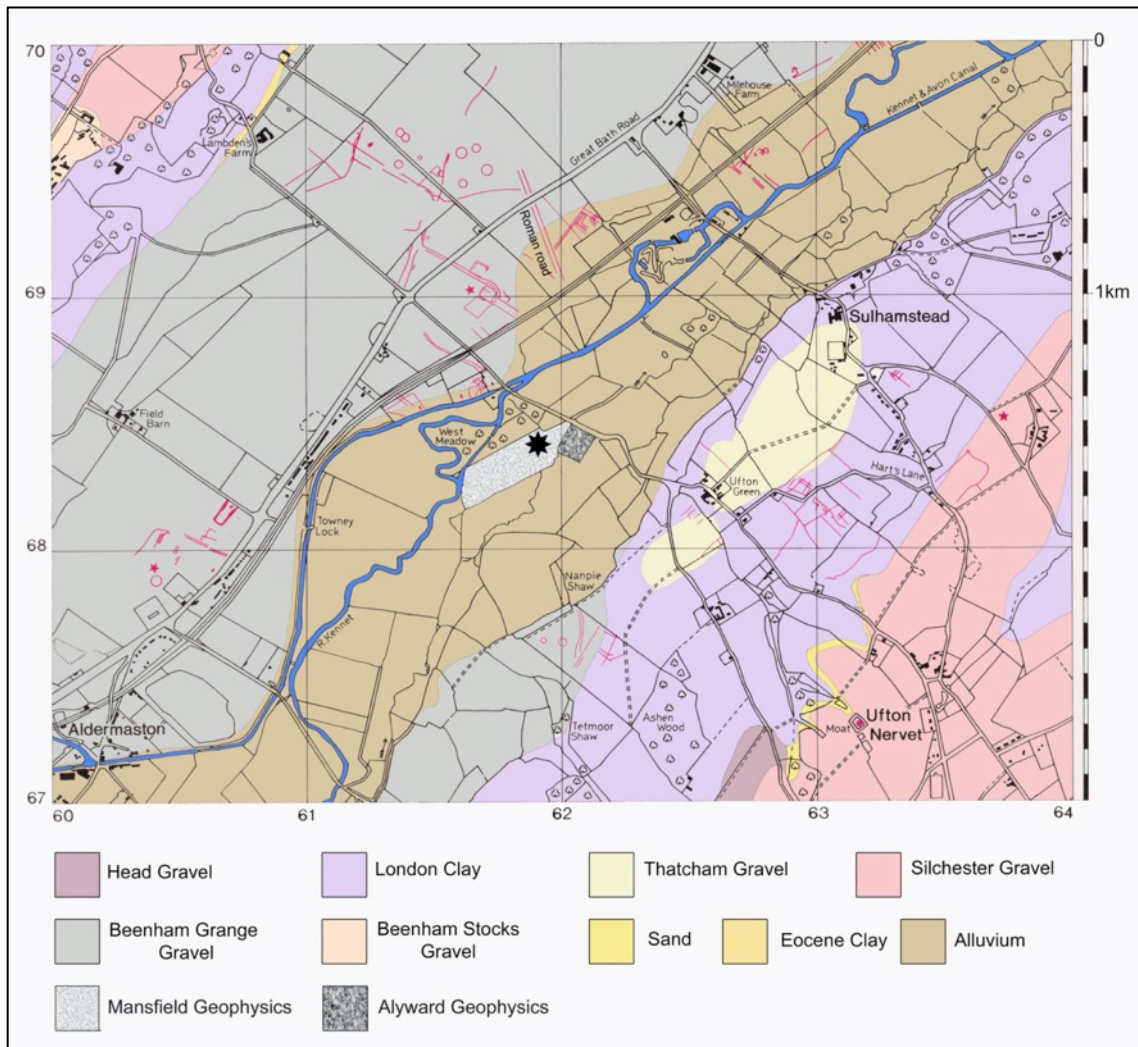


Figure 9: Map of Ufton Bridge location against the geological background (after Geological Survey Sheet 268) and archaeological features mapped from air photographs. The red stars mark the sites of archaeological excavations noted by Gates (1975), and the large black star is the site of Ufton Bridge (after Gates 1975, Map 8).

### *Archaeological context*

The archaeology of the Lower Kennet has been previously reviewed by Lobb and Rose (1996). The main concentration of Mesolithic finds is on the floodplain and its edge 12.5km upstream of the present site in the Thatcham/Newbury area.

Downstream of this Lobb and Rose record a scatter of Mesolithic find-spots on the terrace on the north side of the valley. Downstream of Ufton, Mesolithic sites are reported near the floodplain edge at Haywards Farm (3km) and Field Farm (6.5km). An appreciation of the later archaeology is necessary for understanding impacts on the landscape and the Mesolithic deposits. A significant concentration of Neolithic and Early Bronze Age activity is represented by cropmarks (especially ring ditches) on the Beenham Grange Terrace on the north side of the valley. Gates (1975, plate 4, map 8) published an air photograph of cropmarks on the terrace and mapped these in a 4 by 3km area around Ufton Bridge (as shown in **Figure 9**). This includes a group of cropmarks known as the Bath Road Complex 0.5km north of

the Ufton Bridge site. Other cropmark sites include a number of ring ditches of which two have been excavated and shown to be of later Neolithic date: one at Beenham (1.6km west of the present site) produced two axes, one of Great Langdale type; the other at Englefield (1.9km north of the present site) was one of a line of four ring ditches. A group of three cropmark enclosures on the north side of the valley 600m to the north-north-west of the Mesolithic site was excavated by Manning (1974). One enclosure originated in the Late Iron Age, while two were Romano-British. One included a simple rectangular building; another is in the area of a Roman building destroyed by aggregate extraction (Gates 1975, 29).

The air photograph from which **Figure 9** was derived shows the Silchester-Dorchester on Thames Roman road which Manning also excavated. This is the two parallel red lines which cross the Bath Road 200m west of the point where that is labelled. From the Roman road a side track leads to an area where rectangular enclosures are defined by ditches. The Roman road heads for a crossing of the Kennet 350m north-east of the Mesolithic site. **Figure 9** also shows at least four ditched trackways running from the terrace to the floodplain. The trackways are likely to indicate the role of the floodplain as seasonal grazing which could have been a significant resource just 6km north of Roman Silchester. Manning's excavation also produced 76 flints mainly of Mesolithic date including a tranchet axe, microburin, core and three scrapers (Wymer 1974). Smaller areas of cropmark occur on the south side of the valley but these have not been dated by excavation. However, Stephen Allen has reported Romano-British artefacts around SU 621 679.

The floodplain itself lacks crop marks, with the exception of a possible track and small circular features near Milehouse Farm 1.3km north-east of the present site. One objective of the geoarchaeological investigation was to establish to what extent the apparent absence of cropmarks and known sites on the floodplain (**Figure 9**) related to burial by riverine sediments.

### *Geophysical survey in the West Meadows Field and Mesolithic site at Ufton Bridge*

by Carol Mansfield

Geophysical work at Ufton Bridge was conducted as one of three case studies in a project designed to examine the contribution of combined geophysics and geoarchaeological investigations to an understanding of archaeological sites in alluvial and coastal sedimentary contexts (Mansfield 2007). The other two case studies were in the Severn Estuary at Caldicot, Gwent (Mansfield 2009) and Cow Hill, Gloucestershire. At Ufton the strategy was particularly designed to investigate the palaeotopography and sedimentary sequence associated with the Mesolithic site and to establish if there was any other trace of archaeological features within the alluvial sequence. Full details of the geophysical methods and full comparisons of the range of techniques used are contained in Mansfield (2007); only key results are outlined here.

### *Electromagnetic survey*

Three electromagnetic induction instruments were deployed at Ufton: Geophex EM38, GEM-2, and Geonics EM31, the best results being obtained from the last two. Ground-truthing was based on auger hole transects undertaken in 2002, 2005 and 2006, and associated sedimentary analysis. These transects are described below.

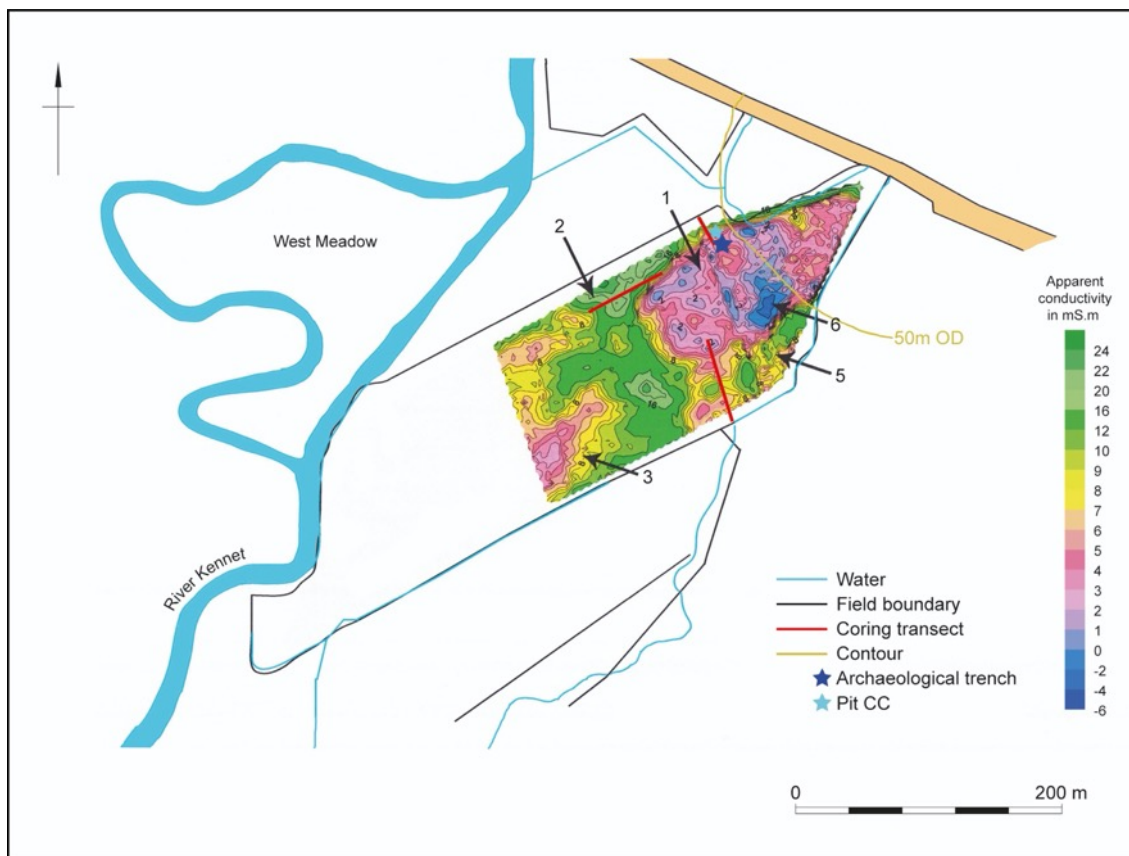


Figure 10: Ufton Bridge West Field: Apparent conductivity from EM31, instrument zeroed on site data is relative not absolute values (graphic C.Mansfield)

EM31 results cover the eastern part of West Meadows Field (**Figure 10**). Feature 1 is an area of moderate to low conductivity in the eastern half of the survey area. In parts of this area conductivity is as low as  $-6\text{mSm}^{-1}$ . In contrast there is a sharp rise in conductivity ( $10\text{--}24\text{mSm}^{-1}$ ) to the west and north: this is Feature 2, which corresponds to a curvilinear depression in the field subsequently confirmed by boreholes as a palaeochannel. To its west, Feature 3 is a return to lower conductivities similar to Feature 1. To the south of Feature 1 is another less pronounced and more broken area of high conductivity (Feature 5): boreholes subsequently produced evidence for a palaeochannel in this area.

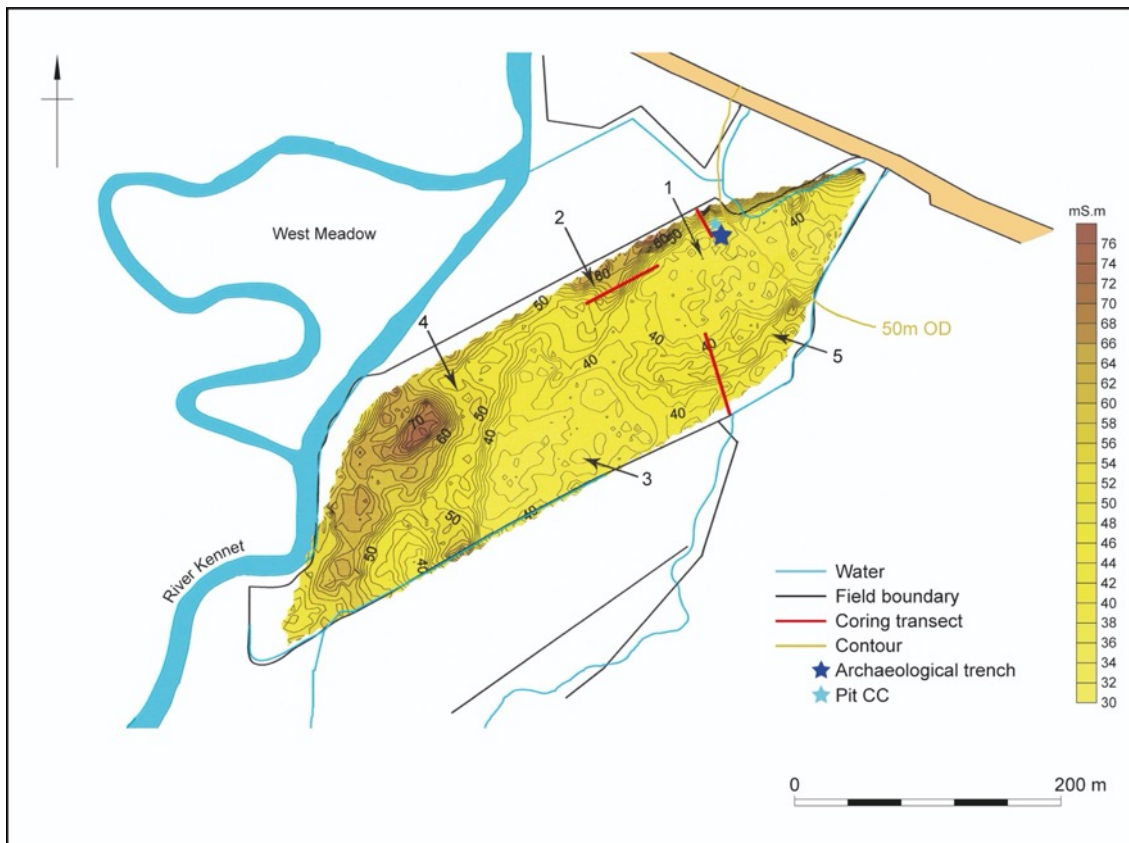


Figure 11: Ufton Bridge West Field: GEM-2 data, showing electrical conductivity as calculated from the data recorded at 3925Hz (graphic C. Mansfield)

The GEM-2 survey covers the whole of West Meadows Field (**Figure 11**). The instrument used can collect data at multiple frequencies and **Figure 11** shows conductivity at 3925Hz. The area of low conductivity (Feature 1) is present, but with less variability than in the EM31 data. Feature 2 is only present in the north and does not continue across the field as in the EM31 data. Feature 5 is more distinctive as a possible palaeochannel than in the EM31 data. In the west Feature 3 is present and west of this, in the area not surveyed using EM31, are high conductivities close to the present course of the River Kennet.

Conductivity is affected by water content since the ions dissolved in water carry the electrical current through the soil. Thus finer sediments (including silts, clays and peats) which retain water tend to correlate with areas of high conductivity, and coarser sediments (sands and gravels) with areas of lower conductivity. These inferences were supported by the borehole results which showed that the areas of low conductivity were raised areas of gravels and sand and the high conductivities were fine sediments, in and around palaeochannels. The difference in results from the two instruments may be accounted for by differing depths of penetration. The EM31 has the larger coil spacing compared to the GEM-2 and will collect data at greater depths, but the data produced will be averaged over a larger volume of sediment than the GEM-2. This may be used to infer that the EM31 data is older than that of the GEM-2 and this could contribute to a chronology of sedimentary features.

### Ground Penetrating Radar

Two centre frequencies of GPR antennae were used (200MHz and 400MHz) coupled to a SIR-20 GPR system. The 200MHz antenna collects from a larger Fresnel zone than the 400MHz antenna, collecting data more rapidly because it can be towed behind a car using a wider spacing between individual GPR traces, and also penetrating deeper than the 400MHz. The GPR data are quoted in time (ns) not depth as no estimate of the wave velocity was made in the field. This account is restricted to the 200MHz data. The 400MHz data and a larger selection of GPR time slices and radargram sections are included in Mansfield (2007). In general, low reflectance channel or ditch features are separated by areas of higher reflectance, some of which are shown by subsequent boreholes to represent higher areas of gravel and sand.

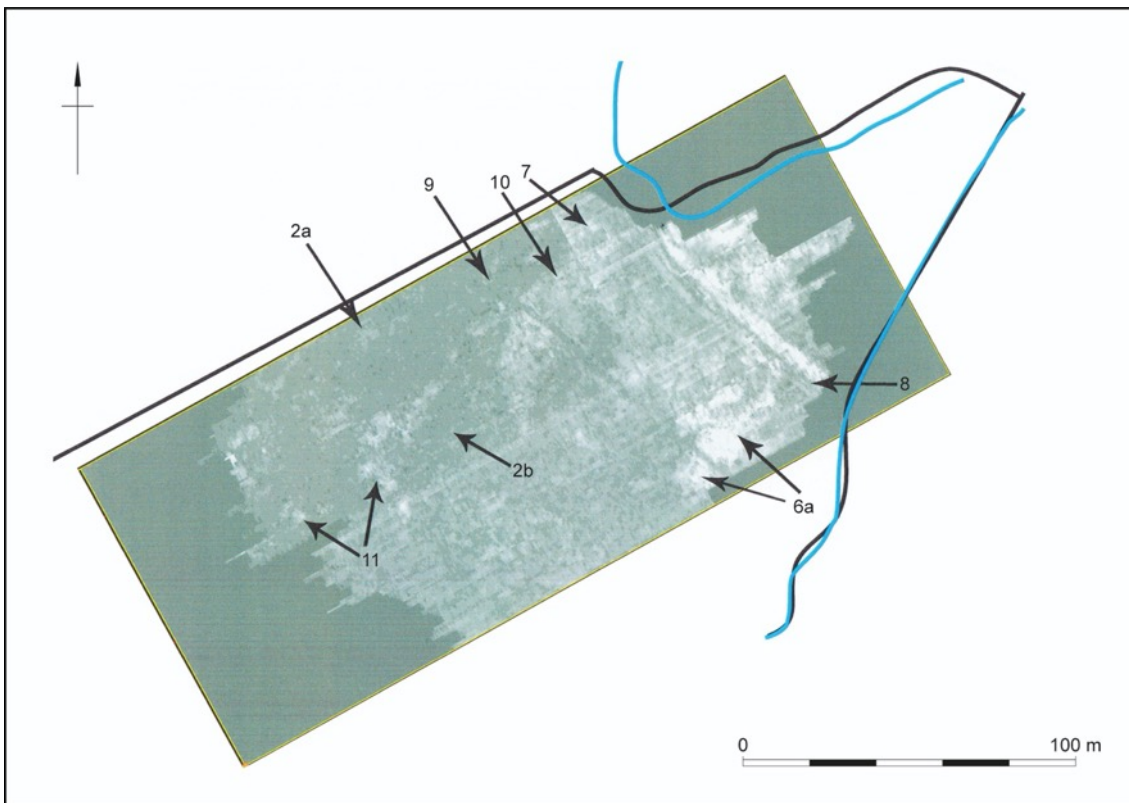


Figure 12: Ufton Bridge West Field: GPR time slice, 200MHz at 24ns averaged over a time window of 5ns. High-amplitude reflections are shown as white and low-amplitude as black (graphic C.Mansfield)

The plot at 24ns is shown as **Figure 12**. The most apparent feature is a band of high reflectance which is twinned with a band of low reflectance apparently as part of the same feature (Feature 8). This is some 15m wide and is associated with a rise and dip in surface topography. A second linear is present 40m to the west (Feature 9) as a low reflectance feature, at its clearest where it cuts an area of high reflectance (Feature 6a). It is tentatively suggested that Feature 8 might represent a trackway with a ditch on one or both sides; Feature 9 may be a ditch. These features may well relate to the buried landscape revealed by geophysics in the adjoining field to the east as discussed by Alyward below.

Clearer indications of the topography and palaeochannels come from the GPR transect data. For instance, **Figure 13** shows a transect along the line of the 2005 borehole transect. This clearly shows the dipping structure characteristic of a palaeochannel at Feature 2a. Differing dips on either side of the channel suggest a migrating channel bend with the inside of the bend to the north-east with the channel migrating to the south-west with sediments accumulating in succession on the inside bank. The transect also shows the apparent ditch at Feature 9. A GPR transect 20m to the south of the 2005 Borehole Transect (Mansfield 2007 Figure 4.19) again shows Feature 9 as a distinct trough-shaped reflector but it also indicates that the palaeochannel Feature 2 is apparently a multiple feature with evidence for an earlier channel of distinct U-shaped form suggestive of the straight portion of a river channel. Twenty-five metres west of Feature 2 this transect also shows a further possible palaeochannel 30m wide. A further possible palaeochannel (Feature 12: Mansfield 2007, Figure 4.18) was detected on the south side of the site in the GPR transect data but was not apparent from the time slice data. This may correspond to a channel later detected in the south-east corner of the 2013 borehole grid (below). Clearly from the GPR results the channels west of the Mesolithic site are complex and multiphase.

An area 150 by 90m around the Mesolithic site was also surveyed using a Fluxgate gradiometer. In this survey the two linear Features 8 and 9 were both apparent as areas of slight magnetic enhancement. Part of the same area was also surveyed using a Geoscan RM15 resistance meter (**Figure 14**). Feature 8 was again visible as a linear band of high resistance. Feature 9 is visible as a linear feature of low resistance. Of particular note is a circular ring of high resistance some 7m in diameter with a core of low resistance centred on the area of the Mesolithic finds. It does not apparently correspond to the area of the 2002 excavation. It is possible that this represents a feature, maybe a structure of Mesolithic date. Alternatively, anticipating later discussion of the borehole results, it might represent the crest of the gravel/sand ridge (Feature 1) where plough erosion has exposed concentric bands of later more resistant sediment. Only further field investigation will clarify the nature of this feature.

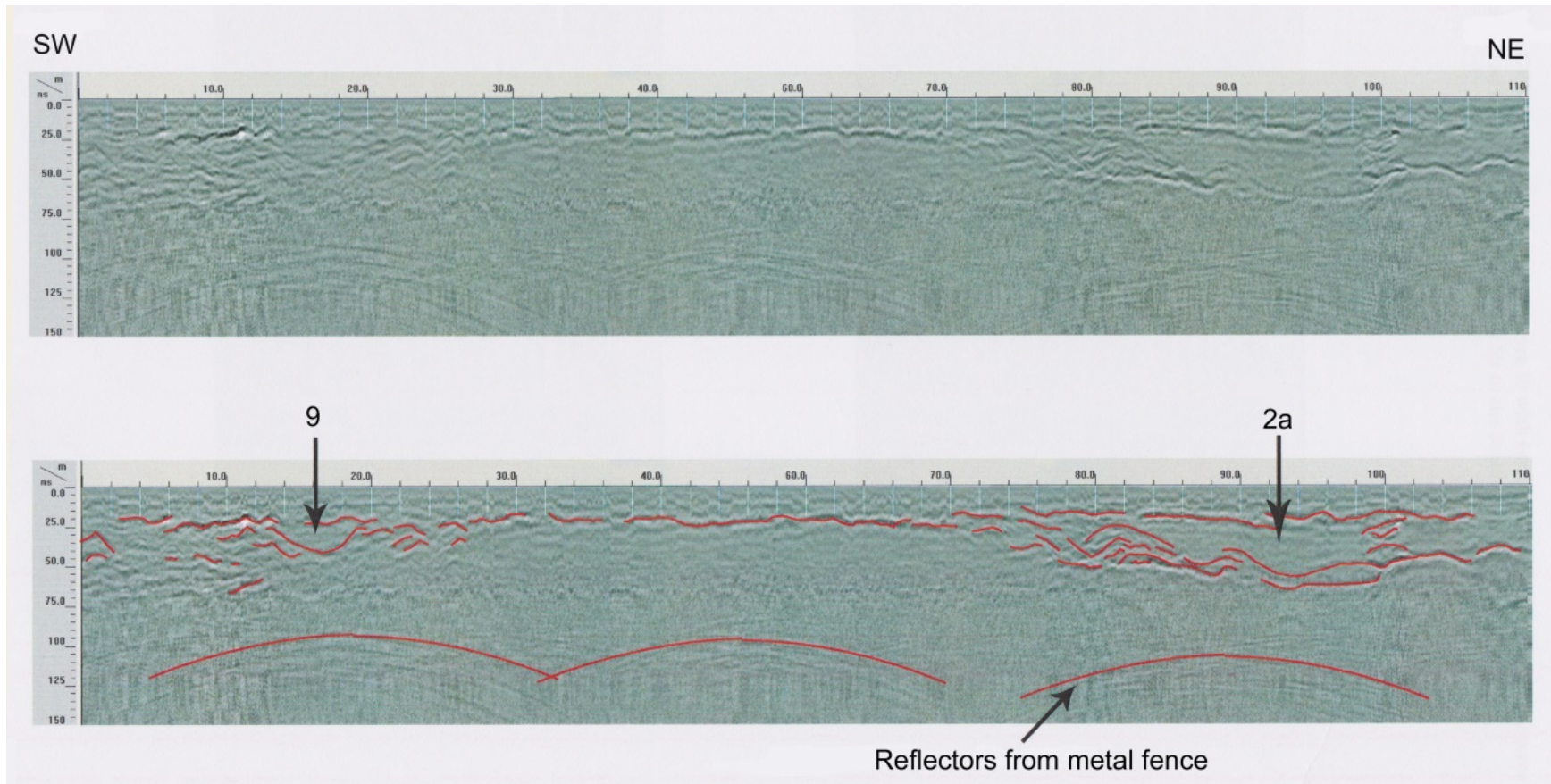


Figure 13: Ufton Bridge West Field: GPR 200MHz transect 1.13 across Features 2a and 9 with interpretation below. Red lines have been used to pick out reflectors of note (graphic C. Mansfield)



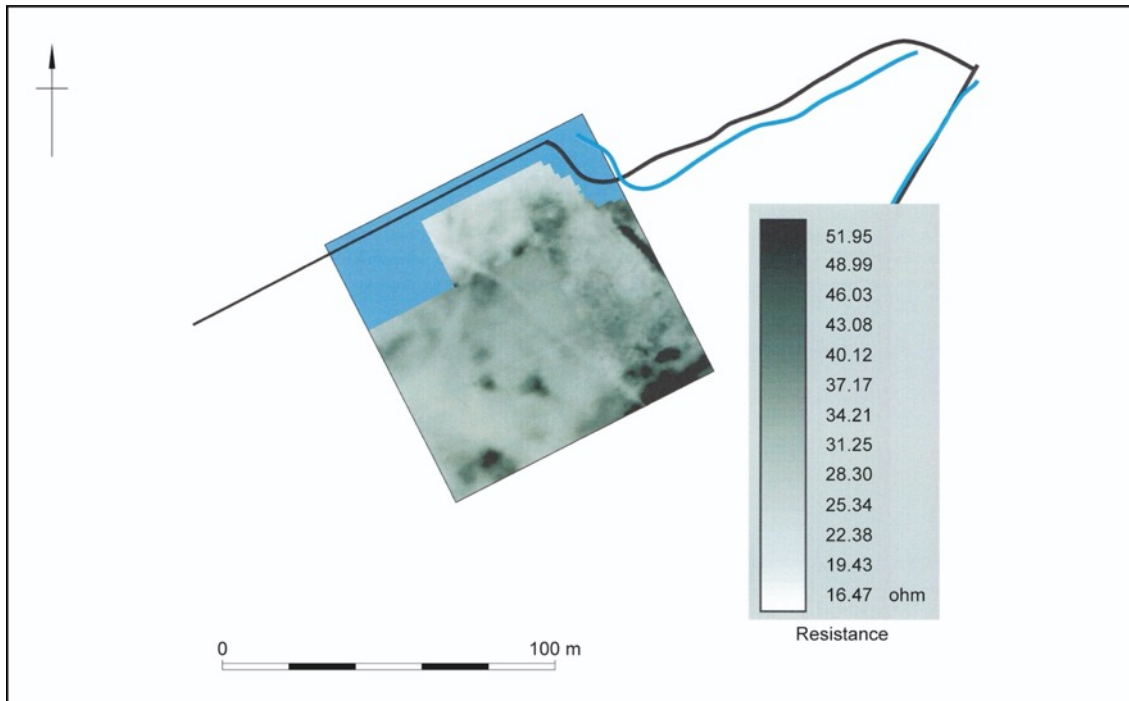


Figure 14: Ufton Bridge part of West Field: Geoplot 0.3 greyscale image of resistance data using the RM15 resistance meter in twin-probe configuration with a 0.5m mobile probe separation (graphic C. Mansfield)

Borehole data coupled with the more detailed evidence from the excavation trenches was used to ground-truth the geophysics evidence. Particularly significant in this regard were the borehole transects of 2002, 2005 and 2006 (marked by green lines on some of the geophysics plots) which particularly illuminate the nature of geophysical anomalies. The details of this approach are outlined more fully by Mansfield (2007) and the example of the 2005 transect is used here to illustrate the approach. This transect was particularly designed in tandem with the writer's research to investigate the geophysical anomalies Features 2 and 2a both thought to be palaeochannels (eg **Figure 10**). The results from part of the transect are shown in **Figure 15** where the GPR plot is overlain by the borehole record illustrating how the sedimentary changes registered geophysically. Particle size analysis using laser granulometry was further used to characterise the sediment sequence. The basal reflector mirrors the shape of the gravels well. In Core 30m the stratigraphy within the gravels correlates with the dipping reflectors of the radar trace, thought to represent the point bar of the meandering channel. Another distinct reflector appears to correlate with the top of the peat. This combination of GPR, boreholes and sediment analysis confirms the existence and character of the palaeochannel. Similarly the borehole transect 2006 was carried out in order to investigate the geophysical anomaly Feature 5 (eg **Figure 10**). This confirmed the geophysical interpretation that this was a channel but demonstrated that it was shallow and had a poorly defined base reflecting the more undulating gravel.

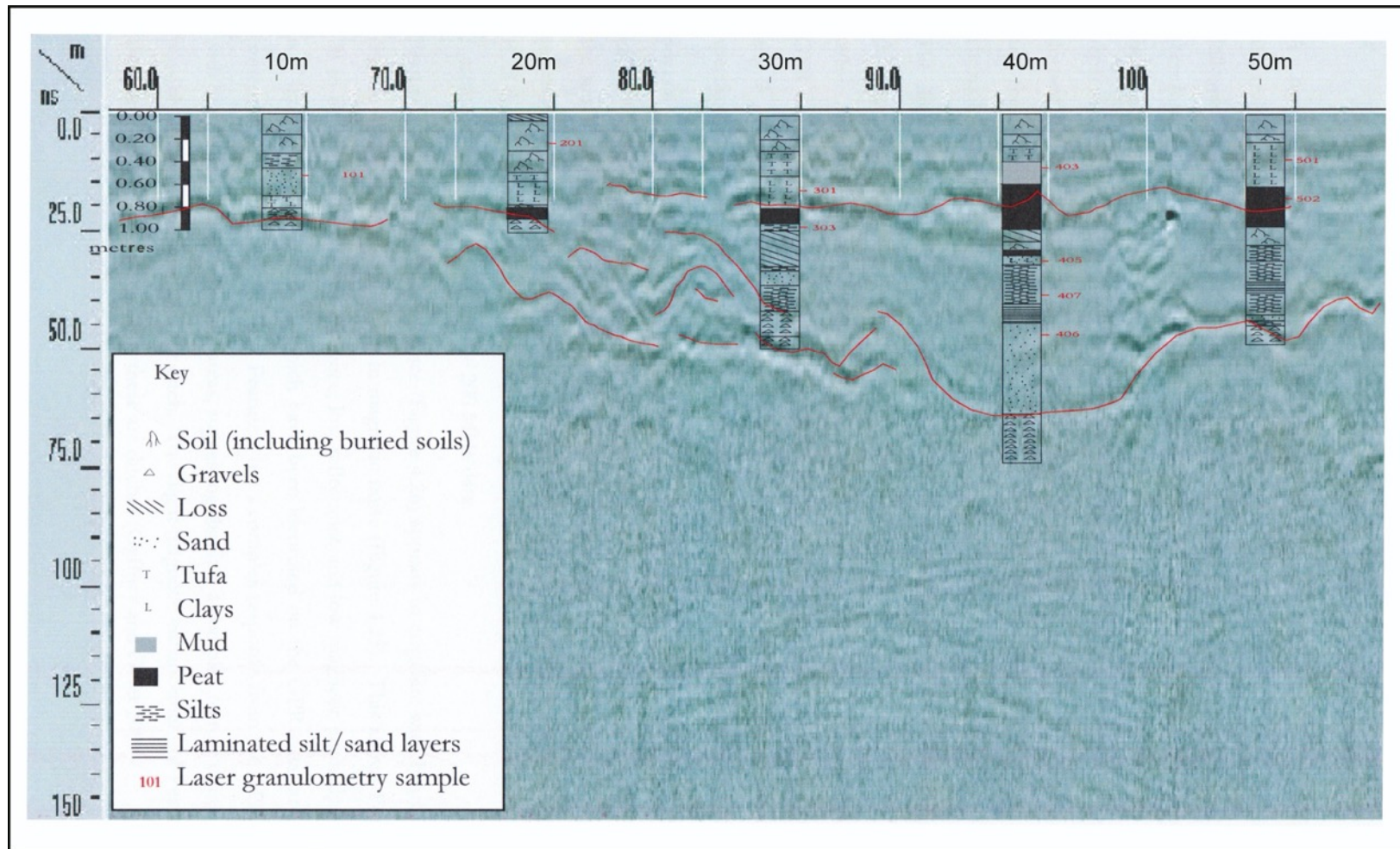


Figure 15: Ufton Bridge West Field: Comparison of 200MHz GPR transect 1.13 and the UG05 coring transect, showing the sedimentary units responsible for the GPR reflectors (graphic C. Mansfield)

### ***Conclusions***

This research has demonstrated the value of a comparative approach employing a range of geophysical methods to illuminate different aspects of the buried landscape. The electrical conductivity results were important in identifying the broad scale palaeochannels. The character of those features was investigated using GPR which demonstrated that in some cases palaeochannels were multiphase with earlier channels being cut by later channels in a similar position. GPR time slices were important in identifying ditch and possible trackway features of a later buried landscape which may correlate with buried landscape features observed in the east field (below). The combination of GPR transects, coring, limited excavation and sediment analysis proved important in ground-truthing the geophysical results.

**Figure 16** is a 3D model based on the GEM-2 survey data which summarises the main features of the palaeotopography. It shows two areas of low conductivity in beige (Features 1 and 3) which the boreholes show are raised areas of gravel. The Mesolithic artefacts are from the upper part of the Feature 1 gravel rise. Intersecting these gravel rises are two features of high conductivity (Features 2 and 5) which ground-truthing shows are palaeochannels, the latter fairly shallow and less clearly defined, the former (in places multi-phase) creating a broad curve on the inside of which the Mesolithic site lies. To the west of the area is the modern floodplain (Feature 4) in blue. These results from the West Field can be compared to those obtained from a smaller-scale study of the East Field.

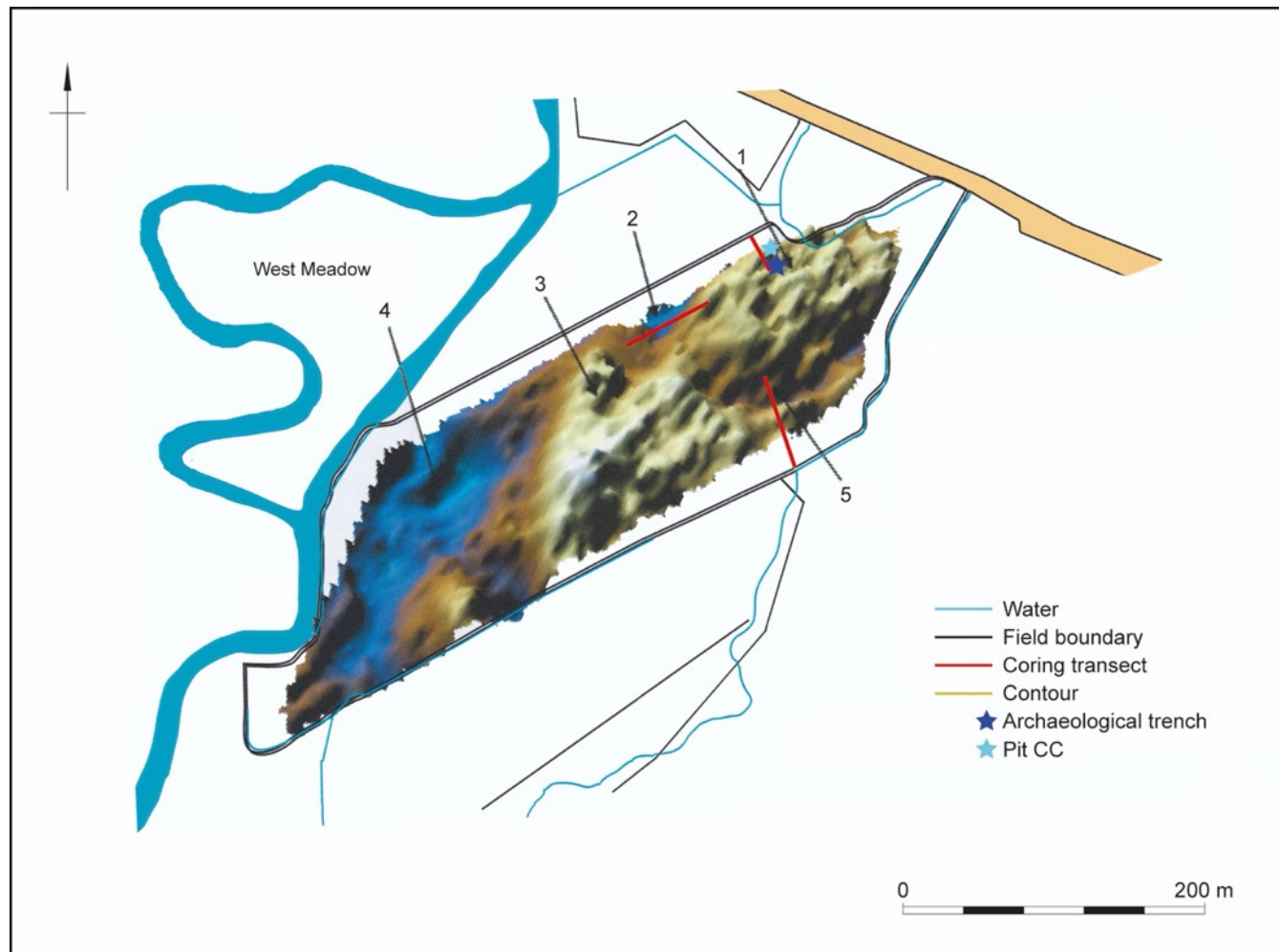


Figure 16: Ufton Bridge West Field: 3D surface data from the GEM-2 survey representing the palaeotopography of the site with gravel bars (Features 1 and 3) and palaeochannels (Features 2, 4 and 5) (graphic C. Mansfield)

### *Geophysical survey in the East Field, Ufton*

by Dan Alyward

Geophysical survey was carried out over an area 120 by 90m in the north-east corner of the East Field (**Figure 9**): the north edge was the road to Ufton Nerve, the west edge the stream separating the West and East Fields. Full details of the geophysical survey are provided by Alyward (2008) and are summarised here.

Magnetometry survey was carried out with a Bartington 601 Magnetic Gradiometer with transect data collected at 0.5m intervals. Resistivity data was collected with a Bartington RM-15 twin-probe array which was placed in the ground at 0.5m intervals in traverses at 1m intervals. The data from the magnetic and resistivity surveys was processed using Geoplot. Conductivity and magnetic susceptibility data were obtained with the same machine: a Geopex GEM 2 with a GPS device used in tandem for location. Conductivity maps were produced using Surfer.

The rather coarse electrical conductivity results (**Figure 17**) were mainly significant in identifying aspects of the topography of the underlying gravel surface, interpreted as a pattern of braided channels. Higher values were associated with a channel in the southern part of the site, although this was not so continuous, or clear, as subsequently revealed by boreholes. There was also a band of higher conductivity down the centre of the area. This was evident as a channel on the borehole survey, but in this case its form is rather clearer from the Electrical Conductivity. The lowest values in the middle on the west side were shown by boreholes and a test pit to represent a gravel rise apparently delimited by a C-shaped channel around two sides on an area where Stephen Allen had found medieval pottery. The conductivity plot also shows a linear feature which is much clearer on the resistivity results and corresponds to a linear boundary on the first edition of the Ordnance Survey map, and other post-Mesolithic features, an appreciation of which is necessary for an understanding of later impacts on the landscape and the Mesolithic deposits.

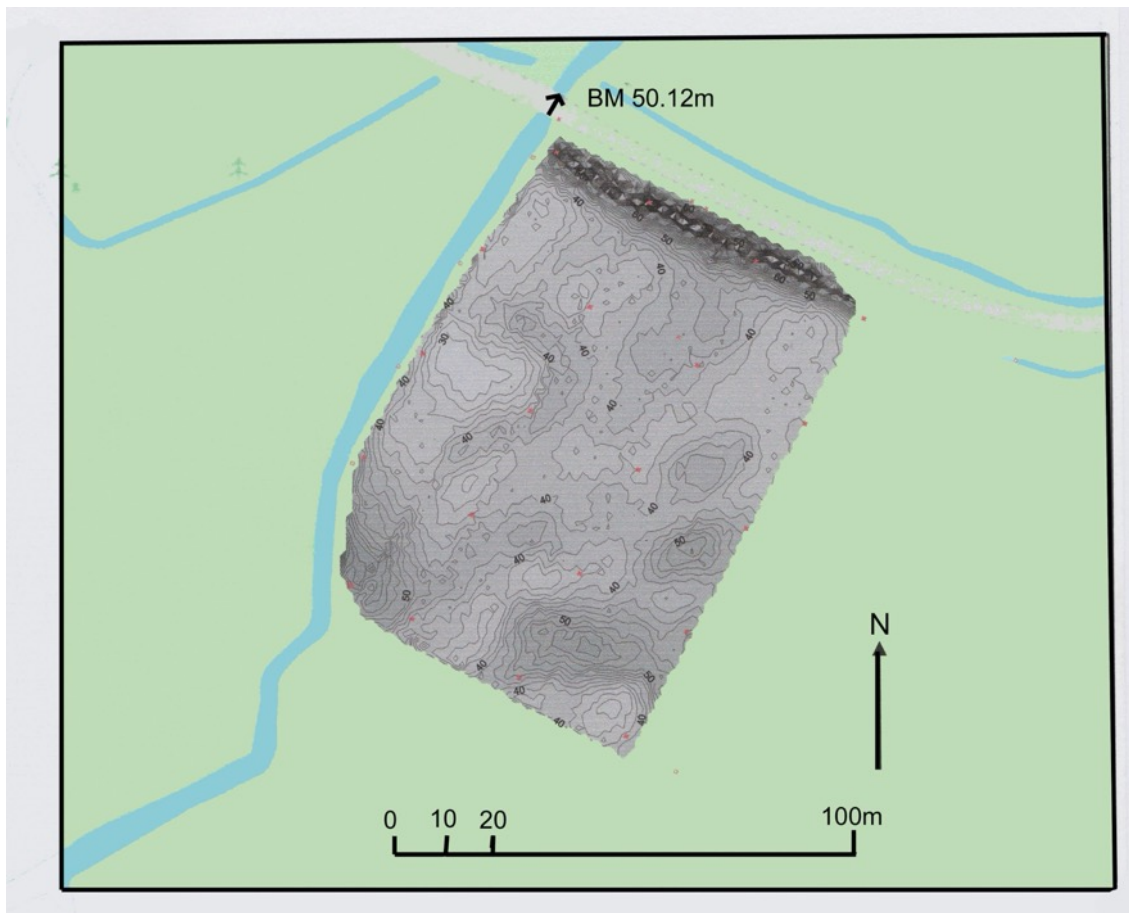


Figure 17: Ufton Bridge East Field: Electrical Conductivity results in milliSiemens per metre (mSm<sup>-1</sup>). Red dots are auger holes (graphic D. Alyward)

The magnetometry survey (**Figure 18**) revealed three linear features which may represent the line of a trackway running east to west in the southern part of the survey area. A less distinct linear feature (Feature 15 on **Figure 19**) represents the boundary shown on the first edition of the Ordnance Survey map.

Particularly significant are the resistivity results (**Figure 19**) which reveal a series of ditches which may represent three sides of a ditched enclosure (Features 19–21) with hints of a fourth side (Feature 22) possibly delimiting a rectangular enclosure measuring 100m by 78m. Within the enclosed area there are fainter traces of a possible trapezoidal enclosure measuring 37m by 37m (Feature 23). A further ditch (Feature 24) runs from the east boundary of the larger enclosure to the north-east corner of the surveyed area. The alignment of these ditches is oblivious to both the stream to the west and the road to Ufton Green to the north. It is at a distinct angle of 40 and 130° to the present road below which the apparent ditch junction lies. The historic period boundary (Feature 15) is very evident on the resistivity plot where it has the appearance of a ditch cutting the gravel rise (Feature 22). This boundary is much clearer than on the magnetic survey. Of that boundary one solitary large tree survives in the field today. With the stream on its west side this ditch delimits a strip 120m by 45m within which the medieval finds lay: it seems possible that this represents a boundary associated with the medieval site on the gravel rise. Alternatively, the very distinct ditches on the resistivity survey might be

contemporary with the medieval site. However, the fact that the ditches appear oblivious to the stream, road and recent boundaries suggests that they may relate to an earlier landscape buried, at least in part, by alluviation: this could relate to evidence of Iron Age activity subsequently found in Pit E2. The overall pattern of ditched enclosures and possible ditched tracks revealed by geophysics in this small area of the floodplain is somewhat reminiscent of that revealed by air photography (**Figure 9**; Gates 1975) and investigated by Manning's (1974) excavations on the Beenham Grange gravel on the west side of the valley. Given these geophysics results and the subsequent discovery of Iron Age artefacts in Pit E2 it seems probable that a ditched landscape of Iron Age and perhaps Romano-British date extends across the floodplain where it is buried by later alluvium.

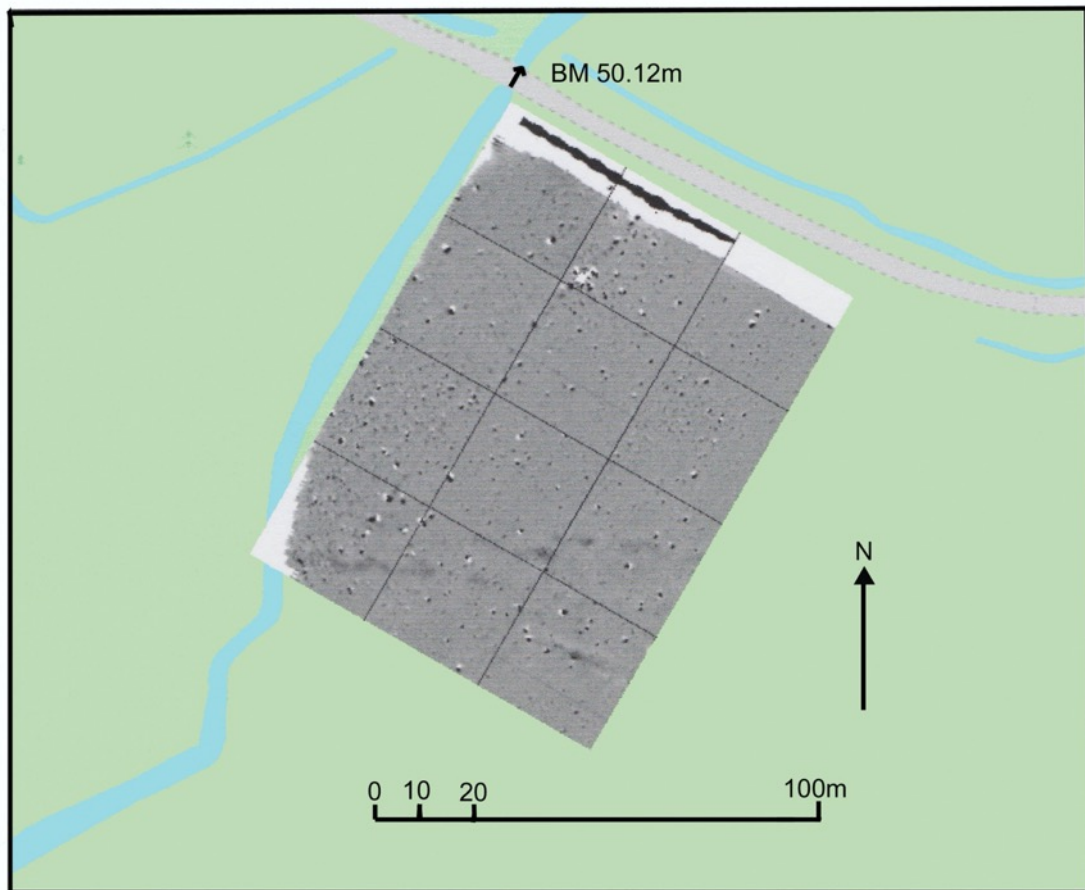


Figure 18: Ufton Bridge East Field: Magnetic gradiometric results. Range -14 to 14nT (graphic D. Alyward)

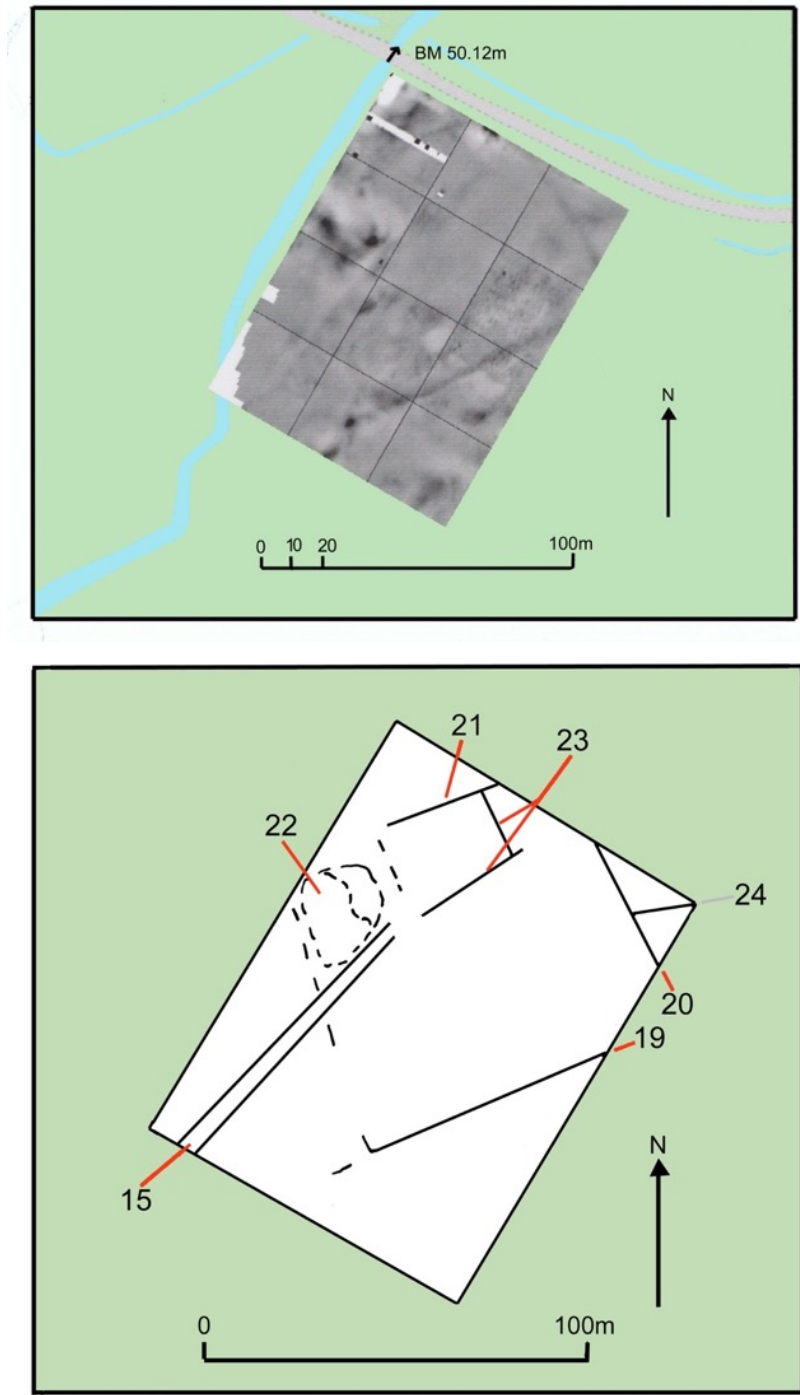


Figure 19: Ufton Bridge East Field: (a) Resistivity results. Range -7 to 7 ohms (graphic Dan Alyward); (b) key to features interpreted (graphic J. Foster)

***Borehole surveys at Ufton***

by Martin Bell

The sedimentary sequence was investigated with a total of 198 boreholes between 1999 and 2013. These were done as part of a MSc Geoarchaeology training programme. One hundred and thirty-six of the boreholes were in West Meadows



Field where the original Mesolithic find-spot is located and 32 (20 of them by Dan Alyward) in the East Field.

Holocene sediments above Pleistocene gravels and in places sands varied considerably in depth, with deeper channels of about 3m and gravel rises where there was sometimes less than 0.3m of sediment. Where the sediments were thick the boreholes were done using a cobra power corer (**Figure 20**) which was generally used to take 50mm cores in a plastic sleeve which was taken back to the laboratory and then cut open to describe and sub-sample the sediments.



Figure 20: Ufton Bridge borehole survey in progress (photo M. Bell)

Shallower sediment sequences were generally sampled with a 20mm diameter gouge auger, or a Dutch bucket auger (**Figure 21**): these were described in the field. All boreholes were levelled to OD with reference to the Ordnance Survey Benchmark (50.1m OD) conveniently situated on the brick bridge where the road crosses a small stream just 140m east of the site. Standard recording sheets were used throughout and the sequences from all types of boreholes were input to the stratigraphic modelling programme Rockworks which was used to create transects across the site and sedimentary models of key sediment horizons, for instance the surface of the Pleistocene gravel.

The main sediment types revealed by the borehole survey were as follows:

- Unit 1 Topsoil
- Unit 2a Alluvial clay

- Unit 2b Calcareous alluvium
- Unit 3a Tufa (in places)
- Unit 3b Sand and gravel lenses with organic content (localised in channel fills)
- Unit 3c Peats (localised lenses in channel fills)
- Unit 4 Organic peaty silts (localised in channel fills)
- Unit 4a Black organic silty clay on sandy gravel palaeosol
- Unit 4b Palaeosol developed on sandy gravel (only really clear in Pit CC and excavation trench)
- Unit 5a Laminated sands and tufaceous sand (localised in channel fills)
- Unit 5b Peaty silt in channel fills
- Unit 6 Calcareous sand interleaved with gravel lenses (Pleistocene)
- Unit 7 Gravel (Pleistocene)



Figure 21: Ufton Bridge: black organic silty clay in hand auger chamber (photo M. Bell)

Units 1–3, 4a, 6 and 7 were widely represented across the site in that sequence downwards. Each of these units was not present in every borehole and as noted the distribution of Unit 3a and 4a was more discontinuous, although both Units were present in places over much of the area of the borehole survey.

### *Boreholes in West Meadows Field and the Mesolithic site*

by Martin Bell

In West Meadows Field the borehole survey (**Figures 22 and 23**) was a grid of 103 cores mainly concentrated in an area 40m by 40m around the original Mesolithic find-spot.

Here boreholes were put down on a 5m grid with some closer on key transects. Four transects were also put down west and south of this area (in 1999, 2001, 2005 and 2006) to look at the wider sedimentary context, and a 15m grid of 20 boreholes was put down in 2013 to the east to provide a connection with the sedimentary

sequence in the East Field. The borehole survey demonstrated that the original Mesolithic find-spot was on a gravel rise where Holocene sediments were only 0.3m thick above the gravel. Holocene sediments thickened somewhat in all directions away from this rise; to the north-west there was a palaeochannel running along the edge of the field. This palaeochannel is distinct on the geophysical survey of Mansfield (**Figures 10 and 11**). Boreholes also confirmed the sequence (up to 3m deep) in the substantial north–south channel on Mansfield’s survey and also the less pronounced and shallower curvilinear channel south of the main gravel rise on Mansfield’s plot. The existence of these channels confirms that the gravel rise on which the Mesolithic site is located is defined and probably created on the north, west and south sides by palaeochannels of two or three phases.

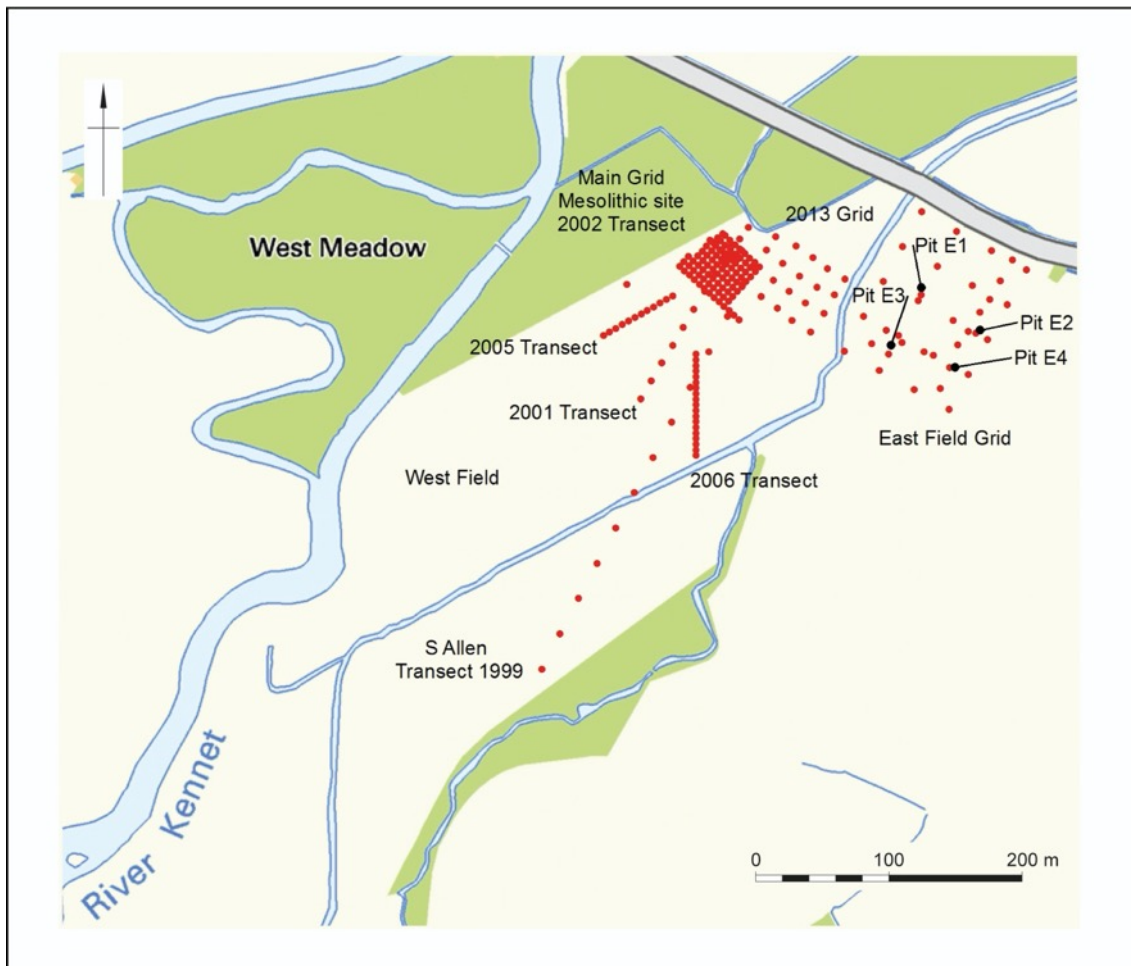


Figure 22: Ufton Bridge plan showing the locations of borehole surveys (graphic S. Maslin)

The picture from the closely gridded area of boreholes around the Mesolithic site is complex and more easily discussed in terms of key transects through the area made in 2001 and 2002 which will be outlined first before going on to discuss other transects which radiate beyond this gridded area and help to provide a wider picture of the sedimentary sequence in this field and the field to its east.

### 2001 Transect

This transect (Figures 23 and 24) ran from the field edge across the area of Mesolithic artefacts in a north-east to south-westerly direction. It was 110m long and comprised 15 boreholes put down as a prelude to the 2002 excavation. It clearly shows the raised area formed of gravel with calcareous Pleistocene sand in places: this is some 50m across with the lithic find-spot on the highest part. At the east end on the field edge there is evidence of a palaeochannel at least 2m deep with a peaty silt fill overlain by calcareous alluvium. On the edge of this channel organic clays apparently correspond to the black organic horizon (Unit 4a) which was later found to overlie Mesolithic artefacts. This is overlain by tufa with abundant freshwater shells. The organic clay horizon is present above the gravel in most of the boreholes on the crest of the dome but in places ploughing has cut into this horizon, mixing it in borehole G and perhaps removing it in borehole F. Such disturbance has clearly taken place because it was this that led to Stephen Allen's discovery of the lithic artefacts. The relationship between the channel, the organic clay on its edge, and the tufa suggests that this channel may be the same as that crossed by the 2002 transect to the north of the site and the 2005 transect to its west. If so the Mesolithic findspot sits on the inside of a curving early Holocene meander around the gravel rise.

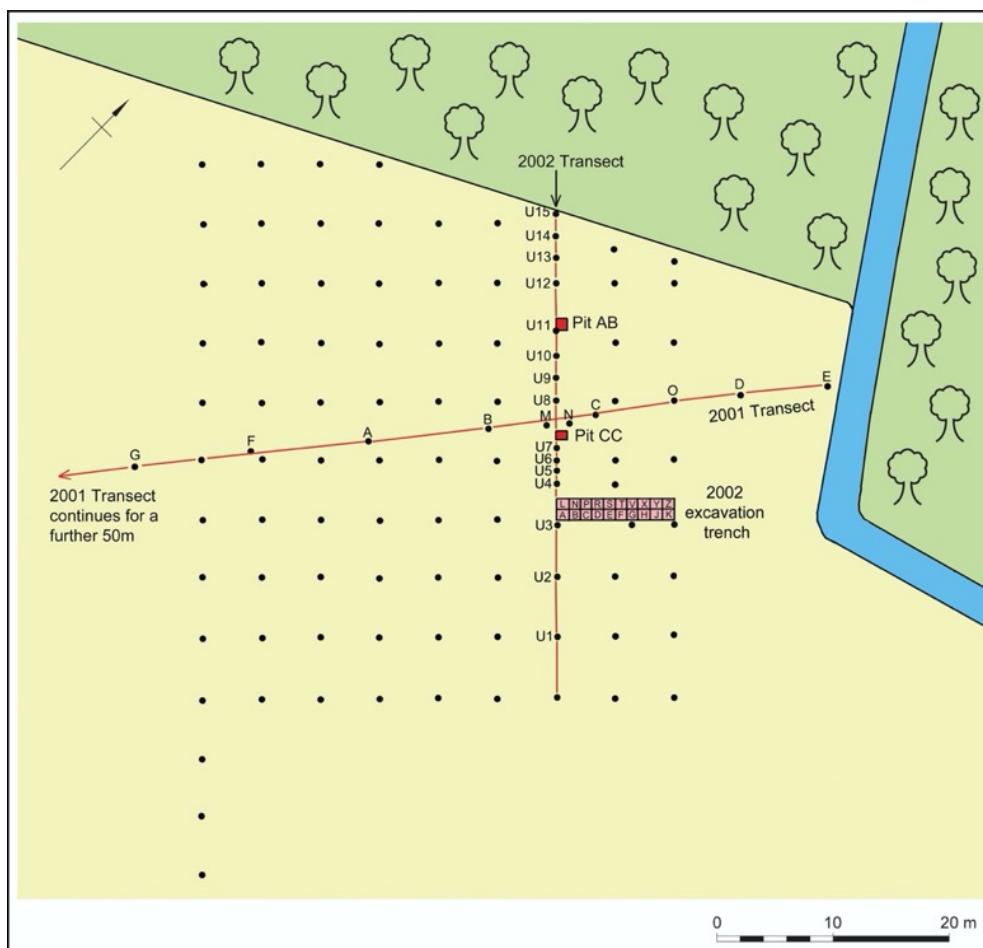


Figure 23: Ufton Bridge: area of main borehole grid around 2002 excavation site showing the borehole transects of 2001 and 2002 (graphic S. Maslin)

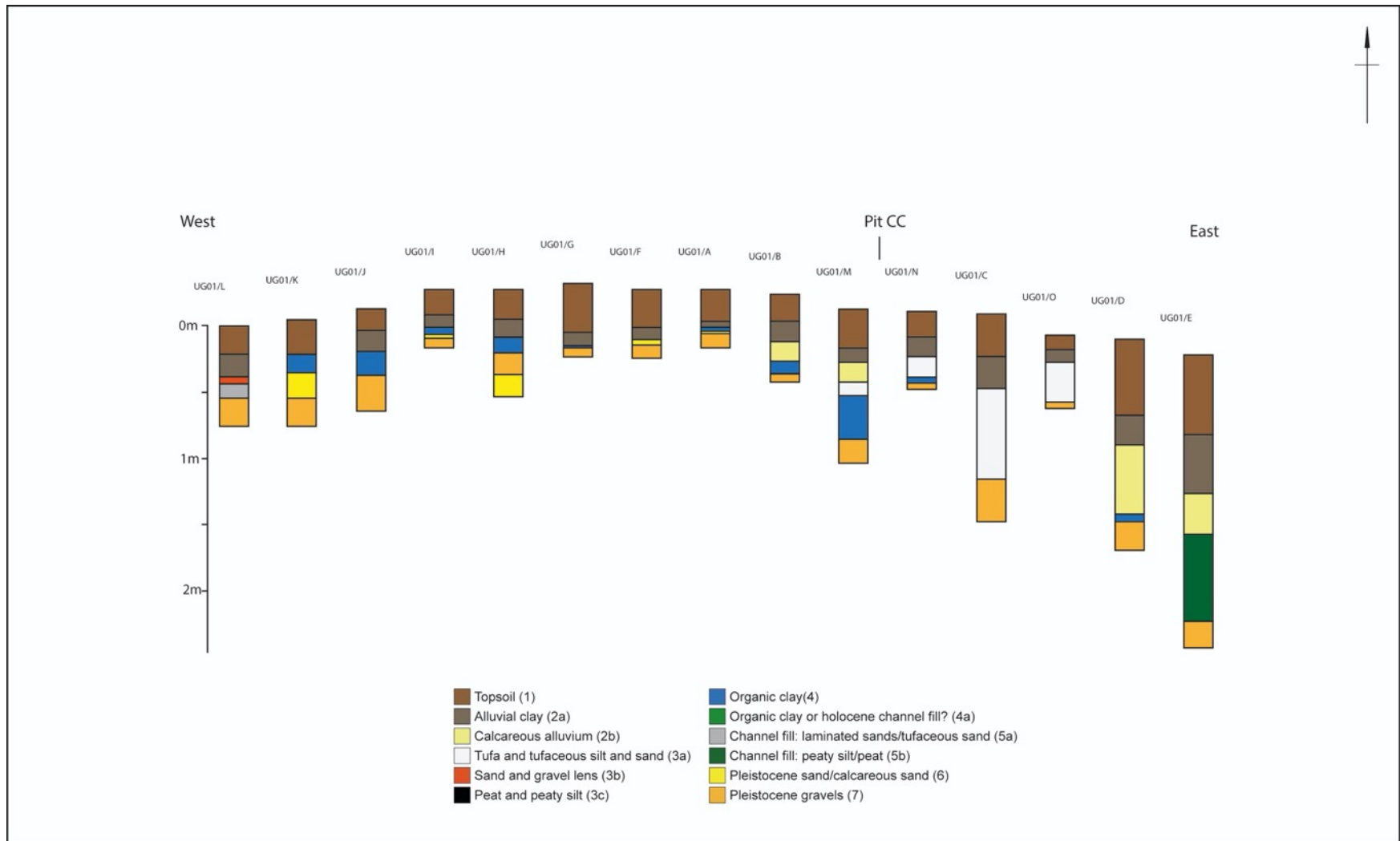


Figure 24: Ufton Bridge: 2001 borehole transect across Mesolithic finds location (graphic S. Maslin)

### *2002 Transect*

This transect (**Figures 23** and **25**) linked the 2002 Trench, Pit CC and Pit AB. It was 42.5m long with boreholes at 5m intervals reducing to 1m intervals between excavation areas. At the south end of the transect boreholes 1–9 show a clear sequence: the basal gravel has a domed surface overlain in places by calcareous Pleistocene sand. Over this surface is a black organic clay (Unit 4a) which excavation showed sealed the Mesolithic artefact horizon. The sequence thickens to the north and here the black layer is sealed by calcareous alluvium and (in borehole 9) by tufa (Unit 3a) overlain by calcareous alluvium. All these boreholes have an upper layer of alluvial clay/topsoil. At the north end of the transect, boreholes 10–15 reveal a more complex and variable sequence filling a palaeochannel which cuts down to at least 2.65m. Above the gravel is an organic, generally stoneless peaty silt with some plant material. Above this, sandy sediments, laminated organic and silty in places, form the south side of the channel. Tufa formed within the channel on two occasions as borehole 12 shows. These sediments grade upwards into organic clay, calcareous alluvium and alluvial clay as elsewhere on the site.

The stratigraphic relationship between boreholes 1–9 and 10–15 is not clear. The sequence could be interpreted as a later channel (10–15) cutting the earlier sequence. However, plant material from the base of borehole 13 has been dated 9320–9250 cal BC (SUERC-56979: **Table 1**) which suggests that the channel is a little earlier than the Mesolithic activity and the lower fill could be contemporary with Mesolithic activity. The tufa within the channel may correspond to that which seals the black layer and the Mesolithic activity in borehole 9, or it might represent later episodes of tufa formation. In boreholes 10 and 14 there were black organic clay layers which might correspond to the organic horizon sealing the occupation surface, but that is far from certain. Either way the radiocarbon date does suggest that at the time when Mesolithic activity took place the distinct gravel rise was defined on the north side by a palaeochannel, at least part of the fill of which is likely to be contemporary with Mesolithic activity. Given the variable nature of the channel fill we cannot exclude the possibility of various phases of channel cutting and fill in this area.

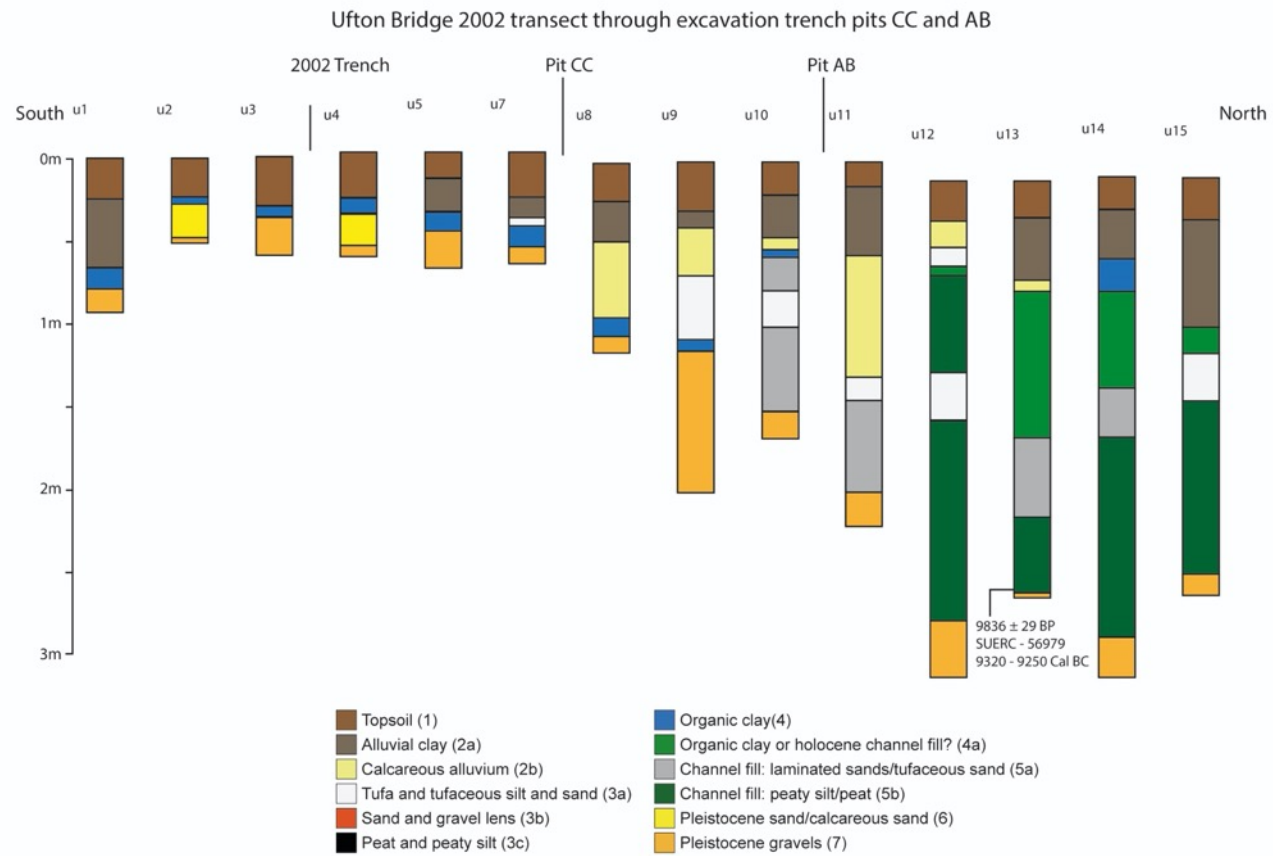


Figure 25: Ufton Bridge: 2002 borehole transect across areas excavated in 2002 (graphic S. Maslin)

### *2005 Transect*

This ran west from the main borehole grid (**Figure 26**) with the aim of providing a section across the very distinct palaeochannel on Mansfield's geophysical survey (**Figure 10**, Feature 2; **Figure 22**) which was also evident as a curvilinear surface depression. The transect was 60m long with cores at 5m intervals. The channel was found to be cut down to at least 2.7m with some gravel at the base. Above this was sand, laminated in places and including organics, both peaty and wood. Above this was up to 1m of peat and silty peat overlain by tuff in the channel centre and then by calcareous alluvium and alluvial clay. The black organic layer which had been found elsewhere to overlie Mesolithic artefacts appeared to be present on the east side of the channel in borehole 05/10 above the gravel. If so, it appears to correspond to the peat fill in the palaeochannel to the west. Given a similar stratigraphic sequence it seems probable that this palaeochannel is the same as that located in the 2002 transect north of the site and that running north-south at this point it curves round in a great meander to run east. If that is so these channel deposits may also be broadly contemporary with the Mesolithic activity.

A single core was put down in 2013 15m north of this transect at what appeared to be the palaeochannel centre where it met the field edge at SU 61829 68422. This revealed Holocene channel sediments down to 3.78m; 1.68m of sandy silts in the lower fill, laminated in places; a 0.42m layer of gravel, overlain by 0.7m of peat, and then 1.19m of silty clay alluvium in the upper fill. This deeper sequence may reflect the presence of a later and perhaps more substantial channel to the north. This point lies within 90m of a large meander of the present Kennet river to the north.



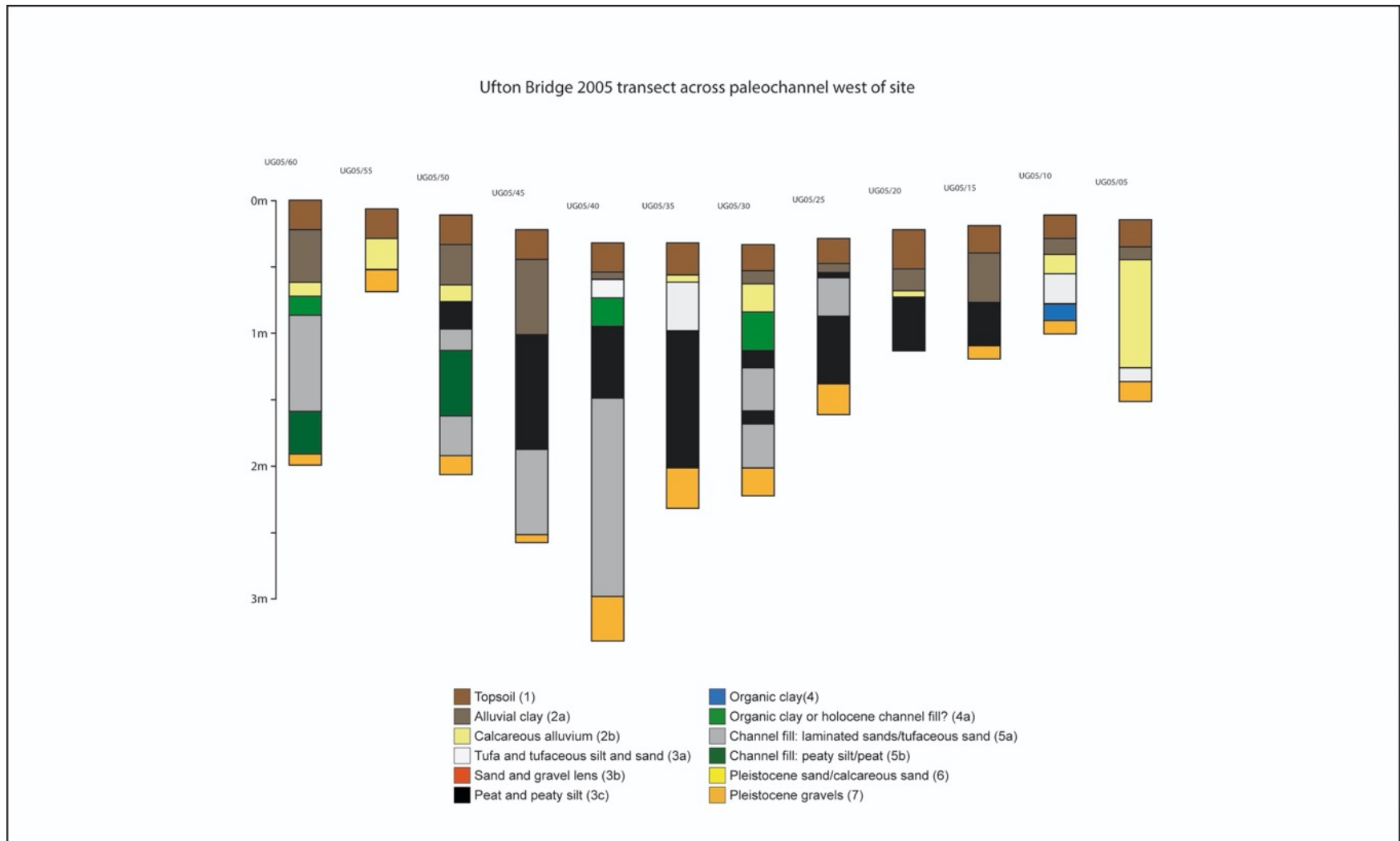


Figure 26: Ufton Bridge: 2005 borehole transect across palaeochannel (geophysics Feature 2) west of site (graphic S. Maslin)

### *2006 Transect*

This was 50m south of the main borehole grid (**Figure 27**) and ran from here to the stream which forms the south edge of the West Meadow Field. The transect was designed to investigate the probable palaeochannel (**Figures 10 and 11**, Feature 5) which runs on the south side of the gravel rise. The transect was 90m long and comprised 19 boreholes at 5m intervals. The existence of a palaeochannel was suggested both by surface topography and a depression in the underlying gravel surface revealed by coring. The deepest deposits were 1.4m although some of the gravels below this were organic and may represent basal channel fill. They were overlain by sandy silts with peats and peaty clays mainly on either side of the channel. Tufa/tufaceous silts overlay these deposits in the channel centre and to its south. In places the gravel was overlain by a black organic layer which appeared to correspond to the layer (Unit 4a) that was found to overlie the Mesolithic activity elsewhere. This appeared to grade into the peaty silts at the channel margins. If so, the stratigraphic sequence here is comparable to that encountered at the Mesolithic site and the palaeochannel may be broadly contemporary, although more minor than that encountered on the west and north sides of the Mesolithic site. That is suggestive of an anastomosing channel system with the gravel rise delimited by channels round much of its edge.

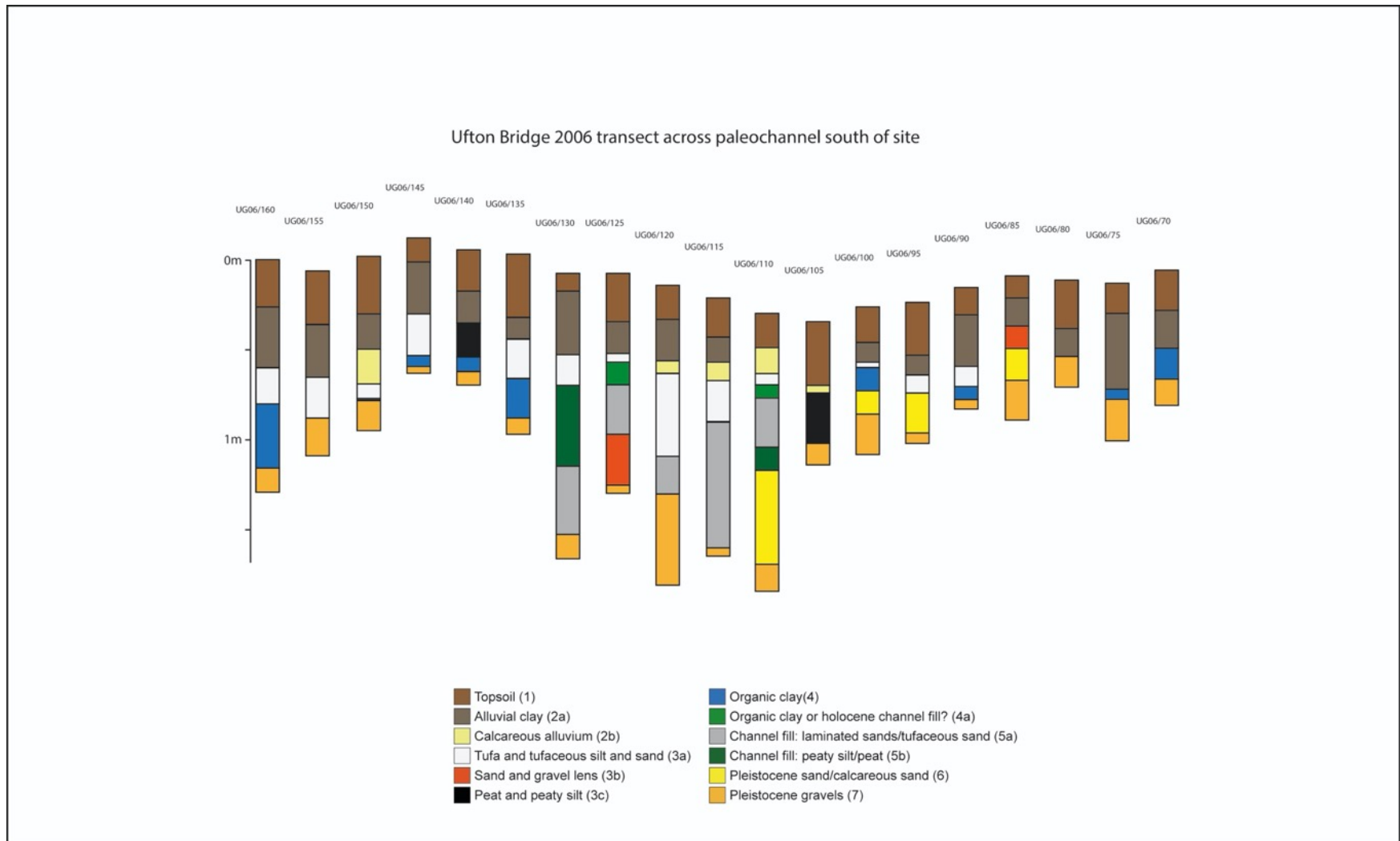


Figure 27: Ufton Bridge: 2006 borehole transect across palaeochannel (geophysics Feature 5) south of Mesolithic site (graphic S. Maslin)

### *2013 Grid*

This was a grid of 20 cores in an area 60m by 45m cored at 15m intervals (**Figure 28**). It lay east of the main borehole grid between this and the East Field (**Figure 22**). It was designed to link the borehole surveys in the East and West Fields and to help to establish the extent to which the sediment sequence around the Mesolithic site was more widely represented. Most of the boreholes in this grid were relatively shallow, the average depth to gravel being 0.68m and the main deposit being alluvial clay. The black organic clay (Unit 4a) which covered the artefact horizon was present on both the west and east sides of the grid but absent in the middle where it may have been eroded. In this band alluvial clay rested directly on the gravel, with the exception of borehole 30/45 where tufa overlay the gravel and was covered by a further layer of gravel. The borehole at the south-west corner was deeper: 1.3m to gravel overlain by sandy clay, then tufa and then the organic clay below alluvium, clearly indicating a palaeochannel in this area at the field edge. This is likely to be one of the palaeochannels detected in the immediately adjoining East Field. This borehole grid is significant in showing that the sediment sequence represented around the gravel rise to the west extends with an interruption to the east edge of the West Field.

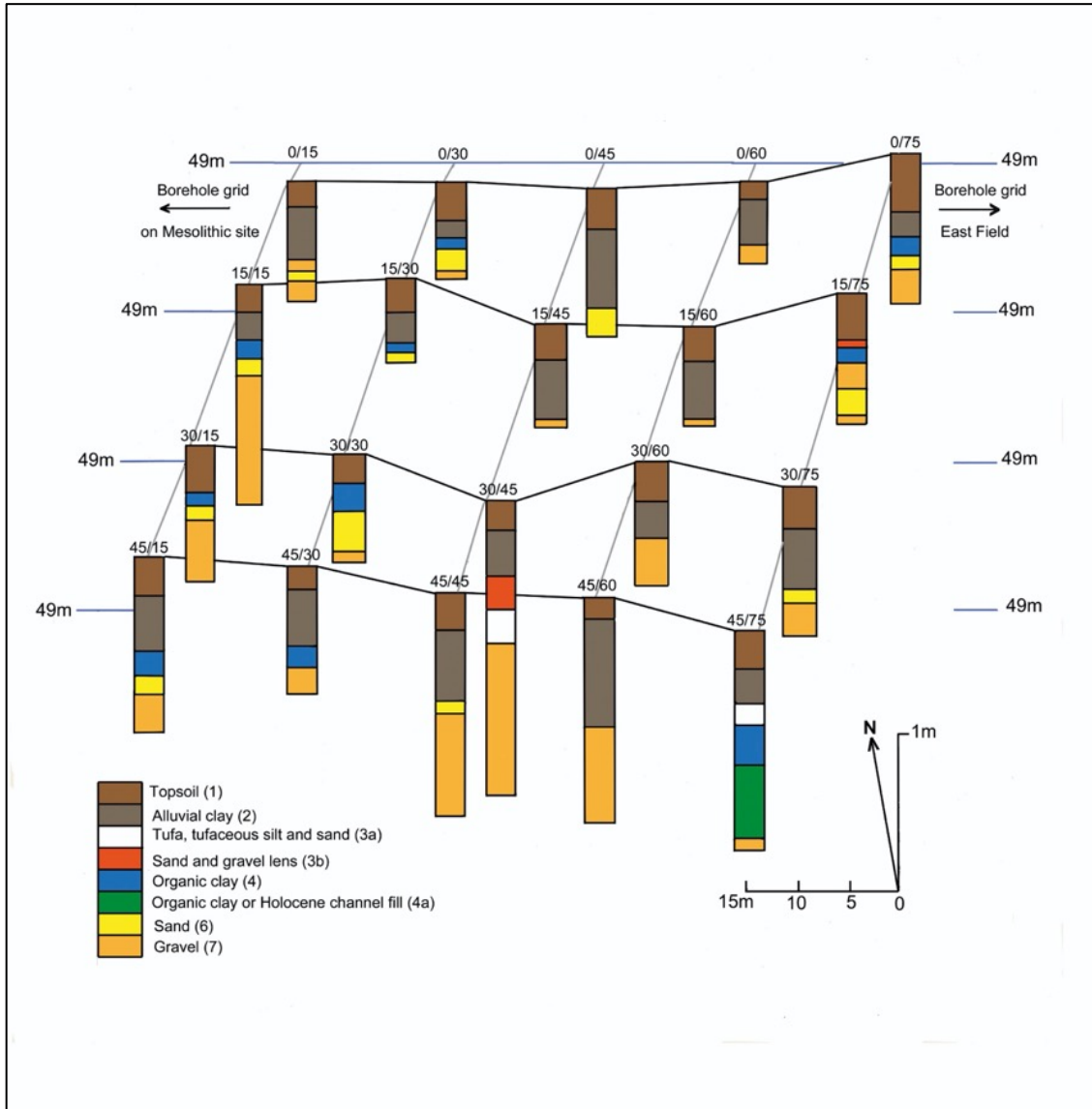


Figure 28: Ufton Bridge: 2013 borehole grid east of Mesolithic site (graphic D. Alyward and J. Foster)

### ***Boreholes in East Field, Ufton***

by Dan Alyward and Martin Bell

Fieldwalking by Stephen Allen in the north corner of the East Field produced evidence of medieval activity; nearby preliminary coring revealed evidence of a similar sediment sequence to that outlined above in the West Field. The sedimentary sequence in the East Field was investigated by Dan Alyward (2008) as part of a MSc Geoarchaeology dissertation using geophysics, as noted above, coupled with boreholes and sediment analysis. Boreholes were put down in the north-east corner of the field over an area 120 by 90m (**Figure 29**).

Alyward put down a grid of 20 boreholes in 2008, followed by an additional 12 boreholes by a geoarchaeology class in 2011. On the north-west edge of the field the boreholes show a distinct gravel rise capped by a thin deposit of Holocene alluvium. In one borehole the gravel was within 0.3m of the present surface. This was the area where Stephen Allen had found medieval pottery in the ploughsoil. The Holocene sediments thickened to the east, the Pleistocene gravels (Unit 7) or calcareous sands (Unit 6) generally being covered by calcareous alluvium and then clay alluvium. There is evidence of a minor shallow north-to-south channel in the middle of the area with sandy or tufaceous sediments. This had been evident on the electrical conductivity survey (**Figure 17**). Two boreholes in the northern half produced evidence of the organic clay layer (Unit 4a) which on the main site has sealed the Mesolithic activity. The southern part of the borehole grid revealed deeper quite complex Holocene sequences, up to 1.7m thick comprising channel fill deposits of sandy silts, peaty silts, calcareous silts and, in nine boreholes, tufa. Ten boreholes on the southern side also produced evidence of the black clay layer (Unit 4a). In most cases this black layer was on the Pleistocene gravel/sand, sometimes with traces of an intervening palaeosol. In one case peat occurred between the black layer and the underlying Pleistocene gravel.

Generally, as in the West Field the black layer was overlain by tufa but in two cases tufa was present below the black layer and in one of these cases tufa occurred both above and below the black layer. The boreholes demonstrate a similar sedimentary sequence to the West Field and similar relationships between that sequence and the channels as observed in that field. They clearly show a palaeochannel running roughly west to east in the southern part of this borehole grid. That channel is likely to be associated with the channel located by borehole 45/75 in the south-east corner of the West Field 2013 grid (**Figure 28**) and probably also by the east-west channel evident in Mansfield's West Field geophysical survey where the 2006 borehole transect was done (**Figures 11 and 27**). The sediment sequence in this field was further investigated by four test pits which are discussed below.

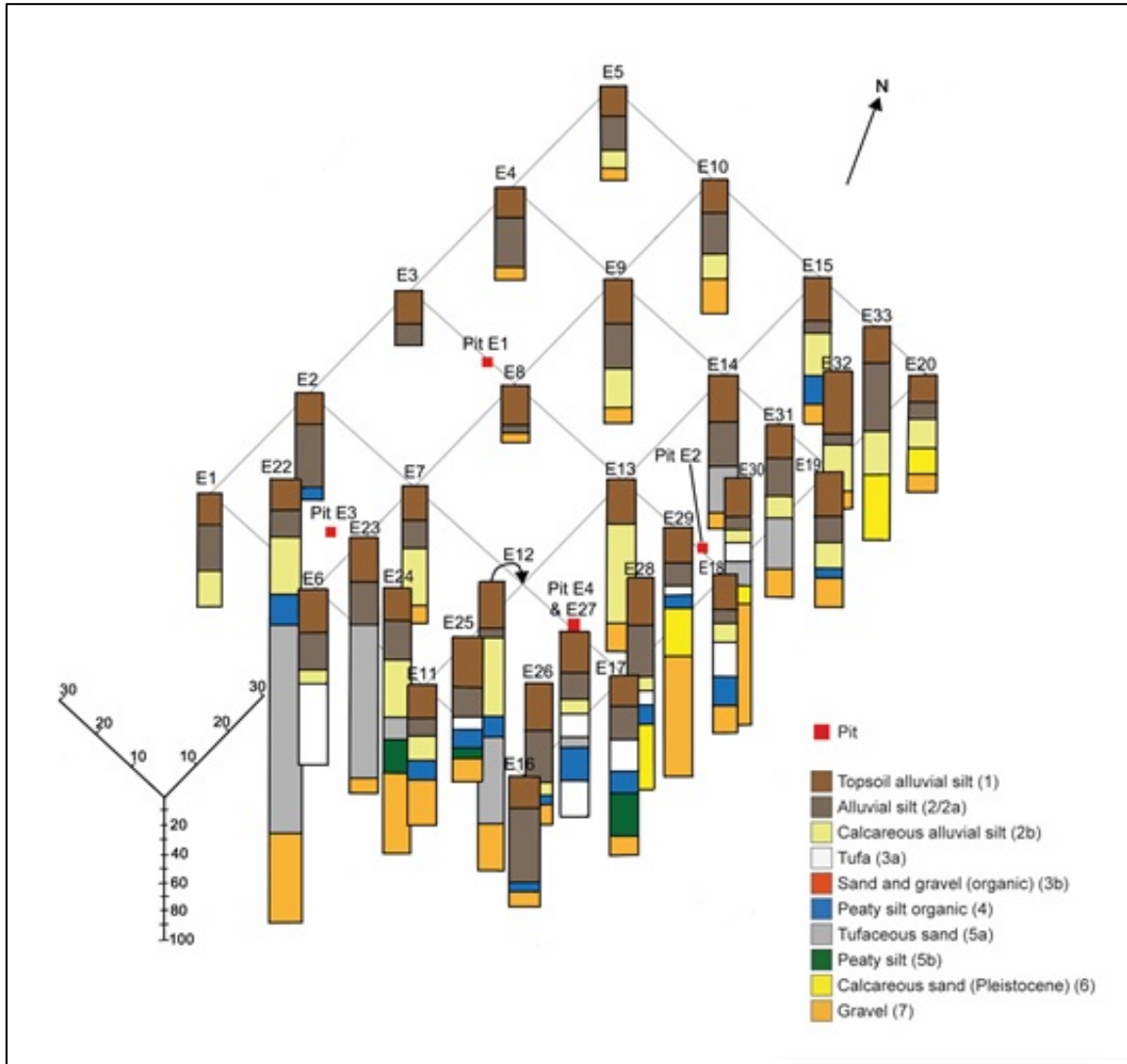


Figure 29: Ufton Bridge East Field boreholes grid (graphic D. Alyward and J. Foster)

### *Gravel surface modelling*

by Martin Bell and Simon Maslin

Putting all the boreholes in the East and West Fields together using the Rockworks stratigraphic modelling programme, the surface of the underlying gravels can be modelled (**Figure 30**). This clearly shows the gravel rise on which the Mesolithic activity was centred. That feature emerges as a much larger gravel 'island' than originally appreciated: it has been largely buried by accumulating Holocene sediments. There is a secondary gravel rise connected to the first by an isthmus in the north-east corner of the East Field; this is the place where the medieval finds were made. Palaeochannels are seen on three sides of the main gravel rise and in the southern part of the East Field borehole grid, apparently connecting with the channel (Feature 5) south of the main gravel island.

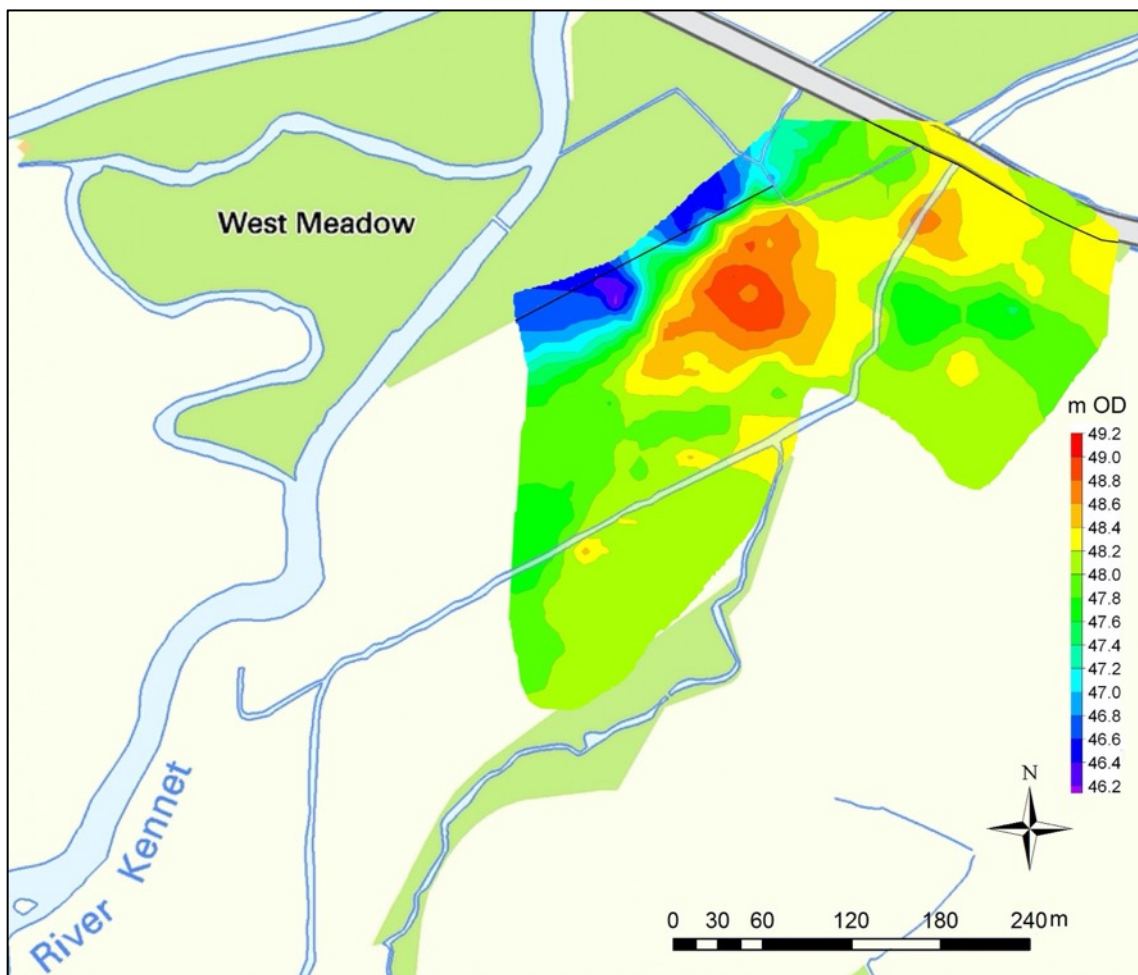


Figure 30: Ufton Bridge showing the modelled surface of the underlying Pleistocene gravels derived from the borehole survey (graphic S. Maslin)



### *Ufton Bridge: 2002 excavation*

by Martin Bell and Catherine Barnett

The original test pit investigation by Stephen and John Allen was followed in 2002 by the further excavation of a 10m by 2m trench by Stephen Allen with support from Reading University, where he was a postgraduate research student. The 10m by 2m trench (**Figure 31**) was divided into 1m squares for recording purposes and **Figure 32** shows the excavations and square layout.

The trench was generally excavated well into Pleistocene sandy sediments. The northern 2m (squares K and J) were excavated to a depth of 0.9m providing a deeper section of the Pleistocene sediments (**Figure 33**). At the south end square N was excavated to a depth of 0.7m to expose a fuller soil and subsoil profile (**Figures 32 and 33**).

The stratigraphy is described from the base upwards.

- Context 5: The deeper sections showed that at a depth of 0.5m there was subangular flint gravel (95%) and some sarsen with occasional coarse sand.
- Context 4b: 0.2m of olive yellow (2.5Y6/6) sand without stones but mottled with iron staining.
- Context 3b: 0.04m of subrounded to subangular gravel (70%) in matrix of silt and fine sand.
- Context 4a: 0.08m thick in square N. Brownish yellow (10YR 6/6) fine sand with 5% flint gravel (2mm–10mm). Upper 150mm subject to pedogenesis.
- Context 3a: 0.1m of flint gravel (60%) unsorted 2–60mm in brown (10YR5/3) in organic sandy silt matrix. Main artefact horizon with worked flints and bone.
- Context 2: 0.06m thick black (10YR/2/2) sticky organic silty clay marl with flint gravel inclusions in places (1–4mm). Some lithic artefacts in this Unit.
- Context 2a: in square N Unit 2 was overlain by 10mm of brown clay with numerous tufa inclusions.
- Context 1: 0–0.19m topsoil of dark yellowish brown (10YR3/6) clay loam with 10% gravel (1–60mm) and some rounded calcareous nodules (1–4mm), formerly cultivated with patchy vegetation as set-aside at the time of excavation.

The artefact horizons, Contexts 2 and 3a, were dry sieved with a 10mm mesh. The very tenacious silty clay Context 2 proved difficult to excavate and break up for sieving.



Figure 31: Ufton Bridge: photograph of 2002 excavation trench in 1 metre squares (photo M. Bell)



Figure 32: Ufton Bridge: photograph of 2002 trench profile in Square N (scale 100mm divisions) (photo M. Bell)

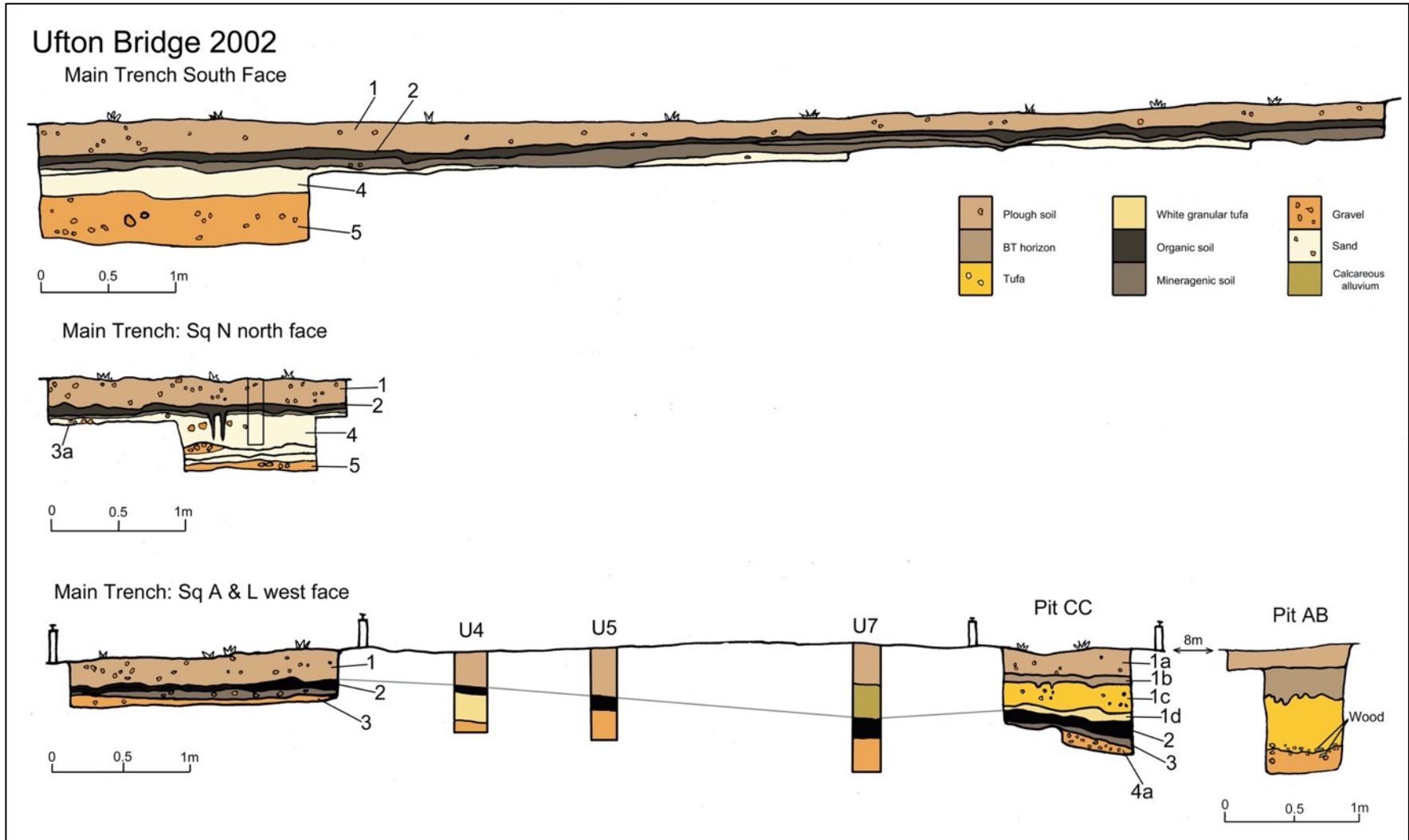


Figure 33: Ufton Bridge: sections of 2002 trench and pits (graphic J. Foster)

As part of that investigation a 1m x 1m pit was opened 8m south of the trench where coring had suggested that the sediment sequence was deeper (**Figures 34 and 35**). This pit was excavated to obtain a palaeoenvironmental sequence as part of the PhD thesis on the Mesolithic environments of the Kennet Valley (Chisham 2004).



Figure 34: Ufton Bridge: photograph of the profile of Pit CC (scale 100mm divisions) (photo M. Bell)

The base of the exposed sequence in Ufton Pit CC was of 60% rounded to subangular gravel in a sand matrix from 0.845–1m, overlain by gravels in organic sandy clay to 0.645m (equivalent to Context 4 of the main trench). The context fined upwards to form at its top (at 0.615–0.635m) a defined pedogenically altered organic silty clay containing the artefact horizon (Context 3). This was overlain by a highly calcareous black organic silty clay marl with no visible inclusions to 0.555m (Context 2). A body of fine-grained tufa occurred at 0.29–0.555m, which at top and bottom was in a pale clay matrix. This layer was overlain by sandy clay, with small tuffaceous inclusions, which graded into a clay loam topsoil at 0.22m.

Extensive coring in the vicinity of the site has subsequently traced this series of Holocene-age strata and shows them to thicken and deepen moving into former channels to the north. Coring transect 2002 traversed the line between the main excavation trench and Ufton Pit CC, so allowing direct correlation of the west-south-west faces as shown in **Figures 25** and **33**. It can be seen that despite variations in the relative position of alluvial silty clays between the two excavations, the sticky black organic clay layer occurred throughout, with a steady fall in height of 0.49m, apparently mirroring that of the basal gravels, from 48.87m OD in the main trench Square A to 48.38m OD at the northern edge of Ufton Pit CC, where the most southerly occurrence of overlying tufa was observed.

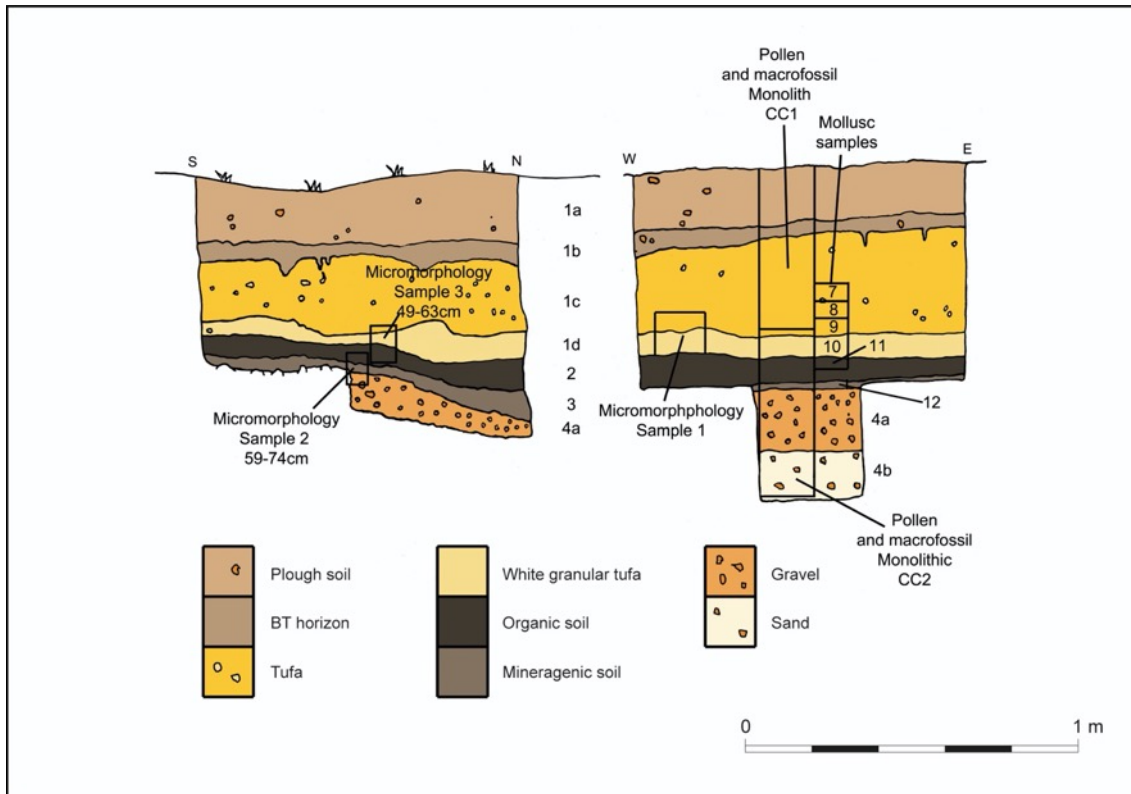


Figure 35: Ufton Bridge: sections of Pit CC with sample locations marked (graphic J. Foster)

### *Pit AB*

This was 8m north of Pit CC and its excavation was rather by chance, occasioned by the need to retrieve a broken corer (**Figure 33**). The sediment sequence was 0–0.12m topsoil dark brown (7.5YR3/4); 0.12–0.40m brown (7.5YR4/4) silty clay loam alluvium; 0.40–0.75m dull brown (7.5YR5/3) tufa; 0.75–0.95m gravel. The water table was on the gravel surface and a pump was not available. The black organic layer was not observed. It is notable that pieces of wood were present at the surface of the gravel, so waterlogged deposits extend to within 0.75m of the present ground surface.

### *Ufton Bridge: East Field excavation pits*

by Dan Alyward and Martin Bell

### *Pit E1*

This was 1m square (**Figure 36**) on the crest of a gravel rise demonstrated by geophysics and boreholes and at the centre of an area where Stephen Allen had found medieval ceramics. There was 0.21m of clayey silt topsoil with deeper plough furrows which had cut into the underlying sediments. This contained medieval to modern pottery, building material, nails, bone and coke. Below this was 0.25m of olive brown (10Y4/3) clayey silt subsoil containing medieval ceramics with at its base a 0.1m horizon of calcareous nodules, probably a tufa disrupted by pedogenic processes. Below this was light olive brown (2.5Y5/3) coarse silt/fine sand with gravel at 0.85m.



Figure 36: Ufton Bridge: East Field photograph of Pit E1 section (photo D. Alyward)

The medieval ceramics have a fabric which indicates that the earliest date to the twelfth century, comparable to group A ceramics at Bartholomew Street, Newbury (Vince *et al.* 1997, 46; G. Astill pers. comm.). A horseshoe found unstratified nearby was of Clark's (1995, 88) type 4 introduced from AD 1270–1350. Other sherds of Surrey Border and Tudor green wares suggest activity continuing into the 15th and 16th centuries AD (Pearce 1992).

### *Pit E2*

This pit (**Figure 37**) was 1.5m by 1m, put down on the east side of the borehole grid to investigate a linear geophysical anomaly which it probably did not locate. It produced other evidence which makes a significant contribution to dating the sequence.



Figure 37: Ufton Bridge East Field photograph of Pit E2 section (scale 10 cm divisions) (photo M. Bell)

The sediments were as follows:

- Topsoil 0–0.25m, very dark greyish brown (10YR3/2) clay former ploughsoil now under grass.
- (2) 0.27–0.62m, light yellowish brown (2.5Y6/3) calcareous silt.
- (3) 0.62–0.71m, light brownish grey (2.5Y6/2) calcareous marl with fine sand.
- (4) 0.71–0.74m, greyish brown (2.5Y5/2) calcareous coarse silt with gravel.
- (5) 0.74–0.85m, dark greyish brown (2.5Y 4/2) humic gravel.
- (6) Flint gravel

Levels 4 and 5 produced artefacts (**Figure 38**). In Level 4 there were two joining sherds of a Middle to Late Iron Age saucepan pot (R. Bradley pers. comm.) and an ovicaprid metapodial with a perforation and surface polish. Such artefacts are generally thought to have been used in weaving (Coles and Minnitt 1995, 146). In Level 4 there was a pig skull, and bones of ovicaprid and cow were also present. Heat-fractured flint and sarsen and a flint blade and flake of probable Mesolithic date were also found.



Figure 38: Artefacts from Ufton Bridge East Field: Iron Age pottery and bone tool, and probable Mesolithic blade



### *Pit E3*

A pit measuring 1.5m by 1m (**Figure 39**) was excavated to determine the origin of a linear anomaly in the gradiometry data.

- (1) 0–0.27m topsoil, very dark greyish brown (10YR3/2) clayey silt.
- (2) 0.27–0.49m, olive brown (2.5Y4/3) clayey silt subsoil.
- (3) 0.49–0.69m, greyish brown (2.5Y5/2) clayey silt with gravel.
- (4) 0.69–0.74m, greyish brown (2.5Y5/2) fine sand/coarse silt.
- (5) 0.74–0.80m, dark greyish brown (2.5Y4/2) silty sand.
- (6) 0.80–1.0m, dark greyish brown (2.5Y5/2) gravel.
- (7) 1.0–1.13+m, black (10YR 2/1) peat.



Figure 39: Ufton Bridge East Field: photograph of Pit E3 section (scale 10 cm divisions) (photo M. Bell)

Ceramic building material and a clay pipe stem were found in the topsoil. A bone from Layer 4 was Uranium Series dated to  $2208 \pm 195$  BP (below). Layer 5 appeared to represent a land surface which thus corresponds to the Iron Age land surface in Pit E2. However, it here overlay a gravel layer and below this was peat. Thus it is likely that the gravel relates to the palaeochannel present on the southern part of the borehole grid. The presence of gravel here in Layers 3 and 6 indicates higher energy environments in this area during the Holocene. On this basis we need to keep in mind that some of the gravels, which boreholes could often not penetrate, may be Holocene rather than Pleistocene.

### Pit E4

This pit (**Figure 40**) was excavated in 2011 on the east side of the borehole grid to investigate the black organic silt and overlying tufa which had been found on either side in boreholes 29 and 18.

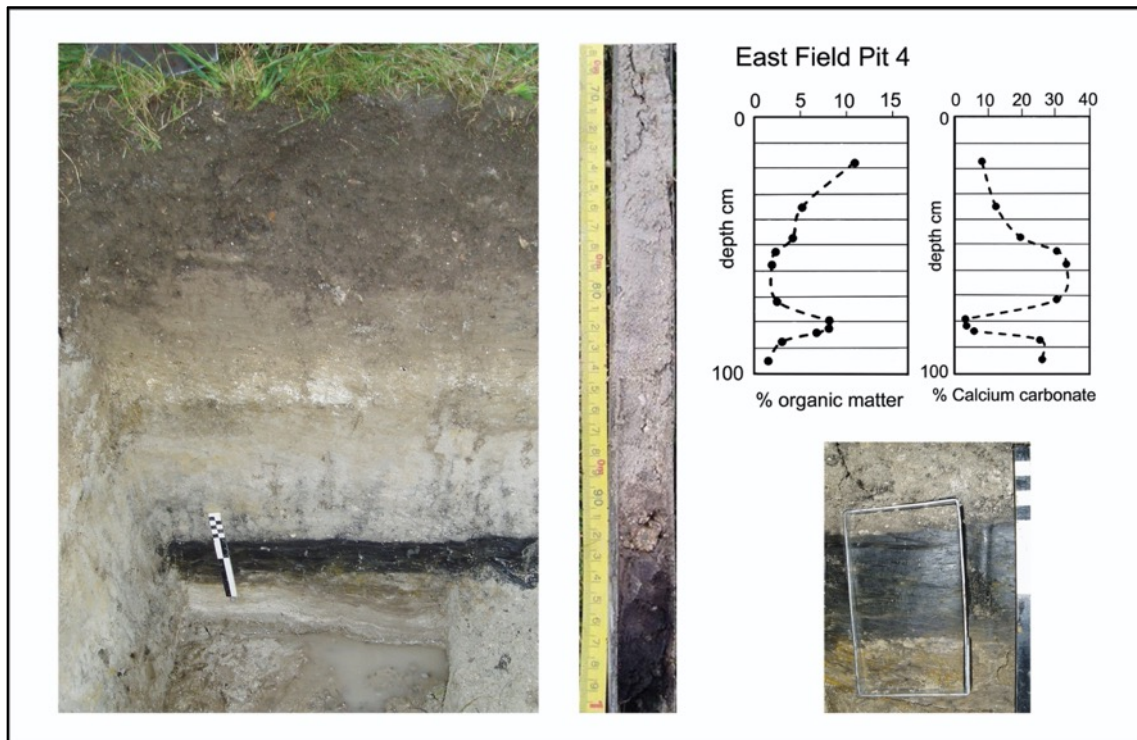


Figure 40: Ufton Bridge East Field photograph of Pit E4 section with inset showing black organic silty clay and the same deposit in borehole 27 and graphs of organic matter and calcium carbonate (photos M. Bell / graphs C. Speed).

- 0–0.24m, topsoil very dark greyish brown (2.5YR 3/2) silty clay.
- 0.24–0.42m, greyish brown (2.5YR5/2) calcareous silty clay alluvium.
- 0.42–0.50m, light greyish brown (2.5Y6/2) tufa gravel disrupted by subsequent pedogenesis.
- 0.50–0.56m, light greyish brown (2.5YR6/3) silty marl appeared more organic at surface, appears to be a palaeosol.
- 0.56–0.78m, light greyish brown (2.5YR6/2) sandy tufaceous marl with organic peaty inclusions in lower half.
- 0.78–0.85m, black (5YR2.5/2) organic clay with distinct fine (3mm) laminations of grey silty clay and occasional small tufa inclusions.
- 0.85–0.90m, dark olive grey sandy tufa, fine laminations of tufa, sand and clay.
- 0.90–1.0m, light brownish grey (2.5YR6/2) tufa with silt laminations. On the east side of the pit is a shallow (0.2m) palaeochannel in which there are laminations of olive grey sandy silts and tufa and tufa gravel lenses.
- 1.0+m, flint gravel.

In order to further characterise the sediments in this pit a loss on ignition test was carried out to establish organic matter content (loss at 500° C) and calcium carbonate content (loss at 950° C). The results are shown on **Figure 40**.

Organic matter reduces steadily from the surface: there is no marked increase related to the apparent palaeosol at 0.5m. Organic matter content increases markedly to 8% in the organic band then decreases steadily in the tufa below. Calcium carbonate content increases steadily down profile and between 0.5–0.7m is over 30%; it decreases dramatically in the organic band and increases again in the underlying tufa.

Some 200m east of the excavated site, this pit was significant in demonstrating the extent to which the stratigraphy on the Mesolithic site is represented more widely across the floodplain. The black organic layer and the overlying tufaceous sediment was present, the latter divided into two units by an apparent period of soil formation. Also significant was the demonstration of tufa occurrence below the black organic clay as also noted in two nearby boreholes (**Figure 29**). In the East Field there were clearly a number of distinct episodes of tufa and tufa marl deposition.

### ***Conclusions: East Field, Ufton Bridge***

This field was significant in providing geophysical and artefactual evidence for a number of distinct phases of activity on the floodplain which contribute significantly to the dating of the overall stratigraphic sequence in both fields. The discovery of a flint blade in Pit E2 and one or two other flints during preliminary fieldwork indicates some Mesolithic activity may have extended into this field. Pit E4 and several of the boreholes shows that the organic clay layer which sealed Mesolithic activity in the West Field is also present, mainly in the southern part of this borehole grid. Pit E2 produced rather surprising evidence of an old land surface on gravel with evidence of Middle to Late Iron Age activity with later deposition of calcareous marl and subsequently alluvium. Thus, the calcareous alluvium which was present in both the West and East Fields may be Iron Age and later and relate to a period of spring activity and flooding by highly calcareous water later than the Iron Age. The evidence for medieval activity on the gravel rise at Pit E1 is likely to relate to one of the phases of ditched enclosures identified by the geophysics. This seems most likely to be a small farming site established on this gravel rise on the floodplain between the 12th and 16th centuries AD when presumably the site was little affected by flooding. The sediments in Pit E1 show some subsequent alluvial deposition and thus a return to flooding.

### ***Ufton lithics***

by Stephen Allen

From the original trial excavation (Allen and Allen 2002) a total of 270 pieces of flint were found, about half from the fieldwalking and half from the small excavation. The lithic artefacts (**Figure 41**) included three cores, 70 blades or bladelets and six tools (five scrapers and a notched piece). The proportion of blades was comparable with, or greater than, other excavated Mesolithic sites in the

Kennet Valley, although the original Ufton assemblage did not include any diagnostic Mesolithic artefact types.

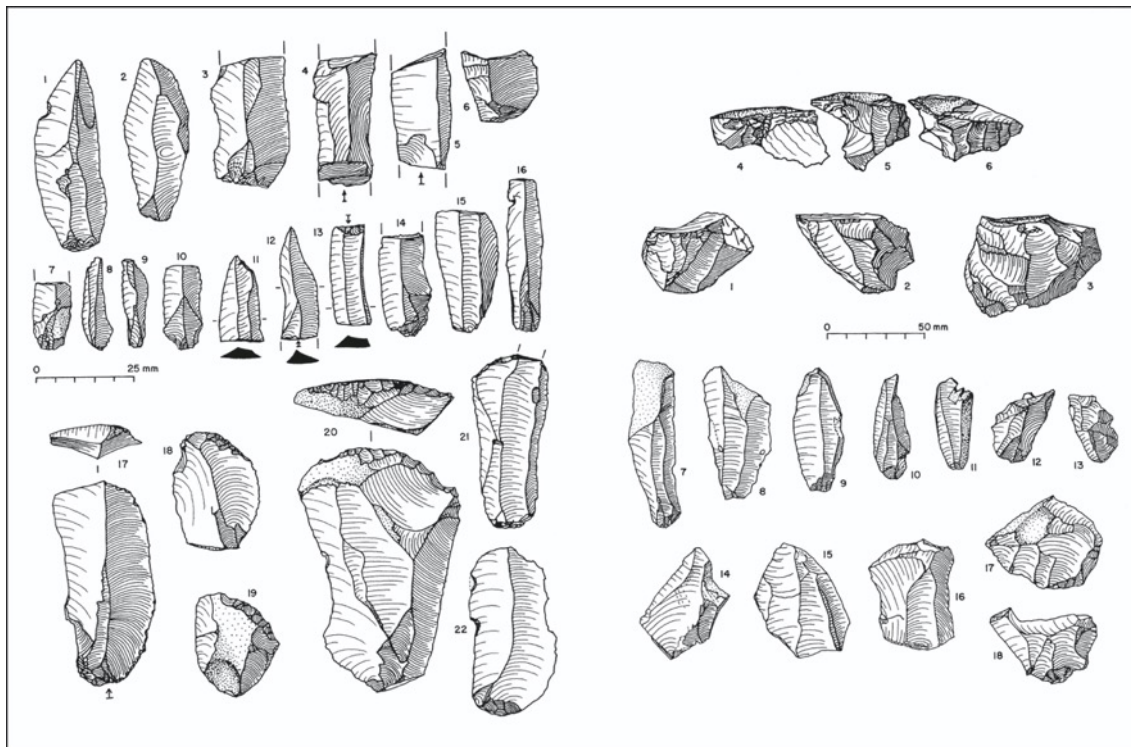


Figure 41: Lithic artefacts from the excavations of Allen and Allen (2002)

The lithics from the 2002 excavation are now unfortunately lost as a result of most unfortunate circumstances, so illustration and detailed study have not been possible. Preliminary observations on the assemblage were, however, made before loss. The assemblage was dominated by debitage associated with knapping at the site: unretouched blades, bladelets, trimmed or reshaped flakes, waste flakes and cores. Finished tools represented 5–10% of the assemblage. Scrapers dominated the tools, typically side and end blade-scrapers, and small concave scraping edges, constructed along the edge of a blade. Two microliths were present, one in the 2002 trench, and one in Ufton Pit CC. Cores tended to be single or bi-platform sub-conical blade cores, typical of material found elsewhere in the Kennet Valley at sites such as Wawcott (Froom 1972a, p30, figs 2–4; Froom 2012) and at Thatcham (Healy *et al.* 1992, 58, figs L21–24; Wymer 1962, 341, figs 1–8).

The assemblage can be described as typically Mesolithic in character and suggests that some sort of butchery and processing activity was taking place, with knapping taking place *in situ*. This is supported by the high proportion of blade-scraping tools, and more so by the presence of small concave scrapers on blade edges. These tools would have been suitable for removing sinews and other tough ligaments/muscle from bone. There is further support for the site function due to the abundance of animal bones and the very small number of microliths present (two). One of these microliths was found in Pit CC associated with the bones in the artefact horizon. Two other lithic pieces were recovered from Pit CC, both unretouched debitage pieces.

Some tentative suggestions can be put forward regarding the date of the assemblage on the basis of the lithics. The microlith from Pit CC can be described as a partially-backed point, similar to the microliths recovered from one of the sites at Thatcham III (Wymer 1962). Reynier (2000, 35) dates occupation at Thatcham III to c. 7250 cal BC (9200 cal BP), where there is a strong representation of partially backed points, absent from other earlier Mesolithic assemblages at the site. A piece of resin from this site dated to 8630-8260 cal BC (9200±90 BP; Oxa-2848; Roberts *et al.* 1998; Hedges *et al.* 1994). Pitts and Jacobi (1979, 164) suggest that the British Mesolithic can be divided into the early 'broad blade' and later 'narrow blade' stages with the distinction between the phases perhaps taking place around c. 7000 cal BC (c. 9000–8800 cal BP). Scalene microtriangles and narrow bladelets (rods) are the most common microlith shapes found in later assemblages. These are not represented at Ufton. Barton *et al.* (1995, 104) regard the dividing point between earlier and later assemblages as c. 6500 cal BC (c. 8500 BP).

The diagnostic elements of the microlith from Pit CC and the general characteristics, including flake scars, of the assemblage, suggest that activity at the Ufton site, which may represent one or more visits by hunter-gatherer groups, may have taken place somewhere between c. 7000-6500 cal BC (c. 9000 and 8500 cal BP), towards the end of the Early Mesolithic period. These deductions concerning date, made independently in 2004 on the basis of the lithics alone, are broadly consistent with the radiocarbon results reported by Marshall below.

### ***Ufton animal bones***

by Rachel Scales

The bones from the 2002 excavations are still available and 21 fragments or groups of fragments of bone and antler were examined: of these 14 were identifiable. Three were deer (*Cervus* sp) whilst a further nine were identified as adult roe deer (*Capreolus capreolus*) with a minimum age of 2–3 years. Most identified were highly fragmented and several were corroded. The bones represented one or more individuals and came from the 2002 trench concentrated in square I and Ufton Pit CC. One roe deer scapula (Pit CC, bone 3) displayed a possible puncture mark and two poor cut marks while a metatarsal (Pit CC, bone 6) showed cuts from possible dismemberment. A bone from square T comprised small fragments with signs of possible gnawing by rodents. Five of the bones were tested for nitrogen content to establish if they were suitable for radiocarbon dating but unfortunately none was.

### ***Ufton Bridge: radiocarbon dating***

by Peter Marshall

Full details of the radiocarbon dating and methodology are given in the dating report on the wider project (Marshall *et al.* 2015). Only the results specific to Ufton Bridge are included here.

The samples dated at The Queen's University Belfast were processed and dated by Accelerator Mass Spectrometry (AMS) as described in Reimer *et al.* (2015). Of the samples dated at the Scottish Universities Environmental Research Centre, the charcoal and waterlogged plant remains were processed using an acid-alkali-acid pre-treatment as described by Stenhouse and Baxter (1983). CO<sub>2</sub> obtained from the pretreated samples was combusted in pre-cleaned sealed quartz tubes (Vandeputte *et al.* 1996) and then converted to graphite (Slota *et al.* 1987). The samples were dated by AMS as described by Freeman *et al.* (2010).

Both laboratories maintain continual programmes of quality assurance procedures, in addition to participating in international inter-comparisons (Scott 2003; Scott *et al.* 2010). These tests indicate no significant offsets and demonstrate the validity of the precision quoted.

### ***Radiocarbon results***

The results (**Table 1**) are conventional radiocarbon ages (Stuiver and Polach 1977), and are quoted in accordance with the international standard known as the Trondheim convention (Stuiver and Kra 1986).

### ***Radiocarbon calibration***

The calibrations of these results, which relate the radiocarbon measurements directly to the calendrical time scale, are given in **Table 1** and **Figure 42**. All have been calculated using the datasets published by Reimer *et al.* (2013) and Hua *et al.* (2013) and the computer program OxCal v4.2 (Bronk Ramsey 1995; 1998; 2001; 2009).

The calibrated date ranges (**Figure 42**) cited are quoted in the form recommended by Mook (1986), with the end points rounded outward to 10 years or five years if the error is <25. The ranges in **Table 1** have been calculated according to the maximum intercept method (Stuiver and Reimer 1986); the probability distributions shown in **Figure 44** are derived from the probability method (Stuiver and Reimer 1993).

Table 1: Ufton Bridge radiocarbon results

Lab. no.	Sample ref.	Material & context	Fraction modern	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)	Calibrated Date (95% confidence)
Excavation Trench						
SUERC-56978	Do2 Char 1 (2)	Charcoal, <i>Rhamnus cathartica</i> . single fragment (C Barnett, Wessex Archaeology), from excavated from Context 2, a black organic silty layer sealing the main artefact horizon	1.2533±0.0044		-27.2	Cal AD 1959–1962 (26%) or 1980–1983 (69%)
UBA-27304	Do3 Char 1 (2)	Charcoal, <i>Pomoideae</i> . single fragment (C Barnett, Wessex Archaeology), from excavated from Context 3, an organic silty clay marl-artefact horizon	1.5301±0.0054		-27.4	Cal AD 1969–1970
UBA-27305	Unit 3_o.68m	Charcoal, <i>Betula</i> sp. single fragment (C Barnett, Wessex Archaeology), from main trench Unit 3, depth 0.68m, from the sandy Old land Surface which was sealed by an organic silty clay.		1194±33	-26.5	Cal AD 710–950
Pit CC						
SUERC-56973	(2) <11> 55.5–61.5cm sample A	Charcoal, <i>Salix/Populus</i> sp. single fragment (C Barnett, Wessex Archaeology), from [2] <11>, a black organic silty clay marl that seals the artefact horizon, recorded at 55.5–61.5cm		9455±30	-25.5	8820–8630 cal BC
UBA-27302	(3) <12> 61.5–63.5cm sample A	Charred tuber (C Barnett, Wessex Archaeology), from [3] <12>, a organic silty clay 'artefact horizon' recorded at 61.5–63.5cm		8440±55	-26.4	7590–7380 cal BC
UBA-27303	(3) <12> 61.5–63.5cm sample B	Charcoal, <i>Salix/Populus</i> sp. single fragment (C Barnett, Wessex Archaeology), as UBA-27302		9311±60		8740–8340 cal BC
SUERC-56977	(3) <12> 61.5–63.5cm sample 3	Charcoal, <i>Pomoideae</i> . single fragment (C Barnett, Wessex Archaeology), as UBA-27302		9323±28	-25.2	8700–8480 cal BC
Core 13						
UBA-27739	2.21–2.29m	<i>Chenopodium</i> seeds (x12) (S Wyles, Wessex Archaeology), from Core 13 at a depth of 2.21–2.29m	1.0461±0.0034		-28.8	Cal AD 1956–1957 (22%) or 2007–2010 (73%)
SUERC-56979	2.5m	<i>Phragmites</i> , charred, single fragment (C Barnett, Wessex Archaeology), from Core 13 at a depth of 2.5m		9836±29	-27.9	9320–9250 cal BC

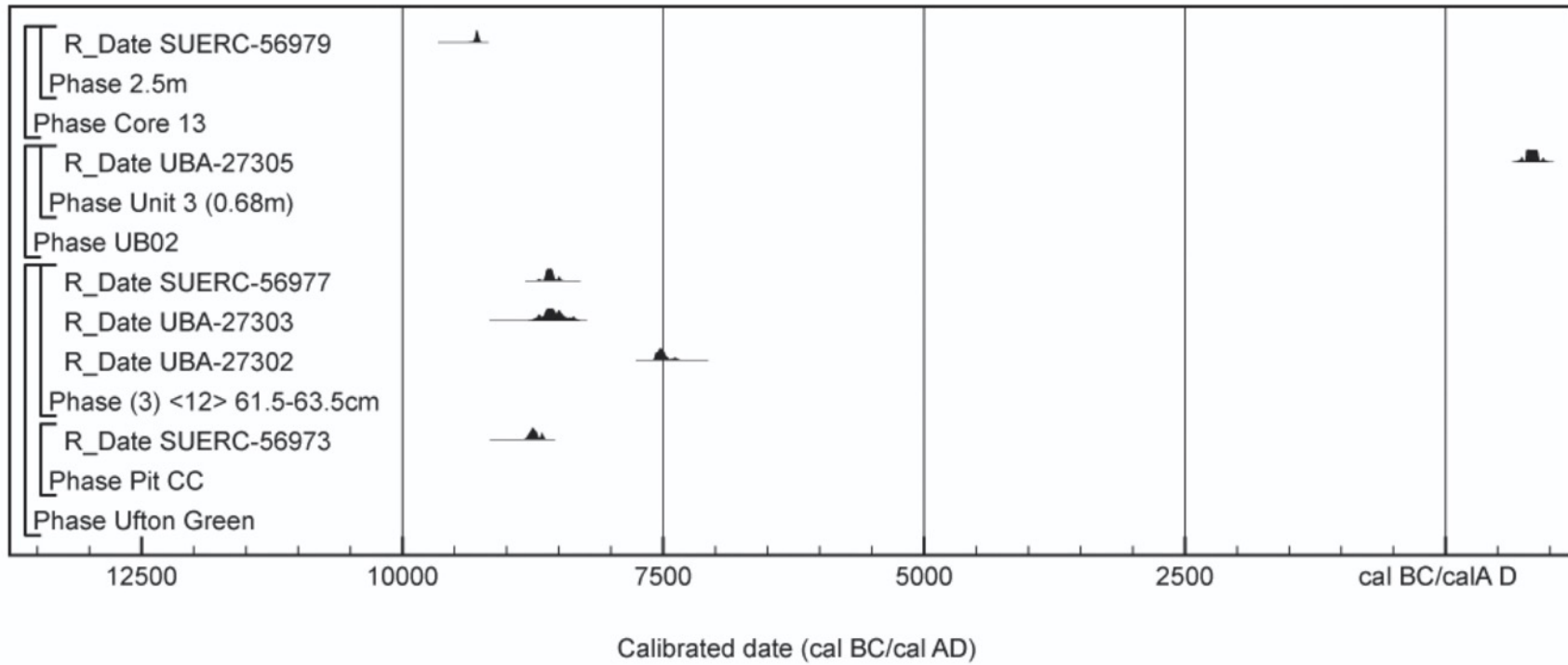


Figure 42: Probability distributions of dates from Ufton Bridge - from the cores and archaeological site. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).



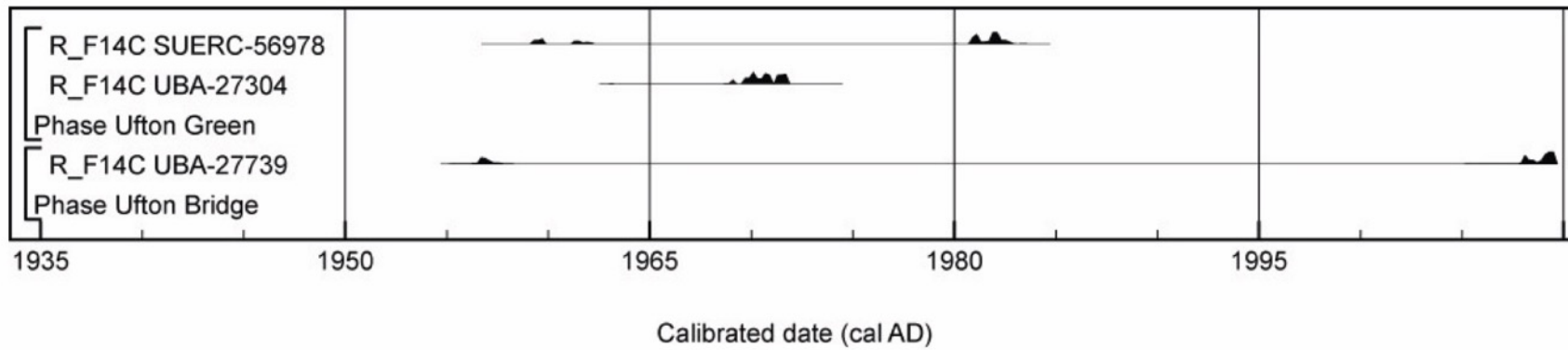


Figure 43: Probability distributions of modern dates from Ufton Bridge. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

### *Ufton %N testing*

Samples from five bone fragments were submitted for %N measurement to the ORAU. The results (**Table 2**) show that none of the samples had %N measurements >0.76%. The %N content of whole bone has been shown by Brock *et al.* (2010) to have an 84% likelihood of correctly predicting if a bone is suitable for dating if %N is greater than 0.76%.

Table 2: Ufton Bridge %N results

Sample	Identification	% N	%N>0.76%
Ufton F55			
Ufton F	Roe deer antler	0.13%	Fail
Ufton Green 2002			
Ufton G	15 + 16 bone 6	0.15%	Fail
Ufton H	T28 roe deer antler	0.17%	Fail
Ufton I	cc (7) roe deer scapula	0.14%	Fail
Ufton J	F54 ?antler	0.20%	Fail

### *Ufton Bridge UG02 excavation trench*

Three single fragments of charcoal were dated from main 2002 excavation trench at Ufton Bridge (**Table 1**) from Contexts 2 and 3. In this trench the artefact horizon was only shallowly sealed: the depth below the soil surface was 0.25-0.3m. The radiocarbon measurements are clearly not associated with the extensive lithic material and animal bone assemblage as two are modern (**Figure 43**) and one (UBA-27305; **Figure 43**) early medieval in date.

### *Pit CC*

Four samples were dated from Pit CC where a well-stratified sequence of deposits was closely associated with a Mesolithic flint and bone assemblage 0.5-0.75m below the soil surface (see **Figure 34**). A single charcoal sample from Context 2, a sticky black clay marl which seals the artefact horizon Context 3 (SUERC-56973) probably represents residual material. In a pattern seen at other dated sites in the Kennet (Marshall *et al.* 2015), the radiocarbon dating evidence would suggest two chronologically distinct episodes of Mesolithic activity in the mid-ninth and eighth millennia cal BC (**Figure 44**).

Two samples were submitted from borehole U13 in the palaeochannel, 14m from Pit CC (**Figure 44**: the low number being due to the difficulties in finding suitable material in the core) in order to establish its stratigraphic relationship to the Mesolithic site and ascertain if the channel was contemporary with the occupation. One sample (UBA-27739; **Table 1**) is modern (and presumably the result of contamination during coring) while that from 2.5m is Mesolithic but predates the occupation of the site. As it is from the peaty silt in the base of the channel it does suggest that organic material contemporary with the site does survive. This is confirmed by the Uranium Series dates from the same borehole transect (below).

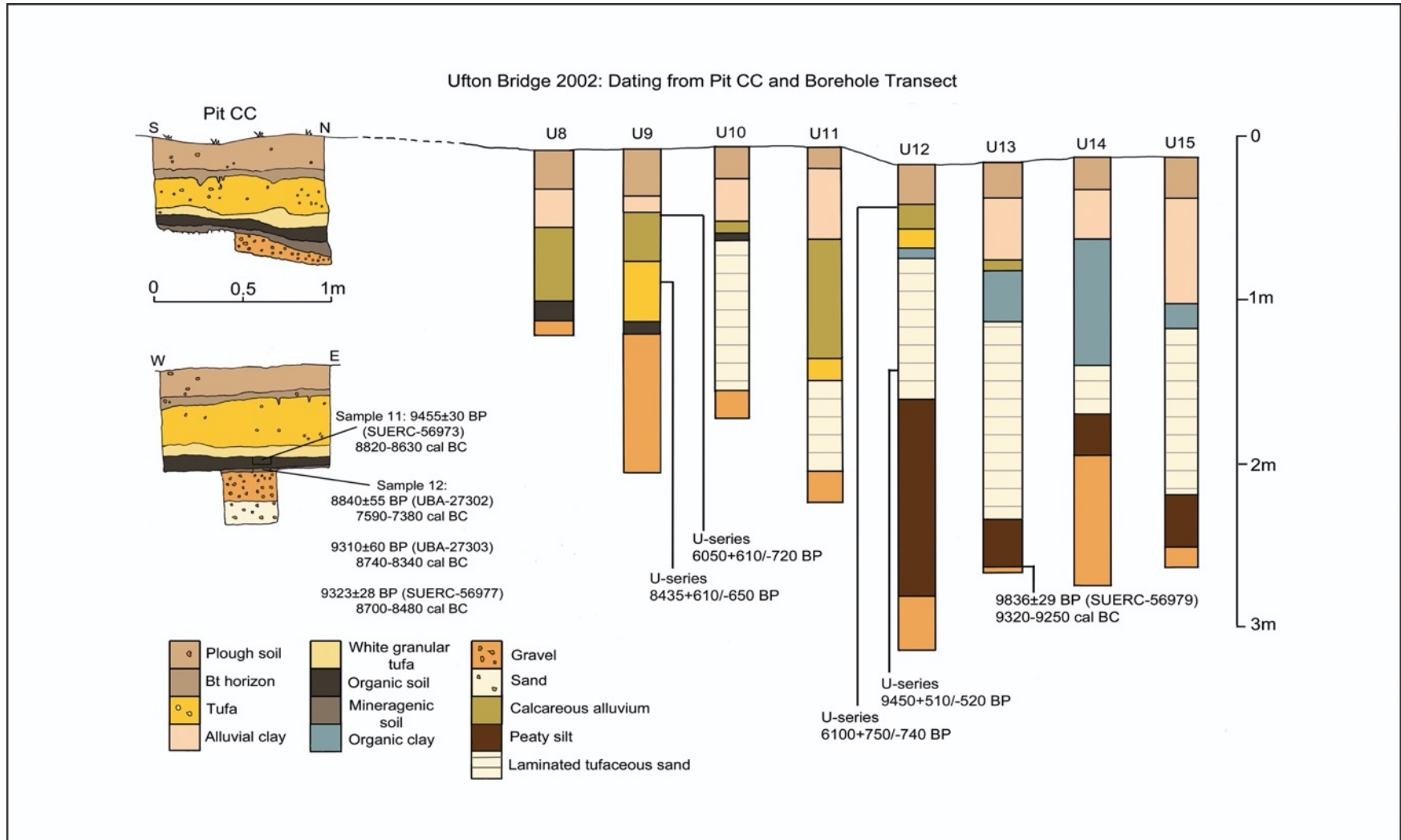


Figure 44: Ufton Bridge West Field: radiocarbon and Uranium Series dating of Pit CC and 2002 borehole transect (graphic J. Foster)

## Conclusions

The dating programme at Ufton Bridge has shown that the Mesolithic activity in Pit CC, where the archaeological deposits are covered by tufa (Chisham 2004, fig 5.4), does not contain intrusive charcoal and carbonised material like the main excavation trench where only topsoil and a black marl are present.

## Ufton Bridge: Uranium Series dating

by Stuart Black

Four samples of tufa nodules and tufaceous material were examined; two each from boreholes U9 and U12 which were on the 2002 borehole transect (**Table 3**). The sampling positions in relation to the stratigraphy are shown in **Figure 44**. Details of the methodology are in Appendix 2a.

Table 3: Ufton Bridge Uranium Series dates on tufa and bone (by S. Black)

West Field Borehole	Depth	Material	Date (yr BP)
U9	0.4m	Tufa nodules	6050+710 -720
U9	0.8m	Tufa nodules	8435+610 -650
U12	0.3m	Tufa	6100+750 -740
U12	1.3m	Tufa	9450+510 -520
East Field Pit E3	0.69–0.74 (Layer 4)	Bone	2208±195

Samples were cleaned and sub-sampled and analysed for U and Th isotopes using both gamma spectrometry and ICP-MS (concentration and isotope ratio mode determinations). The ages were determined from both single analyses of tufa (uncorrected) and through isochrones from multiple sub-samples. The ages were determined from a determination of the slopes from the isochrones taking into account correlated errors which were reduced by calculating isochron ages in ISOPLOT v4.15.

The upper samples in each core may represent reworked tufa particles in later sediments. The two lower dates are from what appeared to be *in situ* tufa deposits and are considered to represent the true ages of the sediments. This is consistent with the radiocarbon dates reported above from the same borehole transect and together they confirm that the palaeochannel north of the Mesolithic site is broadly contemporary with the Early Mesolithic activity.

A bone from East Field Pit 3, Layer 4 (above) was also dated by U-Series and the Iron Age date is consistent with the finding of Iron Age pottery at a similar position in Pit E2.

In addition Uranium Series dates (tufa and shell) were obtained from the main site grid boreholes 21, 30, 32, 66, Pit CC and 3 boreholes from 2008.

**Ufton Bridge: sediment analysis Pit CC**

by Catherine Barnett

Nine 10mm samples were taken from Pit CC from the base of the tufa to the basal gravels (ie, between 0.39–0.85m) for characterisation using particle size analysis of the less than 2mm fraction using a Coulter LS230 laser granulometer (full methodology in Chisham 2004, 52) . The results are compared on a triangular diagram of the proportions of sand, silt and clay on **Figure 45**.

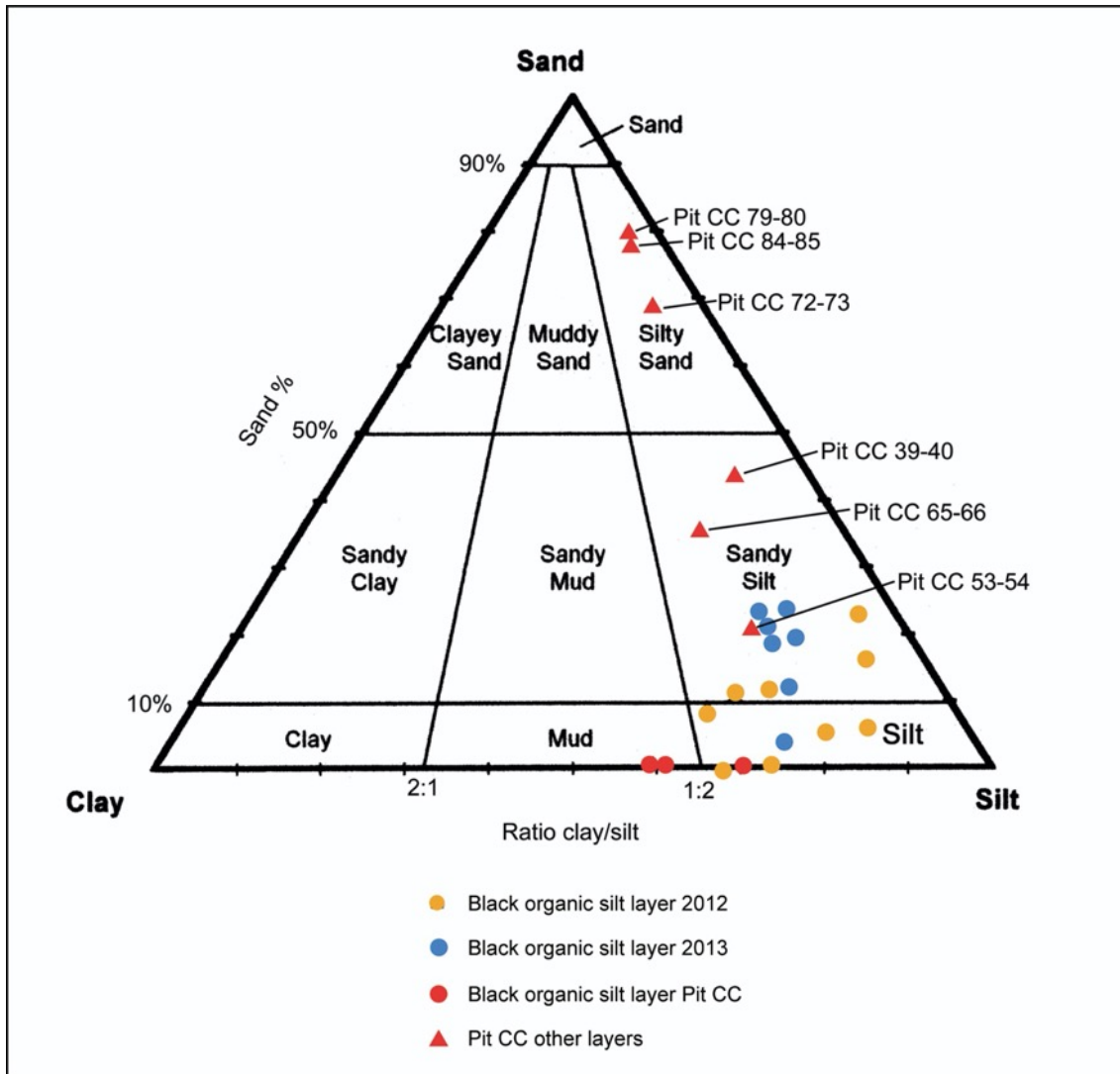


Figure 45: Ufton Bridge: triangular diagram showing the relationship between sand, silt and clay content in samples from Pit CC and samples of black organic silty clay in Pit CC and the borehole surveys of 2012 and 2013 (graphic J. Foster)

The base of the tufa (0.39–0.40m) and underlying silty tufa (0.53–0.541m) are characterised as a very poorly sorted sandy mud but these results may be partly skewed by the inclusion of fine tufa particles. In contrast the underlying black organic layer (0.56–0.57m and 0.59–0.60m) is predominantly fine silt (43%) and clay (40%) with a complete absence of very coarse silt and sand: this would be consistent with deposition under very low energy flood conditions. The underlying brown clay (0.62–0.63m) is of similar composition but with 18% coarse silt. The

underlying deposit is the probable old land surface with which the Mesolithic artefacts were associated (0.65–0.66m); a sandy (36%) silt (48%). Below this, under 2mm fractions of the bottom three samples are silty sands with larger flint gravel fractions consistent with high energy river deposition. These sandy gravels are interpreted as Pleistocene river gravels.

In order to compare the black organic band from Pit CC with similar bands encountered elsewhere in the borehole survey, particle size analysis was undertaken of the black band (Unit 4a) samples from the 2012 borehole transect (on the southern edge of the main West Field borehole grid) and the 2013 borehole grid (locations on **Figure 22**). The results of these analyses are plotted onto **Figure 45** with the Pit CC data. This shows that the other black band samples are also silts and at the silty end of sandy silt but with variable proportions of clay between 15 and 30%. Two of the 2012 samples are comparable to the Pit CC samples in that they have no, or very little, sand; the others have more variable proportions of sand up to 23%.

In order to investigate the nature of the black organic layer in Pit CC (0.56–0.57m) and the underlying brown clay (0.62–0.63m), which were interpreted in the field as the upper horizons of a palaeosol, the bulk mineralogy of two samples was examined by X-ray diffraction in a powder X-ray diffractometer (Siemens D5000: full methodology in Chisham 2004, 53). The two samples had widely differing bulk mineralogy. Almost a third of sample 0.56–0.57 consisted of calcite and should be described as silty clay marl. Sample 0.62–0.63 was dominated by quartz at 86% but also contained small quantities of kaolinite, microcline, goethite and haematite and 3% calcite. Both samples displayed several peaks related to expandable clays, notably smectite (cf. montmorillonite), the smectites indicating conditions of poor drainage.

The same two samples were analysed using X-ray fluorescence using a Philips PW 1480 X-ray spectrometer (full methodology in Chisham 2004, 53) in order to obtain the elemental composition of the samples. The two samples are closely comparable, differing significantly in only two elements. The upper sample has nearly four times as much calcium as the sample below and the lower sample has nearly five times the manganese as the sample above. Both these contrasts may relate to translocated material: the upper sample is overlain by tufa and manganese deposition occurs within gleyed profiles and gleying is evident in the lower part of this layer (**Figure 34**).

These analyses strengthen the interpretation of the artefact horizon as a palaeosol. The high levels of Mg, Al, V, Cr, Co, Ni and Zn indicate weathering of both strata, each being associated with co-precipitation with iron and manganese oxides in a weathering profile or being associated with clay minerals (Wedepohl 1969).

Zirconium normally accumulates in such a profile, but its lowered level in 0.56–0.57m can be explained by attack by carbonated humic acids (Wedepohl 1969) in the organic marly sediment. The high iron content of the upper sample, despite the lack of iron oxides found, indicates that an amorphous iron oxide coating had

precipitated out around particles. This is not discernible during XRD, and is again an indicator of weathering and iron movement in the layer.



Figure 46: Ufton Bridge: small-scale crevasse splay on stream bank at approximately SU 6200 6835 between East and West Fields, scale 0.5m divisions) (photo M. Bell)

The upper alluvial units have not been subject to detailed analysis and are thought to be the result of overbank flooding. The first edition of the Ordnance Survey (1849) marks this field as subject to flood and it still occasionally floods to this day. **Figure 46** shows the sedimentary results of this where the stream bank between East and West Fields at SU 6200 6835 has broken over the slight levee along its edge to create a small scale crevasse-splay on the floodplain.

## *Ufton Bridge: sediment micromorphology Pit CC*

by R.Y. Banerjea

### *Introduction*

Samples for micromorphological analysis were collected in 2009 from reopening Pit CC (**Figures 35** and **47**). The aim of the micromorphological analysis was to understand the pedogenic and formation processes within the sequence to address the following specific questions:

- Do the basal layer and the black silty clay (**Figure 47**) have the characteristics of a buried soil in terms of pedogenic processes and formation processes?
- What features and formation processes have produced the distinctive highly organic clay horizon with artefacts at its base?
- Is there any evidence for human activity such as microdebitage, angular flints, charcoal and bone fragments?
- Are there any plant fossils and/or phytoliths present?

The hypothesis to test is that this is a buried soil which became waterlogged and has a peaty top, and that there is evidence of Mesolithic activity within it.



Figure 47: Ufton Bridge: the location of micromorphology samples in relation to the stratigraphic units on the section of the field (photo M. Bell).



### *Sample preparation*

Two micromorphological thin-sections (**Figure 48**) were prepared from the monoliths (**Figure 47**) in the Microanalysis Unit, University of Reading, following the unit's standard protocol for thin section preparation. Samples were dried to remove all moisture and then impregnated with epoxy resin while under vacuum. The impregnated samples were then left overnight to allow the resin to enter all of the pores. The samples were placed in an oven to dry for 18 hours at 70°C before they were clamped and cut to create a 10mm slice through the sample. The surface of the 10mm slice was flattened and polished by grinding on a Brot machine. The prepared surface of the 10mm slice was then mounted onto a frosted slide and left to cure. This was followed by cutting off the excess sample, so the sample was down to a thickness of 1 or 2mm. The sample (now mounted to the glass slide and reduced to 1 or 2mm thick) was taken back to the Brot and ground down to approximately 100µm. This 100µm section was then further thinned by lapping it on a Logitech LP30 precision lapping machine to the standard geological thickness of 30µm. The samples were then cover slipped ready for analysis.

It must be noted that the basal 10mm of the upper sample (**Figure 47**) that was collected from the depth 490–630mm failed to fully impregnate with resin and cure, and as a result has been lost.

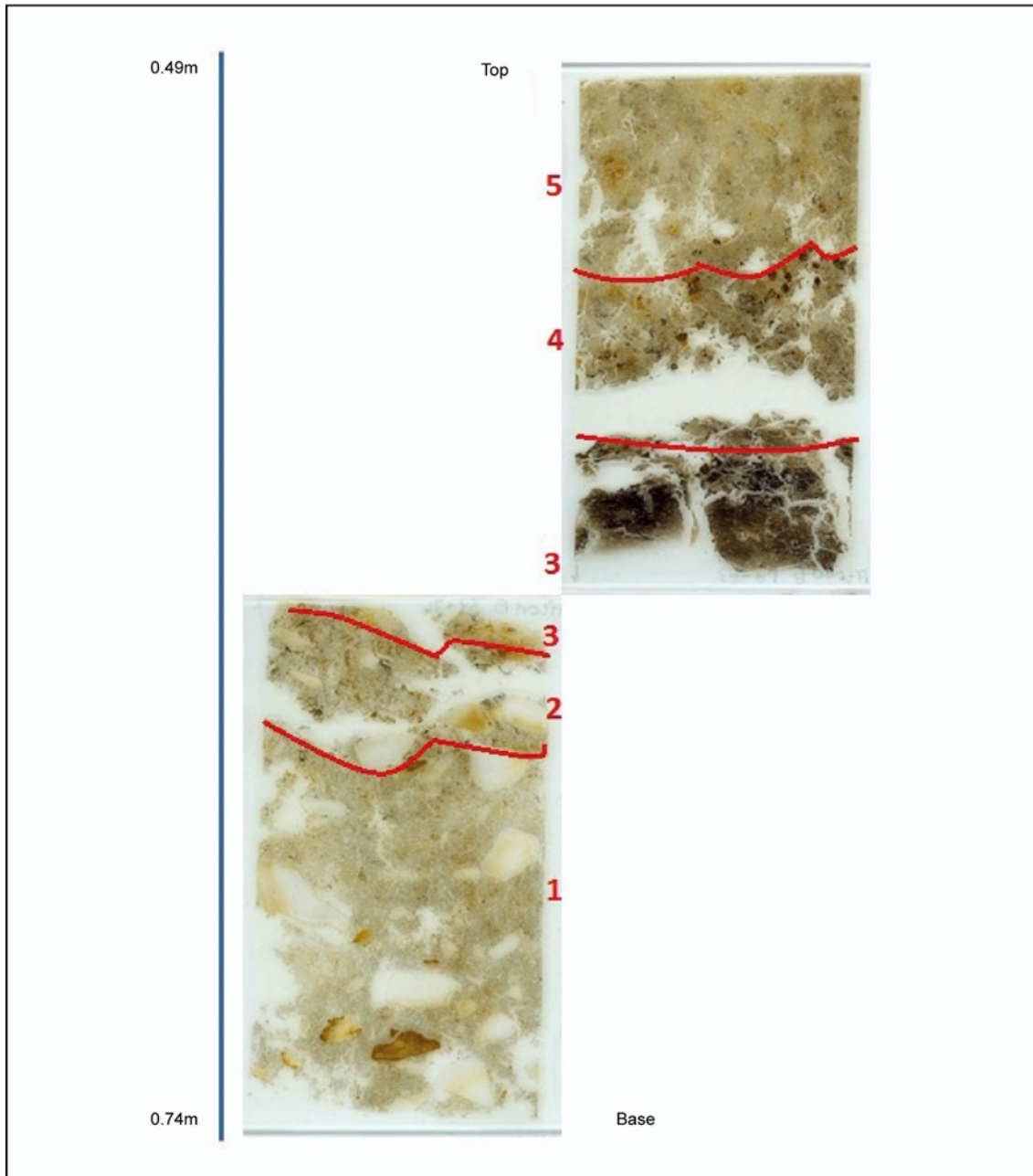


Figure 48: Ufton Bridge: micromorphology slide scans of the thin-sections and the corresponding microstratigraphic units: M1 = B horizon; M2 = mixed zone; M3 = trampled zone; M4 = mixed zone; M5 = tufa. N.B. the overlap between the samples (shown in Figure 49) was lost during preparation due to impregnation problems (photo R. Banerjea)

### **Sample description**

Micromorphological investigation was carried out using a Leica DMLP polarising microscope at magnifications of x40–x400 under Plane Polarised Light (PPL), Crossed Polarised Light (XPL), and where appropriate Oblique Incident Light (OIL). Thin-section description was conducted using the identification and quantification criteria set out by Bullock *et al.* (1985) and Stoops (2003), with reference to Courty *et al.* (1989) for the related distribution and microstructure, Mackenzie and Adams (1994) and Mackenzie and Guilford (1980) for rock and

mineral identification, and Fitzpatrick (1993) for further identification of features such as clay coatings. Tables of results use the descriptions, inclusions and interpretations format used by Matthews (2010) and Simpson (1998). Micropictographs were taken using a Leica camera attached to the Leica DMLP microscope.

Micromorphology enables the following properties to be examined at magnifications of x40–x400 under PPL, XPL and OIL: thickness, bedding, particle size, sorting, coarse: fine ratio, composition of the fine material, groundmass, colour, related distribution, microstructure, orientation and distribution of inclusions, the shape of inclusions, and finally the inclusions to be identified and quantified. In addition, post-depositional alterations can be identified and quantified, such as effects on the microstructure by mesofaunal bioturbation and cracking due to shrink-swell of clays or trampling; translocation of clays and iron; chemical alteration such as the neoformation of minerals such as vivianite and manganese; organic staining as a result of decayed plant material; and excremental pedofeatures such as insect casts and earthworm granules.

### ***Results and interpretation***

To determine the deposit type classification, each deposit was grouped using diagnostic sedimentary attributes and inclusions which provide crucial information concerning the origin of inclusions, transportation mechanisms of particles and the deposition processes. To ascertain the origin of sediment components descriptions were made of particle size, shape, and the composition of the coarse and fine fraction, particularly the frequency of rock, minerals and anthropogenic inclusions. The depositional events are characterised by the following sedimentary attributes: sorting, related distribution, orientation and distribution of the inclusions, and bedding structure. Understanding the formation processes for deposits is crucial to interpreting the depositional pathways of rock fragments and minerals, any anthropogenic debris such as charred wood and artefacts, and other types of plant remains and microfossils (La Motta and Schiffer 1999; Matthews 2010; Schiffer 1987). Analysis of post-depositional features provides crucial information concerning the effects of weathering, preservation conditions (Bisdorn *et al.* 1982; Brady and Weil 2002; Breuning-Madsen *et al.* 2003; Canti 1999; Courty *et al.* 1989) and stratigraphic integrity of the deposit (Canti 2003; 2007; Courty *et al.* 1989).

### ***Microstratigraphic unit classification and descriptions***

#### ***B horizon (microstratigraphic unit M1)***

This unit has been classified as a B-horizon as there is evidence of organic matter (**Figures 49** and **50**), and clay and iron that has translocated from the units above, resulting in the orangy brown colour (PPL: mid brown - orange. XPL: light orange brown - very dark orange brown). These characteristics are consistent with a B-horizon (SASSA, 2007).

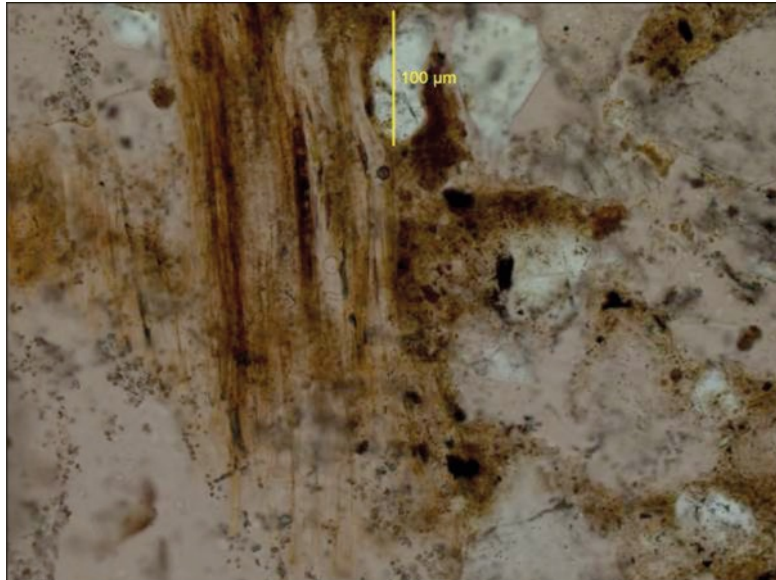


Figure 49: Ufton Bridge: micromorphology slide, plant tissue with organic staining and fungal spore, PPL, unit 1 (photo R. Banerjea)

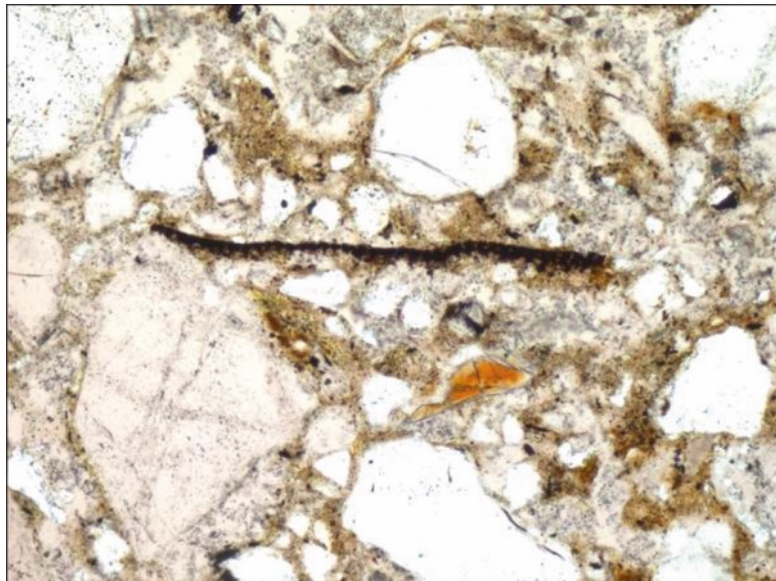


Figure 50: Ufton Bridge: micromorphology slide, plant tissue replaced by Mn, PPL, unit 1 (photo R. Banerjea)

Anthropogenic residues include possible microdebitage (angular shaped fragments of flint). Flints are angular and 500 $\mu$ m–12mm in size. Notably, those fragments 500–1000 $\mu$ m in size are particularly angular and occur more abundantly at the boundary with the unit above (**Figure 51**).

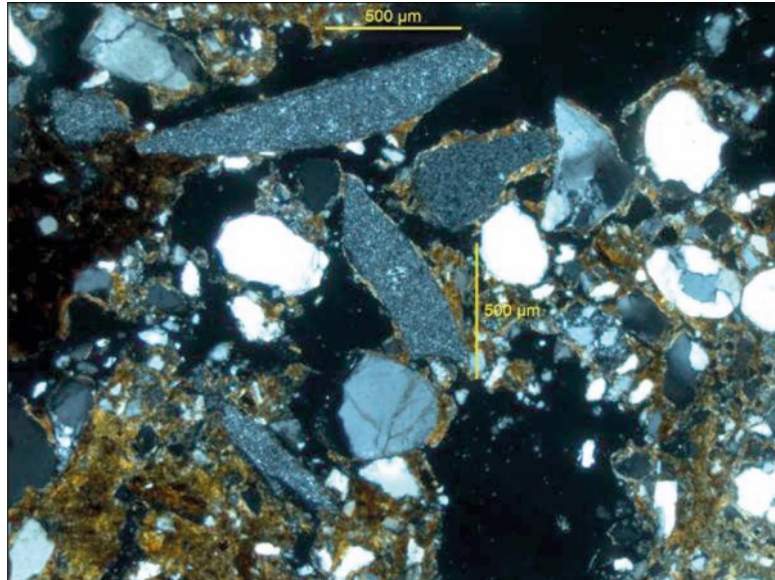


Figure 51: Ufton Bridge: micromorphology slide, concentration of angular flints at the boundary with unit above, XPL, unit 1 (photo R. Banerjea)

*Mixed zones (microstratigraphic units M2 and M4)*

Units M2 and M4 have been classified as mixed zones due to clear evidence of bioturbation processes and evidence for the mixing of units. Mesofaunal bioturbation is evident by channels and chambers in the microstructure in both units 2 and 4, and earthworm granules occur in unit M4. Bioturbation processes have incorporated sub-angular aggregates of organic-rich sediment, 10%, unit M4 also contains calcareous sediment reworked into the organic sediment from the tufa deposit (unit M5) above (**Figure 52**). Unit M4 has a laminated bedding structure and embedded related distribution towards the base, where it is more compressed.

Higher up the profile of unit 4, bioturbation processes have disturbed this compressed sediment resulting in a massive bedding structure, a linked and coated related distribution, and the inclusions have become unoriented and randomly distributed.

*Trampled zone (microstratigraphic unit M3)*

Unit M3, described in the field as a highly organic clay horizon, has been classified as a trampled zone. The trampled zone has a laminated bedding structure (**Figure 53**) consisting of superimposed microstratigraphic lenses. Thin lenses with strong parallel orientation and distribution of components generally suggest periodic accumulation and compaction over time (Goldberg and Macphail 2006). Clays and organic lenses are referred parallel to basal boundary, whereas coarse components are locally oriented to each other and clustered. The embedded related distribution is attributed to compaction and soft, organic-rich lenses are oriented parallel to the basal boundary as if compressed by downward pressure (Banerjea *et al.* 2015; Goldberg and Macphail 2006). The lenses comprise mineral and amorphous organic materials which have a clay/silty clay particle size, interspersed with occasional sandy clay or loamy sand lenses. Charred plant remains (**Figure 54**), 15–20%, occur in the lower 20mm of unit M3. Phytoliths <5%, spherical fungal spores, 10%, and diatoms, <5%, also occur.

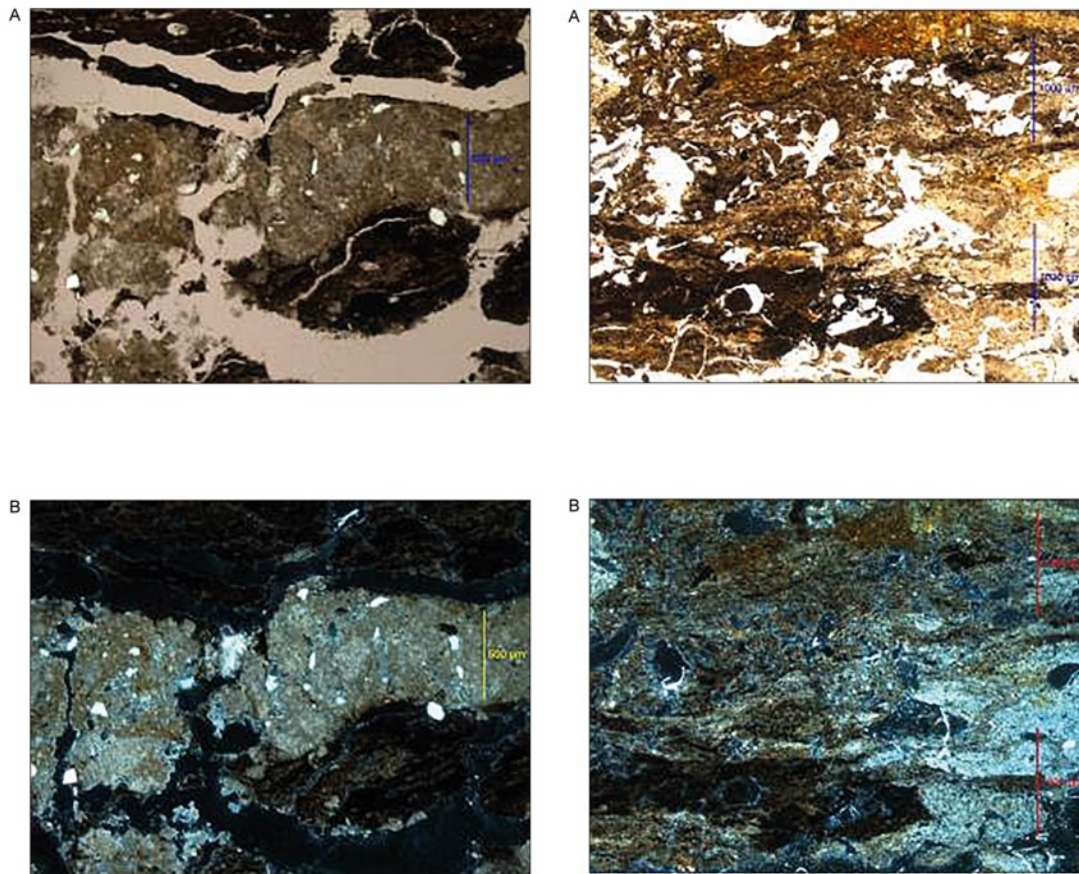


Figure 52 (left): Ufton Bridge: micromorphology slide, lens of reworked calcitic material (tufa) in between organic lenses, unit 4: A) PPL, B) XPL.

Figure 53 (right): Ufton Bridge: micromorphology slide, laminated bedding structure, unit 3: A) PPL; B) XPL (photos R. Banerjea)

### ***Microartefacts***

Angular, rectilinear flint fragments ranging from 250–1000μm in size (**Figure 51**) occur in unit M1, at the boundary with the unit above, unit M2 and, unit M3, but only in the lower part of this unit (slide 59–74cm). It is possible that flint inclusions, <1000μm in size, represent microdebitage as these fragments have a highly angular form (Fladmark 1982). Microdebitage is defined as particles less than 1000μm in maximum dimension resulting from deliberate lithic reduction (*ibid.*). The larger flint inclusions, >1000μm, have a more sub-rounded form in all units.

### ***Bioarchaeological and organic remains***

The types of bioarchaeological and organic remains are: shell fragments, charred plant remains, plant tissue, phytoliths, fungal spores and diatoms.

### *Shell fragments*

Fragments of mollusc shells occur most frequently in unit M4 (mixed zone) within aggregates of tufa, 20%, and unit M5 (tufa), 30%. Very few, <5%, fragments have been reworked into unit M3 (the trampled zone) and unit M1 (B horizon).

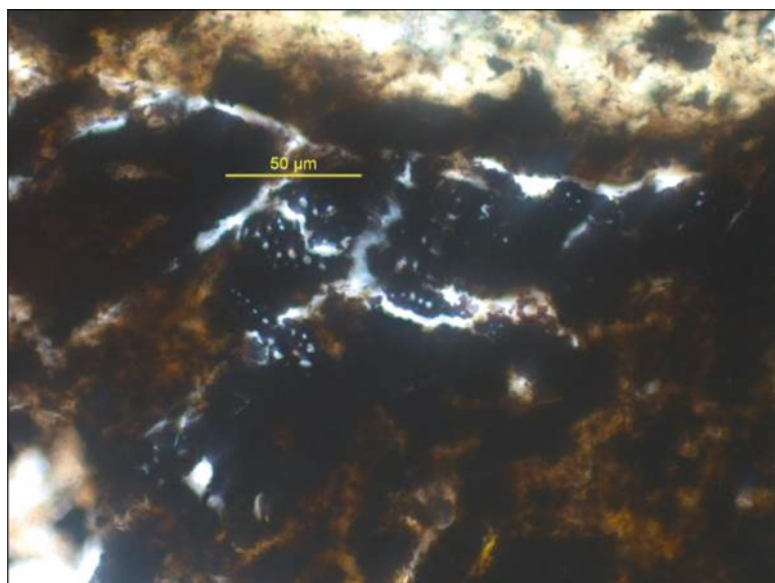


Figure 54: Ufton Bridge: micromorphology slide, fragments of charred plant remains, possibly reed, unit M3, PPL (photo R. Banerjea)

### *Charred plant remains*

Charred plant remains occur most frequently, 15–20%, in unit M3 (trampled zone) and towards the base of this unit. Very few, <5%, fragments of charred plant remains were identified in unit M4 (mixed zone). Charred plant remains are angular in shape, 25–125 $\mu\text{m}$  in size, and are probably from burnt reeds or other grasses (**Figure 54**). It is possible that the fragments of charred reed have been transported by trampling processes from elsewhere on the site, perhaps from the edge of a marsh/river channel where reeds have been burnt to promote good grazing for animals (Law 1998), particularly as the fragments are embedded within lenses of sediment.

### *Plant tissue*

Very few, <5%, fragments of plant tissue occur in unit M1 (B horizon), unit M2 (mixed zone) and unit M4 (mixed zone). The fragments of plant tissue comprise those that are replaced by organic staining (**Figure 49**) and manganese (**Figure 50**) (unit M1), epidermal grass tissue (**Figure 55**) (unit M2), and ferruginous plant tissue (units M2 and M4).

### *Microfossils*

Phytoliths, <5%, occur in unit M1 (B horizon) and unit M3 (trampled zone), and include squat saddle phytoliths, unit M3 (**Figure 56**), which are common in *Phragmites communis* (Piperno 2006, 33; Twiss 1992, 121). Notably, unit M3 also contains spherical fungal spores (**Figure 56**), 10%, and pennate diatoms (**Figure 57**), <5%. The diatoms may have been incorporated with trampled reed plant material.

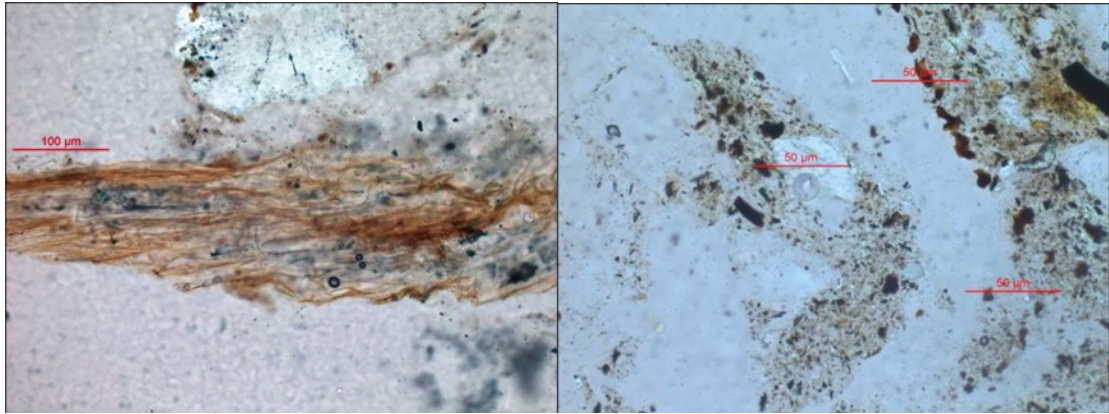


Figure 55 (left): Ufton Bridge: micromorphology slide, epidermal grass tissue, unit M2, PPL;

Figure 56 (right): Ufton Bridge: micromorphology slide, saddle phytolith (centre) and spherical fungal spores (top and bottom right), unit M3, PPL (photos R. Banerjea)

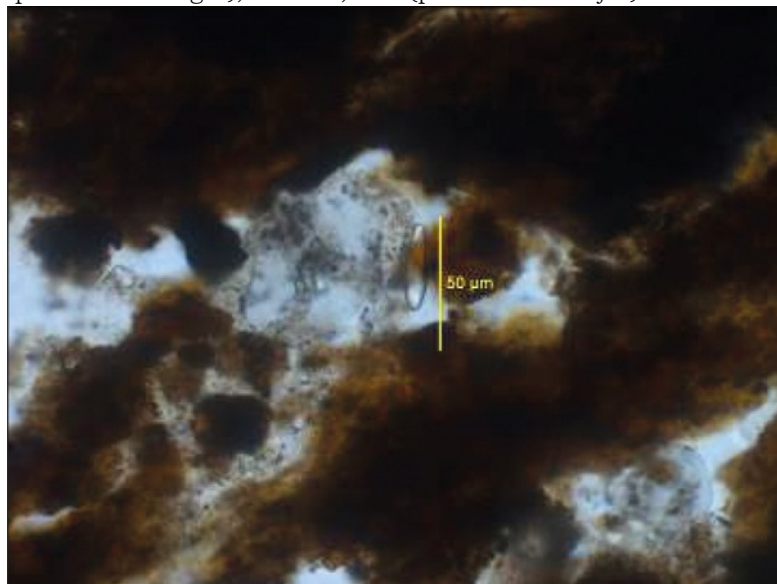


Figure 57: Ufton Bridge: micromorphology slide, pennate diatom, unit 3, PPL (photo R. Banerjea)

### ***Post-depositional alterations***

#### ***Weathering and decay processes***

All units show substantial evidence for translocation processes, chemical weathering and fluctuating reduced conditions as indicated by the translocation of iron, and gypsum and manganese neomineral formation. However, clay translocation, in the form of strongly oriented silty clay coatings, is absent from unit M3 (trampled zone), but occurs in all other units; many of these clay coatings are impregnated with iron. Fluctuating redox processes can lead to the mobilisation of silts and clays; in this case the cause is most probably a result of fluctuating water tables. Free iron is highly mobile only when present in the ferrous state which occurs under anaerobic conditions (Courty *et al.* 1989) but oxidises to produce intrusive and impregnative iron and manganese pedofeatures as a result of wetting drying cycles (Lindbo *et al.* 2010). Manganese may accumulate at the top of either the water table or the capillary fringe (Bartlett 1988; Rapp and Hill 1998).



Fluctuating water tables lead to alterations of reducing and oxidising conditions (Brammer 1971; Brown 1997; French 2003; Lindbo *et al.* 2010). Gypsum does not occur in unit M3 (trampled zone) or unit M5 (tufa) but occurs in all other units. The formation of gypsum crystals within pores may be related to an interaction between jarosite and calcium-bearing water (Mees and Stoops 2010, 555), perhaps resulting from depositions of tufa.

Darkening in colour, known as organic staining, is observed in thin-section from the decomposition of organic matter (Courty *et al.* 1989) and occurs here in all units.

#### *Bioturbation*

Bioturbation, most probably from earthworm and other mesofaunal activity, occurs in all units and is identified by channels and chambers (10–25%) in the microstructure and by the occurrence of both calcareous earthworm granules (units M4 and M5) and organo-mineral insect casts (unit M3). Calcareous earthworm granules (**Figure 58**) are excremental pedofeatures, which are deposited by earthworms (Canti 2003; 2007).

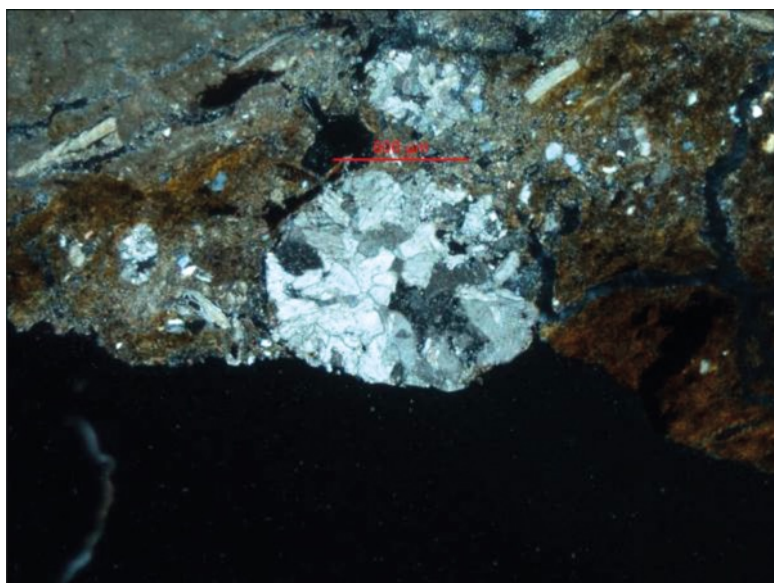


Figure 58: Ufton Bridge: micromorphology slide, calcareous earthworm granule, unit 4, XPL (photo R. Banerjea)

Bioturbation processes have created two mixed zones, units M2 and M4. As described above, there is clear mixing of sediments in these units, which sees organic-rich sediment transported from the trampled zone (unit M3) into the units above and below, and calcareous sediment from the tufa (unit M5) into the unit below; therefore, it is important to note that inclusions, particularly charcoal and micro-artefacts, may not be *in situ* within these units and they are likely to have been incorporated from unit M3 (trampled zone). Bioturbation is most extensive, 25%, in the upper part of the sequence, at the depth 0.44–0.63m (**Figures 47 and 48**) from the upper part of the unit M3 (trampled zone) through to unit M5 (tufa).

## ***Micromorphology: discussion and conclusions***

### *Sequence of depositional events*

There is evidence for a B horizon at the base of the sequence, on which organic-rich sediment was deposited by alluviation and affected by trampling processes. A fluctuating water table played a role in the formation of this sequence. The B-horizon (unit M1) was made wet, leading to the mobilisation of clays and iron, and then the area quite possibly had started to dry out at the point when the trampled sediment (unit M3) was deposited, as there is no evidence for the mobilisation of clays in this unit and the trampled zone has not been homogenised. The area then became flooded, leading to the deposition of tufa (unit 5).

The formation of the mixed zones, units M2 and M4, which are found above and below the trampled zone (unit M3) is post-depositional as aggregates of sediment from unit M3 are found in both units M2 (below) and M4 (above).

### *Evidence for pedogenesis*

The basal unit, Unit M1, shows characteristics of a B horizon. There is evidence of organic matter (**Figures 49** and **50**), and translocated clay and iron, resulting in the orangey brown colour (PPL: mid brown - orange. XPL: light orange brown - very dark orange brown).

Evidence of an A horizon is poorly developed and could have been subject to some erosion prior to deposition of the organic silt.

### *Evidence for human activity*

The evidence for human activity comprises charred plant remains and possible microdebitage consisting of angular, rectilinear flint fragments ranging from 250-1000µm in size. The concentration of the microdebitage is interesting. It is concentrated in the lower part of the sequence (slide 59–74cm) at the boundary of the B horizon (unit M1), at the mixed horizon (unit M2) and the lower part of the trampled horizon (unit M3). This suggests that the B horizon may have been an old land surface on which flint tools were worked.

Charred plant remains occur within the trampled zone (unit M3). Fragments of charred reed were perhaps transported by trampling processes from elsewhere on the site, perhaps from the edge of a marsh/river channel where reeds have been burnt to promote good grazing for animals (Law 1998).

### *Plant ecology and environment*

The evidence within the micromorphology thin sections (**Figure 48**) relating to plant ecology and environment consists of charred plant remains, plant tissue, phytoliths, fungal spores and diatoms. The fragments of charcoal show structural characteristics of reeds or grasses rather than wood (**Figure 54**), and the presence of diatoms and 'saddle' phytoliths suggests that they are reeds, most probably *Phragmites communis*.

### ***Ufton Bridge: pollen and plant macrofossil analysis***

by Catherine Barnett

A well stratified and sealed 1m sequence from the trial pit Ufton Pit CC (**Figures 34–5**) was chosen for sedimentological analysis and high-resolution pollen and micro-charcoal analysis. Sub-samples of 10mm<sup>3</sup> of material were taken at 50mm intervals from the top of the sequence (tufa) and the base of lower gravel, and at 5–10mm from the lowest clay-tufa and the upper gravels, a total of 35 levels. Macrofossil, molluscan and macrocharcoal analyses were undertaken on an adjacent column of bulk samples. Standard methodology was used for analysis (following Leney and Casteel 1975; Schweingruber 1990; Clarke 1982; Tomlinson 1985; Moore *et al.* 1991; Kerney 1999, see Chisham 2004 for details) with plant nomenclature according to Stace (1997) and the results plotted using Psimpoll (v.3.10: Bennett 1998). In Ufton 2002 trench SqN (**Figure 33**) a 0.5m sequence was analysed at lower resolution, with the intention of gaining a pollen record directly associated with the greatest concentration of lithics and to complement that of Ufton Pit CC. The pollen sequence, however, proved to be poor as described below.

#### ***Pollen results and interpretation***

The 2002 SqN sequence proved to be highly disturbed, with the pollen sequence almost homogenised, thermophilous taxa occurring in the probable Devensian age basal sands and high numbers of Lactuceae and Pteropsida monolete undiff. due to differential preservation. The results and diagrams are presented in Chisham (2004). Disturbance by ploughing was not in evidence but it is thought repeated desiccation and earthworm burrowing of this shallow sequence had allowed movement of pollen and macrofossils through the profile. Indeed of the three radiocarbon dates obtained for charcoal fragments from the artefact horizon, two were modern and one early medieval (above) and clearly not associated with the artefact assemblage. Although devastating to the environmental sequence, these factors have seemingly had little impact on the flint and bone artefacts which were apparently *in situ* below the black organic silty clay.

In Ufton Pit CC a securely stratified pollen record (**Figure 59**) was established for this deeper (1m) sequence. The profile has been divided into five zones from UG-1 at the base to UG-5, and the following description based on those zones. Individual taxa were calculated as a percentage of the sum of all pollen (total pollen) excluding spores and aquatics and the spores, and aquatics and the unidentifiables as a percentage of the total pollen plus themselves.

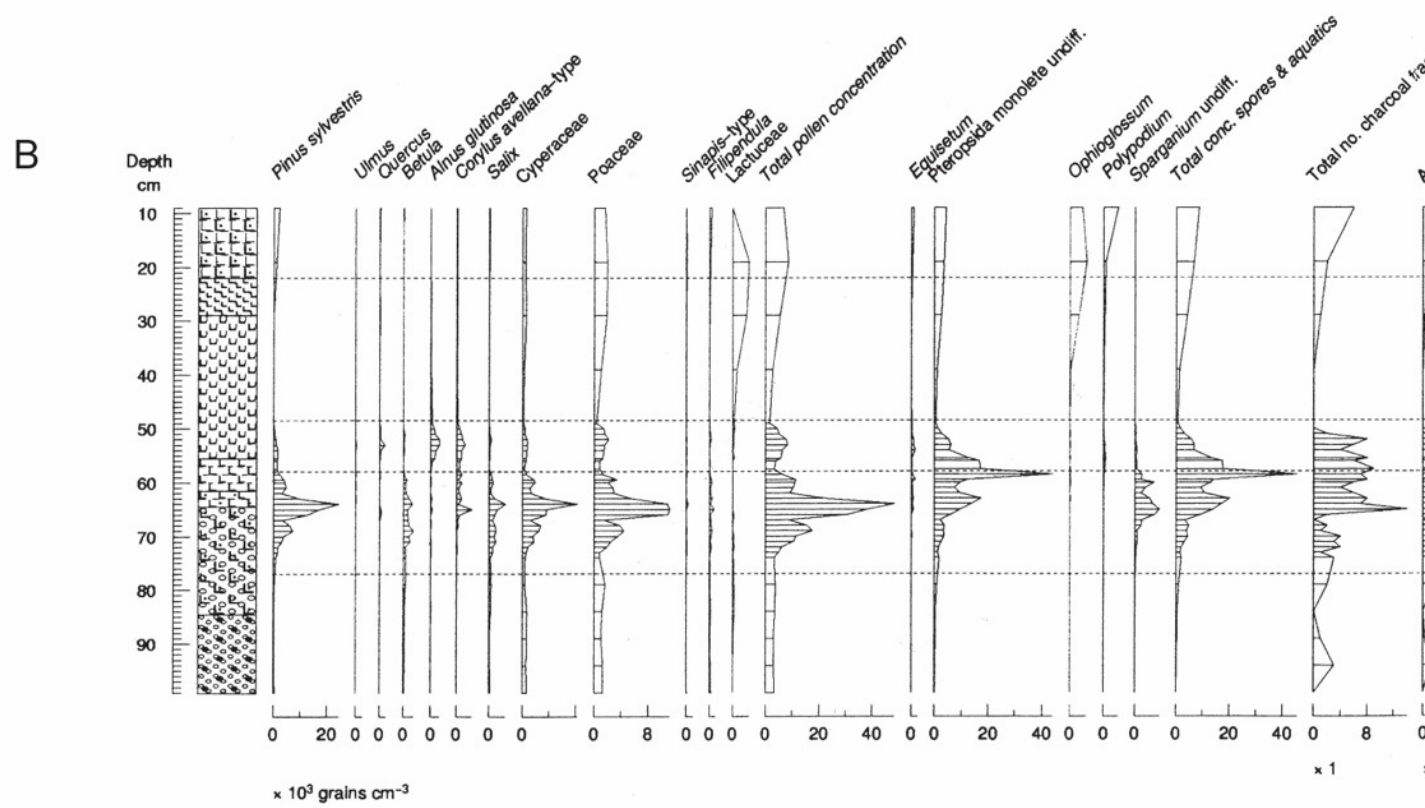
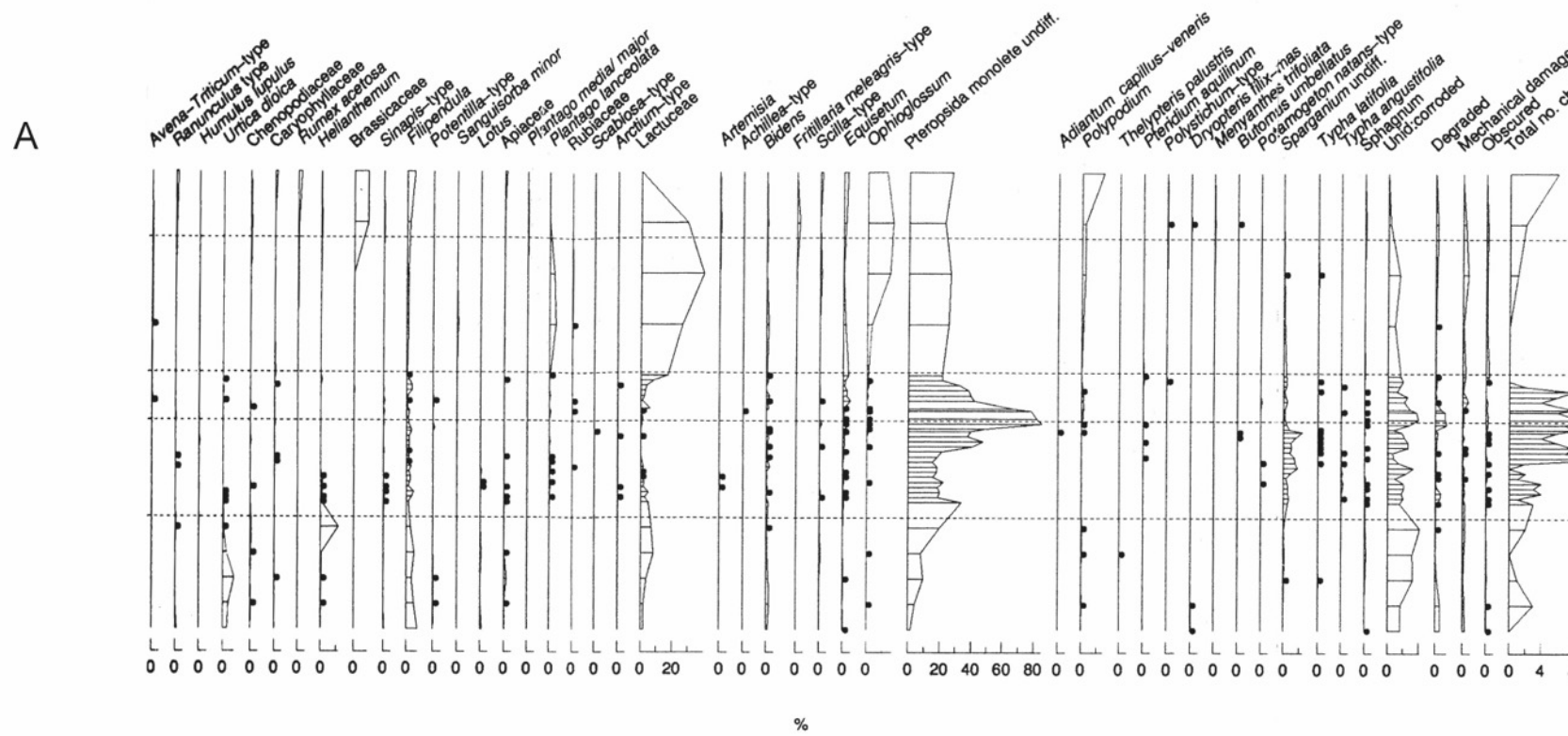


Figure 59: Ufton Bridge Pit C: A) Percentage pollen diagram B) Pollen concentration diagram selected taxa (by C. Barnett)

**UG-1 (0.79–1m)** The basal sandy gravel of Context 4 and lower portion of Context 3, was dominated by Poaceae at 40% and Cyperaceae at 10–20%. *Pinus sylvestris* was present at 10% and *Salix* at 5%, while *Betula* rose slightly to 10% at the top of the zone. *Urtica dioica*, *Filipendula* and Lactuceae occurred in significant numbers and a clump of 10 well-preserved Lactuceae grains were seen at 0.79m. Other herb types included Chenopodiaceae, *Helianthemum*, *Bidens*, *Potentilla*-type and Apiaceae. Pteropsida monolete undifferentiated rose from 0–20% and small numbers of identifiable spore types were observed, including *Dryopteris filix-mas* and *Sphagnum*. Occasional grains of highly corroded *Quercus*, *Tilia cordata* and *Corylus avellana*-type pollen were found. A small degree of corrosion was observed on most of the pollen grains from this zone and the total number of grains unidentifiable rose to 20% at 0.79m, however, the pollen was generally in good condition for such sediment. The pollen concentration was relatively low at a steady  $3\text{--}4 \times 10^3$  grains  $\text{cm}^{-3}$ .

An open grassland environment is indicated, with herb types indicating bare, disturbed conditions common eg Chenopodiaceae, Apiaceae and *Urtica dioica*, and ferns increasing. Presence of *Helianthemum* indicates this was limestone grassland (Stace 1997, 218). Tree and shrub cover was minimal: the low levels of *Pinus sylvestris* pollen observed likely indicates a regional background signal but there was some local presence of *Betula* and *Salix*. Grass (likely reed) and sedge fen dominated the floodplain and contained a limited range of marsh and aquatic species. Such an open, restricted environment is characteristic of the late glacial and the start of the Holocene. At odds with this scenario is the small number of thermophilous tree species pollen observed. These grains were particularly corroded and, given the nature of the sediment as high-energy fluvial gravel, it is believed these came from reworking of small quantities of material eroded out of sediments from an earlier (interglacial) period. This suggestion is supported by the presence of three fragments of fossil coral from bulk sample 0635m.

**UG-2 (0.58–0.79m)** The organic sandy gravels and silts of Context 3 with the artefact horizon and with the overlying silty marl of Context 2 were characterised by *Pinus sylvestris* becoming dominant, peaking at 50% at 0.64m before declining to 38% at the top of the zone; within this general trend it dipped to 26% at 0.72m. *Betula* rose to 13% at 0.74m then declined to <5%. *Corylus avellana*-type pollen was present at <2% from 0.73m but showed significant continuous presence from 0.65m, rising to 13% at the top of the zone. Rare grains of *Alnus glutinosa* were recorded, *Ulmus* appeared from 0.63m and *Quercus* from 0.59m. *Salix* continued at 5–10%, and Cyperaceae at 15%. Poaceae fell from 40% to 17% at 0.73m before recovering to a sustained presence of 20–30%, with a peak of 36% at 0.66m. A clump of 29 Poaceae grains were observed at 0.72m. *Urtica dioica* and Chenopodiaceae decreased but an increasing variety of herbs occurred through the zone including *Sinapis* type, *Scabiosa* type, *Lotus*, *Rubiaceae* and near continuous presence of *Plantago lanceolata* from 0.65m. A single grain of *Humulus lupulus* was recorded at 0.62m (differentiated from *Cannabis sativa* pollen on the basis of pore protrusion). *Sparganium* undiff. rose to 5–10% and clumps were observed at 0.595m and 0.60m and identifiable spores including *Typha angustifolia*, *T. latifolia*, *Menyanthes trifoliata*, *Ophioglossum*, *Polypodium* and *Equisetum* were observed. The numbers of unidentifiable grains remained acceptable at 5–10%, although the

number of degraded rose to the top of the zone. The absolute pollen values rose greatly in this zone, peaking in the artefact horizon at  $48 \times 10^3$  grains  $\text{cm}^{-3}$ .

Some increase in tree cover occurred with local colonisation of *Pinus sylvestris*. That *Betula* peaked then fell is thought to represent the classic early Holocene succession, although it was not as well marked as similar aged sequences at Thatcham Reedbeds and Woolhampton Quarry (Chisham 2004). However, a clump of four *Betula* grains at 0.74m do indicate local presence. The colonisation and expansion of *Corylus avellana* is indicated, reaching its rational limit at 0.65m, coincident with the base of the artefact horizon. The appearance of *Quercus* and *Ulmus* occurred shortly after in the sequence. That the colonisation of the three taxa should appear close together also indicates that a relatively large span of time is represented by the two strata. The upper level of Context 3 and the overlying Context 2 were clearly indicated by sedimentological analyses to have been heavily weathered soil horizons, having been exposed as land surfaces for perhaps a considerable time; this is supported by the greatly increased pollen input in these levels. Three radiocarbon dates on charred plant remains and charcoal from this layer are however coherent (above) and indicate that two episodes of Mesolithic activity occurred during the accumulation of this layer in the mid-ninth and eighth millennia cal BC.

Despite the colonisation of tree types, this was still a relatively open landscape, with Poaceae and Cyperaceae continuing to be important. Herbs such as *Lotus*, *Sinapis*-type (likely *Sinapis arvensis*) and *Plantago lanceolata* indicate continued presence of open, disturbed grassland, but the increase in variety shows the environment was less restricted. The wetland and transition onto the raised gravel areas was of rich sedge fen with marginal willow. The continuing presence of *Plantago lanceolata* and early occurrence of *Pteridium aquilinum* is particularly pertinent, as both are commonly associated with human activity.

**UG-3 (0.485–0.58m)** This zone, corresponding with the top of the black silty clay marl Context 2 and the base of the tufa was characterised by a fall in *Pinus sylvestris* from 40% to 10%; despite this trend the absolute values suggest the main fall occurred just before this zone. The top 20mm of the lower unit was found to contain a greater number of corroded and degraded grains and a peak in Pteropsida monolete undiff. *Quercus* occurred from 0.56m and rose to a small peak of 10% at 0.53m before declining. *Ulmus* and *Betula* continued in low numbers, while *Alnus glutinosa* (see **Figure 59**) rose to 17% at 0.52m. *Tilia cordata* appeared in small but significant quantities (<2%) from the base of the zone and *Corylus avellana*-type pollen maintained a steady presence at 15% before declining to <5% at the top of the zone. Cyperaceae and Poaceae declined slightly but continued to occur with a variety of herb, spore and aquatic types, including *Urtica dioica* and *Plantago lanceolata*.

A decline in *Pinus sylvestris* and the continued spread of *Corylus avellana* is demonstrated. *Quercus* expanded and *Alnus glutinosa* established on the fen edge at the site while *Tilia cordata* colonised locally on raised, drier ground and mixed thermophilous woodland continued to establish in the region. The variety of herb flora seems to have decreased in response; however, the continued presence of grasses and open-loving herbs suggests that sedge and reed fen continued to be

important. Unlike the dryland herb flora, an increase in the variety of marsh species occurred in this zone, and a rich wetland flora established. The single radiocarbon date from this layer 8820–8630 cal BC, (9455±30 BP; SUERC-56973) is Early Mesolithic, but given it is slightly older than those from underlying Context 3, is believed to be on residual material.

**UG-4 (0.22–0.485m)** The assemblage above 0.49m became very restricted, dominated by Poaceae at 30%, Lactuceae to 40%, and Pteropsida monolete undiff. at 20%. Large clumps of Poaceae were observed at 0.39m and 0.50m. A degree of corrosion was evident, although the total number of unidentifiable grains did not increase, but the concentration diagram reveals a substantial drop in absolute pollen and spore values from the base of this zone with  $<5 \times 10^3$  grains  $\text{cm}^{-3}$ .

The pollen of the upper 20mm of the black organic silty clay marl was likely corroded during the desiccation of the surface of this horizon while it was an exposed stable land surface. This is believed to have caused the lack of *Quercus* pollen at the base of the zone despite its presence and that of *Ulmus*, with which it usually expands, at the top of the previous zone. Importantly, however, the other pollen curves appear continuous through this portion of the diagram, indicating there was no major hiatus at the base of the tufa. Portions of the sediment of this zone were clearly subject to differential preservation as the tufa changed from having a clay matrix to being a purer, firmer tufa, highly calcareous in nature and prone to aeration after deposition; the pollen assemblage for these levels is an unreliable indicator of environment.

**UG-5 (0.09–0.22m)** This zone, corresponding with the lower topsoil, is based on only two samples. Pollen concentration recovered to  $7\text{--}8 \times 10^3$  grains  $\text{cm}^{-3}$  and the number of unidentifiables decreased moving into the base of the modern soil. Dominant *Pinus sylvestris* (rising to 34%) and Poaceae at 25% was observed, with high Lactuceae at 0.19m. *Abies* sp. was recorded for both samples. *Brassicaceae* reached 10%. This zone clearly represents recent material, with the assemblage resembling the disturbed vegetation of the set-aside field observed at the site. The high *Pinus sylvestris* and presence of the introduced taxon *Abies* is believed to relate to commercial coniferous plantations established in the Kennet in modern times. A hiatus of unknown length therefore exists, most likely at the top of the tufa.

### **Microscopic charcoal**

All slides prepared for pollen were analysed for microscopic charcoal, and the results presented on the pollen diagrams (**Figure 59**; see Chisham 2004 for methods). The quantities of microcharcoal proved very small, and of a different order of magnitude to the counts for similar age sequences at Thatcham Reedbeds and Woolhampton where early Mesolithic landscape burning has been identified (Chisham 2004; Barnett 2009). Small background total area of charcoal levels of  $<0.05 \text{cm}^2 \text{cm}^{-3}$  were usual, with a minor rise in zones UG-2 and UG-3 coincident with the artefact horizon and sticky black silty clay marl. Occasional fragments of charred Poaceae epidermal cells were recorded. Local use of fire has therefore not been identified, with only low background levels of airborne charcoal indicated. There was a slight peak at 0.65m, just before artefact deposition and raised levels through the overlying Contexts 3 and 2. Six fragments of *Salix/Populus* sp. were

found at 0.635–0.655m (lower portion of artefact horizon, Context 3) with a piece of glassy bituminous-like material, which compares favourably with burnt sap, or resin (cf. Aveling and Heron 2000).

### *Waterlogged plant macrofossils*

A small quantity of waterlogged seeds was recovered from Ufton Pit CC. Large numbers of *Eupatorium cannabinum* seeds occurred between 0.50–0.635m. These are highly resistant to desiccation, hence their increased likelihood of survival. The species is a large member of the Asteraceae that today occurs in damp places (Stace 1997, 757), notably in reedbeds. They are the likely source of the pollen identified as *Bidens* in pollen analysis. The only other plant macrofossils were seeds of Chenopodiaceae, Caryophyllaceae (cf. *Cerastium*-type) and Apiaceae, at 0.555–0.615m, all indicators of disturbed ground. No identifiable wood was found.

### *Macroscopic charcoal*

All macroscopic charcoal excavated by hand or recovered during wet-sieving was analysed. The assemblage proved extremely sparse for the 2002 trench, consisting only of five identifiable pieces of juvenile hedge types. These have since been radiocarbon dated and proven to be modern intrusive material (above). The small assemblage from deeper Ufton Pit CC is likely more secure: aside from numerous unidentifiable fragments there were 17 pieces of *Salix/Populus* sp. and one of Pomoideae charcoal at 0.615–0.635m in the upper portion of the artefact horizon.

### *Ufton Bridge: molluscan analysis Pit CC*

by Catherine Barnett

The mollusc assemblage was examined for four key continuous bulk samples (**Figure 35**) to complement the botanical analyses and provide environmental data for the base of the tufa, where pollen was poorly preserved. Few shells came from the lower two samples but useful counts were achieved for the black silty clay marl and basal tufa with 342 and 783 identifiable shells respectively. **Figure 60a** shows that the majority were freshwater molluscs with a ratio to terrestrial species of 6:1 for the upper two levels, clearly showing the importance of freshwater in the formation of the two strata. Description of the assemblages is made with reference to **Figures 60–2**, percentage plots and Excel histograms for freshwater and land molluscs. The latter are percentage plots but absolute numbers have also been superimposed on each species.

**Sample 13 (0.635–0.655m)** Only three freshwater molluscs were recovered from the lower portion of the artefact horizon (Context 3): one each of *Valvata cristata*, *Gyraulus crista* and a bivalve (cf. *Pisidium* sp.), too scant to make ecological interpretations other than to suggest that clean freshwater was present at the site.

**Sample 12 (0.615–0.635m)** Seven freshwater species were represented by 14 shells in the upper part of the artefact horizon, 25% being *Valvata cristata*, with three bivalves and single shells of *Valvata piscinalis*, *Lymnea* cf. *stagnalis*, *Planorbis* sp, *Gyraulus crista* and *Ancylus fluviatilis*. The land mollusc assemblage comprised four shells of *Vallonia excentrica* and presence of *Cepaea* sp., Limacidae, *Discus rotundatus* and *Succinea/Oxyloma* type.



The sample is small but a few suggestions can be made. The importance of the aquatic environment continued, with clean and slow moving or still water supporting *Valvata* spp. Conversely *Ancylus fluviatilis* would have required clean, quick-flowing, even turbulent water (Kerney 1999, 72), so indicating a variety of fluvial environments on the floodplain. The *Lymnea* cf. *stagnalis* indicates this was hard (calcareous) water. The land mollusc assemblage was one of moist, base-rich conditions, as would have occurred at the wetland edge, except for *Vallonia excentrica*, which indicates local dry, open grassy areas (Kerney 1999, 109; Evans 1972, 161). The presence of a single shell of *Discus rotundatus* was noted. It appeared in the Boreal layers at Thatcham Reedbeds 12 (Holyoak 1983, 488, 492) and Evans (1972, 183–185) suggested it has been present since the Boreal or Pre-Boreal, having replaced *D. ruderatus* in the early Postglacial period. Kerney's mollusc zonation (1977) indicates it appeared in zone c, from 8170–7060 cal BC (Q-1425; 8470±190 BP). This date was revised at Holywell Coombe, where *Discus ruderatus* was present at 8720–8270 cal BC (9240±90 BP), but was replaced by *D. rotundatus* in a layer dated to 8170–7490 cal BC (OxA-2157; 8630±120 cal. BP; Preece and Bridgland 1998, 186–187), while at Sidlings Copse (Preece and Day 1994) the replacement occurred at 8330–7930 cal BC ((OxA-3859; 8990±90 cal. BP). Assuming the shell was *in situ* this gives a useful indicator of age but caution is needed since only one shell was found and the micromorphology (below) did produce evidence of biogenic mixing.



Figure 60: Ufton Bridge: Pit CC Mollusc diagram (A) total of land and freshwater shells, (B) proportions of land and freshwater, (C) land molluscs by habitat type: A=woodland, B=intermediate, C=open country, M=marsh, (D) freshwater molluscs by habitat: D=ditch, MW=moving water, Ca=catholic; S=slum (by C. Barnett)

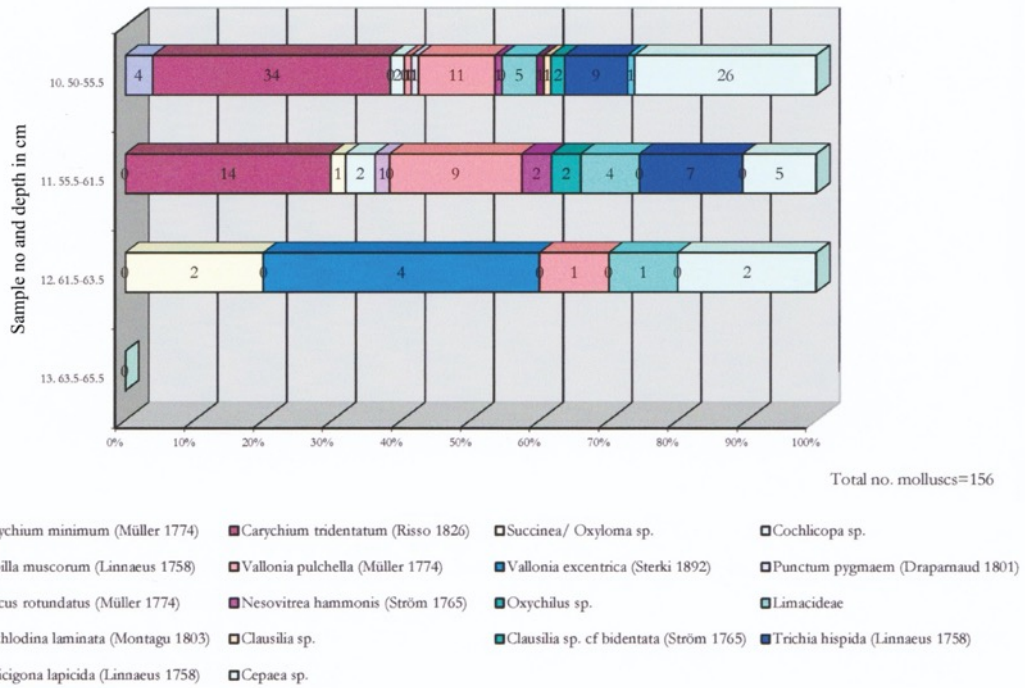
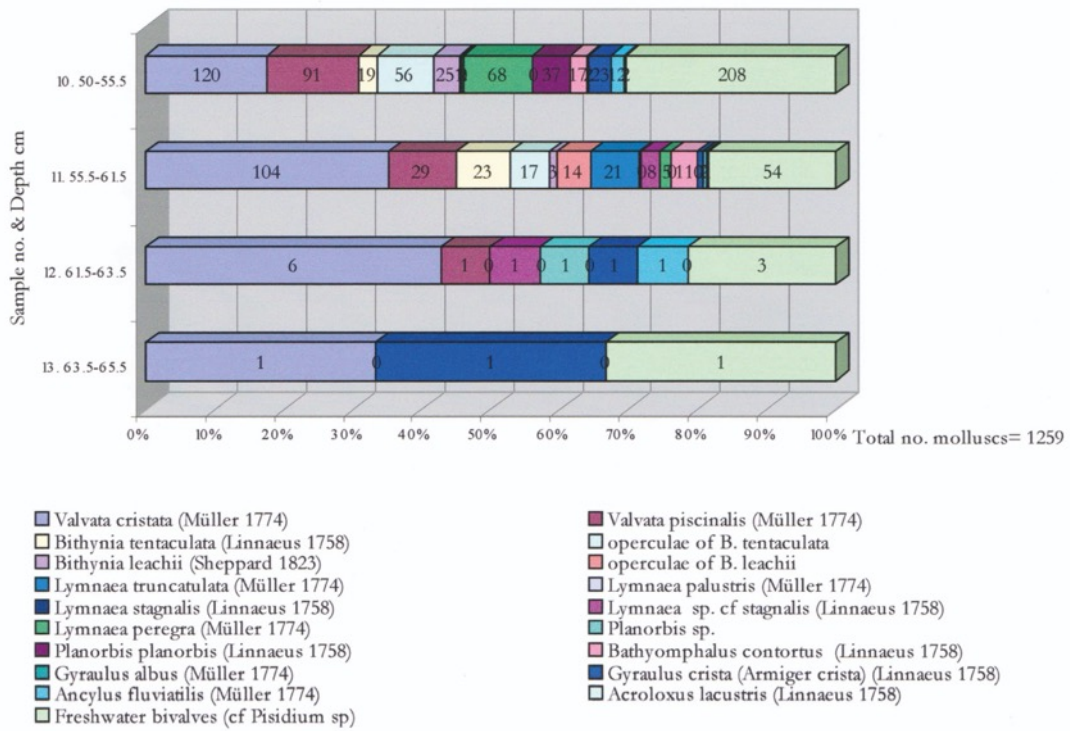


Figure 61: Ufton Bridge, Pit CC: Mollusc diagram (top) land molluscs, (bottom) freshwater molluscs (by C. Barnett)

**Sample 11 (0.555–0.615m)** Two hundred and ninety-five freshwater molluscs and 47 land molluscs were recovered from the black silty clay (Context 2). 30% of the former were *Valvata cristata*, with 8% *V. piscinalis* and there were significant numbers of *Bithynia leachii* and *B. tentaculata* (operculae and shells) and bivalves (cf. *Pisidium* sp.). *Lymnea* sp included *L. truncatula* at 6%, with lesser *L. palustris*, *L. cf. stagnalis* and *L. peregra* and 3% *Bathyomphalus contortus* and presence of *Gyraulus crista*, *Ancylus fluviatilis* and *Acroloxus lacustris*. This rich fauna is dominated by species of hard, slow-moving bodies of water. The *Bithynia* spp. also indicate the waters were well-vegetated with a high diversity of flora and fauna. The number of operculae was similar to the number of shells suggesting there was little movement or sorting of material by the water. Swamp or stagnant water conditions on the floodplain are indicated by the presence of *Lymnea palustris* (Kerney 1999, 53) while the presence of *Bathyomphalus contortus*, *Gyraulus albus* and *G. crista* indicates full seasonal desiccation did not take place across the site. The continued low-level presence of *Ancylus fluviatilis* indicates there was also faster-moving water in the immediate area, but it is unclear whether this was year-round or seasonal. Two of the freshwater species represented here, *Bythynia leachii* and *Acroloxus lacustris*, were also observed by Holyoak in his Kennet Boreal age samples but not late glacial, and he proposed that these species were not known elsewhere for the Late Devensian/Early Flandrian either (Holyoak 1980, 493). The land mollusc assemblage is small but relatively diverse, with species of moist, well-vegetated places dominated by *Carychium tridentatum* (4% total assemblage, 27% land mollusc assemblage), *Discus rotundatus* (3%) and *Trichia hispida* (2%, suggesting base-rich soils: Kerney 1999, 197). *Pupilla muscorum*, *Nesovitrea hammonis*, *Oxchilus* sp., Limacidae and *Cepaea* sp. were also present. These species seemingly represent conditions on raised areas of the floodplain and the wetland-dryland transition; dryland species are less well-represented. *Pupilla muscorum* indicates the local existence of dry, exposed areas, likely of calcareous sandy or stony ground (Kerney 1999, 103).

**Sample 10 (0.50–0.555m)** This sample from the base of the tufa proved richest in molluscan remains, in part due to the excellent preservation environment it offered. A minimum of 27 species were represented within the 684 freshwater snails and 99 land snails identified. Large numbers of bivalves occurred (cf. *Pisidium* sp.), *Valvata cristata* and *V. piscinalis* (combined these comprised >50% of the total assemblage). Many of the species from the underlying unit were again represented, including *Bithynia* and *Lymnea* spp, with a rise in *L. peregra* to 9%. *Planorbis planorbis* (5%) and *Gyraulus albus* (>1%) appeared in this layer. Aquatic conditions were similar to that of the underlying layer, with slow-moving clean, well-vegetated calcareous water indicated. However, the appearance of *Planorbis planorbis* indicates that shallow pools liable to summer desiccation may also have been present (Kerney 1999, 58).

The land snail assemblage included many new appearances: *Carychium minimum*, *Vallonia pulchella*, *Punctum pygmaem*, *Cochlodina laminata*, *Helicigona lapicida*, *Clausilia* sp. and *Clausilia* cf. *bidentata*, all at >1%. *Carychium tridentatum* showed continued presence at 4% and *Cepaea* sp. at 3%, while *Cochlicopa* sp., *Discus rotundatus*, *Trichia hispida* and *Nesovitrea hammonis* declined. *Pupilla muscorum* did not occur in this sample.

Some, such as the marsh species *Carychium minimum* and *Vallonia pulchella*, may also have been minor constituents of the lower assemblages, not seen due to the smaller number of shells preserved and recovered. A clear pattern of change in the terrestrial landscape is shown, however: species of shaded habitats and deciduous woodland appeared for the first time including *Cochlodina laminata*, *Helicigona lapicida* and *Clausilia* cf. *bidentata*, all of which favour calcareous conditions. That open conditions were reduced is also suggested by the lack of *Pupilla muscorum* and reduction in *Trichia hispida*. These findings confirm the tentative interpretation of the pollen results for the lower tufa that mixed deciduous woodland began to establish at this time or that it was already established.

At Holywell Combe (Preece 1998, 183, 186, 189) *Clausilia bidentata* appeared from near the base of the tufa, dated to 8720–8270 cal BC (9240±90 BP), 8640–8280 cal BC (Q-2710; 9230±75 BP) and 9250–8330 cal BC (OxA-2088; 9460±140 cal. BP) and at Sidlings Copse (Preece and Day 1994) it was found in low numbers from the base of the tufa sequence dated to 8330–7930 cal BC (OxA-3508; 8990±90BP) so clearly this species was not a late arrival to Britain. However, it appeared locally: at Avenell's Cottage, only from pollen zone e (Fl VI b/c), with zones f and d giving dates of 7540–6590 cal BC (BM-65; 8100±180 BP) and 8290–7810 cal BC (BM-1136; 8928±71 BP (Holyoak 1980, 492); at Runnymede from the early Atlantic layers (Needham 2000, 130); and part way up the Atlantic tufa at Cherhill near Avebury (Evans *et al.* 1978). It may, therefore provide a good local indicator of Atlantic conditions. Shells of *Cochlodina laminata*, and *Helicigona lapicida* came from the same tufa sample at Ufton Bridge. Holyoak (1980, 492) had his first finds locally for both from pollen zone f: Boreal/ FIVIIa while at Sidlings Copse (Preece and Day 1994) *Cochlodina laminata* was absent and *Helicigona lapicida* appeared only in levels immediately prior to and after a level dated to 6230–5890 cal BC (OxA-3509; 7180±85 BP), and then only a minor presence. *Cochlodina laminata* appeared at Holywell Coombe after 6650–6390 cal BC (Q-2716; 7650±80 cal. BP; Preece 1998, 186) and *Helicigona lapicida* in mollusc zone d/e, with the base of zone e dated to 4690–4320 cal BC (OxA-2091; 5620±90 BP; Preece 1998, 182–183). These local and regional comparisons indicate the latter two species might be useful chronological indicators, with the proviso that they were possibly infrequent so not reliably found for the period of arrival.

Though arbitrary grouping by habitat type should be used with caution, **Figure 60d** does indicate that the black silty clay marl received more shells with a preference for clean, slow moving water (ditch group) than the tufa, which contained a greater proportion of taxa of moving and larger bodies of water. The land mollusc grouping (**Figure 62c**) also indicates an increase in taxa of shaded and woodland habit and those catholic in nature and a percentage decrease in those of marsh and open ground habit upwards through the sequence.

### *Ufton Bridge: environmental discussion*

by Catherine Barnett

The basal sedimentary sequence at Ufton Bridge is believed to have been deposited during the terminal Devensian late glacial period or late glacial-early Holocene

transition. Molluscan evidence was inadequate to date the lower material. The pollen, however, showed that the local environment at the time of deposition of the upper sands and gravels at the base of the sequence was open. Calcareous grassland was present in UG-1, with herb taxa of disturbed ground and little tree cover other than scattered *Betula* and *Salix* spp. Sedge and likely reed fen was present on the floodplain, which contained the high-energy, braided fluvial system.

The transition to Holocene conditions is shown by the apparently continuous sequence at the top of these sands and gravels with the incorporation of more silt as the river regime decreased in energy. This upper surface was subsequently transformed into a soil as water levels dropped and formed the main artefact horizon. The botanical remains for this level (UG-2) indicate the early Holocene *Betula* peak (with a likely date of c. 7425 cal BC, Pre-Boreal) and colonisation of the local area by *Pinus sylvestris*. At the same time, an increasingly rich herb flora developed on the wetland and wetland edges. Tree cover was, however, still sparse and open disturbed grassland remained in the area. The repeated presence of *Plantago lanceolata* in zone UG-2 and early appearance of *Pteridium aquilinum* might also indicate ephemeral anthropogenic disturbance; there is no evidence of burning of the landscape at this site so any such disturbance would have been clearance by cutting. Alternatively the impact of large herbivores might be of import.

The first continuous presence of *Corylus avellana*-type pollen in zone UG-2 gives a useful chronological marker, allowing correlation with the rise at the comparable sites of Thatcham (Chisham 2004), Sidlings Copse and Cothill Fen (Preece and Day 1994; Day 1991). The taxa reached its rational limit at 0.65m, and dates the sediment immediately underlying the main artefact horizon to c. 9.1ka BP. The majority of the overlying sequence was found to be of Mesolithic date on botanical grounds though of poor resolution due to the short and slowly accreted stratigraphic sequence. *Ulmus* appeared then *Quercus* rose, only a few centimetres above the *Corylus avellana*-type pollen rise and corresponding with the time of artefact deposition. The *Corylus* rise at Cothill Fen was dated to 8560–7960 cal BC (OxA-2114; 9070±110BP; Day 1991) and to 8990±90 cal BP at Sidlings Copse (Preece and Day 1994) having appeared c. 7395-7410 cal BC 9.3- 9.4ka BP. The rise was dated for Thatcham Reedbeds (Chisham 2004) to 8550–8240 cal BC (AA-55306; 9,134±65 BP). *Ulmus* appeared at Cothill at c. 7045 cal BC and *Quercus* at c. 6935 cal BC (Day 1991), while at Thatcham, *Quercus* showed its first (but low) continuous presence at 8550–8240 cal BC (AA-55306; 9134±65 BP) but did not expand before the uppermost dated level of 7940–7530 cal BC (AA-55308; 8629±82 BP) and *Ulmus* rose at 8300–7960 cal BC (AA-55307; 8982±64 BP) (Chisham 2004). The pollen curves are coherent and apparently continuous so no hiatus is proposed but it appears that on comparison with these dates, a relatively large span of time, up to 150 years, is represented by just a thin layer of sediment. It is suggested that sedimentation during this period was slow, with the continued development of the soil. The zone showed the increasing importance of shrub flora but a closed canopy was not indicated, with open flora and fauna continuing to exist on the wetland and dryland areas. The artefactual and environmental evidence both indicate that the artefact horizon, and the early Holocene palaeosol with which it is associated, is of Early Mesolithic (Boreal) date but that it is more recent than the majority of material at Thatcham. This is borne out by the three radiocarbon dates

gained on charcoal from Context 3 (above) which represent two phases of Early Mesolithic activity at 8740-8340 cal BC (9311±60 BP: UBA-27302 and 9323±28 BP: SUERC-56977) and 7590–7380 cal BC (8440±55 BP: UBA-27302) within this narrow layer.

The base of the tufa in Pit CC at 0.50–0.555m, which post-dates the palaeosols and artefact horizon, is proposed to correspond to the late Boreal-Atlantic period, ie the Late Mesolithic, on the basis of the comparison of the new molluscan appearances in sample 10 with the assemblages described by Holyoak (1980, 492), Preece and Day (1994) and Preece (1998). Cessation of palaeosol formation and a latest likely date for artefact deposition has been indicated to be c. 6935 cal BC. Uranium Series dates for tufa in the palaeochannel immediately to the north show that there tufa formation began significantly earlier at c. 7410 cal BC. Pollen assemblage UG-4, from the base of the tufa, showed the continued development of mixed woodland and the establishment of alder carr at the wetland edges. The molluscan assemblage supported the interpretation that an increasingly closed canopy established in the area, but that well-vegetated marsh conditions continued on the floodplain into the Late Mesolithic.

### *Ufton Bridge: conclusions*

by Martin Bell

#### *Stratigraphic sequence*

Overall the geophysics and boreholes present a picture of a valley floor with a series of islands and bars composed mainly of flint gravel with a smaller proportion of sarsen but also with bands of coarse sand. This undulating topography (**Figures 10 and 30**) is similar to that identified by Cheetham (1980; Alyward 2008) in gravel pits downstream at Theale, which he inferred represented the braided palaeochannels of the Pleistocene. This braided channel topography was inherited by the much lower energy river of the Holocene. The result was low-lying areas forming lakes, ponds and wetlands within an uneven topography with many sediment traps in which rapid sedimentation occurred in the early millennia of the Holocene. This included early Holocene tufa formation as shown by East Field Pit 4 and a few boreholes, and the early Holocene deposition of calcareous marl at other Kennet Valley sites, such as Woolhampton (Bell *et al.* 2006). By c. 9300 cal BC peaty silt was accumulating in the channel north of the Ufton Bridge Mesolithic site. Rapid sedimentation created the ideal contexts for the preservation of Early Mesolithic evidence, as Thatcham clearly shows (Wymer 1962; Chisham 2004). What Ufton and the wider ‘Tracing Their Steps’ survey has shown, however, is that these conditions of rapid early Holocene sedimentation occurred widely in the Middle and Lower Kennet Valley creating a high potential for the discovery of Late Upper Palaeolithic and Early Mesolithic sites.

The stratigraphic unit which has emerged as of particular interest at Ufton is Unit 4a, the black organic silty clay which overlay the Mesolithic occupation horizon. It was highly distinctive and readily identifiable in the borehole survey (**Figures 21 and 40**). In Pit CC this black layer formed the upper part of an old land surface with a stony soil containing the Mesolithic artefacts at its base, although some worked

flints were recorded within it. Here the black layer comprised silt and clay and the silt is medium and fine, sand is absent. In some other parts of the site the black layer was slightly sandy. In the field there was clear macroscopic evidence for laminations (**Figures 34** and **40**). Given the contrast between the finer silts of the black layer and the sandy and stony underlying soil, and the presence of clear laminations in the black layer and abundant freshwater molluscs in its upper part, it seems that the black layer was laid down under very low energy, probably seasonal, riverine inundation of the floodplain. Micromorphology indicated that trampling contributed to the lens-like laminations evident in this layer (**Figure 34**). This is likely to indicate the activities of animals such as deer at the palaeochannel edge. However, no macroscopic involution type features indicative of animal trample in soft coastal sediments were apparent (Bell 2007), although, given the firm gravel substrate at Ufton such features would not really be expected. Other processes also contributed to the distinctive character of the black layer. These include mobilisation of silts and clays as a result of a fluctuating water-table, which was evident in the micromorphological sections from iron and manganese deposition. XRD analysis showed calcium to be abundant in the upper part of the layer and this may indicate that algal activity in shallow water also contributed to its formation, although the calcium may be derived from the overlying tufa since micromorphology showed some mixing at the boundary.

The black layer does not occur in every borehole. It may have been eroded in places and not formed in others, but it is present in places throughout the Ufton borehole survey area. It appears to blanket the underlying gravel and the palaeosol traces on its surface. The horizon is significant not just at Ufton Bridge but because a very similar layer is associated with several other Mesolithic find-spots in the Kennet Valley, although on some of the other sites the artefacts vary in their stratigraphic relationship to the black layer. At Ufton the Mesolithic artefacts are largely sealed by the black layer which also contained some worked flints. Micromorphological analysis produced evidence for possible flint microdebitage in the minerogenic soil (M1), a mixed horizon on its surface (M2), and the lower part of the black silty clay layer (M3). There was clear evidence from both the pollen analysis and micromorphological sections for charcoal within the black layer, to suggest that activity on the site, whilst mainly preceding its formation, probably continued through the period of its formation. At Thatcham (Wymer 1962, plate XLVIII lower plate) there was also an organic layer overlying the artefacts. A humic clay/peat is also described overlying the main Early Mesolithic occupation at the Thatcham Sewerage Treatment Works (Healy *et al.* 1992, 46). At Wawcott XXX the artefact horizon was below the top of a stony very dark organic soil (Froom 2012, 17). At Faraday Road the Mesolithic layer was sealed by very dark grey humic silty loam, the lower part of which also contained Mesolithic artefacts (Ellis *et al.* 2003, 112). At Wawcott IV artefacts and a hearth were in a horizon which in places was a very dark black clay with charcoal below peat (Froom 2012, fig 3.3). At Victoria Park the main concentration of Mesolithic artefacts was in the upper part of the organic clay with lesser numbers in the underlying minerogenic old land surface. At Wawcott XV a tenacious dark clay silt above marl and below peat is described, but its relationship to the artefact horizon was not established from the excavations and most of the artefacts were from fieldwalking (Froom 1970, 1972a, 2012).



It cannot be demonstrated that these black organic layers are all the same, or are necessarily contemporary. It does, however, seem likely that this organic silty-clay formed at a time when similar environmental conditions of widespread low energy, probably seasonal, flooding occurred extensively across the Kennet floodplain.

These conditions did not occur from the very beginning of the Holocene, because the black layer seals Mesolithic activity at Ufton and several other sites, so its formation does not seem to relate solely to the disrupted drainage inherited from Pleistocene conditions. These fine silts are in any case more likely to have been derived from deposition in a fully vegetated environment. A likely cause of the widespread flooding represented by these black silt layers is the activities of beavers on the floodplain. There is no direct evidence for beavers at Ufton but they are represented on several sites in the Newbury area (Coles 2006) including Thatcham and Victoria Park. The water bodies inherited from the disrupted drainage of the Pleistocene, coupled with alteration by beavers, and the development of tufa formation, seems to have contributed to an environment in the Kennet Valley which was highly attractive to people, given the frequent association of Mesolithic artefacts below, within, or above, the black layer. Evidence that the main concentration of lithics in Victoria Park and some lithics and most charcoal at Ufton were within the black layer has the possible implication that people were active within a landscape subject to seasonal flood inundation, which in turn might imply activities centred on the dryer summer months.

As noted above, tufa formation preceded and also formed above the black layer in Pit E4 (**Figure 40**). Tufa occurred above the black layer in Pit CC and many of the other boreholes in which it was found on the sides of channels and within the fill of former channels, often above sandy silts or peaty organic silts. Calcareous marls also formed in some parts of the site probably within water bodies. At Ufton Pit E2, deposition of calcareous marl occurred after Iron Age activity on the floodplain. The final sedimentary unit was deposition of alluvium generally more calcareous in the lower part, and with a greater proportion of clay and silt in the upper part. This is presumed to reflect erosion which occurred from arable land mainly, judging by the East Field Pit 2 sequence, in the last two millennia. Medieval pottery below alluvium in East Field Pit 1 suggests that the highest parts of the gravel rises may only have been covered with alluvium in late medieval or post-medieval times. The fields at Ufton are still subject to seasonal flooding and the deposition of small increments of sediment (**Figure 46**).

Biological evidence from Pit CC includes pollen, plant macrofossils (some waterlogged) and Mollusca. The 2002 borehole transect indicates that the black organic silt layer continues to deepen to the north and in borehole U9 is at a depth of 1.17m below tufa. In Pit AB (8m north of Pit CC) a high watertable prevented detailed examination of the basal horizons, but wood was found in the base of the tufa and the surface of the underlying gravel. To the north of this is the palaeochannel with laminated sand and tufaceous sand on the channel edge and organic clay and peaty silt where the channel deepens to the north.

Dating evidence shows that the palaeochannel is contemporary with the Mesolithic activity. The potential represented by the palaeochannel north of the site is

increased because the borehole evidence indicates that the stratigraphic sequence associated with the Mesolithic finds is represented widely within the surveyed area. The boreholes also indicate that the palaeochannels to the west and south of the site have a similar stratigraphic sequence to that to the north; there are traces of the black organic clay on their margins and they too have a tufa fill in places. It seems probable that some of these channels may also be broadly contemporary with the Mesolithic site. The channel to the west of the site is thought to represent the same channel as that to the site's north. However, the GPR transects also indicate that some at least of the channels are multi-phase (Mansfield 2007, fig 4.9).

### *Mesolithic site*

It has been established that the lithic scatter found by Stephen Allen was on the crest of a gravel rise at a point where recent cultivation was cutting into the artefact horizon. Although the Mesolithic artefact horizon with its flints and bones appeared in the field to be intact, when excavated below the organic clay layer the section (**Figure 32**) reveals bioturbation by earthworms and this was also evident from the early medieval and modern radiocarbon dates obtained from charcoal samples in the 2002 trench in Pit CC. The pollen from the Square N monolith also included intrusive pollen of more recent date and consequently the pollen record from that sequence has not been presented here (but is outlined in Chisham 2004). On the flanks of the gravel rise 8m north of the 2002 trench the Mesolithic horizon was well sealed below 0.5m of the black organic silt, tufa and alluvium. This 1m square pit produced one microlith, two pieces of flint debitage, two pieces of charcoal and nine bones. The artefact horizon does therefore extend down the slope of the gravel rise.

What we can say about the nature of Mesolithic activity at Ufton is limited by the small scale of investigation and the unfortunate unavailability of the lithic artefacts. The environmental evidence, sediment samples and animal bones survive. The presence of bones and antler of roe deer, some with cut marks, is notable. The interim conclusions at the time of the original excavation were that the site may represent a short-term hunting site but borehole evidence subsequently obtained suggests that the site may have been more extensive than originally appreciated. That can only be resolved by future work but it is clear from this geoarchaeological investigation that the site has considerable potential for investigations of the nature and seasonality of Mesolithic activity.

### *Dating*

The three radiocarbon dates from the 2002 excavation trench were disappointing; they were all much later than the Mesolithic, one was early medieval and two were recent. Clearly on the crest of the gravel ridge, where the Mesolithic horizon was quite shallowly sealed, there was contamination by more recent plant material. However, dates from Pit CC and the boreholes on the 2002 transect produced a coherent sequence which resolved the key questions about the date of the site and the palaeochannel to its north (**Figure 42**). The well stratified plant macrofossils in the artefact horizon in Pit CC suggest the possibility of two phases of activity, the earlier between 8740–8340 cal BC and later activity between 7590–7380 cal BC (Marshall *et al.* 2015). Charcoal in the overlying black organic layer is in the earlier group and may be residual from the first phase. The notion of two distinct phases

may seem questionable on the basis of just four radiocarbon dates, were it not for the fact that several of the other Mesolithic sites in the Kennet have dates centred on the same two periods (*op. cit.*). The earlier group includes Marsh Benham, Thatcham, Greenham Dairy Farm, Newbury Flyover and Victoria Park.

The second phase of activity includes Newbury Sewage Works, Greenham Dairy Farm, Faraday Road, Thatcham Newbury Flyover and Victoria Park. If these two distinct phases of activity prove to be a reality, then the palaeoenvironmental record may provide some clues to the conditions which made activity in these episodes especially favourable. It is also interesting to speculate on the factors which led to people reoccupying the same site after a period of possibly reduced activity lasting 500–1000 years, on five of the seven dated sites. A strong possibility is that the following of existing paths and the making of encampments where routes converged, or crossing places existed, imposed long term structures on the landscape (Bell 2020).

As regards the palaeochannel immediately north of the excavations the single radiocarbon date from the base of borehole 13 produced a date of 9320 - 9250 cal BC which is around 600 years earlier than the Mesolithic activity. The uranium series dates have large standard errors but nonetheless add to the chronological picture provided by radiocarbon dates. A sample from near the base of the tufa in borehole U12 again produced a U-series date of c. 7500 BC which is broadly contemporary with the later phase of Mesolithic activity. The lower tufa sample in Borehole 9 produced a date of 6485 BC. Higher tufa samples in the same two boreholes produced very similar dates around 6000 BP suggesting that tufa deposition continued for more than a millennium after Mesolithic activity. The upper tufa samples in Boreholes U9 and U12 again produced closely similar dates (both dating to the late 5th millennium BC) and although these detrital tufa fragments may be reworked they indicate tufa deposition, probably locally, up to the end of the Mesolithic. It is therefore clear from this dating evidence that the palaeochannel north of the site was actively sedimenting through the period of Mesolithic activity. It clearly contains an organic environmental sequence covering the period before, during and after the period of Mesolithic activity and a compressed form of that sequence has been obtained from Pit CC.

### ***Environment***

The botanical and molluscan conclusions were discussed in detail above so only key points need be noted here. The pollen indicated that the basal sands and gravels were of late glacial or initial Holocene date, being indicative of an open environment with some birch and willow. This was followed by increased pine in the old land surface. Hazel appears at around the artefact horizon and a little later is followed by alder and oak. The vegetation succession here is compressed by comparison with Thatcham (Chisham 2004) showing that the old land surface and the black silty clay above span a significant length of time, the radiocarbon dates suggesting at least two millennia. The occurrence of a few freshwater molluscs in the old land surface indicates some flooding. Through the old land surface and the lower part of the black silty clay there are indications that the landscape remained at least partially open, as there are open ground indicators such as *Plantago lanceolata* and the land mollusc *Vallonia excentrica*. The wetland edge was sedge fen with

marginal willows. In the upper part of the black silty clay layer many freshwater molluscs are present indicating hard slow moving water, suggestive perhaps of deposition at the edge of a channel which at this stage may have been partly abandoned by the river itself. Abundant freshwater molluscs indicative of slow moving water are also found in the lower part of the tufa; the upper part was not analysed. The increasing diversity of land Mollusca in the tufa, mainly shade-loving taxa, accords with the pollen evidence that by this stage there was a cover of deciduous woodland.

Micro-charcoal occurred in the old land surface but there is more in the black silty clay and the very base of the tufa. In the micromorphology samples charcoal was particularly noted in the lower part of the black silty clay. This charcoal occurrence suggests that activity on the site continued through the period of the black layer's formation and perhaps to initial tufa formation. Although micro-charcoal levels are low, compared with Thatcham for instance, the occurrence of charred *Poa* epidermal cells indicates the possibility of some small-scale burning at the wetland edge, as is well attested somewhat earlier in the Mesolithic at both Thatcham (Chisham 2004; Barnett 2009; Holyoak 1980, 263) and Star Carr (Mellars and Dark 1998). This may have been a factor contributing to the maintenance of some open areas on the floodplain through the first two millennia of the Holocene. However, it should perhaps be seen as one of a group of linked factors. One could be the effects of beavers in felling trees, disrupting drainage and creating areas of open water followed by beaver lawns in sedimented ponds (Coles 2006). Coupled with this, although perhaps of more local significance, was formation of lobes of tufa which could have disrupted drainage. Additionally there are the effects of grazing herbivores, such as deer, aurochs and boar to be considered. Their activities would have been particularly concentrated around water bodies and the micromorphology produced probable evidence of animal trample at Pit CC. Furthermore the Kennet is a natural east-west routeway across southern England from the Thames Basin into Wessex and the Bristol Avon, the Severn Estuary and Bristol Channel. Such a routeway is likely to have been favoured by migrating herbivores, the activities of which may also have contributed to a significantly more attenuated timeframe for early Holocene woodland colonisation than in some areas. The existence of more open areas created to varying spatial degrees by this combination of factors will itself have attracted animals in increasing numbers as surrounding areas became more rapidly colonised by closed forest. An abundance of resources at the woodland/wetland edge (plants, animals, and though yet to be demonstrated in any quantity, birds and fish) probably goes a long way to explain why there is such a concentration of Early Mesolithic sites in the Kennet Valley between Wawcott and Ufton Bridge.

### *Future work*

Not only is there a major concentration of mainly Early Mesolithic sites in the middle and lower Kennet Valley, but it has also been shown that their occupation coincided with a period of very rapid sedimentation leading to deposition of a distinctive sequence of sediments within which the Mesolithic sites are stratified. Work at Ufton and other sites in the 'Tracing their Steps' project, especially Thatcham, Victoria Park and Wawcott, shows that waterlogged deposits are found immediately adjacent to Mesolithic sites. Such sites should have a high priority for

future research investigations given the very limited work which has been done on well stratified Mesolithic sites with environmental evidence in southern Britain. In particular it is considered that there is a very strong case for a limited research excavation of the waterlogged sequence at the Ufton Mesolithic site. That is an especially attractive prospect because, as a result of the 16 years investigation by Reading University student teams, much of the geophysical, sedimentary and palaeoenvironmental research has to a significant degree already been done and synthesised as part of the present project.

## Geoarchaeological investigations at Wawcott, West Berkshire

### *Introduction to archaeology and previous work*

A major complex of Mesolithic sites was found as a result of fieldwalking by Roy Froom in the Wawcott area (**Figure 62**). This led to a series of excavations which he directed for the St Bartholomew's Grammar School, Newbury between 1964 and 1981. Interim reports on these excavations were published regularly (Froom 1963a–c, 1965, 1970, 1972a, 1972b, 1973, 1976, Froom *et al.* 1993). The whole study has recently been brought together in a monograph (Froom 2012), the distillation of more than 55 years research dedicated to the Mesolithic of the Kennet Valley.

There had been some earlier intimations of archaeological interest in the Wawcott area. In the mid-19<sup>th</sup> century there were finds of human skulls and antlers made during peat digging in the Halfway area (Peake 1935; Froom 2012) and finds of beaver were made at Beenham Marsh (Peake 1931). Froom found some 32 sites with Mesolithic artefacts and a significant Late Upper Palaeolithic, or initial Holocene, site of Long Blade type (Wawcott XII), which he excavated, together with the Long Blade site at Avington which is 2.2km upstream from the area mapped in **Figure 62** (Froom and Cook 2005). Altogether he carried out excavations on some 14 Kennet Valley sites, five of them on a reasonably large scale (Wawcott III, XII, XXIII and XXX and Avington VI). In addition to the Froom excavations Reynier (2011) reported on an Early Mesolithic site at Marsh Benham in the south-east corner of the mapped area.

Excavations focused on areas where artefacts were found in fieldwalking. In parts of the excavated areas the Mesolithic horizons had been disturbed by cultivation resulting in the discovery of flints in the topsoil. Froom also found evidence for peat and marl digging which had disturbed some areas. More significantly, however, the excavations revealed parts of these sites where the artefact horizons were undisturbed, being more deeply buried and often associated with distinct old land surfaces sealed variously by organic silt, clay marl or tufa (Froom 2012). The Marsh Benham artefacts were in a grey/orange loam soil sealed by peat (Reynier 2011). In 1976–77 a gas pipeline was dug across the floodplain and the 3m deep section revealed was meticulously recorded in sketches (**Figure 63**) and unpublished photographs by Froom (2012, fig 3.2). This revealed a series of three palaeochannels which were close to Wawcott sites XXVIII and XXVII. The sections generally showed gravel followed by marl, then a channel filled by clay, silt marl and some stones overlain by peat covered by granular marl.

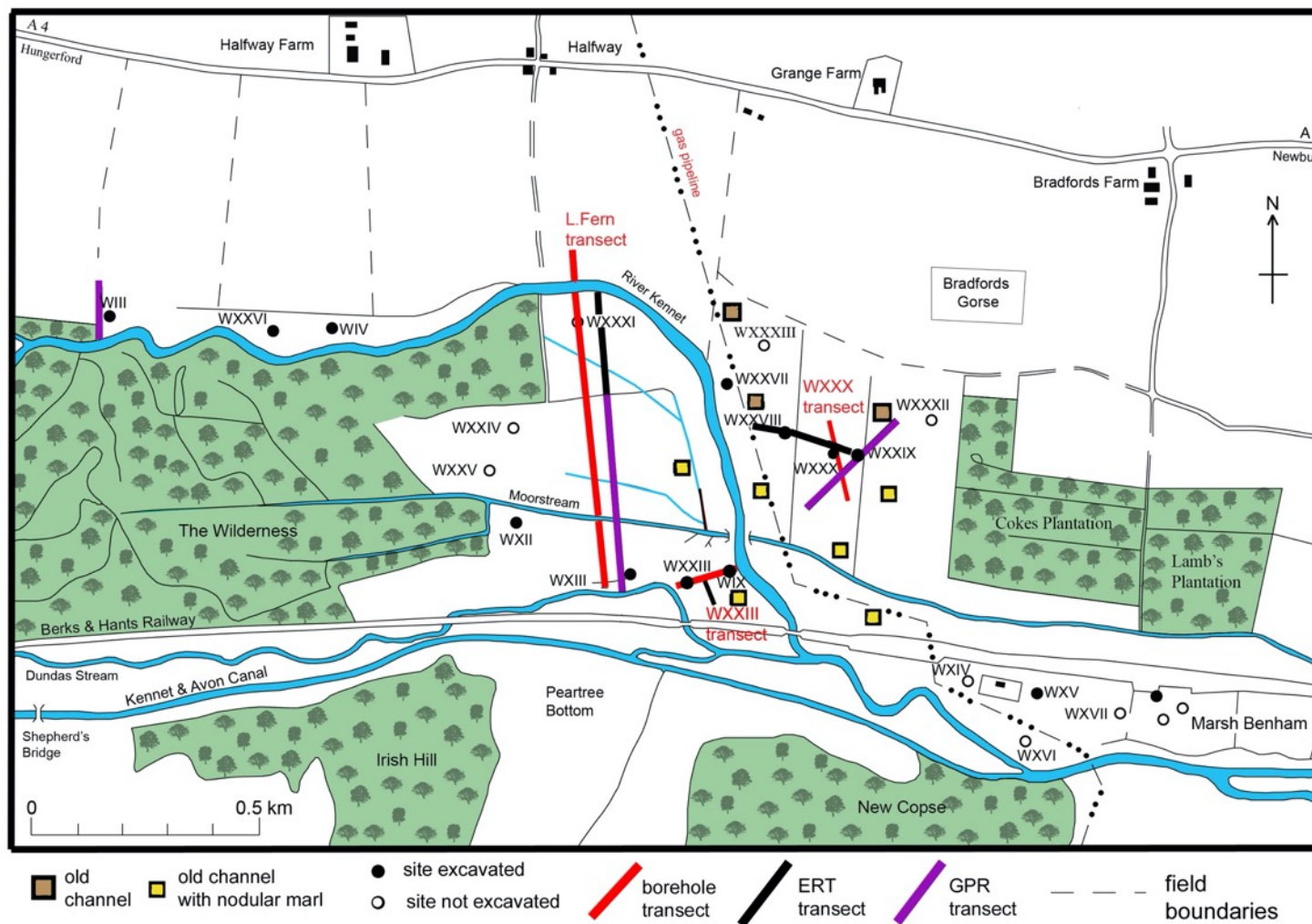


Figure 62: The location of Mesolithic sites at Wawcott (from Fromm 2012, figs 3.1, 7.1–2) with the transects provided by the gas pipeline, the transect of Fern (2004) and the transects of 2014 through sites WXXX and WXXXIII (graphic A.D. Brown)

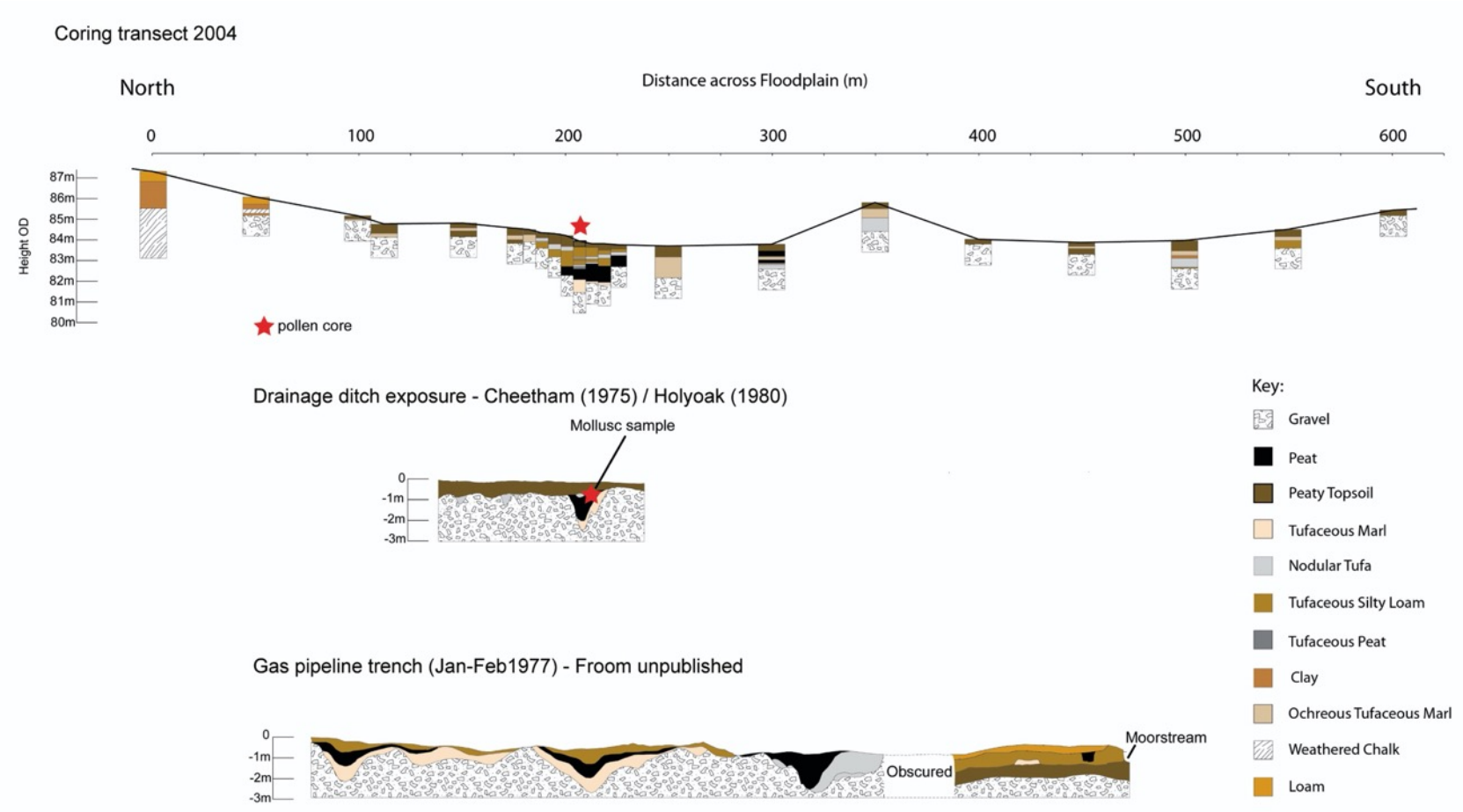


Figure 63: The borehole transect by Leon Fern (2004) compared with the section of a drainage ditch recorded by Cheetham (1975) and Holyoak (1980) and the gas pipeline recorded by Roy Froom in 1977 (source: Fern 2004)



### *Topography and geology*

The River Kennet enters Froom's survey area (**Figure 62**) from the west, runs east to west, then meanders south before turning east. The Kennet and Avon Canal (opened 1810) runs along the south side of his survey area and joins the river soon after it resumes its east-west direction. On the south side of Froom's survey area is also the main railway line between Newbury and Hungerford (opened 1847). The drainage of the Wawcott area is complex with the river embanked and flowing well above the floodplain and other drainage ditches such as the Moorstream reflecting attempts at drainage; this stream flows in a culvert below the Kennet. The difference in levels between these watercourses is thought to be in part because of peat, and perhaps marl, digging in the post-medieval period. Froom (2012) argues that this peat digging was largely mid-19<sup>th</sup> century in date and follows the making of the canal. Peat wastage following drainage will also have contributed to a situation in which the floodplain is markedly lower than both the River Kennet and the Kennet and Avon Canal. These processes of peat digging and wastage have significant implications for the archaeological sites, some of which may once have been significantly more deeply buried below Holocene sediments. It was clear from Froom's excavations, however, that at least the lower part of the Holocene stratigraphy survived well in places whilst being subject to some disturbance in others.

The main area of Mesolithic sites are around an area known as the Wilderness which is today very wet, heavily tree and scrub covered and carefully managed for licensed recreational fishing. North and east of the River Kennet, and in unwooded areas between the Wilderness and the Kennet on the floodplain, there is grazed pasture.

In the area of Froom's survey the Kennet Valley is asymmetrical with a steeper south side broken by the valley of Pear Tree Bottom. The Geological Survey Sheet 267 (Aldiss *et al.* 2006) shows that on the south side of the valley the bedrock is chalk overlain by Palaeogene Lambeth Group clay and sand and Hampstead Marshall Terrace Gravels (Silchester Gravel Member). The north side has a gentler slope: here there is chalk immediately north of the mapped area overlain by Lambeth Group clays, then successive terrace gravels of the Beenham Stocks and Silchester Terraces. Three minor dry valleys enter the mapped area from the north and have valley bottom head gravels, some chalky, on their floor. Just north of the floodplain is a band of Beenham Grange Terrace Gravels (within the Woolhampton Gravels). The Geological Survey shows the present floodplain with a band of peat approximately 0.5km wide with bands of tufa and alluvium to its north and other smaller areas of tufa. These Holocene sediments have been designated as the Midgham Member (Collins *et al.* 1996; 2006).

### *Geophysical survey*

by Paul Baggaley and Ross LeFort

Three ERT transects were surveyed at Wawcott (**Figures 62 and 64**). Transect 7 was surveyed approximately 50m to the east of the BH transect by Leon Fern (2004) and Transects 8 and 9 link the Wawcott XXX BH transect surveyed as a part of this project and the sections recorded during the excavation of the gas pipeline (Jan–Feb 1977; Fern 2004).

#### *Transect 7*

Transect 7 was surveyed as one ERT profile using the roll-along method with an electrode spacing of 3m across a total length of 149m and attained readings to an approximate depth of 15m. Depth values are estimated during the inversion process and do not reflect the natural variation in soil morphology and composition that will affect depth penetration.

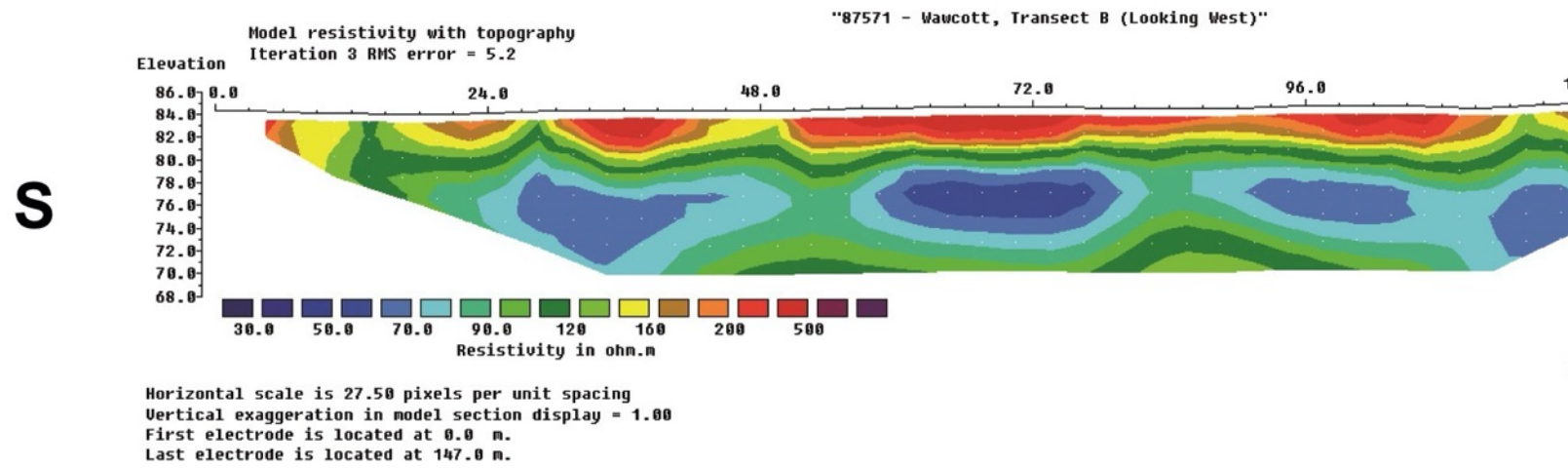
The top of Transect 7 (**Figure 64**) is characterised by a band of high resistivity that correlates with a layer of gravel/sand. This is not a homogeneous band; there are breaks of lower resistivity and variation in the strength of resistivity values and depth reflecting variation in the size and extent of the gravel deposits in this area. Underlying this high resistivity band are layers of decreasing resistivity that are suggestive of the solid geology beneath (Chalk). The boreholes collected by Fern (2004) reach a depth of 1–1.5m for the shallowest boreholes and an approximate depth of 4m for the deepest borehole. These show characteristic levels of peat deposits overlying a band of gravel that is encountered between 0.8 and 1.5m in depth. This is consistent with the ERT results where the first measurements in Transect 7 reflect a depth of 1.5m below ground surface (Mbg) and show a band of gravel that varies in thickness from 0.5 and 4m.

#### *Transects 8 and 9*

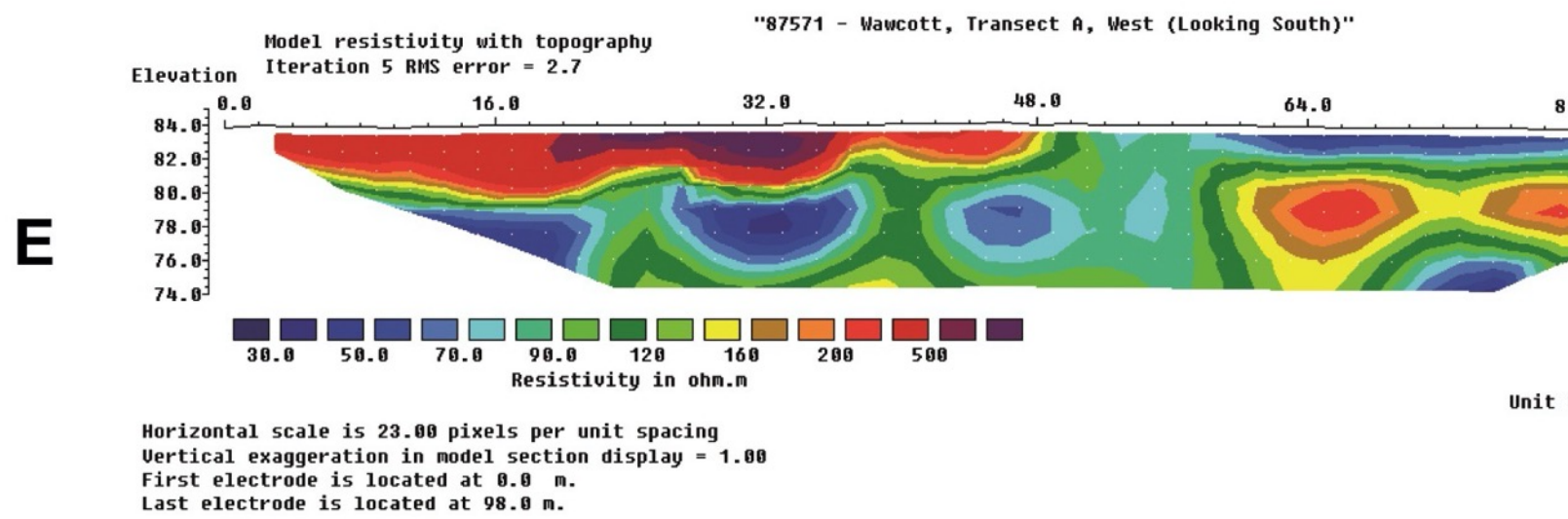
Transects 8 and 9 (**Figure 64**) cover a length of 200m and link together the Wawcott XXX Borehole transect, collected in 2014, and a Gas Pipeline Trench (Jan–Feb 1977). Transects 8 and 9 were each surveyed using the rolling method with an electrode spacing of 2m across a total length of 149m and attained readings to an approximate depth of 10m.

Transect 8 (**Figure 64**; the western part of the transect marked on **Figure 62**) extends from the terminus of Transect 9 for 96m north-west on the same alignment towards the gas pipe-line that was excavated in 1976 (Froom 1976). The eastern half of this transect, 0–48m, shows a strong band of high resistivity with readings in excess of 500Ohm.m. Beneath these high resistivity readings are lower resistivity values, similar to the model seen in Transect 7. Three deposits of relatively low resistivity (30–50Ohm.m) are surrounded by readings of 90–120Ohm.m suggesting variation in the underlying geology. Results from the 2004 borehole transects and the gas pipe-line section show chalky sediments overlain by clay on the north side of the valley. Both clay and chalk can retain water to greater or lesser extents dependent upon the recent weather conditions and as such variation in resistivity as seen in the pseudosection can be encountered.

ERT Transect 7



ERT Transect 8



ERT Transect 9

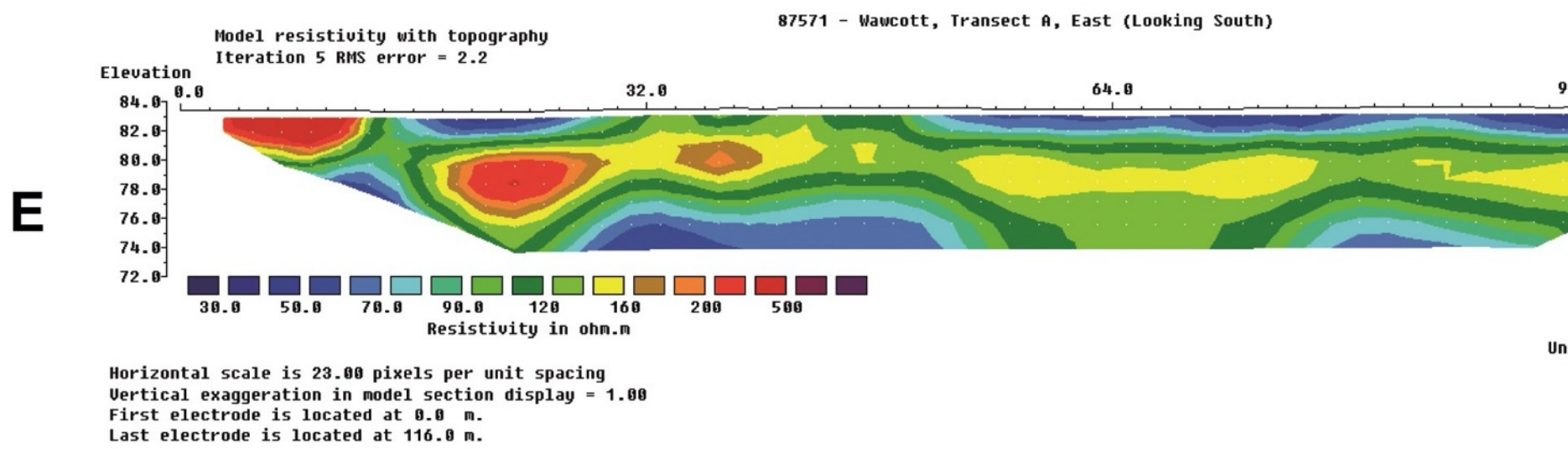


Figure 64: Wawcott ERT transects

The high resistivity band discussed above ends abruptly at 48m, and a break of 16m, displaying resistivity values between 70 and 100Ohm.m, suggests a channel. This channel shows consistent resistivity measurements from the top of the pseudosection to the bottom suggesting a relatively homogeneous fill. The Wawcott XXX BH transect has suggested a potential channel in the eastern part of the transect. As such it is conceivable that further channels are present in the area. This break is made more pronounced by a relatively thin band (0.5–1m) of low resistivity 30–50Ohm.m from 56 to 82m along the pseudosection. This band of low resistivity overlies a band of high resistivity (with values >200Ohm.m) that are characteristic of the gravel deposits seen between 0 and 48m of this transect and also in Transect 7. This band does not show the same level of consistency as the stratigraphically higher section at the beginning of the transect, again suggesting an uneven spread of gravel deposits. The relative low resistivity of the chalk bedrock can be seen underlying this band of high resistivity.

Transect 9 (**Figure 64**; the eastern part of the transect marked on **Figure 62**) overlaps with the Wawcott XXX borehole transect and lies approximately 15m north of Fromm's excavation which took place in 1973–4 (Fromm *et al.* 1993; Fromm 2012). This transect extends for 116m on a south-east to north-west alignment. A short section of high resistivity (with readings >200Ohm.m) has been measured between 0 and 12m, that varies in thickness from 2 to 4m. These readings are consistent with those seen in Transects 7 and 8, and are most likely to be gravel deposits. Beyond this short section of high resistivity the top 1–3m of this pseudosection show resistivity values that fluctuate between 50 and 120Ohm.m. Two stratigraphic models dominate this area: in Transect 7, the southern half of Transect 8 and the south-eastern section of Transect 9 the model is of high resistivity overlying low resistivity readings; whereas the majority of Transect 9 and the northern half of Transect 8 show the inverse. This variation may relate to the variation in fluvial deposits from flooding.

The north end of the Wawcott XXX BH transect shows a sediment stratigraphy of soliflucted chalk overlain by chalky flinty gravel, in turn overlain by silty marl and peat deposits. The stratigraphic sequence shown in the boreholes is comparable with that seen in ERT Transect 9, with *low* resistivity values at the bottom of the pseudosection relating to the soliflucted chalk, high resistivity readings between 82 aOD and 76 aOD relating to the chalky flinty gravel and low resistivity readings at the top of the pseudosection corresponding to the silt marl and peat deposits.

Two potential channels have been identified in the ERT results, between 48m and 56m in Transect 8, *and* between 54m and 76m, in Transect 9. The channel interpreted from the Wawcott XXX BH transect shows an infilling of silt marl, gravel with Holocene marl and tufa, whereas a channel in the 2004 BH transects further to the west has tufaceous marl overlain by a lens of peat followed by tufaceous silty loam and nodule tufa. The material shown as infilling the channels in the boreholes would provide low resistivity readings in comparison to the gravel which is consistent with the measured readings adding credence to their interpretation as channels.

Variations in this stratigraphic sequence shown in the boreholes are present in the ERT results with Transect 8 showing a high resistivity band between 9 and 48m dominating the top 1–4m (84–80 aOD) of the pseudosection, and a similar deposit between 0 and 12m of Transect 9. This is likely to be localised variation in the stratigraphic sequence, and evidence that the silty marl and peat may have been removed during peat cutting during the mid-19th century (Froom 2012).

### ***2004 transect and pollen analysis***

by Leon Fern

In 2004 a dissertation was prepared as part of a MSc in Geoarchaeology at Reading University. It concerned the sedimentary context of the Wawcott sites (Fern 2004). A 600m coring transect comprised 22 boreholes between the area of Wawcott XXXI, to the north, and the Long Blade site at Wawcott XII and the Mesolithic site Wawcott XIII to the south (**Figure 62**). In **Figure 63** the borehole transect is compared with a compilation of the gas pipeline sections prepared in consultation with Froom, and a ditch exposure recorded by Cheetham (1975) and sampled for Mollusca by Holyoak (1980). These sections show an essentially similar sequence. On the north side of the valley, chalky sediments were overlain by clay; south of this the base was gravel. In one borehole clay was overlain by a chalky solifluction deposit. The gravel has a notably uneven surface as in the gas pipeline section. It is overlain by tufaceous marl. At 200m there is a channel in which tufaceous marl is overlain by a 0.53m lens of peat followed by tufaceous silty loam and a band of nodular tufa. South of this the uneven gravel surface is variously overlain by tufaceous marl, nodular tufa or tufaceous silty loam.

Pollen analysis of a sequence from the palaeochannel (location on **Figure 63**) helps to clarify the environment and chronology represented by this sequence, especially when compared to the dated pollen sequence at Thatcham reedbeds (Chisham 2004; Barnett 2009). Above the gravel at the base of the sequence was silty algal marl characterised by a largely open landscape with sedges, *Poacea* and *Ranunculus* and some *Betula* and *Pinus*, which is consistent with a late glacial origin. The peat layer in the channel was characterised at the base by *Betula* and *Pinus*; this corresponds to a horizon at Thatcham reedbeds dated c. 9000 cal BC. Half way up the peat sequence *Alnus* appears as it does at Thatcham at c. 8000 cal BC. Other deciduous taxa such as *Quercus*, *Tilia*, *Ulmus* and *Fraxinus* only appear in the overlying tufaceous sediment and these are also represented at Thatcham from c. 8000 cal BC. It is clear therefore that the palaeochannel dates from the *Betula* and *Pinus* phase of the early Holocene. This channel is about 40m south of Wawcott XXXI which is an artefact scatter which has not been excavated or dated. Some of the channel fill sediments may be contemporary with that site.

### *2013 borehole transects*

By Martin Bell

As a small-scale case study it was decided, in consultation with Roy Froom, to investigate two transects on the floodplain across Wawcott XXIII and XXX (**Figure 62**); both of these sites had been subject to quite extensive excavation which showed that the sites were buried within a defined stratigraphic sequence and in each case there were surface topographic indications of nearby palaeochannels.

Geophysics were also employed on each transect: ERT investigations were carried out by Wessex Archaeology (Paul Baggaley and Ross Le Fort) and Ground Penetrating Radar by English Heritage (Neil Linford). The results of the ERT investigations are presented above; the GPR surveys have not been included. The combination of geophysics and coring was also employed at Ufton Bridge (Bell *et al.* 2015b) and Thatcham as part of this project and on three sites for the related project on the Mesolithic of the wetland edge in the Somerset Levels (Bell *et al.* 2015a).

One day's coring was done at each of the two sites on 29<sup>th</sup> and 30<sup>th</sup> May 2014. The deeper cores were taken with a cobra percussion corer which took 1m length, 50mm diameter cores in plastic sleeves. These were then taken back to the laboratory, cut open, described and sampled. Other boreholes were obtained using a 20mm diameter gouge auger; these were described in the field using standard forms for the Kennet Valley geoarchaeological survey. Samples were taken from each sedimentary unit so that, where necessary, descriptions could be checked by analysis in the laboratory.

#### *Wawcott XXX Transect*

This site was found by Roy Froom in fieldwalking in 1970 and area excavations took place between 1973–4 with some further work in 1988 to obtain samples for dating (Froom *et al.* 1993; Froom 2012). The excavation sections (**Figure 65**) show basal gravels interleaved in places with marl and overlain by silty soil; in places the soil was stone-free and elsewhere stony. Artefacts were concentrated below the top of this soil but above its base. The soil was sealed by marl and peaty soil. Froom (2012) notes historical evidence for peat cutting in this area during the mid-19<sup>th</sup> century and argues that 1–2m of peat may have been removed.

The probable area of the original excavations was indicated by roughly rectilinear unevenness of the ground. The total area excavated was 126 sq yards (*c.* 105 sq m). A total of 7,260 artefacts were found, with six distinct activity clusters 1.5–2m in diameter. The assemblage included 33 microliths of which 22 were obliquely blunted points, six axe/adzes, 16 scrapers and 18 burins. There was also a worked antler point or bodkin tip. Typologically the assemblage was Early Mesolithic. Forty-three animal bones were found of elk, aurochs, red deer, roe deer, wild pig and badger.

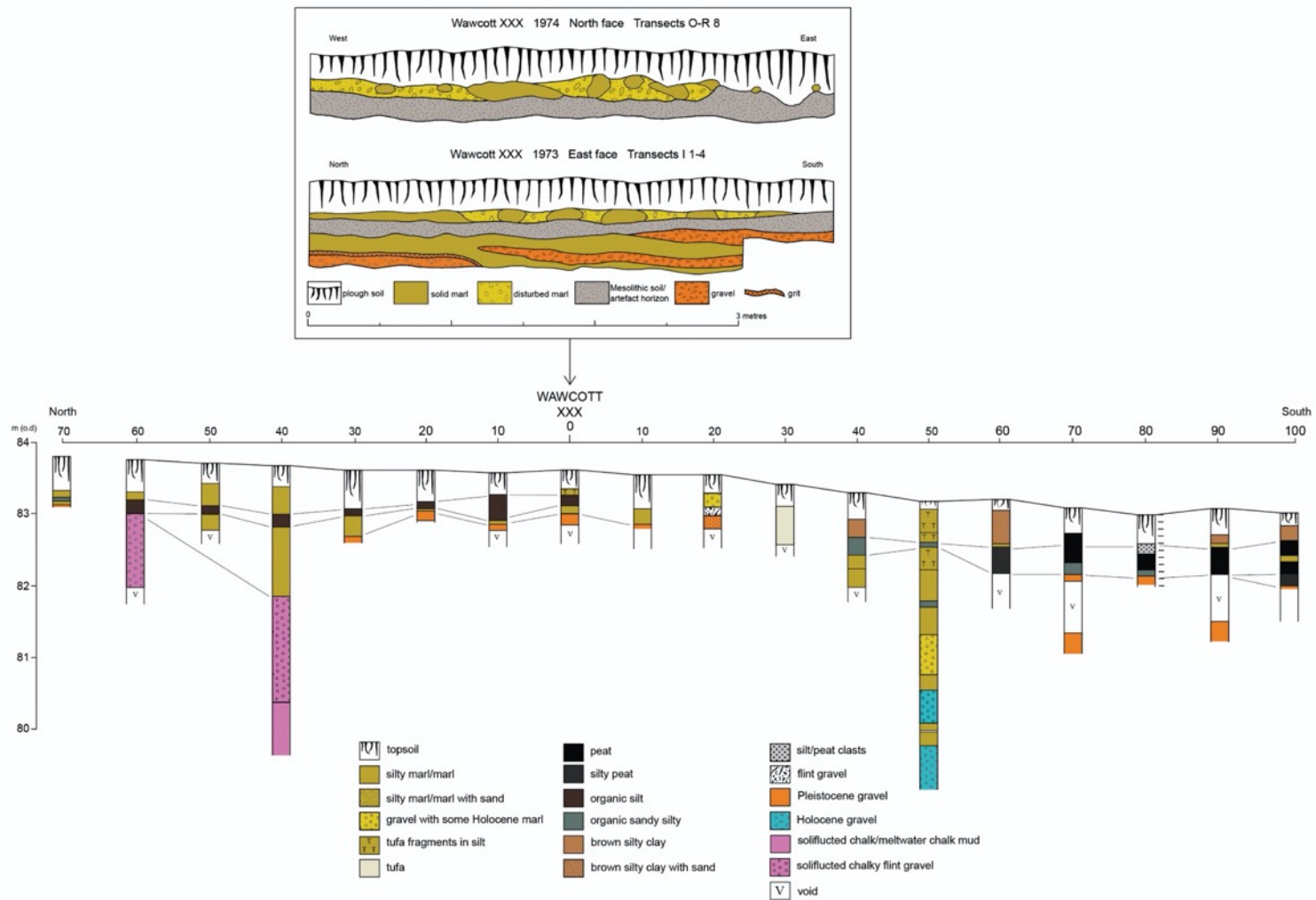


Figure 65: Borehole transect across Wawcott XXX: the inset shows Roy Froom’s 1973–4 sections of the excavation (from Froom 2012, Fig 2.3) (graphic A.D. Brown)

Two radiocarbon dates were obtained, both on bulked bone samples (Froom 2012, 75). One comprised elk and aurochs and dates to 11120–10740 cal BC (BM-2718; 10960±100 BP) and the second on *Bos* to 5320–4790 cal BC (BM-2719; 6130±100BP). Thermoluminescence dating of burnt flints produced a date of 8400±500 BP (c. 6400 cal BC). The interpretation of radiocarbon dates obtained from samples of bulked bone are problematic as they could derive from material of different ages and the measurement is therefore an average of the sample material; these dates span the late glacial and most of the Mesolithic. The first date might suggest the possibility of late glacial activity on the site, while the other dates are Late Mesolithic and may suggest that some activity continued into this period.



Figure 66: Coring at Wawcott XXX with Roy Froom on the right (photo M. Bell)

The 2014 borehole transect (**Figures 65 and 66**) was immediately west of the excavation site and ran 70m north of the original excavation and 100m to its south. At the north end the basal sediments were soliflucted chalk overlain by chalky flint gravel, comparable with the chalky sediments at the north end of Fern's transect (**Figure 63**). To the south was a very uneven surface of Pleistocene flint gravel. North of Site Wawcott XXX soliflucted chalk and gravel were overlain by marl on which an organic silty soil had developed and was sealed in places by marl. **Figure 67** (left) shows the section at 0m on the transect (ie just west of the excavated site). Gravel is overlain by calcareous marl and above this there are indications of soil development which correspond to the artefact horizon in the excavation section. This land surface becomes increasingly organic and peaty and is overlain by peaty marl. The same soil horizon is seen above clay marl at 20m and 40m north and above chalky solifluction deposits at 60m north (**Figures 67 and 68**), so the land



surface associated with Mesolithic activity extends at least 60m north of the site and is buried at depths between 0.4 and 0.65m below later Holocene sediments. This accords with Froom's prediction (2012, 75) that parts of the site were likely to be more deeply buried, perhaps concealing other concentrations of artefacts not brought up by cultivation. At 50m south (**Figure 65**) was a former channel of which there were indications in the surface topography. Boreholes showed this was at least 4m deep. Gravels in the lower part were in an organic matrix which suggested the channel was Holocene. Above this were clay marls, organic silty clay and then, in the axis of the former channel, tufa. South of this channel the gravels were capped by organic silty clay in one borehole and then peat with brown silty clay above. Comparison of the borehole transect and the excavation sections indicate that the Early Mesolithic site was within the minerogenic old land surface developed on calcareous marl; that land surface became increasingly silty and organic reflecting a rising watertable and perhaps occasional inundation. Since the channel has peaty sediments both to its south and north it seems likely that the channel cuts the peaty sediment and is later than both the excavated site and the peaty top. Samples from the peaty sediments and the channel were sieved and some plant macrofossils were recovered but the quantity proved to be insufficient for radiocarbon dating. Nonetheless the section shows that there are suitable deposits both south and north of the excavated site for environmental analysis and radiocarbon dating, although these would be best obtained from small-scale excavation where the context can be investigated in detail rather than boreholes.

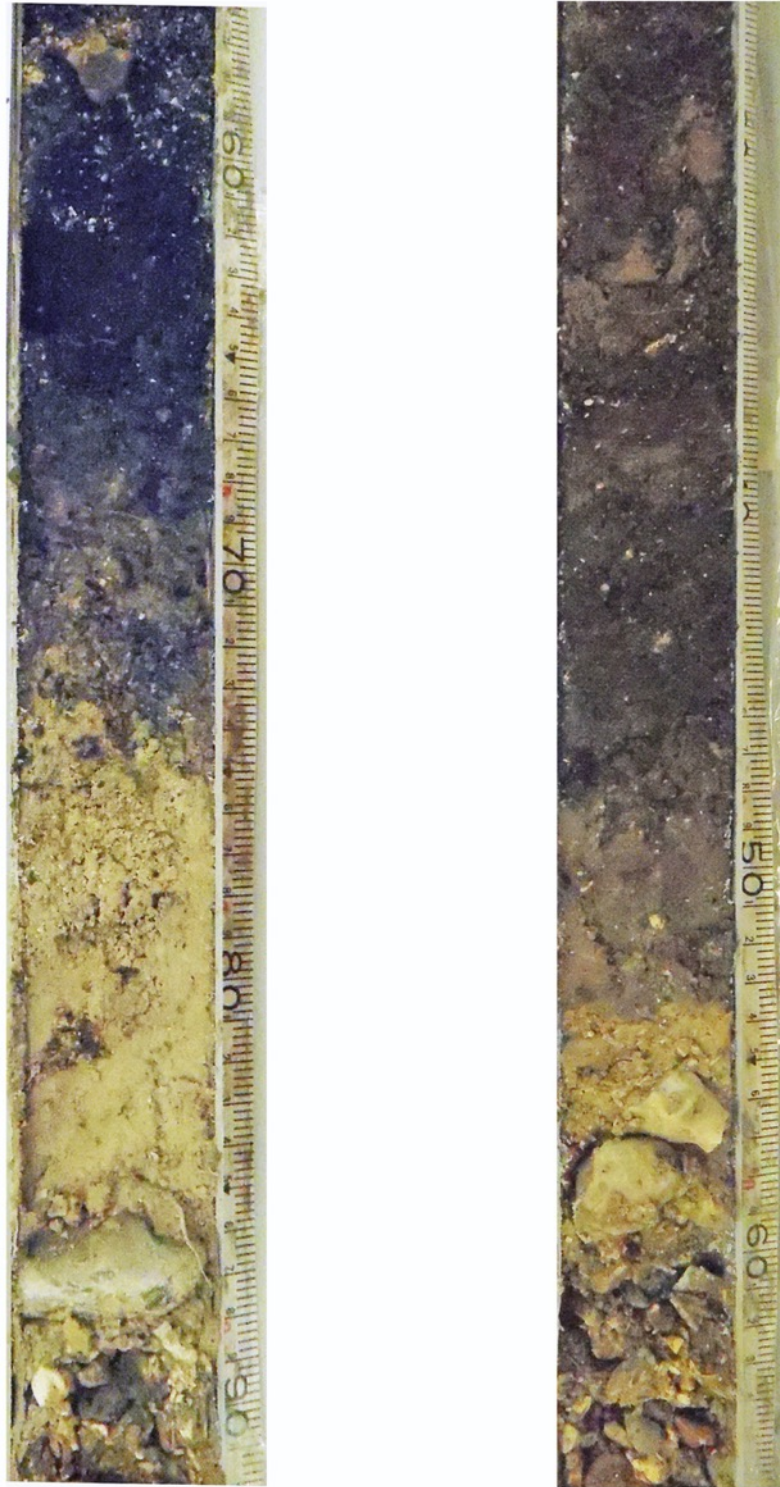


Figure 67: Wawcott XXX: (left) Borehole close to excavation site (0m), depth 0.57–0.92m, (right) Borehole at 20m north of site, depth 0.28–0.61m (photo M. Bell)



Figure 68: Wawcott XXX: (left) Borehole at 40m north of the site, depth 0.59–0.90m, (right) Borehole at 60m north of the site, depth 0.53–0.86m (photo M. Bell)

### *Wawcott XXIII Transect*

The discovery of flints in molehills by Froom in 1967 was followed by the excavation of Wawcott XXIII in 1968, 1971 and 1975 (Froom 2012, Ch7). An area of 46 sq m was excavated on a slight rise at 85.25m OD which is today capped by some scrub bushes. The sequence revealed by the excavation section (**Figure 69**, Trench 1) from the base upwards was (i) ochreous silt, (ii) brown silt, (iii) peaty soil, (iv) marl, (v) thin peat band, (vi) marl, (vii) alluvial silty topsoil. The artefacts came both from the ochreous silt (6471 flints) and the peaty soil and brown silt (4968 flints). In total the site produced 12,275 flint artefacts of which 145 were microliths; there was a predominance of small geometric forms and the site is considered typologically Late Mesolithic. This is confirmed by a single radiocarbon date obtained from Froom's excavation on charcoal from a hearth of 5310–4710 cal BC (BM-826; 6079±113BP). The assemblage was very similar to Wawcott III, 1.4km to the north-west on the northern floodplain edge, which produced a statistically consistent radiocarbon determination ( $T'=0.1$ ;  $T'(5\%)=3.8$ ;  $v=1$ ; Ward and Wilson 1978; BM-767; 6120±134 BP; 5370–4710 cal BC). This site is also significant among the Wawcott sites in producing a small assemblage of 20 identifiable animal bones: red deer, aurochs, wild pig, and horse. Horse is not otherwise known in Britain at this date so the bone may not be in context. There was also one human tooth; charcoal was common and hazelnuts were found.

The 160m long borehole transect ran west to east from the edge of the embankment of the Dundas Stream to the River Kennet embankment in the east (**Figures 62 and 69**). Fourteen boreholes were put down with an additional five at right angles north of the transect at 45m where the excavation had taken place. At the base of the sequence were Pleistocene gravels representing a very uneven surface between 81.2 and 84.6m OD. The boreholes suggest that a gravel rise accounts in part for the raised area where the excavation took place. At the west end of the transect in one borehole at 25m the gravel is overlain by clay marl but mostly it is overlain by the brown sandy silt which was found at the base of the excavations. Around the excavation area the sandy silt was covered by organic silty clay representing the peaty top of the old land surface found in the excavation. Borehole 50m shows a sequence (**Figure 70**, left) which corresponds closely with that described and illustrated from the excavation sections. At the base is silty sediment with evidence of organic soil development on its surface and marl above this. A radiocarbon sample came from the top of the sandy silt immediately below the organic soil very much in the position where the main concentration of artefacts had been reported. Borehole 70m shows a closely similar sequence of sandy silt overlain by a soil with a peaty top (**Figure 70**, right). In four boreholes in the excavation area the stratigraphy above the brown silty clay was mixed silt, marl and peat and this is thought to represent backfill of the 1970s excavation. To the east of the excavation site there is a marked depression in the gravel surface representing a palaeochannel at 110m (**Figure 69**). The base of this channel has a gravel fill with organic matrix suggesting a Holocene date. Above this is clay marl, organic sandy silt becoming peaty upwards, then brown sandy silt and more peat. Borehole 130m is in the position of Froom's site Wawcott IX. The inset at the top right of **Figure 69** shows the section Froom (2012, Fig 6.3) published of this site. The upper part closely replicates what was found in the borehole with two peat bands separated by sandy silt. In Borehole 130m the lower peat was underlain by organic silty clay which was

not present in the excavation trench. Site IX was not extensively excavated and only produced small numbers of artefacts: some burnt stone in the upper peat and flints at all depths in the silty clay above.

Samples were sieved and plant macrofossils were collected from a number of stratigraphic horizons in this transect but unfortunately only two samples were of sufficient size for radiocarbon dating. A sample from the base of the channel at 110m produced a date of 9650–9280 cal BC (UB-27332; 9920±49 BP), thus demonstrating that the channel is very early Holocene and perhaps quite close in date to the Long Blade site XII which lies some 400m to its east. The other date is from borehole 50m at 0.55–0.68m (**Figure 72**, left) and is charcoal from the position of the occupation horizon close to the original excavation. This date was 6000–5830 cal BC (UB-27332; 7026±37BP). This is earlier than the original British Museum date from Froom's excavation but it does confirm that the site is later Mesolithic, perhaps indicating that activity extended over a millennium.

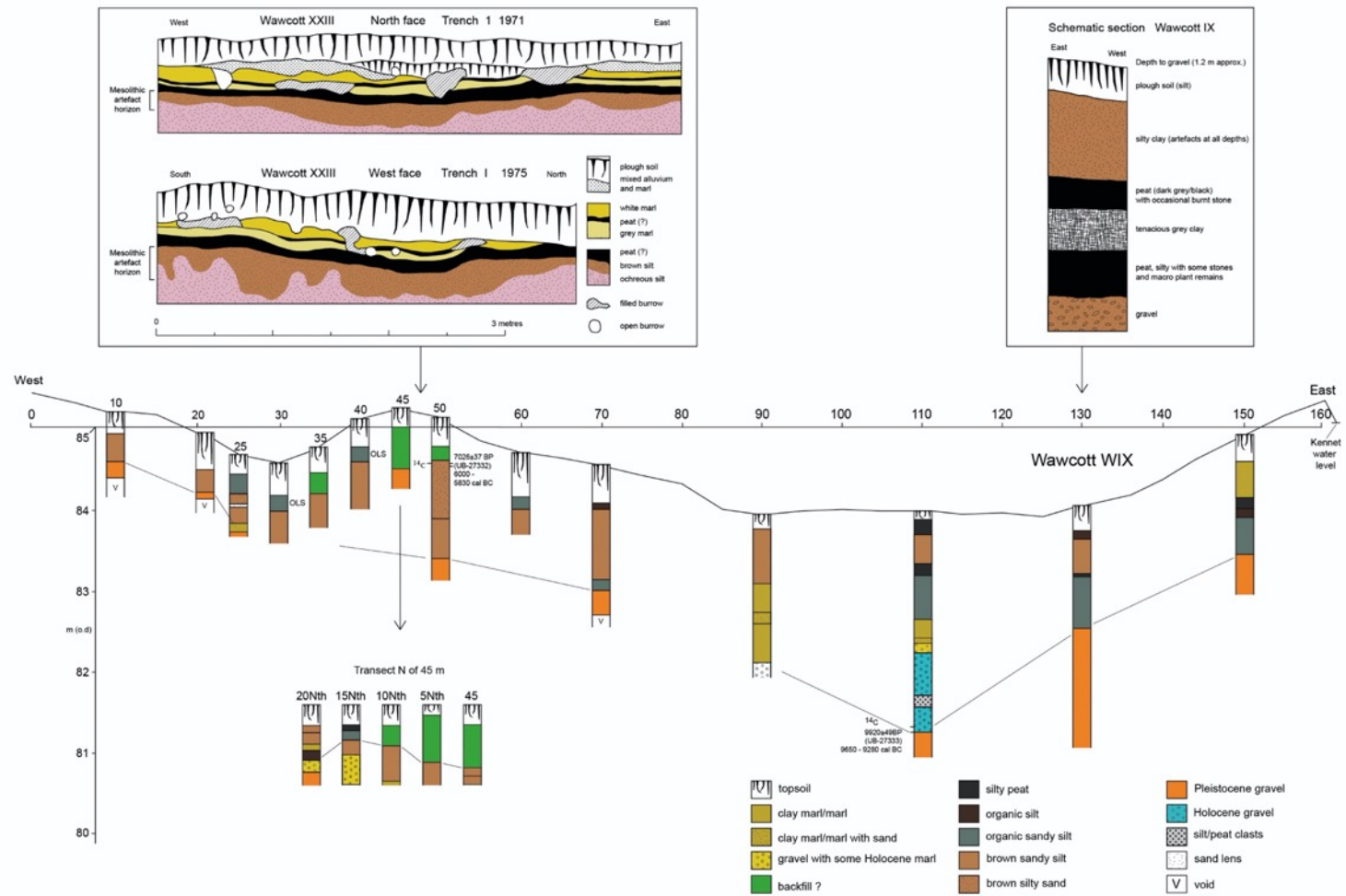


Figure 69: Borehole transect across Wawcott XXIII and Wawcott IX: the insets show Roy Froom's sections of the excavation of 1971 and 1975 (from Froom 2012, Figure 7.3 and 6.3) (graphic A.D. Brown)

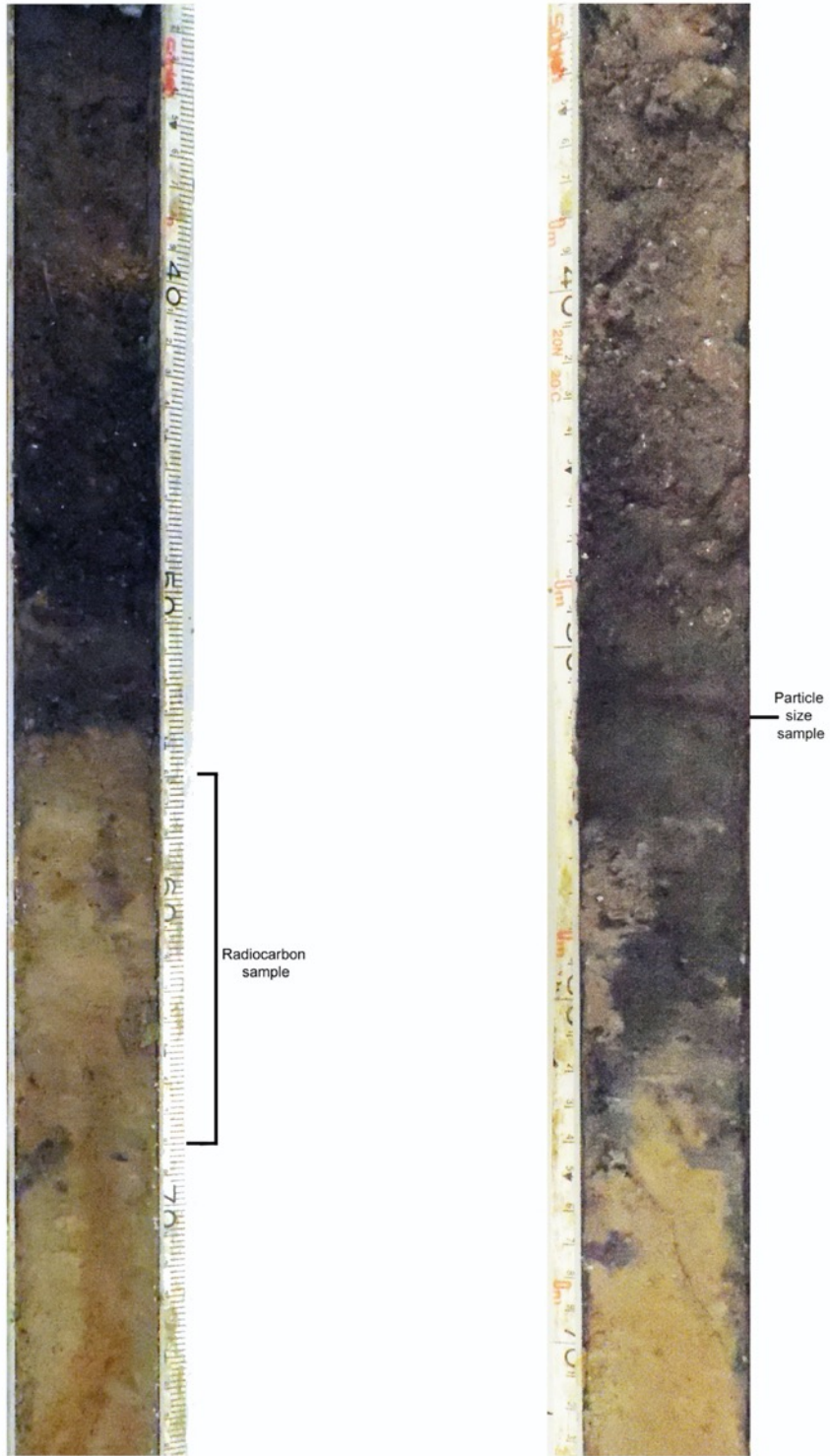


Figure 70: Wawcott XXIII: boreholes at 50m, 0.38-0.78m and at 70m, depth 0.34–0.72m (photo M. Bell)

### *Particle size and elemental analysis*

by Chris Speed

Particle size analysis of the <2 mm fraction was carried out in order to characterise key sedimentary units. This used a laser granulometer Malvern Instruments Hydro Mastersizer 3000 with PIDS; the sediment was dispersed in 2 ml of calgon. For the Wawcott XXX transect the sediments (**Figure 71**, bottom) were predominantly sandy silts with the proportion of silt varying between 30 and 90%, most being over 50%. Samples from the palaeochannel at the 50m south borehole were more sandy, reflecting higher energy conditions; gravel was also present in the channel fill.

In the case of the Wawcott XXIII transect, one of the key questions concerns the origin of the brown sandy silt which capped the gravel in the area of the excavation and on which the soil developed in which the Mesolithic artefacts were found. Particle size analysis helps to clarify its origin (**Figures 71** and **72**). In Borehole 50m, 1.65m depth above the gravel, the sediment is unimodal but not well sorted. It is predominantly fine silt with some clay and fine sand; the most probable environment seems to be deposition under low energy conditions perhaps in a water body. A sample at 0.8m (ie just below the photographed section in **Figure 70**, left) has a strong unimodal peak on the coarse silt and very fine sand. There is no medium or coarse sand but there is a tail of medium and fine silt and some clay. This may be suggestive of aeolian deposition, perhaps with a component of loess, but more probably, given the very fine sand, from local deflation of an unvegetated landscape which implies a Pleistocene origin. It is notable that Froom (2012, 17) suggested that calcareous marl above the gravel at Wawcott XXX may be wind-blown chalk dust. Particle size analysis of the borehole at 70m shows a very comparable picture. A sample at 1.5m has a strong peak in the coarse silt and very fine sand. A sample at 1.2m comprises 16% clay, 46.5% silt and 36% sand. This showed a pronounced peak in the very fine sand and coarse silt. A sample from 0.52m, ie, the organic top of the old land surface (location on **Figure 70**, right), again shows the peak of very fine sand and very little medium and coarse sand but a secondary peak of fine and medium silt and clay. Thus the soil developed on the underlying sediment of probable aeolian origin but may have been subject to some fine-grained alluvial input. Given the dating evidence presented in the previous section it seems unlikely that the brown sandy silt on which the occupation soil developed between 10 and 70m is the same as the brown sandy silt in the palaeochannel between 90 and 130m, though the latter may well have been derived from the former.

Elemental analysis was carried out using Inductively Coupled Plasma Optical Emission Spectroscopy using a Perkin Elmer 2130 machine (**Table 4**). In the Wawcott XXX transect, analysis focused on the organic silty unit interpreted as an old land surface within which the artefacts lay. This unit was characterised by very high calcium content, indicating that the soil had formed on the highly calcareous marl, which in places overlay gravel. This is the deposit which Froom (2012, 17) had suggested was wind-blown chalk dust: this analysis strengthens that interpretation. Iron, aluminium, magnesium and potassium also had high values. Phosphorus was also high, supporting the interpretation that this was a land surface; enhancement may be due to human activity. The results from this transect



are comparable to those from the highly organic silts associated with Mesolithic activity at both Ufton Bridge and Victoria Park, as **Table 4** shows.

In the case of the Wawcott XXIII transect, a sample from the 70m borehole at depth 0.52m showed that the sediment was predominantly calcium; aluminium, iron and manganese were also present and iron deposition was evident lower in the profile. Phosphorus values were lower than those from Wawcott XXX, Victoria Park and Ufton Bridge. Two samples were analysed from the borehole at 150m, a sample of silty peat at 0.97m had low calcium and phosphorus and is probably not the same organic horizon as that associated with the site. A sample of organic sandy silt at 1.8m was characterised by abundant calcium.

Sample	Victoria Park Sample 16 Context 102	Victoria Park Sample 15 Context 105	Ufton Pit CC Organic soil	wXXX 80m 0.83m OLS	wXXX 80m 0.77m OLS	wXXX 40m 0.8m OLS	wXXX 40m 0.7m OLS	wXXX 0m 0.38m OLS	wXXII I 70m 0.52m	wXXII I 150m 1.8m	jwXXIII 150m 0.97m
Aluminium	12208.3	15943.7	38789.3	8441.9	5247.5	10439.9	9715.9	14006	30315.1	42383.5	18042.5
Barium	70.61	55.49	105.7	41.20	28.15	28.70	30.68	38.91	102.95	12340	41.59
Bismuth	54.44	27.75	116.1	63.31	30.05	13.70	20.19	23.18	50.26	81.74	36.01
Calcium	101788.09	106043.88	14543.7	60882	50599.01	148030.5	96620.3	72030.06	17840.18	13179.79	3048.43
Cadmium	0.61	0.23	0.9	0.00	0.20	0.00	0.16	0.21	0.39	0.22	0.02
Chromium	23.29	21.12	10.8	12.19	17.91	9.50	10.35	18.61	45.66	50.54	29.63
Copper	33.51	13.69	65.9	1.11	20.60	4.48	8.24	7.18	27.96	20.62	5.29
Iron	21292.55	15163.36	37412.8	29599	17106.91	7108.94	8759.50	10277.01	20341.15	32215.61	13830.73
Gallium	9.50	13.50	21.9	18.33	6.11	2.58	11.26	2.44	4.77	31.40	4.42
Potassium	841.89	1346.52	2456	1275.23	630.53	1488.23	1199.50	1654.15	3179.79	3964.81	2647.13
Lithium	6.79	10.23	45.3	4.35	1.70	7.71	6.82	10.07	19.37	31.42	12.82
Magnesium	1500.44	2447.12	5401	1583.60	933.58	2298.26	1777.74	2043.93	2983.75	3876.67	2392.82
Manganese	289.92	171.66	132.3	61.94	45.69	169.57	109.32	76.86	158.83	88.05	66.37
Sodium	83.69	102.92	114	233.03	158.30	177.40	130.85	120.53	71.19	117.06	56.43
Phosphorus	4556.14	4105.32	732.2	3717.50	3945.31	5830.41	5451.89	3944.44	1901.20	2134.42	545.85
Lead	43.11	26.46	5.5	7.15	6.54	4.10	4.34	7.14	8.74	12.19	5.84
Strontium	90.46	109.87	50.7	96.20	82.88	183.08	112.13	71.64	44.18	50.87	16.24
Zinc	270.74	38.52	102.7	26.35	19.61	4.77	7.51	17.12	132.71	115.15	43.85

Table 4: Elemental analysis of Wawcott samples using ICP-OES, values expressed as mg/ kg. The Wawcott samples are compared with organic silts on old land surfaces with artefacts at Victoria Park and Ufton Bridge (by C. Speed).

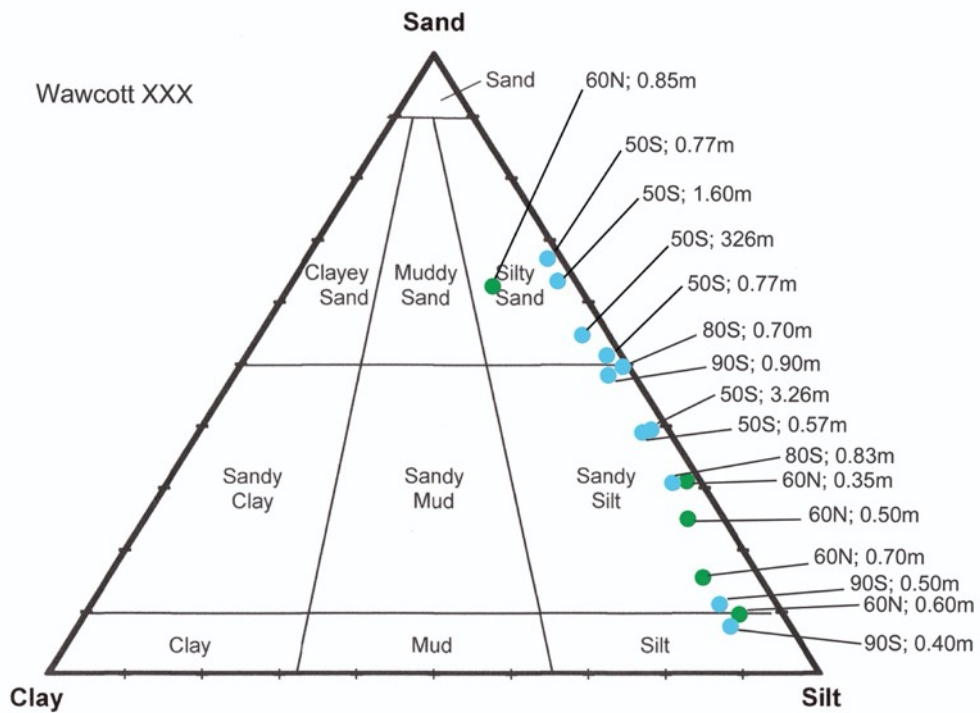
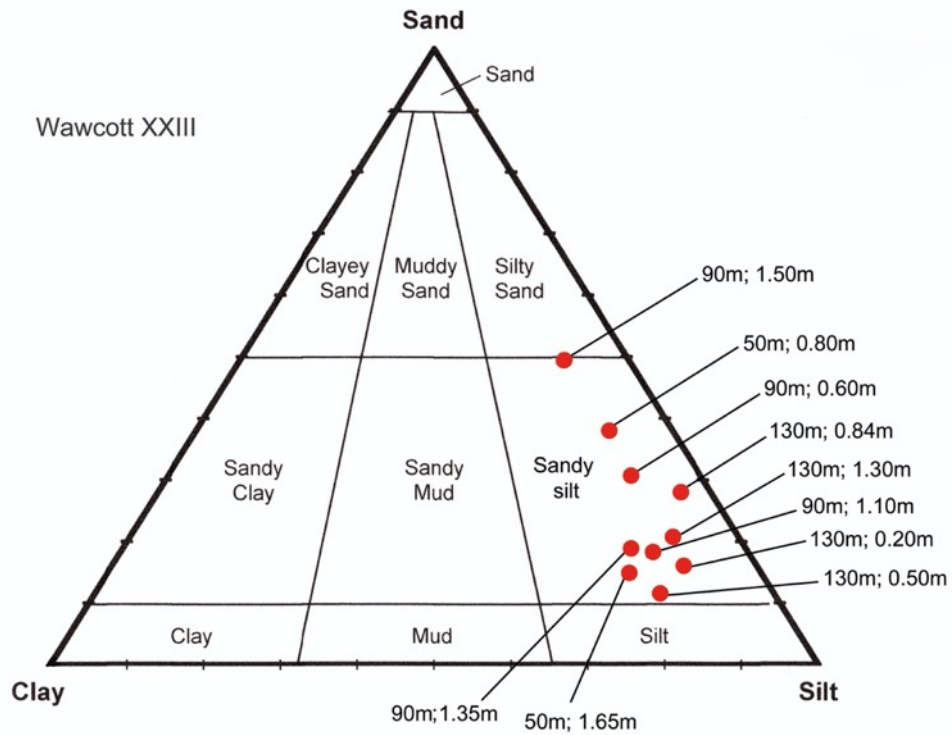


Figure 71: Particle size analysis of the <2mm fraction from Wawcott XXIII and Wawcott XXX (by C. Speed)

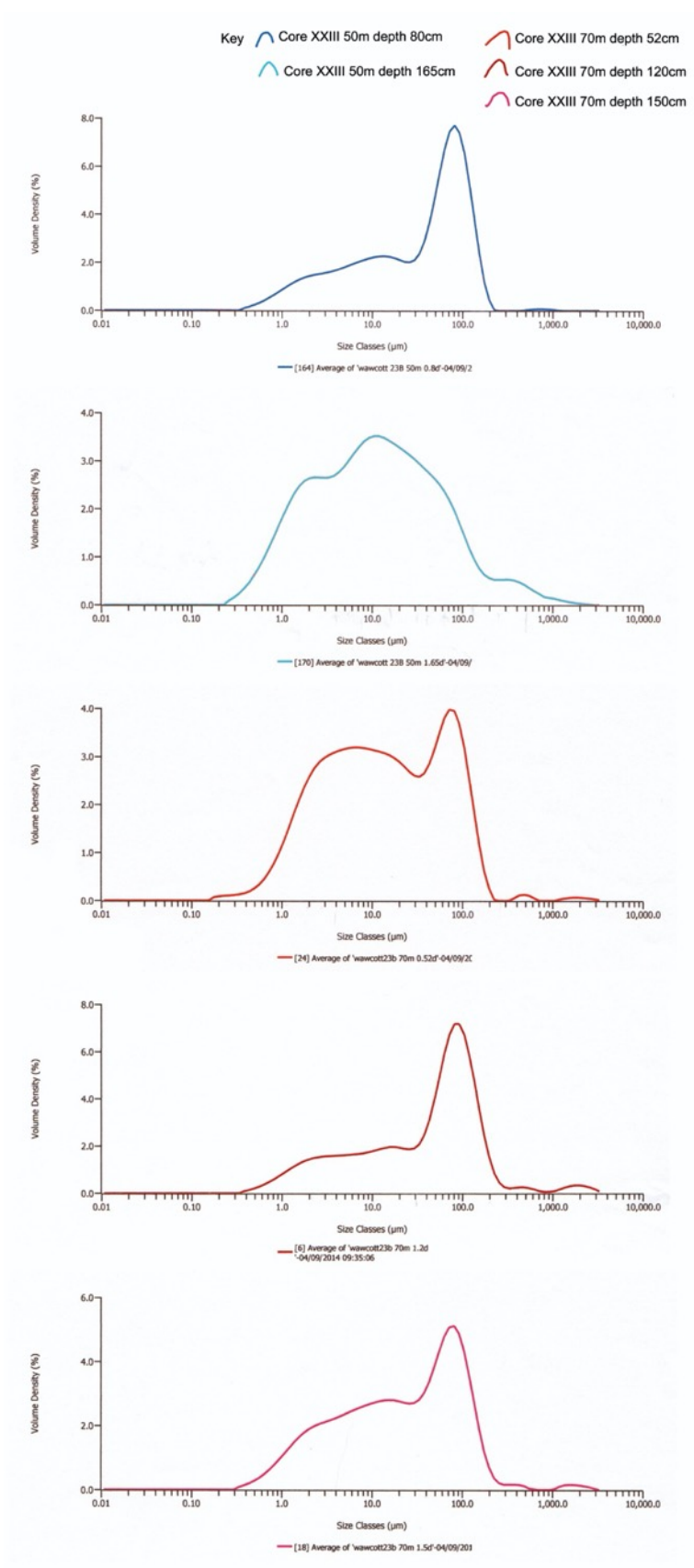


Figure 72: Particle size analysis of samples from Wawcott XXIII Boreholes 50m and 70m (graphic C. Speed and J. Foster)

## *Radiocarbon dating*

By Peter Marshall

Wawcott XXX and XXIII are two of the most extensively excavated Mesolithic sites in the Wawcott survey area (Froom 2012).

The preservation of plant macrofossils in the cores from Wawcott XXX was limited and those that did survive had very low mass (<10mg); even attempts to bulk together material where it was present failed to produce sufficient mass (>60mg) to warrant submission for radiocarbon dating. Hence all the cores from Wawcott XXX unfortunately remain undated.

Wawcott XXIII was chosen due to its later Mesolithic artefact assemblage, because the sections (Froom 2012, fig 7.3) showed the Mesolithic artefacts were sealed within a clear stratigraphic sequence and there was evidence of a deeper palaeochannel 60m east of the site. Despite extensive efforts to identify suitable plant macrofossils from the cores only three samples were submitted for dating (Table 5) and of these one, GU35795, failed as it produced insufficient carbon.

Lab No	Sample reference	Material & context	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)	Calibrated Date (95% confidence)
UBA-27332	50m_0.56–0.68cm	Mature wood, single fragment, (C Barnett, Wessex Archaeology), from coring transect at 50m (ie, within about 5m of Froom's (2012) excavated site) and a depth of 0.56–0.68m in the core	7026±37		6000–5830 cal BC
UBA-27333	110m_2.6–2.7m Sample A	Herbaceous stems, 2 fragments, charred (C Barnett, Wessex Archaeology), from coring transect at 110m and a depth of 2.6–2.7m in the core	9920±49	–29.9	9650–9280 cal BC
GU35795	110m_2.6–2.7m sample B	Twig, charred, unidentified (C Barnett, Wessex Archaeology), as UB-27332	Failed insufficient carbon		

Table 5: Radiocarbon dates from Wawcott XXIII 2014 boreholes (by P. Marshall)

The single date from a depth of 0.56–0.68m in the core at 50m, within about 5m of Froom's (2012) excavated site, calibrates to 6000–5830 cal BC (UB-27332; Table 5). A robust interpretation is problematic given the existence of only two radiocarbon dates and the potential for unknown age-at-death offsets (Bowman 1990) in both of the samples from the excavated sites (Marshall *et al.* 2015, Tables RC4 and RC9). It is thus conceivable, but unproven at present, that organic deposits are preserved within 60m of the occupation site.

The second sample was of charred herbaceous stems from the basal channel fill at a depth of 2.6–2.7m from the core taken at 110m; this established a date for the channel of 9650–9280 cal BC (UB-27333; **Figure 73**). It is therefore doubtful whether organic deposits contemporary with occupation at Wawcott XXIII are present at 110m from the site although overlying sediments were organic and could be contemporary.

#### *Interpretation*

Based on the very small number of scientific dates (TL and radiocarbon), Mesolithic activity at Wawcott seems to extend later than the other sites in the middle Kennet (**Figure 74**). However, the number of dated samples is extremely small and assessment of the archive for suitable single-entity short-lived samples associated with human activity would allow for a better understanding of the chronology of activity in the area.

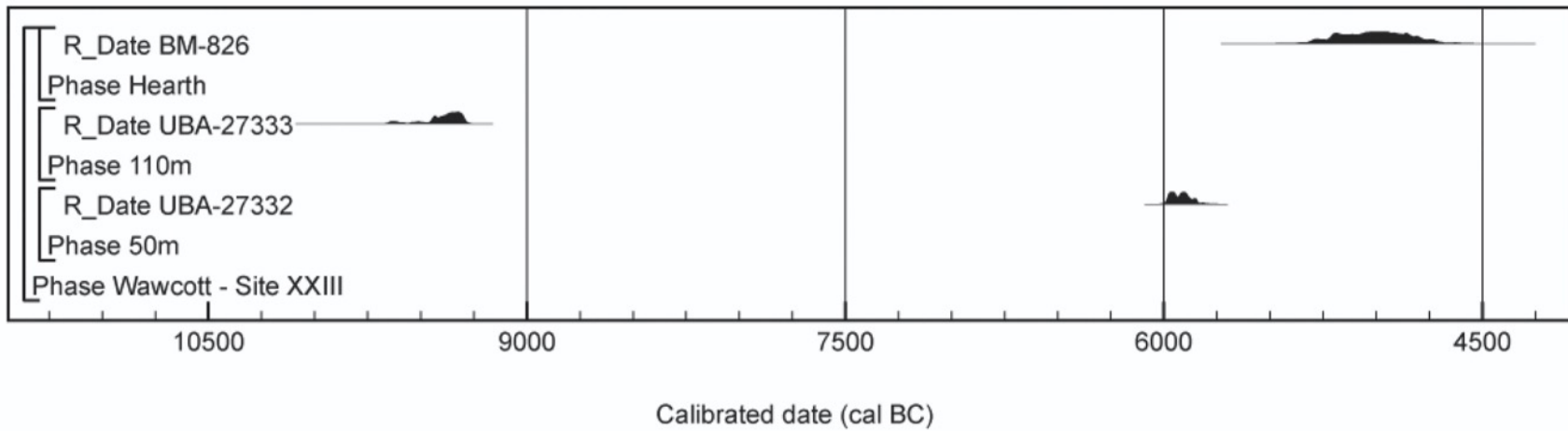


Figure 73: Probability distributions of dates from Wawcott, Site XXIII – from the cores and archaeological site. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

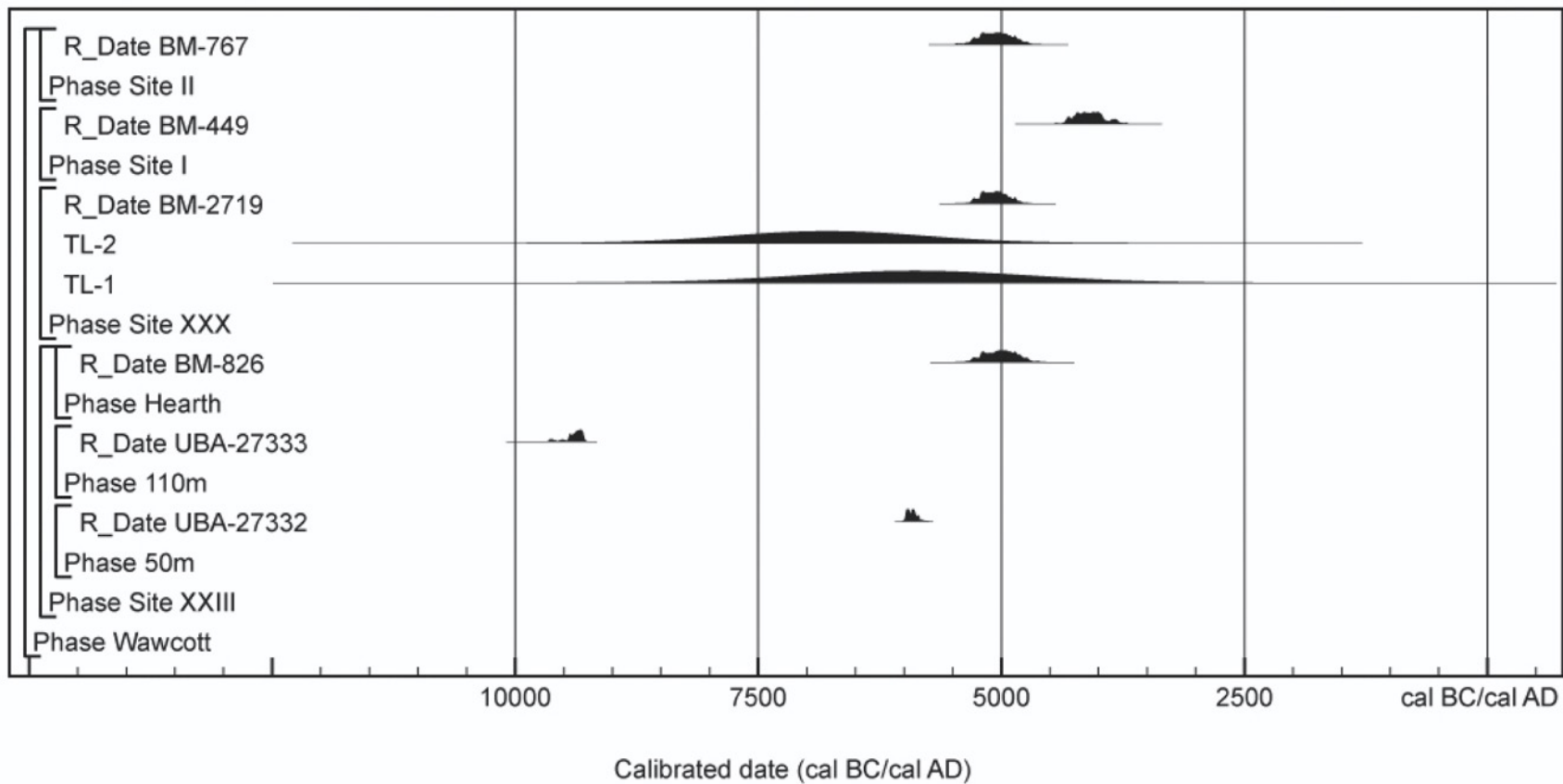


Figure 74: Probability distributions of dates from Wawcott – from the cores and archaeological sites. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).



## *Conclusions*

By Martin Bell

The Wawcott case study within this project was small-scale. Just two days borehole work in the field focused on two of the most productive sites: Wawcott XXX, which is typologically Early Mesolithic, and Wawcott XXIII, which is typologically Late Mesolithic. The investigation was able to build on the long history of excavation and careful observation by Froom (2012) and also on the geoarchaeological dissertation of Fern (2004). It is clear that the stratigraphy is spatially varied and complex with many channels and sedimentation on a very irregular gravel surface. This surface and the overlying stratigraphy is comparable to what has been recorded at Ufton Bridge (see above) and parts of the sequence are comparable to many of the other Kennet Valley sites. At the west end of the Wawcott XXIII transect the gravel is overlain by brown sandy silt which was the surface on which the excavated Mesolithic horizon developed. On the basis of its particle size distribution (predominantly very fine sand and coarse silt) it has been suggested that this unit may be of local wind-blown origin. The predominance of calcium in the ICP sample at 70m (**Table 4**) suggests derivation from the chalk. The hummock on which the site was located may therefore be a low river dune capping a gravel rise. Froom (2012, 212) reports a similar sediment associated with the Wawcott III site on the north edge of the floodplain (Froom 1976).

At Wawcott XXIII the palaeochannel 60m east of the site was shown by radiocarbon dating to be very early Mesolithic. It is comparable to the date inferred from pollen evidence for the palaeochannel identified in Fern's (2004) transect. Very early Holocene palaeochannels are of note because they may be broadly contemporary with the Wawcott XII Long Blade site which is 400 and 450m from the two channels. It is also probable that the channel east of Wawcott XXIII was still accumulating organic sediment at the time of the later Mesolithic site.

At Wawcott XXX the stratigraphic evidence suggests that the nearest palaeochannel, with a tufa marl fill, may post-date the Early Mesolithic site. However, the gas pipeline revealed other nearby palaeochannels (**Figure 65**) with peat fills which may be broadly contemporary with the site.

Wawcott XXX and XXIII were both characterised by occupation on a minerogenic soil surface which was an organic silt with a peaty top. This is interpreted in terms of a dryland soil which became wetter and peaty with time. In the case of Wawcott XXX the artefacts were within the soil and sealed by marl. At Wawcott XXIII the artefact horizon was below the peaty top. The organic horizon is comparable, being characterised by high calcium, to that found at Ufton Bridge and Victoria Park as the elemental analysis in **Table 4** shows. At Ufton Bridge the artefact horizon was mainly below the black layer with some artefacts within it (Bell *et al.* 2015b). At Victoria Park the artefacts were mainly within the black layer with a smaller number in the minerogenic old land surface below. Ufton, Victoria Park and Wawcott XXX are Early Mesolithic and Wawcott XXIII Late Mesolithic. This suggests that the black layer does not represent a single chronological horizon, but is likely to have formed over time transgressively as soils became wetter and subject to periodic inundation reflecting their differing heights on the floodplain. Overall

this black silt deposit reflects a situation of increasing wetness across the floodplain to which it is likely that beaver activity contributed (Coles 2006).

This study has helped to put the Wawcott sites in a broader stratigraphic context which can be related to the overall sedimentary model for the middle and lower Kennet. The contribution of this project to dating the sites was more limited than hoped. Despite the sieving of many samples from the boreholes, suitable material was found for only two dates, both associated with the Wawcott XXIII transect. This serves to highlight the conclusion from experience in this project at Ufton Bridge and Victoria Park, as well as related studies of the wetland edge on the Somerset Levels (Bell *et al.* 2015a; Bell 2015), that geophysics and borehole investigations are at their most effective when combined with small-scale excavations to obtain environmental and dating samples. The locations of these can be very precisely targeted using the borehole and geophysical records.

## Thatcham Reedbeds

by Catherine Barnett

### *Introduction*

Thatcham Reedbeds (NGR 450505 166764) is a site of great importance for Early Mesolithic studies in the UK and is considered to be of national if not international significance. The nature of past work at the site has already been described (above): it includes excavation of a series of hearth sites and associated artefact scatters (Healy *et al.* 1992; Wymer 1958, 1959, 1960, 1962, 1963) and palaeoenvironmental work by Holyoak (1980) and Barnett (Chisham 2004; Barnett 2009). The site is a SSSI and SAC, comprising predominantly reedbeds and wet grassland managed for nature conservation purposes. It was, however, subject to quarrying in the 1960s, resulting in the presence of several lakes and areas of spoil; it is also bordered by an inactive landfill site and Newbury Sewage Works, both of which have somewhat affected the site.

### *Geophysical surveys and identification of key locations for investigation*

Strata at the site have been demonstrated by Chisham (2004) to be of key significance in clarifying settlement and activity, notably in the form of repeated burning activity from the earliest Mesolithic. One of the key aims of the work at Thatcham Reedbeds was to link these strata with the shallower, more truncated sequence excavated by Wymer on higher drier areas of the site. Much of this area had previously been found to be impenetrable to powered coring equipment, particularly in the area of the landfill and edges of the quarry lakes (**Figure 75**). In order to find a window into the sequence around the excavated sites, ERT geophysical survey was first employed.

The layer covering much of the northern portion of the site, identified as being of very high resistivity during the ERT survey, was encountered during hand digging of exploratory pits and coring at borehole locations 1, 2 and 7, where it comprised mixed gravels in a dirty humic soil, likely upcast derived from quarry works and path creation. However, one portion of this area was found to be largely unaffected by this upcast (the area of BHs 3–6 and 8: **Figure 75**). A GPR and coring transect was established running west-east from deepening floodplain and channel deposits up to and onto the area of Wymer's (1962) Site II (**Figure 75**).

Five ERT transects were surveyed at Thatcham Reedbeds (**Figure 76**). Transect 1, north of the railway line, was surveyed in close proximity to a series of boreholes that were surveyed as a part of this project. Transect 4, also north of the railway, lies between a series of lakes that are vestiges of the previous gravel extraction works in this area. Transects 2, 3 and 6 are located south of the railway line and were taken alongside GPR transects which exist between a series of man-made lakes created during gravel extraction works before being given over to become a nature reserve.

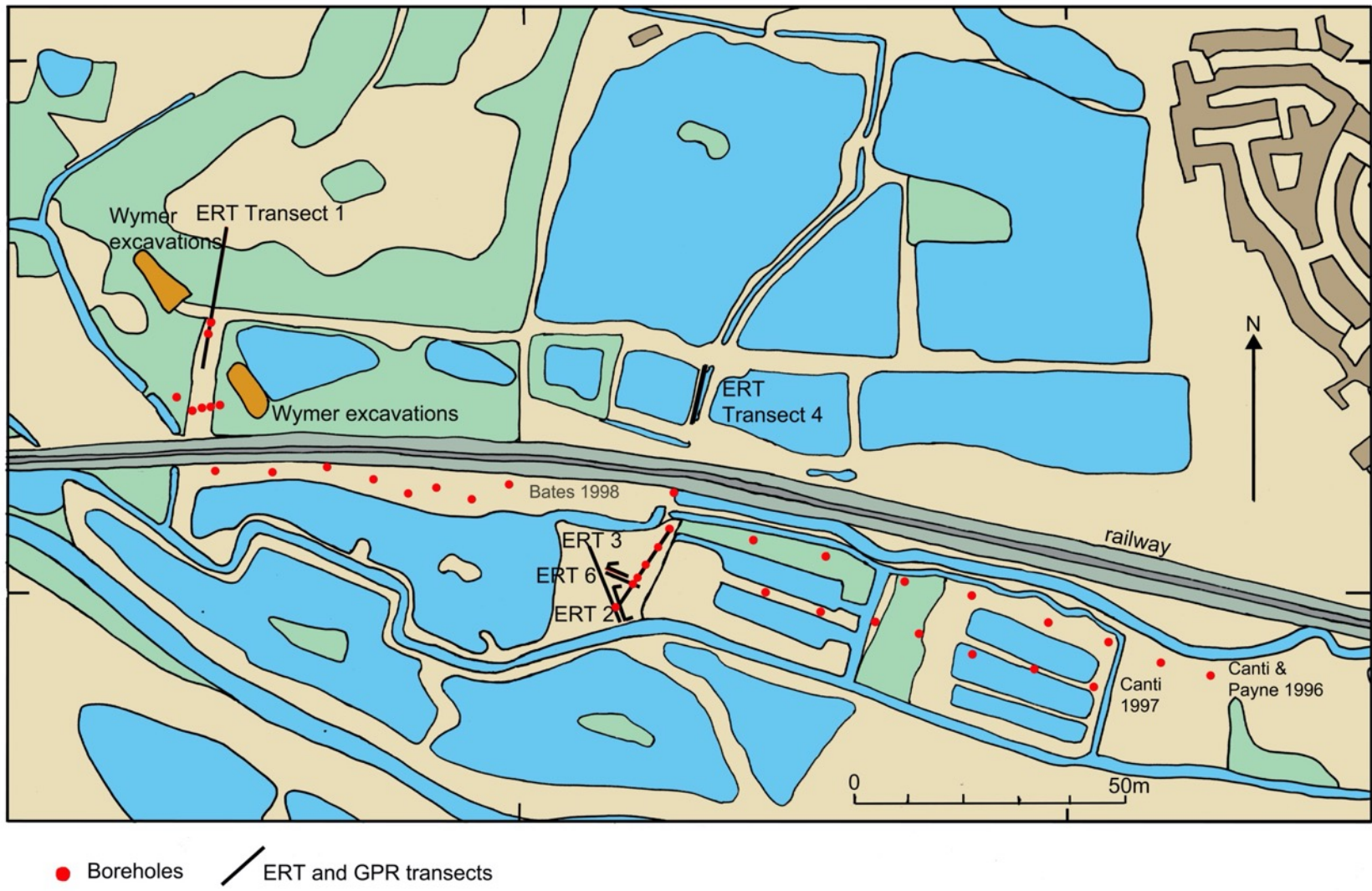


Figure 75: Thatcham: locations of boreholes and ERT and GPR transects

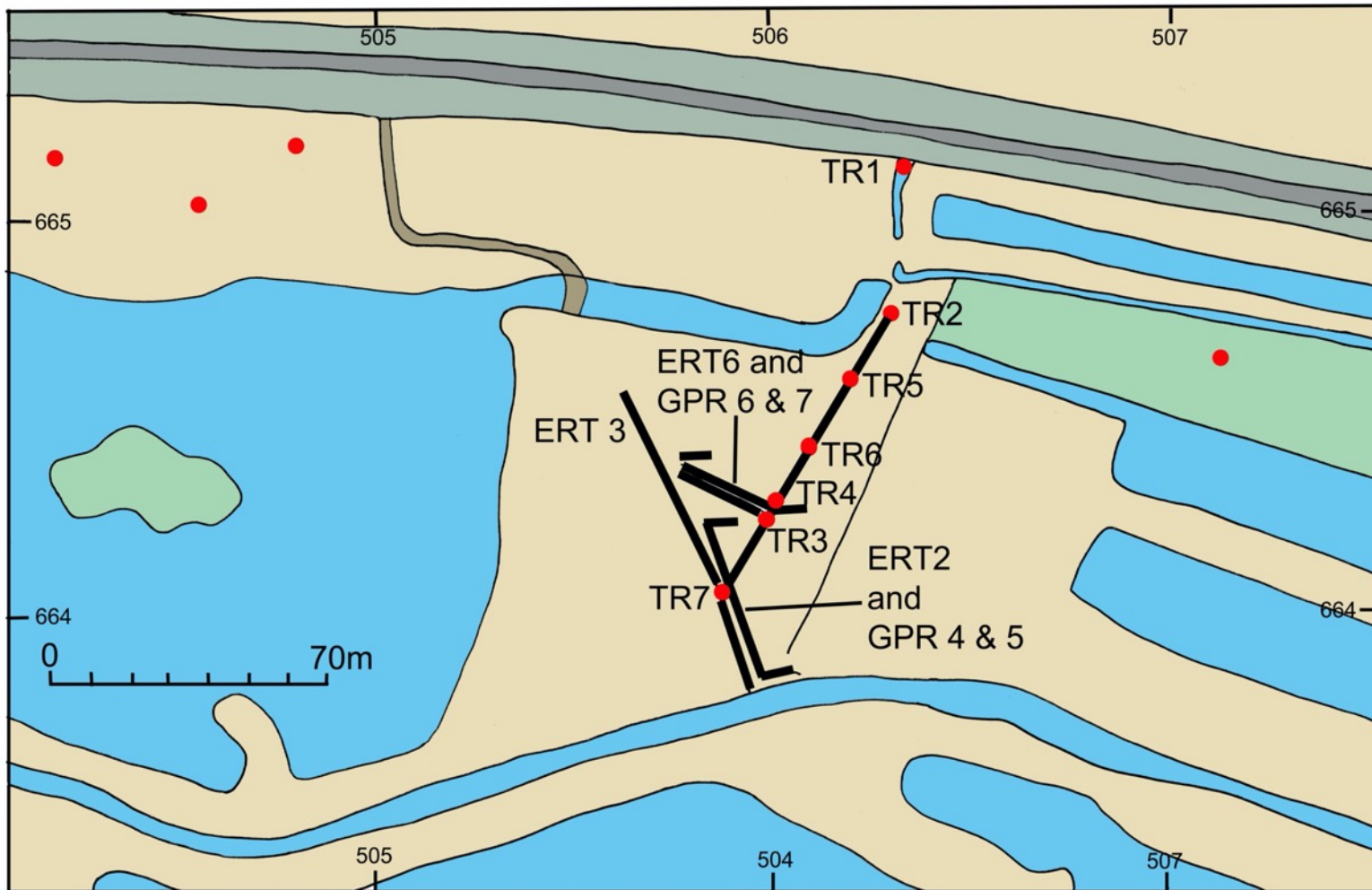


Figure 76: Thatcham: location of ERT and GPR transects (detail)

### *ERT Results*

by Paul Baggaley and Ross LeFort

Transect 1 (**Figure 77**) was conducted over Thatcham landfill and gently slopes from 74 to 70.5m OD. This transect was collected by “roll-along” with electrodes spaced at 2m intervals collecting a total length of 134m. A depth of approximately 10m was attained. The first 18m of the transect displays low resistivity values at 0–8m and 13–18m and a 7m wide deposit of high resistivity values that extends some 6m in to the ground. From 18m onwards, a band of strong high resistivity readings dominates the top 0.5–6m of the pseudosection. The ERT results correspond well with the known history of the site; Thatcham landfill was first used in January 1954 and ceased operation December 1984. Both attempts by Chisham (2004) and attempts as part of this project to take cores at this site failed as the ground proved impenetrable due to backfilling with rubble and landfill. The first 18m of this transect exists upon the terrace approximately 70m east of Wymer’s excavations and may show thinner spread of landfill/rubble backfill and hence the resultant lower resistivity values.

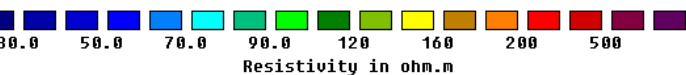
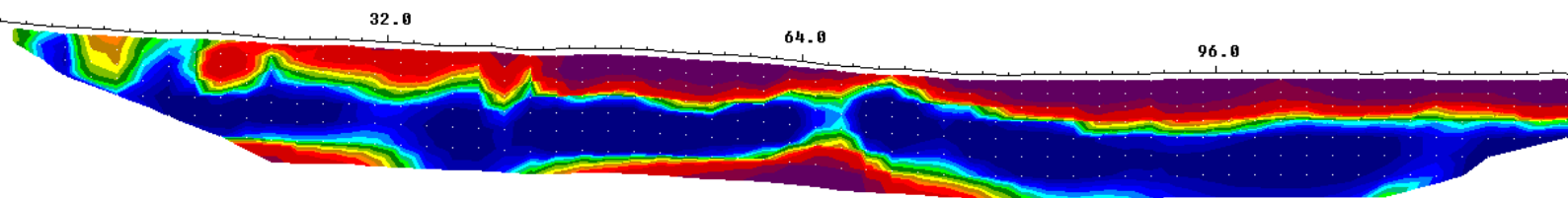
Underlying the high resistance modern spread is a band of low resistivity readings that may relate to the peat and marl that was encountered by Wymer (1960) and Peake and Crawford (1922, 499). This level in turn overlies a further band of high resistivity that is perhaps indicative of gravel deposits. Gravel was encountered at the base of the trenches by both Wymer and Peake and Crawford. Investigation of the terrace by Peake and Crawford (1922) included a trench down towards Moor Brook, which showed gravel at the base, overlain by compact peaty soil or silt, with flint tools and flakes in the upper gravel and lowest peat, at approximately 600mm depth. The ERT pseudosection presents a similar, if not completely consistent, stratigraphy to that encountered in the trenches to the east. It is unclear how much the topography of the land has changed due to landfill since the investigations by Wymer and Peake and Crawford but it could be that the levels they are describing may be represented by this band of low resistivity that is preserved underneath the high resistivity of the landfill and rubble backfill.

Transects 2, 3 and 6 were surveyed to the south of the railway line (**Figure 76**) with inter-probe spacing of 1m, providing an effective depth of 5m. These three transects are located in a relatively low-lying (68m aOD) area north of the Kennet and Avon Canal between a series of small lakes and the moor ditch. The topography of this area has been heavily influenced by gravel extraction works.

Transect 2 (**Figure 77**) extends for 40m from south-south-east to north-north-west from the edge of Moor Ditch (**Figure 76**). This transect is characterised by an undulated 1–1.5m thick band of low resistivity (30–70Ohm.m) across the top of the pseudosection over lying a 2–3m thick deposit of high resistivity material that varies from 70 - >200Ohm.m. This then in turn overlies deposits of low resistivity (30 Ohm.m).

87571 - Thatcham, Landfill Transect (Looking East)

Model resistivity with topography  
Iteration 5 RMS error = 14.4

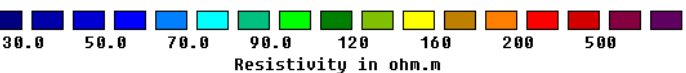
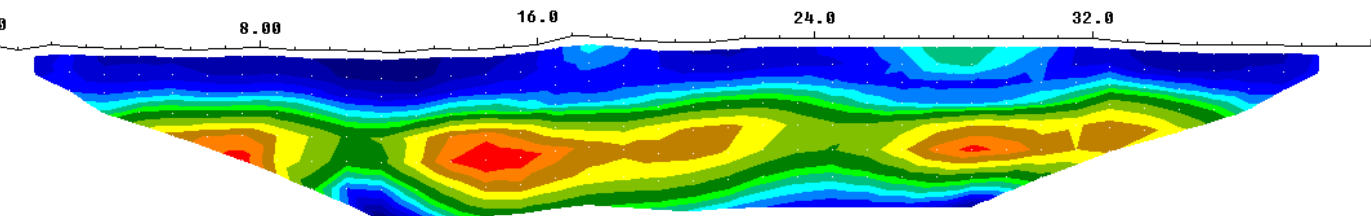


Unit Electrode Spacing = 1.00 m

Model scale is 20.00 pixels per unit spacing  
Exaggeration in model section display = 1.00  
Electrode is located at 0.0 m.  
Electrode is located at 134.0 m.

"87571 - Nature Reserve Path, South (Looking West)"

Model resistivity with topography  
Iteration 5 RMS error = 2.2

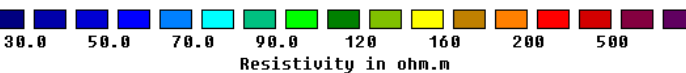
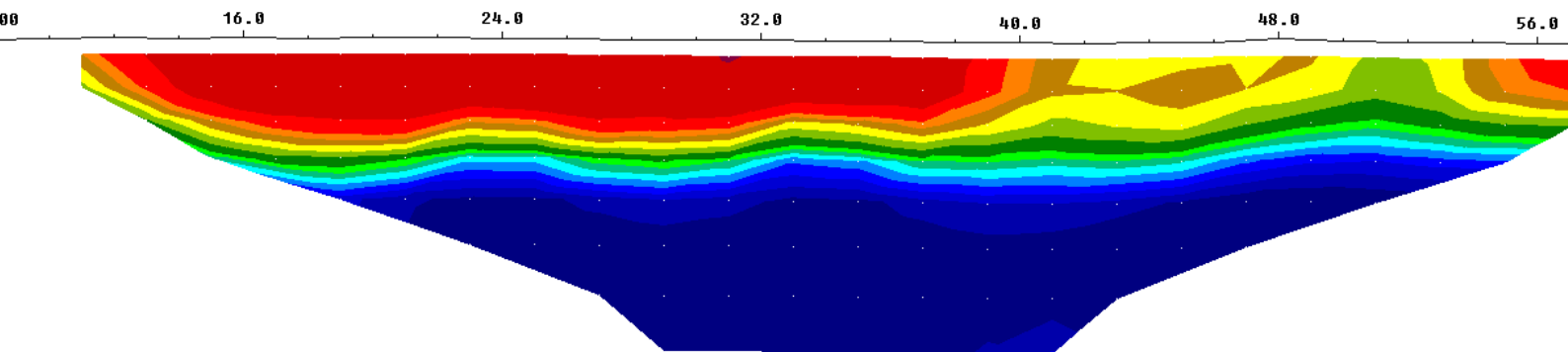


Unit Electrode Spacing = 1.00 m

Model scale is 27.00 pixels per unit spacing  
Exaggeration in model section display = 1.00  
Electrode is located at 0.0 m.  
Electrode is located at 40.0 m.

87571 - Thatcham, North of Railway (Looking West)

Model resistivity with topography  
Iteration 5 RMS error = 2.5



Unit Electrode Spacing = 1.00 m

Model scale is 50.00 pixels per unit spacing  
Exaggeration in model section display = 1.00  
Electrode is located at 8.0 m.  
Electrode is located at 62.0 m.

87571 - Thatcham Reedbed (Looking South)

Model resistivity with topography  
Iteration 5 RMS error = 2.5

Elevation

60.0

60.0

25.0

Transect 3 (**Figure 77**) overlaps with Transect 2 on its northern extent and extends north-north-west for 48m (**Figure 76**). The pseudosection shows corresponding low resistance readings to those of Transect 2 for the first 10m of its length. From 10m onwards, however, a thin deposit (1m thick) of high resistivity has been identified. This deposit increases in resistivity value as it progresses north with readings increasing to >200Ohm.m between 25m and 32m and again between 34.5m and 40m. The high values decrease towards the end of this pseudosection. The band of low resistance readings noted within the first 10m of this pseudosection can be seen continuing beneath the high resistivity material and is present for the full length of the transect. This layer of low resistivity undulates with a thickness varying from 1–1.5m. Similarly to the stratigraphic model displayed in Transect 2, underlying the low resistivity layer are deposits of higher resistivity (90–>200Ohm.m) which overlay further low resistivity readings.

Transect 6 reflects the stratigraphic model of Transect 2 (**Figure 77**). The end point of Transect 6 is located 5m to the east of the approximate mid-point of Transect 3, lying on a south-east to north-west alignment. This pseudosection is 24m in length and has attained data to a depth of approximately 4m. Transect 6 shows a undulating low resistivity layer, varying from 0.5–1.25m in thickness, that is present across the top of the pseudosection. Underlying this layer is a deposit of strong high resistivity material with values in excess of 200Ohm.m. This layer varies in thickness, with the widest and strongest deposit at the southern end of the pseudosection (4–8m), a thinner deposit (8–10m along the transect) and then a thicker deposit from 11–15m. Underlying this it is possible to see traces of a low resistivity level (with values <50Ohm.m) at 9m and 16m along the bottom of the pseudosection.

Transects 2, 3 and 6 show several similarities between one another, namely a model of low resistivity overlying high resistivity that in turn overlays a further low resistivity level. Some local variation occurs at the northern end of Transect 3 but this may be due to shifting deposits from flood water deposits or modern intervention/material dumping. The Thatcham Reedbeds are mapped as occurring on the alluvium of the River Kennet. Undated gravels and brickearth are found about 200m to the north-east, and Reading Beds outcrop around 300m south-east (BGS 2016). Churchill (1962) and Holyoak (1980) undertook studies of the geology and drift deposits across the area of these three ERT transects, with Canti and Payne undertaking a series of cores ahead of the excavation of a ditch for water-table management in 1996 (Canti and Payne 1996). The basic stratigraphy encountered by Canti and Payne (1996) to the east of the ERT transects consists of 1.5–2m of peat or peaty silt/clay materials overlying gravels, sands and silts, deepening slightly to the east (Canti and Payne 1996, 6). Holyoak (1980) recorded around 1m of tufa overlying gravels at a point 100m to the west of Canti and Payne's core 1 which corresponds with the location of the ERT transects. Based upon the knowledge of the surrounding stratigraphy from boreholes and cores, including those undertaken north of the railway as part of this project, the ERT results are likely to represent a layer of peat, or peaty silt/clay material, overlying gravel deposits of 1–4m thickness and waterlogged sands/silts at the bottom accounting for the low resistivity encountered at the bottom of the ERT pseudosections.



Transect 4 is north of the railway and runs between two lakes, and was undertaken with an inter-probe spacing of 2m enabling an estimated 10m of data collection.

The data in this pseudosection follows a similar model as that seen in ERT Transect 1 (**Figure 77**) whereby the top 1–3m is characterised by strong high resistivity readings overlying material of low resistivity. Transect 4 differs largely by the lack of a high resistivity base to the pseudosection. The location of this profile, between two lakes, suggests an area of waterlogging. Low resistivity readings would be expected due to the increased amount of interstitial water between particles. This transect was undertaken along the edge of a trackway; as such the high resistivity values shown from the top to a depth of 3m in the pseudosection may relate in part to the compaction of the soil.

*Ground Penetrating Radar*  
*by Neil Linford*

A series of GPR lines were mapped by the English Heritage Geophysics Team alongside ERT transects 2, 3 and 6 (**Figure 78**): lines 4 and 5 (respectively 450MHz and 225MHz centre frequency antenna) and 6 and 7 (450MHz and 225MHz centre frequency antenna respectively). These GPR profiles relate to the ERT transects that were collected by the Wessex Archaeology Geophysics team to provide contrasting data to clarify the stratigraphy in this area.

A brief summary of the southern GPR profiles is presented here.

GPR lines 4 and 5 (**Figure 79**) run parallel with ERT Transect 2 (**Figure 78**) and show a series of interfaces and horizons with considerable similarity to those seen in the ERT results. Low amplitude responses at 0–5m, 12m, 20m and 27–33m in the 225MHz GPR data (**Figure 79, B**) correspond to low resistivity dips in the ERT transect (**Figure 79, D**). Broad changes in the background amplitude of the GPR reflectance coincide with levels of increasing resistivity shown in ERT Transect 2; this is particularly clear between 66.6–67.3m aOD where a horizon can be mapped in the 225MHz GPR data. This horizon initiates at an elevation of 67m, dips slightly and then gradually rises to a maximum height of 67.5m at 20m along the profile before decreasing down between 22m and 30m and then rising again for the final 10m of the profile. This horizon matches the interface shown in the ERT transect where a clear contrast can be seen at similar elevations, shown by stark increase in readings from around 30–50Ohm.m to >100Ohm.m.



Figure 78: Thatcham: GPR profiles and ERT transects

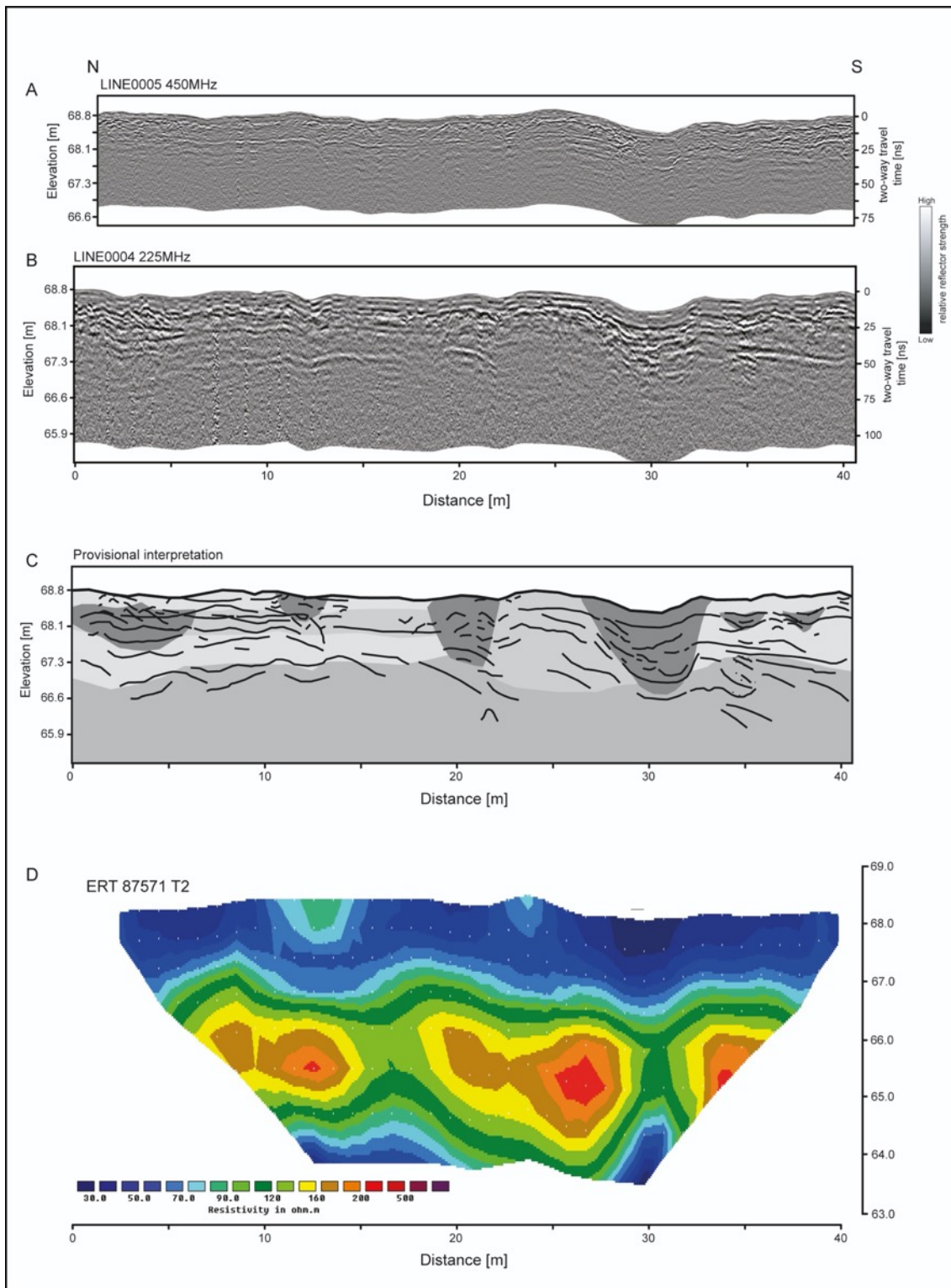


Figure 79: Thatcham: GPR profile 4

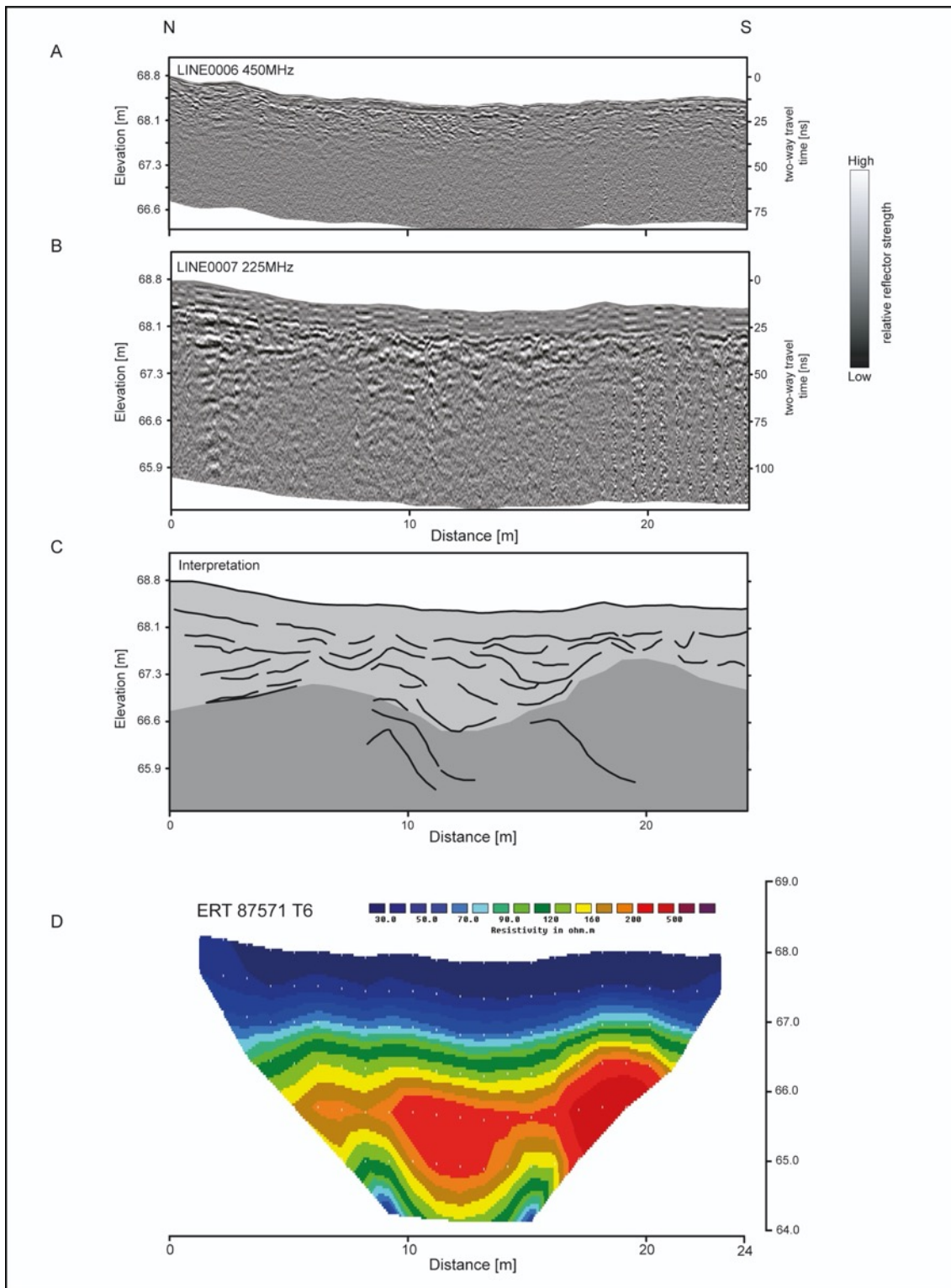


Figure 80: Thatcham: GPR profile 5

The GPR results shows much more detailed relationships between deposits than the broad changes that the ERT reveals. This is particularly clear in the 450MHz GPR profile which details data at shallower depths than both the 225MHz profile and the ERT data. As such it is possible to identify several linear interfaces and horizons in the GPR data which may relate to deposits from flood water or peat growth.

GPR lines 6 and 7 (**Figure 80**) run parallel with ERT Transect 6 (**Figure 78**). The broad changes in amplitude shown in the 225MHz profile match with those mapped by the ERT pseudosection with a horizon that undulates from an elevation of 66.6m at the start of the GPR profile and to a maximum height of 67.3m at 20m along the line before dipping down again. This corresponds closely with the interface between low resistivity values and high resistivity values shown in ERT Transect 6.

GPR profile 6, showing the data from the 450MHz antenna shows a number of interfaces and horizons in the top meter of the data. These are likely to relate to reflectance variation as a result of successive deposits from inundation by the Kennet River.

### *Coring*

by Catherine Barnett

Boreholes 1–8 were taken across the area. Boreholes 1, 2 and 7 failed at shallow depth due to the presence of the upcast/dumped quarry spoil over cleaner fluvial gravels. However, recovery of a line of boreholes 3–6 and 8 was achieved, one of which was taken using a gouge auger and four of which comprised sets of sleeved cores (**Figures 81 and 82**).

As shown in the Lithology and Assessment Tables for the site (**Appendix 4 and Figure 82**), the deepest and believed earliest deposit encountered was a clean yellow sand under fluvial gravels at 2.65–3.38m below ground in Borehole 5. This may be fluvial or aeolian in origin and is interpreted as a late glacial deposit which compares well with the Wasing Bed described and dated at Woolhampton Quarry to c. 15,500–10,500 cal BC (SRR-4955, 11725±45 BP; AA-11971, 11280±85 BP; SRR-4509, 11590±45 BP; AA-11975, 11145±75 BP; SRR-4508, 13980±145 BP; AA-11970, 10790±120 BP; SRR-4954, 11505±55 BP; AA-11969, 11655±80 BP: Collins *et al.* 1996; Collins 1994).

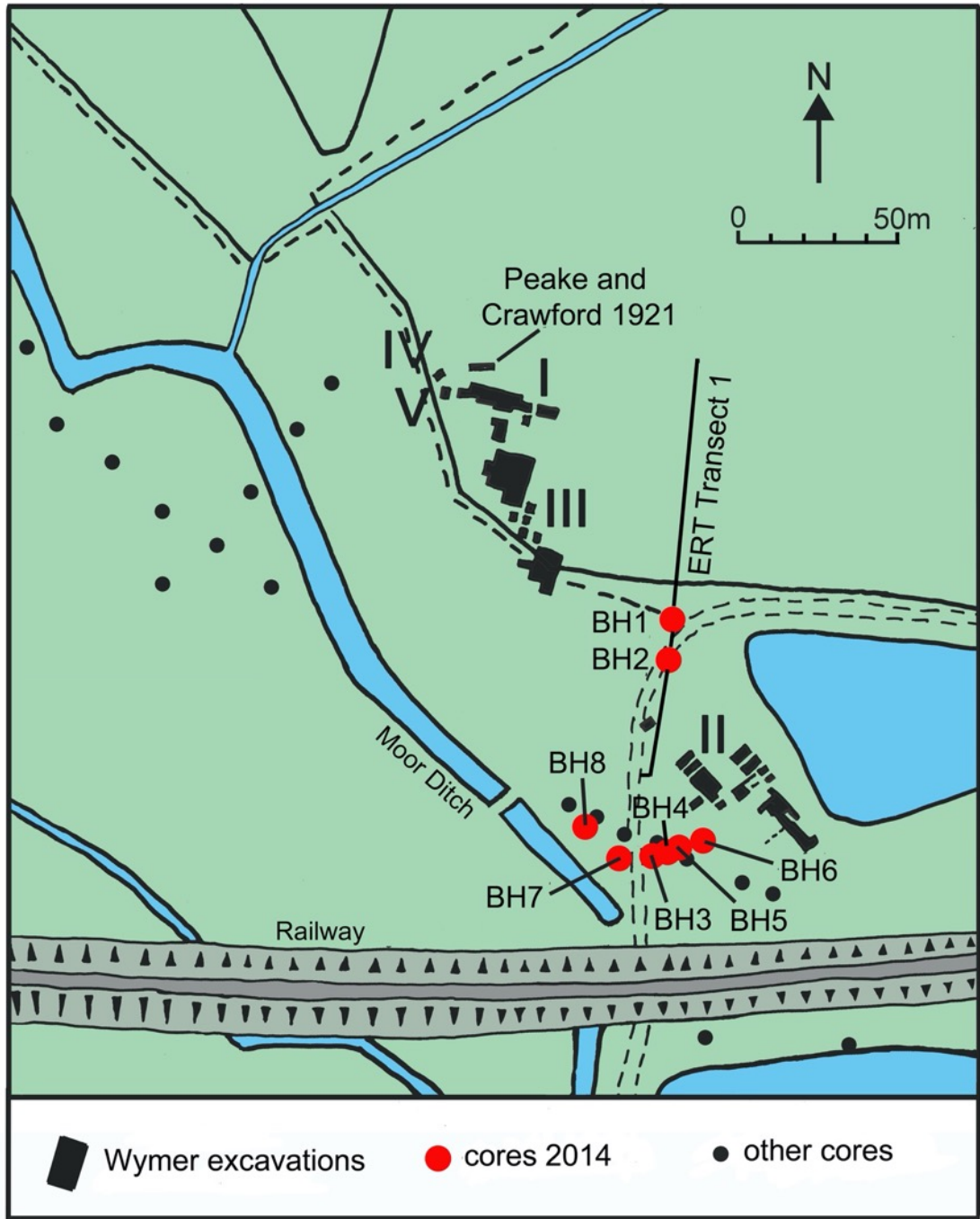


Figure 81: Thatcham: Location plan of coring transect 2014

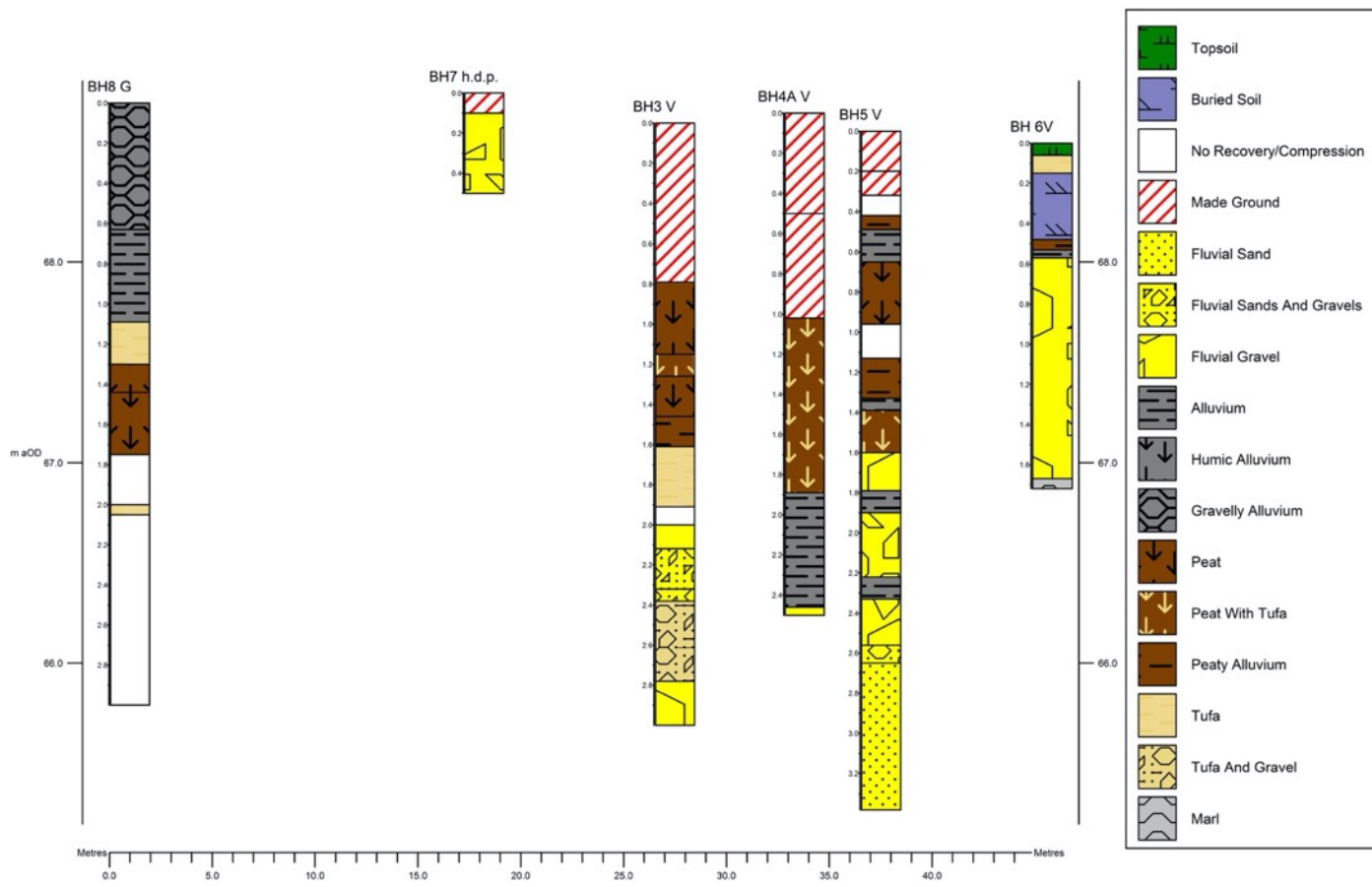


Figure 82: Rockworks figure of the Thatcham 2014 coring

In all other boreholes, the deepest deposits encountered were clean sands and gravels, at 2–2.5m depth below ground (66.2–66.7m aOD), which are believed to represent Devensian-age fluvial activity. The gravels themselves were sampled to depth using a percussion corer enabling recovery of sleeved cores. In Borehole 3 a bed of tufaceous gravely marl with slight organic laminations was encountered within these gravels at 2.38–2.78m (66.316–65.916m aOD) and a similar, though higher-lying deposit at 1.79–1.90m (68.659–68.549m aOD) in Borehole 5, radiocarbon-dated to 8810–8570 cal BC (UBA-27334: 9414±44 BP), although this date is considered problematic given the results from BH3 (Marshall, below). It is currently unclear whether the gravels represented in this borehole are actually a Holocene channel bed and the marl also a Holocene age deposit or whether this is a late glacial deposit, as interpreted at other sites such as Victoria Park and Woolhampton Quarry where it stratigraphically underlies earliest Holocene deposits.

However, marl was also encountered in Borehole 6, a sequence directly associated with Wymer's excavated Site II. Here it lay at 1.67–1.72m, again under gravels, and in this area the gravels are more confidently identified as Devensian in age since they underlie fine alluvium and peat known through Wymer's work to be associated with very early Mesolithic activity. Unfortunately, no dateable material was recovered from this sequence as the level of preservation precluded the recovery of adequate samples from small diameter cores.

The following dates have been published for Site II: a date of 7540–6590 cal BC (BM-65, 8100±180 BP: Wymer 1960, 18; Churchill 1962, 370; Barker and Mackay 1960, 29) was gained on a bulk sample of indeterminate charcoal from a hearth within a depression in a thin soil horizon (layer 2) which contained charcoal, 10 microliths, four gravels, a bone point, burnt bone and antler fragments. A date of 7820–7480 cal BC (Q-1130, 8580±100 BP) was reported by Switsur and Jacobi (1979, 57), seemingly on bulk peat overlying this same hearth. If that is the case, the dates are inverted and not reliable.

The gravel top rises substantially to the east and in Borehole 6 was encountered at just 0.57m below ground (68.023m aOD), a depth very similar to that described by Wymer (1958) for Site II. Interestingly, Wymer's sites have always been assumed to have occurred on the Beenham Grange Terrace edge but, given the presence of the underlying marl described here rather than a continuous bed of fluvial terrace gravel, it is suggested that in at least this area, Mesolithic activity took place on a slightly raised gravel island in the floodplain.

While the marl, sand and gravel beds may well be of Late Upper Palaeolithic age, by their nature they represent transported and redeposited material and are therefore relatively unlikely to contain *in situ* artefacts, even if activity did take place at Thatcham at this time. Of more archaeological relevance is the very top of these deposits, notably the top of the gravels, and the overlying strata. An ephemeral and immature palaeosol was described for the floodplain south of the railway line by Chisham (2004). This was dated to 9140–8610 cal BC (AA-55303; 9480±68 BP and AA-55304: 9528±80 BP: Chisham 2004; Barnett 2009) and shown to be associated with the earliest episodes of burning activity (and indeed artefactual



evidence presented by Wymer) recorded at the site. The humic staining and weathering encountered at the top of the gravels there was not found in the new cores presented here, with possible truncation or – if not – rapid sealing of the top with the fine alluvium noted in Boreholes 4 and 6, while loss occurred at the boundary in Boreholes 3 and 8. Whether the floodplain here stabilised in patches in the earliest Holocene as it did to the south remains unproven. A less abrupt boundary to the overlying alluvium and a fine mat of rootlets and stems were found in the top of the gravels in Borehole 5, and it is suggested that this location remained submerged but at shallow depth at the start of the Holocene.

A laterally variable sequence of overlying Holocene soft waterlogged alluvial channel deposits and peat beds were found in Boreholes 3–6 and 8. Preservation by waterlogging was generally excellent with herbaceous stems, wood and plant macrofossils evident in the field as well as during processing, although the level of preservation declined moving up onto the gravel island represented in Borehole 6. Fine alluvia and nodular tufa dominated the lower portion of the sequence, indicating stream and chalk spring activity immediately adjacent to the gravel island. A little fine overbank alluvium was also deposited there during high water event(s), as evidenced by the presence of a thin bed of clay silt at 0.53–0.57m in Borehole 6 and input of clays and silts to the thin overlying peat at 0.48–0.53m. In the deeper sequences, peat (often intercalated with tufa) occurred at 1.30–1.75+m (67.491–67.041m aOD in Borehole 8) to the west of the transect, where it was overlain with a thick body of fine alluvium (indicating a resurgence in channel activity locally), rising slightly to 0.65–1.60m (68.009–67.059m aOD in Borehole 5) to the east, there interleaved with narrow bands of fine alluvium but overlain by dumps of reworked tufa and gravely soil, the latter probably quite recent.

### *Palaeoenvironmental evaluation of the cores and dating sample selection*

by Catherine Barnett

The peat beds are generally substantial, well preserved and little disturbed and therefore of very high potential to inform on contemporary human activity and landscape. The macrofossils have been identified for key layers within Boreholes 3–6 for dating purposes, with continuous 10mm slices wet sieved to 0.25mm. As noted, the peat was much thinner and preservation was poorer in the shallow sequence of Borehole 6, with only one seed recovered (cf. *Rubus* or *Ranunculus* type) while mollusca included *Trochulus hispidus* and *Helicella* sp., indicating an open environment of possibly grassland with some scrub. In the deeper sequences, however, a rich assemblage of plant and mollusc remains was found, particularly considering the very small sample size dictated by the nature of coring. A full list of species is given in **Appendix 4**, but to summarise, reed (*Phragmites*) stems dominate the lower portion of the peat but small fragments of mature and twigwood (usually unidentifiable) were also common, highlighting the reedbed edge to drier wooded area nature of this location.

Higher in the sequence, twigwood was common and alder (*Alnus glutinosa*) wood was found at 1.44m below ground (67.256m aOD) and a hawthorn seed (*Crataegus monogyna*) in Borehole 3; unidentified waterlogged juvenile wood from this layer was radiocarbon-dated to 8740–8560 cal BC (SUERC-56992: 9378±29 BP). The peat bed represented in Borehole 5 contained the most varied assemblage

with common sedge (*Carex* sp.) seeds to the base, presence of dogwood (*Cornus* sp.) at 1.59m and conifer bud scales at 1.54m, which probably represent pine (*Pinus* sp.) Other types higher in the sequence include spurge (*Euphorbia* sp.), hornbeam (*Carpinus* sp.) and fat-hen (*Chenopodium*).

Tiny fragments of charcoal (>1mm) were commonly found in the samples processed from the boreholes, some clearly being of small brash/twigwood at, for instance, 1.75m in Borehole 4, with charred reed stems also represented in the upper fen peat at 0.80–0.84m in Borehole 3. Local burning – whether in hearths or more likely for clearance purposes given the types noted – is indicated.

Occasional insect remains and water flea were noted during dating sample selection, while molluscs were common in the peats. They were dominated by freshwater and marsh taxa. The tufa layers were not processed or assessed but molluscs were also visible in these.

Samples for dating were selected where taphonomy/stratification was secure and short-lived identified material available, predominantly on the basis of context, with top and bottom of key peat layers favoured. Several of the chosen samples proved too small for dating and were excluded: a list of the five final successful submissions is given below in **Table 6**.

### *Radiocarbon dating*

by Peter Marshall

#### *Objectives and sampling*

An extensive programme of radiocarbon dating was envisaged for the new transect so as to better link these analysed strata with the previously excavated assemblages and to feed into a wider Kennet Valley sedimentary model. Unfortunately, the paucity of plant macrofossils in the cores meant that the number of samples that was submitted was only five (**Table 6**).

Since the early 1990s there has been a tendency for radiocarbon measurements on samples from environmental sequences to be obtained by accelerator mass spectrometry of plant macrofossil material. This is due to two main factors:

- sample size: the size of sample that can be measured (2mg of organic carbon); and
- taphonomic: the belief that plant macrofossils are more reliable than “bulk” samples of sediment matrix as the source of carbon in the former is known and they are not made up of heterogeneous material that could be of different ages (Walker *et al.* 2001; Lowe and Walker 2000).

The following samples for radiocarbon analysis were identified from the cores:

- Terrestrial macrofossils, preferably “fragile” remains that are unlikely to have survived serious reworking. Short-lived, identifiable to species, with bark edge or outer rings of large pieces of wood.
- Aquatic macrofossils (eg *Potamogeton*) were avoided due to the fact that dissolved CO<sub>2</sub> may be utilised resulting in the uptake of “old” carbon

(Bowman 1990) and AMS measurement of “bulk” samples were not submitted because of the potential of inhomogeneity problems (a small amount of contaminant will have a greater effect because of the size of sample (Shore *et al.* 1995)).

Four samples were submitted from BH3, a sleeved vibrocore that reached fluvial gravels at 2.78m. The uppermost sample from near the base of the upper fen peat at 0.80–0.81m dates to cal AD 1968–1972 (95% confidence; SUERC-56991; **Figure 83**) and is clearly intrusive. Given the use of a sleeved corer it is unlikely that material was taken down profile as part of coring, although this remains a possibility; it could also be due to disturbance in the top part of the sequence. The samples from near the base of the lower fen peat (UBA-27335 and SUERC-56992; **Figure 86**) and the base of the peaty alluvium (UBA-27336) are reversed. It is difficult to explain this reversal given the seemingly intact sequence recorded.

Interpretation of the single sample date (UBA-27334) from BH5 (a sleeved vibrocore that reached likely late-glacial fluvial/aeolian sand at 2.65m) is problematic given the results from core BH3.

#### *Interpretation*

**Figure 87** provides a summary of the available radiocarbon measurements from environmental and archaeological sequences at Thatcham Reedbeds (**Table 6**). Given the existence of a detailed pollen record (Chisham 2004; Barnett 2009) – an age depth-model is shown in **Figure 86** – revisiting the archive from previous excavations would clearly pay dividends to better contextualise human activity.

Lab. No.	Sample ref.	Material & context	Fraction modern	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)	Calibrated Date (95% confidence)
BH3						
SUERC-56991	BH3 - 0.8–0.81m	<i>Phragmites</i> culm node, charred (C Barnett, Wessex Archaeology), from near the base of the upper fen peat at 0.80–0.81m	1.5406±0.0055		-24.9	cal AD 1968–1972
UBA-27335	BH3 -1.28–1.29m	Waterlogged juvenile wood, unidentified (C Barnett, Wessex Archaeology), from near the base of the lower fen peat at 1.28–1.29m		9494±44	-29.5	9130–8650 cal BC
SUERC-56992	BH3 -1.44–1.45m	Waterlogged juvenile wood, unidentified (C Barnett, Wessex Archaeology), from near the base of the lower fen peat at 1.44–1.45m		9378±29	-29.4	8740–8560 cal BC
UBA-27336	BH3 -1.51–1.52m	Waterlogged twig, unidentified (C Barnett, Wessex Archaeology), from near the base of the peaty alluvium at 1.5–1.51m		9273±62	-28.7	8710–8300 cal BC
BH5						
UBA-27334	BH5 - 1.88m	Waterlogged twigs (x3), unidentified (C Barnett, Wessex Archaeology), from a band of slightly humic calcareous alluvium/marl within fluvial gravel at 1.88m		9414±44	-29.1	8810–8570 cal BC

Table 6: Thatcham Reedbeds radiocarbon results

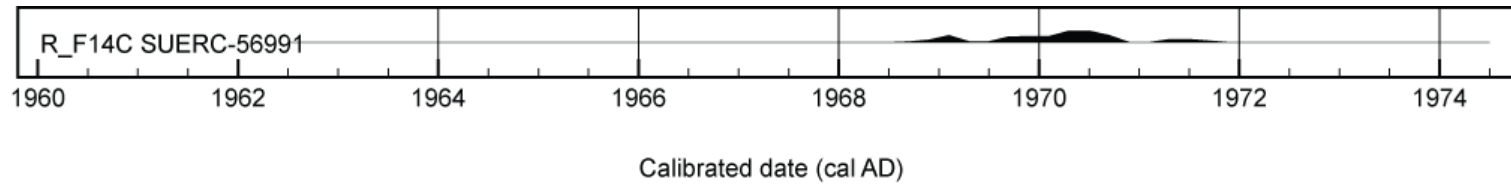


Figure 83: Probability distribution of the modern date from Thatcham Reedbeds. The distribution is the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

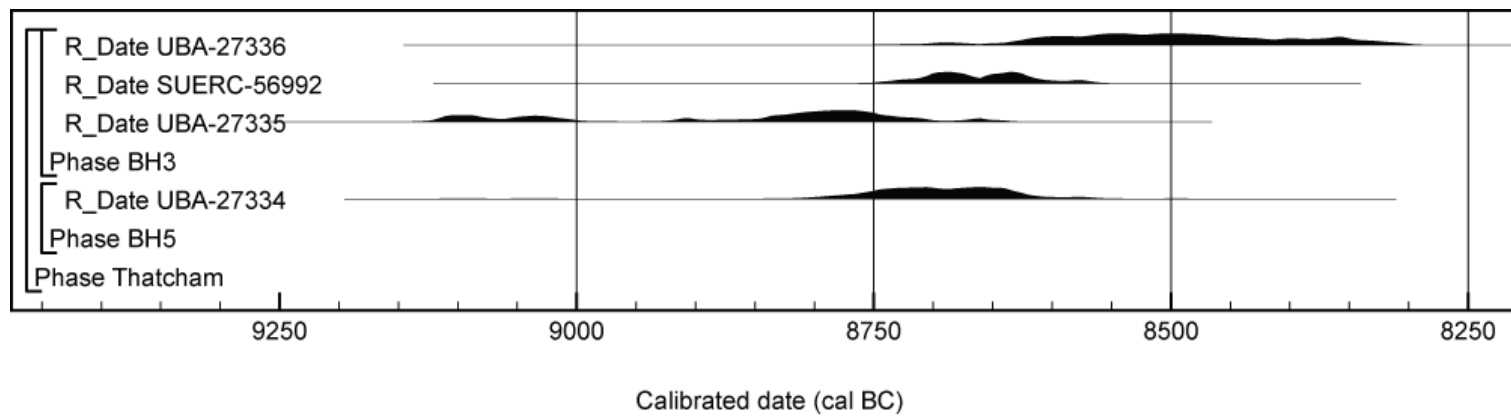


Figure 84: Probability distributions of dates from Thatcham Reedbeds. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

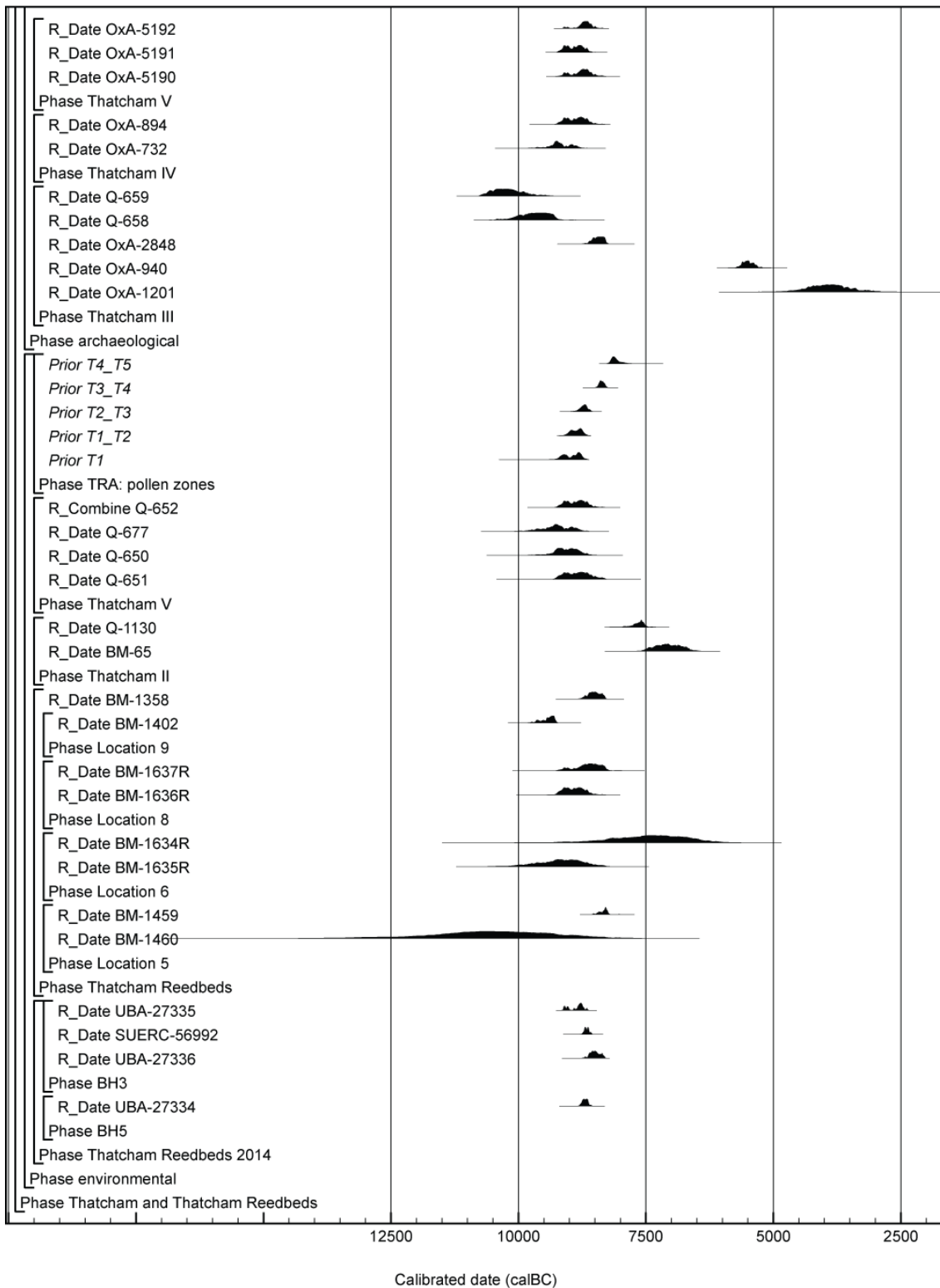


Figure 85: Probability distributions of environmental and archaeological dates from Thatcham and Thatcham Reedbeds. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

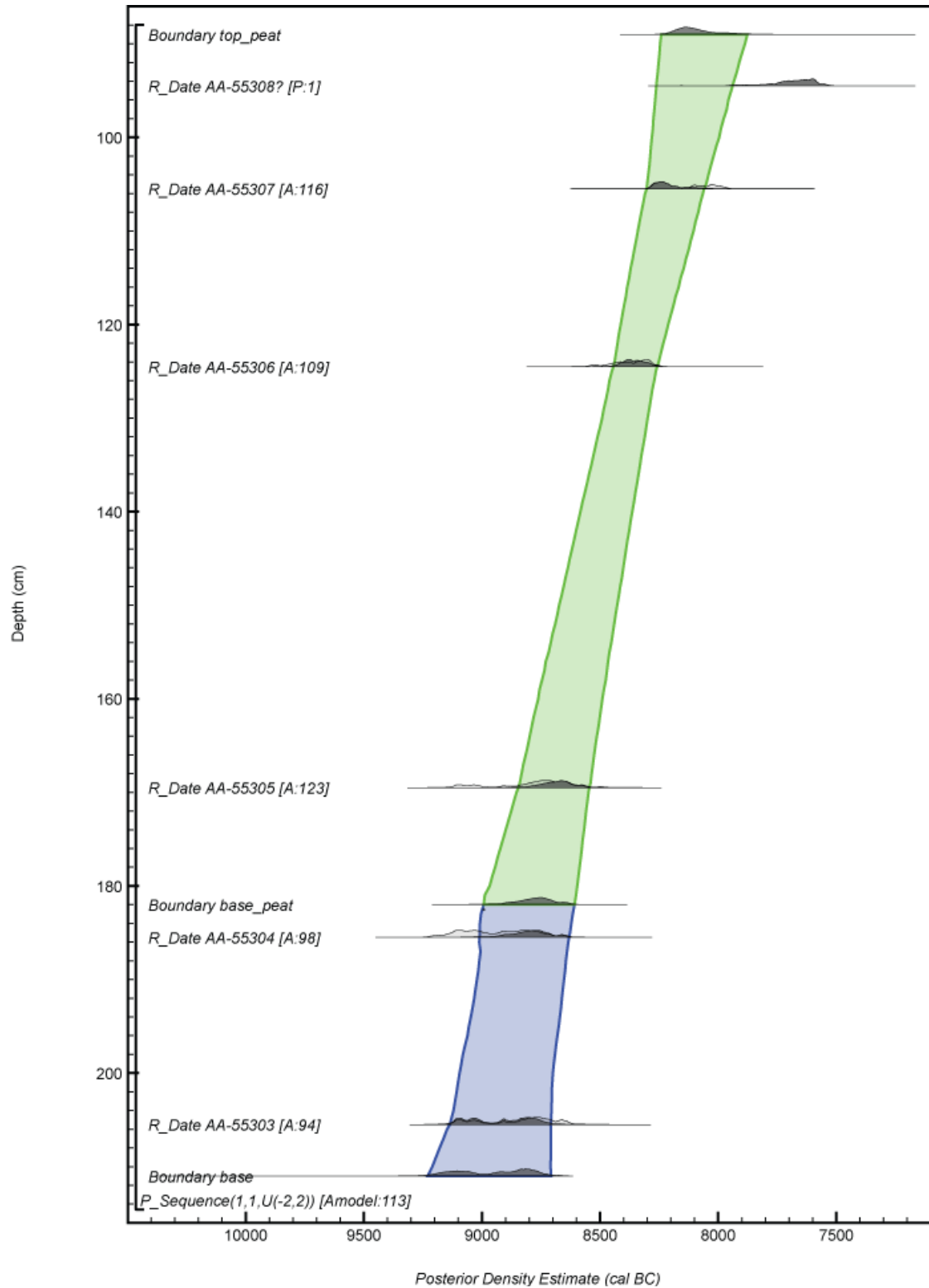


Figure 86: Bayesian age-depth model of the chronology of the TRA sequence (P\_Sequence model ( $k=0.01-100$ ); Bronk Ramsey 2008; Bronk Ramsey and Lee 2013). The coloured band shows the estimated date of the sediment at the corresponding depth at 95% probability.

### *Discussion and recommendations for future work*

by Catherine Barnett

It had originally been hoped that the deep sequence described by Wymer at his Site V might be investigated. Ground conditions including spoil dumps, path creation and spread of landfill over this area made that impossible. However an equivalent set of strata was accessed and sampled in the vicinity of his Site II, establishing that a portion of the key waterlogged area of the Thatcham site, which occurs in direct association with the known Early Mesolithic remains previously excavated by Wymer, has been little affected by aggregate extraction and dumping and that preservation of contained palaeoenvironmental remains is good. This area is therefore of exceptional potential to add to our current knowledge of environment and activity contemporary with those remains.

The results of earlier coring and palaeoenvironmental analyses, notably those by Chisham (2004) are pertinent to the interpretation of these results. The total depths and types of Holocene strata reported here are markedly similar to those encountered south of the railway line and reported by Chisham (2004).



## Victoria Park, Newbury

### *Introduction*

The site lies in the centre of Newbury, adjacent to the Kennet and Avon Canal and The Wharf at NGR 447366 167352. Victoria Park is today a flat landscaped area, mainly laid to grass and flowerbeds with play areas and facilities such as a bandstand and boating pond. Historically it was known as The Marsh, a low-lying damp area but one that had been cut off from the River Kennet by at least 1693 as a court case against a citizen “*for digging downe the Marish Bank in Newbury, whereby the said Marish was drowned*” (Money 1887, 320) demonstrates. It was certainly useable as pasture land by 1772 when it was ruled that “*no persons belonging to or parishioners of this borough shall put into the common called the Marsh more than one horse or two cows*” (Money 1887). Hadcock and Millson (1990, 71; 94) suggest that the North Brook Stream, a branch of the Kennet, once flowed across Northbrook Street and into the Marsh (Victoria Park) but that the area was drained and the Park created by 1855.

### *Geophysical surveys and identification of key locations for investigation*

The potential for Mesolithic artefactual remains was indicated by finds in the West Berkshire (formerly Newbury) Museum archives reported as having been found during construction of the adjacent bypass and boating lake (see also From 2012, 124). Revisiting of these archives has shown that the former in particular, excavated by Sheridan in 1963–4, produced high quality bone and flintwork of Mesolithic age from a similar occupation horizon within a potentially similar stratigraphic sequence to that described here. However, anecdotally, more recent interventions to the immediate north of the boating lake and at the Parkway shopping development <0.5km to the north-west had revealed no significant remains or indeed deep or organic strata. There have been no previous substantial geoarchaeological or palaeoenvironmental analyses on which to rely and the geoarchaeological potential of the site was therefore unknown, but being one of the few undeveloped, low lying areas adjacent to the Kennet in Newbury, it provided the greatest opportunity for understanding the sequence in this area. Exploratory work (in the form of ERT and GPR surveys and recovery of ten sets of sleeved cores in a rectangle of sides 60m round the boating pool using percussion coring) was therefore planned for the area of the boating lake and edge of the flyover.

ERT Transect 5 (**Figure 87**) runs from north to south in Victoria Park and represents one of the few places in Newbury where it is possible to assess the stratigraphy through coring and geophysics.

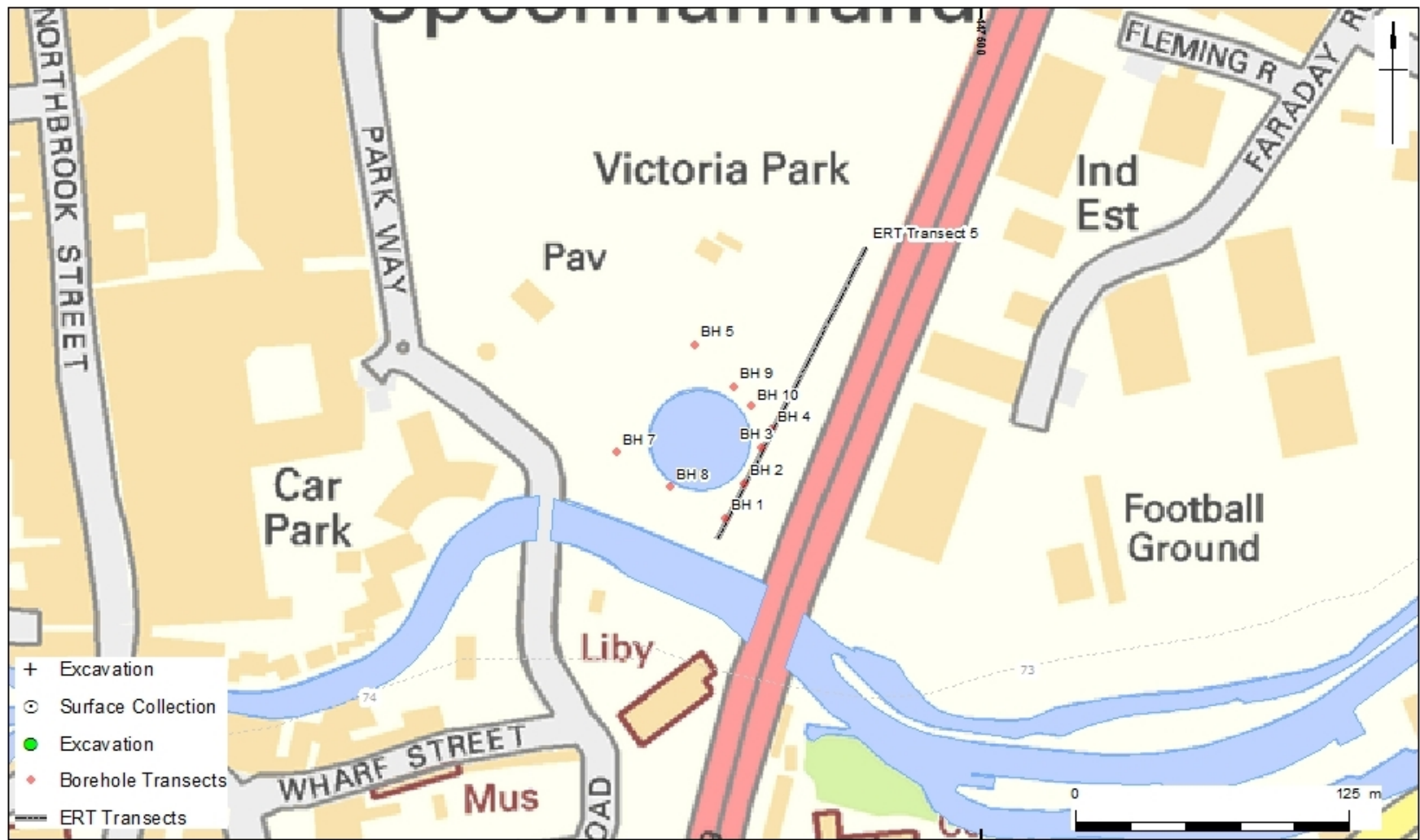


Figure 87: Victoria Park: ERT transects

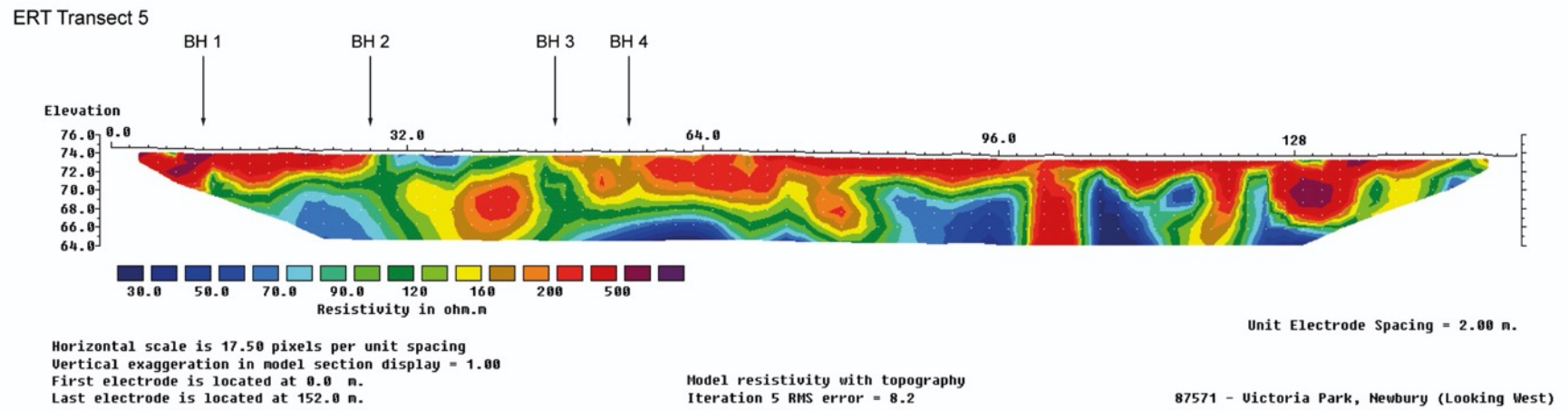


Figure 88: Victoria Park ERT Results - Transect 5

The data displayed in the pseudosection in **Figure 88** shows the most variation seen in any of the transects surveyed as part of this project, reflecting the complexity seen in the boreholes. This transect was surveyed with an inter-probe spacing of 2m, using the “roll-along” method resulting in a total length of 152m of data collected. The transect shows a basic trend of high resistivity values overlaying lower resistivity values. There is, however, small-scale variation in this model. Between 28m along the profile and 48m the high resistivity near-surface layer is broken by a lower resistivity band that overlies a high resistivity deposit. This section is parallel with the boating pond and this change in resistivity may be a result of higher levels of water saturation. At approximately 100m along the transect materials of high resistivity extend from the top of the pseudosection (approximately 74m aOD) to the deepest extents (approximately 64m aOD). A similar, but slightly shallower deposit of high resistivity material is mapped between 118m and 124m and again between 126m and 135m. The high resistivity values are by and large underlain by low resistivity values indicating a different deposit, the relatively lowest resistivity values suggesting a peaty, silt or clay deposit.

Four boreholes (1--4) coincide with this transect; these show significant variation between the south-western (Boreholes 1 and 2) and the north-eastern (3 and 4). Comparison with the borehole logs and the ERT transect provides some help with the interpretation of the ERT levels.

Boreholes 1 and 2 recovered cores to a depth of 2m and are dominated by made ground which is up to 1.3m deep in areas, overlying fluvial sands and gravels. Direct comparisons between the borehole locations and their relative position along the ERT transect (respectively 10 and 28m) marries them up with the first section of high resistivity encountered at the top of the pseudosection.

It is difficult to ascertain the same level of stratigraphic detail in the ERT results which show broader changes as can be identified in the boreholes. At 10m along the ERT transect, equivalent to the location of BH 1, the high resistivity layer is approximately 1.5m thick which matches up with the deposits recovered in the core. However, below this levels of decreasing resistivity are visible.

Fluvial gravel deposits are encountered in boreholes between 1 and 2m below ground level and would be expected to show up in the ERT as continued high resistivity values such as seen in other areas of the Kennet Valley (cf ERT results at Thatcham where gravel deposits display high resistivity values >200Ohm.m). This is the same for location of BH 2 where the band of high resistivity is approximately 1–1.5m thick and overlays levels of decreasing resistivity. A potential reason for this is that the gravel level is relatively thin at this point, and due to the coarseness of the ERT data, the distinction between made ground, the intervening levels of fluvial sands, alluvium, and the gravel, is lost and the ERT provides only a interface between the high resistivity of the made ground and gravel before encountering lower resistivity deposits that underlay the gravel.

Boreholes 3 and 4 are at located respectively at 47 and 56m along the ERT transect. These boreholes are noted as differing significantly from BHs 1 and 2; this degree of variation can be seen in the ERT results. It is, however, difficult to resolve the

degree of change in both sets to the same stratigraphic sequence. BH 3 is located in the area of low resistance (in relation to the readings noted across the majority of the transect) with surface readings of 160Ohm.m and decreasing in resistivity value with increased depth. These lower resistivity measurements can be reconciled with the material evidence of humic alluvium, marls and peat that are encountered between 0.5 and 0.86m (73.87–73.39m aOD) in BH3. A deposit of high resistivity (120->200Ohm.m) underlies this area of lower resistivity, between 36 and 48m along the ERT transect at a depth of 73 to 64m aOD, that also matches with the depths that fluvial gravel were encountered in the cores.

At the location of BH 4 in the ERT results, the first 2–4m (74–70m aOD) of the pseudosection is dominated by high resistivity values of between 160 and 200Ohm.m overlaying gradually decreasing levels of resistivity from 70m aOD. This, again, suggests that the coarseness of the ERT has been unable to show any distinction between made ground and gravel levels in this part of the Kennet Valley, and that the localised variation in resistivity (between 28 and 56m) may be attributed to increased water levels in this particular part of the transect.

The Devensian river gravels at the base of cores (72.91–72.5m aOD/1.59-2Mbg in BH 1; 72.45–72.27m aOD/1.82-2Mbg in BH2; 73.39–72.65m aOD/0.86–1.6Mbg in BH 3; 73.20–72.61m aOD/1.01–1.60Mbg in BH 4) broadly correspond with the interface between high and low resistivity values seen in the ERT transect, beneath which lower resistivity values generally dominate, apart from small-scale localised variation (such as at 98, 100 and 126m) which may be related to channels or modern intervention.

It is clear, apart from small-scale stratigraphic changes, such as seen at Victoria Park, that geophysical methods such as ERT and GPR have the potential for identifying stratigraphic changes in the subsurface. It is clear from the Thatcham and Wawcott datasets that ERT can identify the gravel deposits that are synonymous with Mesolithic activity, with GPR providing high-resolution information about horizons and interfaces of deposits.

### *Coring*

The recovered cores have been fully described in the project archive, but not further assessed or processed, since the decision was rapidly made to expose the sequence more fully through trial pitting, so giving the opportunity to recover better samples.

The detailed sedimentary logs were used to construct a 2D Rockworks model of the site stratigraphy and the results were fed into the overarching 3D deposit model. To summarise, the sequences recovered to the south-west and west of the area investigated (Boreholes 1, 2, 5, 6 and 8) were dominated by made ground up to 1.3m in thickness, over fluvial sands and gravels (with the boundary at 73.2–73.5m aOD). The made ground included brick, tile, charcoal, oyster shell and one piece of clay pipe and often layers of redeposited fluvial gravels in a humic soil matrix. These likely relate to digging out of the canal, land reclamation and finally to landscaping of the park in the 18<sup>th</sup>–19<sup>th</sup> century. The underlying gravels are clean and coarse and are believed to have been laid down by the Devensian age River Kennet (prior to c. 11,000 years ago).

Deposits to the north-east of the site (Boreholes 3, 4, 9 and 10) differed substantially, as did the sequence from the far south-west of the area (Borehole 7). All displayed soft floodplain deposits between the Devensian river gravels at the base and the modern soil profile and/or made ground. These included calcareous tuffaceous marl, alluvium, and old land surfaces in the form of humic alluvium and peaty layers, all of which are found at known Late Upper Palaeolithic-Mesolithic age floodplain sequences elsewhere in the Middle Kennet Valley such as Thatcham Reedbeds, Ufton Bridge and Woolhampton Quarry (Chisham 2004; Barnett 2009). The thickness of these layers varied somewhat but the deposits of interest were generally encountered between 0.4 and 0.9m depth (73.9–73.4m aOD) where made ground was absent or thin and at 1.55–1.89m (73.08–72.74m aOD) where made ground was more substantial (Borehole 7).

#### *Geoarchaeological assessment of the cores and location of trial pit*

The Victoria Park sequence had been less well investigated than the sequence at the other test sites and this – together with the presence of potentially significant Early Holocene layers – indicated that it was preferable to recover samples for dating by exposing a larger proportion of the sequence in the area of highest potential through trial pitting. No further assessment was therefore undertaken on the cored sediments. They are currently stored in cool dark conditions at Wessex Archaeology, but will be discarded once analysis and publication has taken place.

#### *Excavation of the trial pit*

The location of the trial pit (**Figure 89**) was chosen on the basis of both the findings of the ERT and GPR surveys, and the geoarchaeological assessment of the recovered sleeved cores. The pit was excavated by a team under the supervision of Martin Bell, Catherine Barnett and Phil Harding, and with the kind permission of the landowners (Newbury Town Council).

The 2x2m trial pit was hand-excavated from the modern surface to a total depth of 1m, through all Holocene layers and into the underlying Devensian river gravels and marl. Given the quantity and quality of material encountered, once the Mesolithic layers had been fully removed by hand, a smaller area was excavated into the Devensian layers in order to record and sample the full sequence.

The sections were cleaned by hand and representative sections recorded (**Figures 90–1**) by Jennifer Foster and Martin Bell. The contexts were defined and described by Martin Bell and Catherine Barnett. The locations of all pre-modern archaeological remains were digitally surveyed using GPS within the OS NGR system, but also including heights above OS datum (Newlyn). The electronic survey record was downloaded and retained within the site archive, with co-ordinate and/or datum information transposed onto the appropriate paper archives. All recording including samples was undertaken using a series of WA's standardised *pro forma* recording sheets. A full photographic record was maintained during the trial pitting using digital cameras equipped with an image sensor of not less than 10 megapixels.

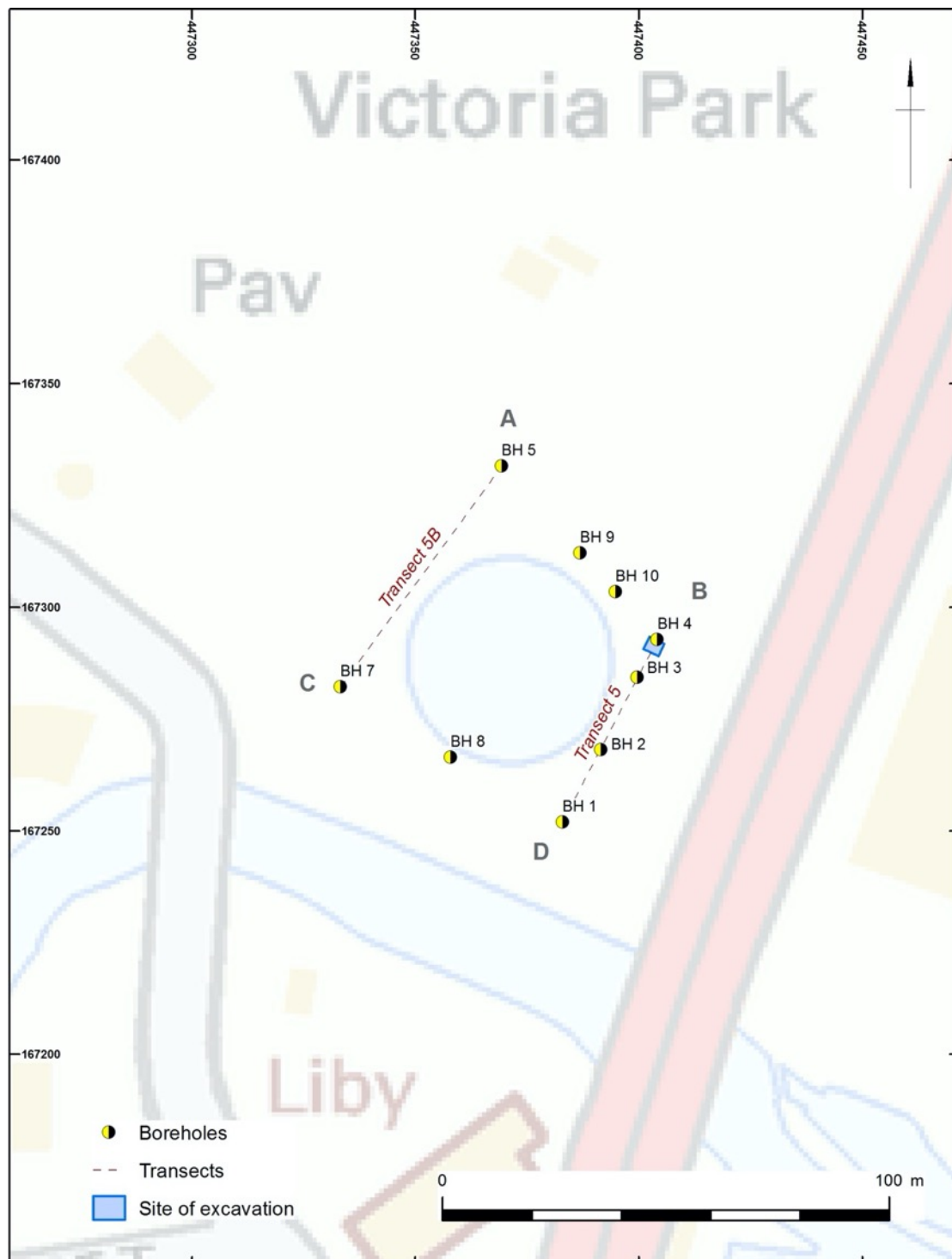


Figure 89: Victoria Park test pit location

Bulk sediment samples were taken from appropriate well sealed and datable archaeological contexts or strata for the recovery of plant macrofossils and small artefacts. Whilst guidance indicates 40–60 litre samples for charred material and 10–20 litres for waterlogged, experience has shown that early layers in the area and indeed at this site can be thin and ephemeral. Ensuring that all samples were context specific was key to establishing context and chronology: eight bulk samples

of 1–5 litres were therefore taken depending on type, thickness of the layer, etc., under the guidance of the geoarchaeologist on site.

Spot samples for ICP analysis, mollusc columns and continuous monoliths of sediment were also collected using monolith tins, again under the guidance of the geoarchaeologist to enable offsite sediment description and further selection of dateable material for key layers. A wide monolith was taken over the occupation layers to enable more substantial 10mm slices to be taken from these key contexts. These were processed under laboratory conditions to recover discrete macroscopic remains for radiocarbon dating. Half of each slice was retained for comparative dating of bulk sediment/humic acids, where deemed necessary by the English Heritage Scientific Dating Team. Details of these samples and assessment of their contents given in **Appendix 3**.



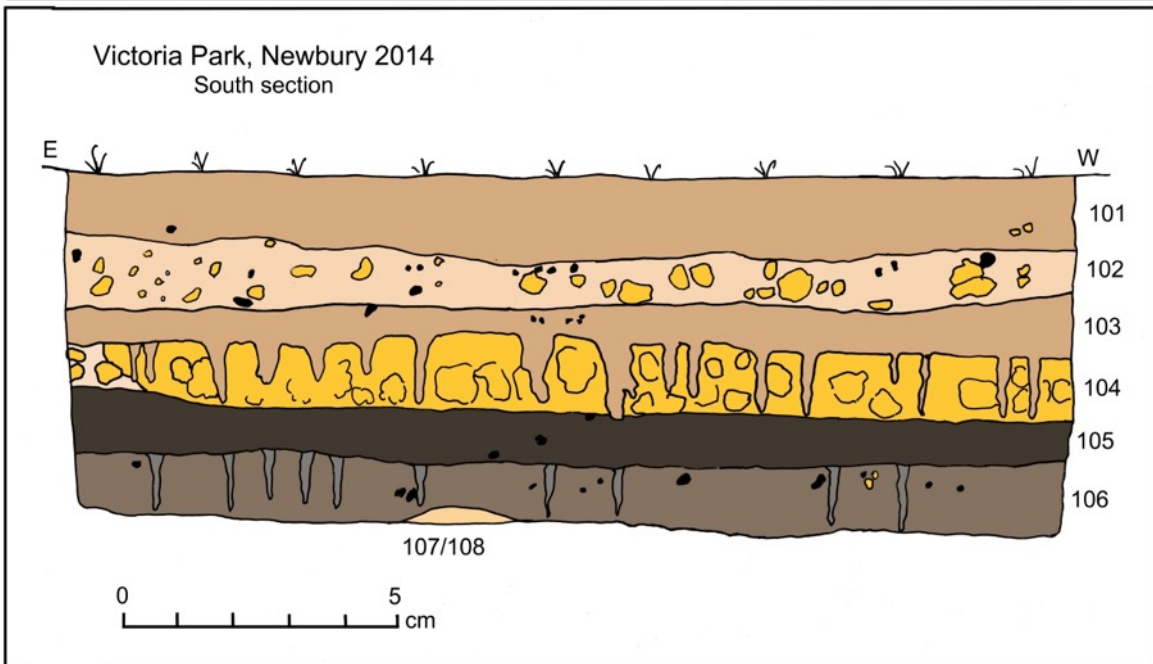
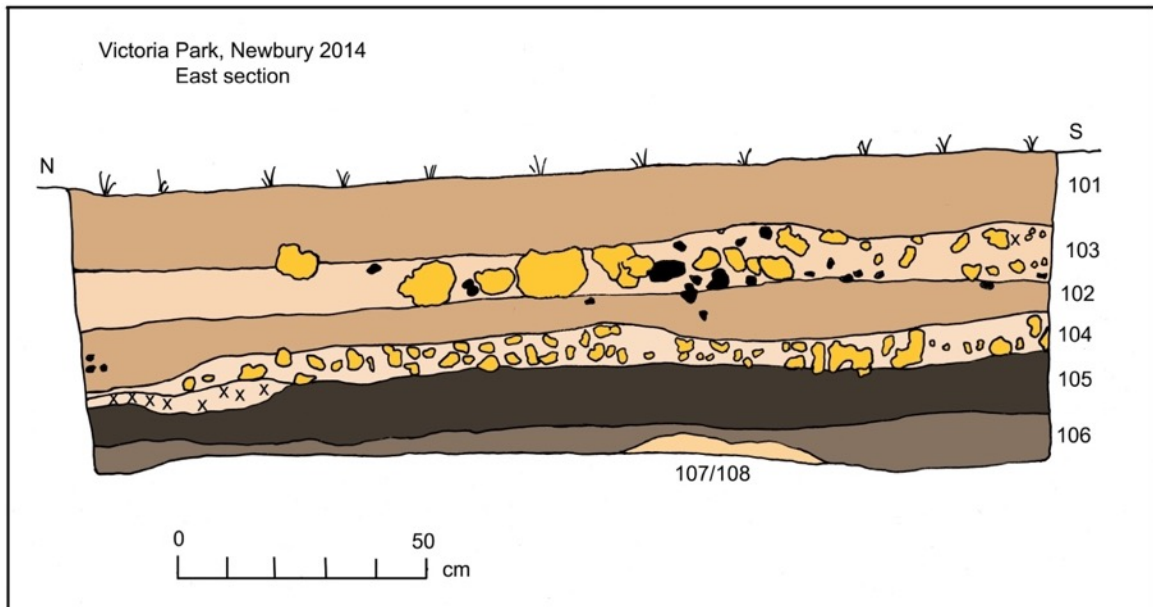


Figure 90: Victoria Park: representative sections (graphic J. Foster)

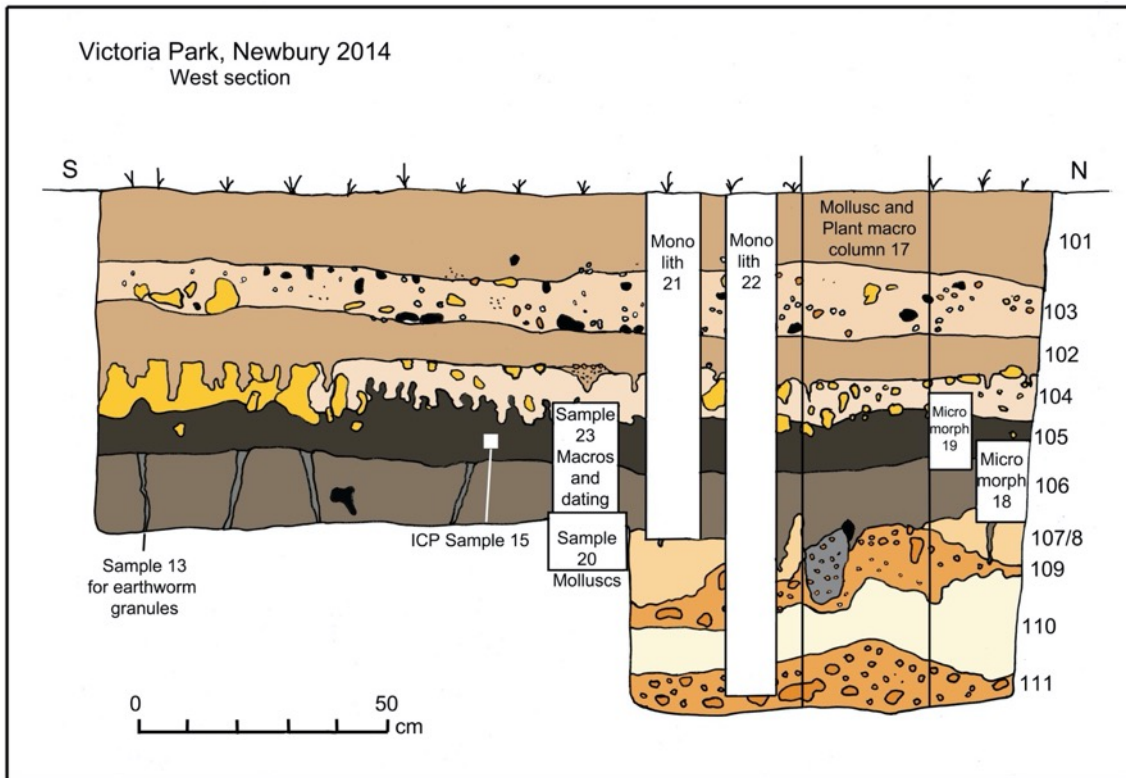
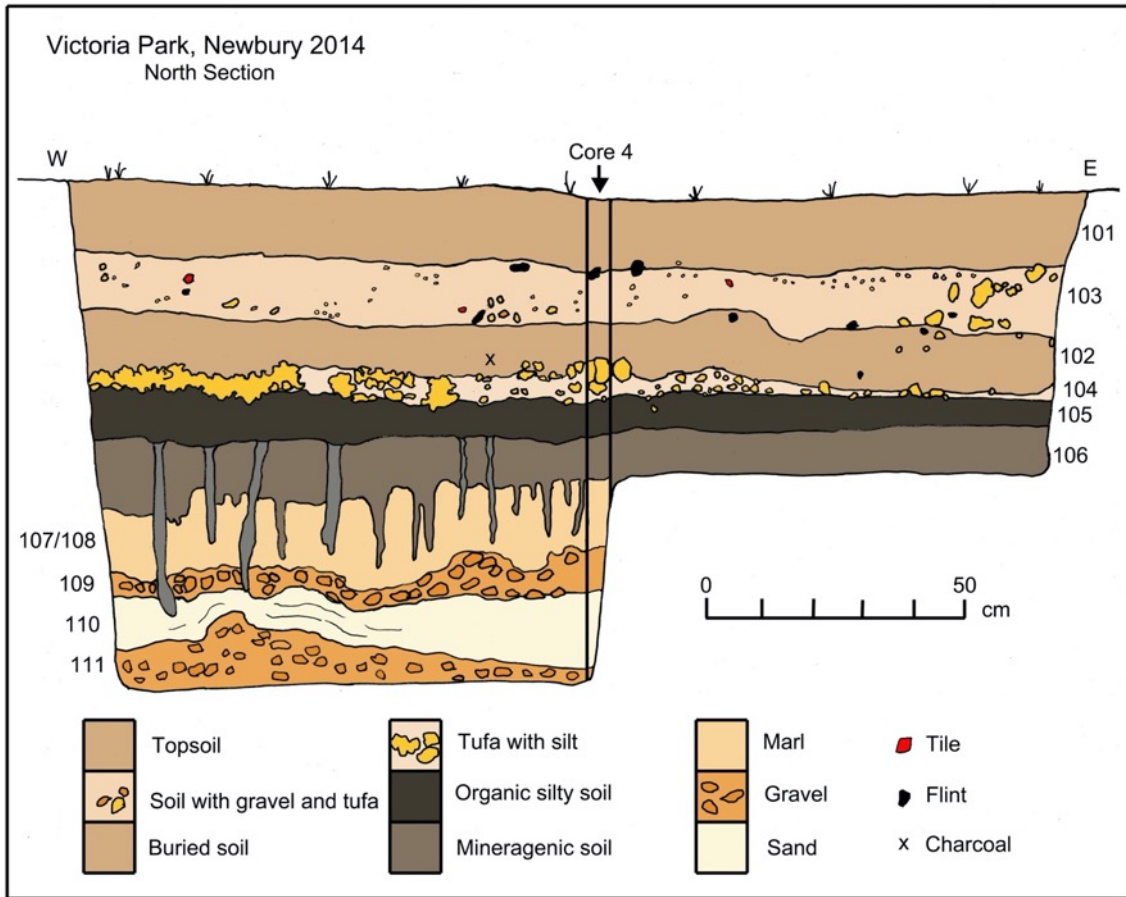


Figure 91: Victoria Park: representative sections (graphic J. Foster)

All other sediment removed from the trench was sieved on site, usually to 5mm. 15x15l samples from the occupation horizon of context 105 were also wet sieved on site to 2mm in order to maximise the recovery of microdebitage (cf Sandway Road: Harding 2005; 2006). Finds (notably animal bone and struck flint) were treated in accordance with the relevant guidance given in the Chartered Institute for Archaeologists' *Standard and Guidance for Archaeological Field Evaluation* (2014), the UK Institute of Conservators Guidelines *Conservation Guideline No 2* and the Museums and Galleries Commissions *Standards in the Museum Care of Archaeological Collections* (1991).

Once the trial pitting had been completed, the pit was backfilled using the excavated material and left level.

The residues and sieved fractions of the bulk environmental samples and 10mm slices were sorted, recorded and retained with the project archive. Comment was made on preservation and presence of macro remains and suitability for dating. Those samples and materials not within the current project remit were kept to enable fuller assessment/analysis in the future. All artefacts from excavated contexts were retained, washed, weighed, counted, identified and indexed, including those from the relatively recent upper soil horizon of modern date. No human remains were found.

All artefacts recovered during the excavations are the property of the landowner (Newbury Town Council) and will be deposited with the landowner's permission with West Berkshire Museum (under accession number NEBYM:2015.2), following a separate programme of full analysis and publication, which was not included within the scope of this project.

### *The sedimentary sequence*

As previously observed in Boreholes 3 and 4, a relatively shallow but well-sealed and stratified sequence was exposed to a depth of 1m. The detailed context descriptions are given in **Appendix 3** and sections in **Figures 90–1**. To summarise, the top of the modern turf at 74.36m aOD was relatively level and dry and comprised short (mown) sward grasses. The well-developed modern soil profile (101) overlay two further humic soil horizons: the upper (103) of loose mixed soil with small tufaceous nodules; the lower (102) a sandy silt soil to 0.40m depth, which contained post-medieval finds. The underlying narrow band (104) comprised large tufaceous concretions with 30% humic loam soil matrix with some indications of post-depositional pedogenesis. The boundary to the underlying sediments was sharp (erosive or sudden dumping). This has been interpreted as the dumping of canal diggings or landscaping spoil in historic times. This set of historic-modern layers sealed the much earlier Holocene strata.

Context 105 varied slightly in thickness but in the north-west corner of the pit lay at 0.43–0.48m below ground (73.93–73.88m aOD). It comprised a sticky black well-humified silty peat. Slight rooting and worm burrowing was noted from the overlying layers but generally the layer was well sealed. It was found to be extremely charcoal- and artefact-rich and represents the main artefact horizon. A gradual increase in minerogenic content occurred down profile and a separate context (106)

was defined from 0.48m below ground, although arguably this is one continuous unit. Context 106 is described as a humic clay-rich soil; the presence of macropores indicates this was at least at times a rooted stable surface/series of surfaces. Artefacts continued into the top of this context but declined with depth as the minerogenic content increased. It is interpreted as a humic soil horizon with high input of alluvial material at its inception which declined over time to become the more stable, vegetated and useable surface, although prone to periodic flooding. This is supported by the findings of the mollusc analysis and plant macrofossil assessment (see **Appendix 3** and below).

A grey and orange iron mottled (reduced) stiff dense massive silty clay alluvium (107) was encountered from 0.59–0.65m (73.77–73.71m aOD) with occasional worm burrows and polygonal marks on its cleaned upper surface, likely large scale structures formed during drying/weathering as the alluvial input declined and the upper surface stabilised. Occasional fragments of charcoal were found in the upper portion (but associated with worm burrows) and apart from these the layer was archaeologically sterile. A relatively slow-moving accreting channel or backwater is indicated. The underlying context (108) was of pale massive calcareous silt marl with 5% very large flint nodules (up to 80mm and increasing in size again to the underlying layer). This is interpreted as an algal marl formed in a slow-moving or still body of water possibly of late glacial age when compared with similar layers encountered at Thatcham Reedbeds and Woolhampton Quarry (Chisham 2004; Collins *et al.* 1996; Collins 1994). This overlay context 109 at 0.78–1.0+m below ground (from 73.56m aOD) which consisted of coarse sands and gravels in a calcareous silty matrix with very large flint nodules, interpreted as a moving but slowing channel deposit probably of Late Devensian age.

### ***Finds and palaeoenvironmental material***

It fell outside the remit of the project to fully assess the palaeoenvironmental remains. However, a number of plant macrofossil identifications have been achieved in pursuit of the dating samples, as shown in the assessment tables (**Appendix 4**). The plentiful and well preserved wood charcoal from hand-picked and bulk samples has not been used beyond the selection and identification of short-lived pieces for dating and its future analysis is recommended along with that of any charred plant macrofossils amongst these assemblages. In addition, monoliths through the full sequence have been stored in order to enable microfossil analysis in the future if so desired. A full molluscan analysis has been provided by Tom Walker for the coring and test pit samples and the report has been included below.

Funding was made available for the full assessment of recovered animal bone and struck flints (below). In addition, a report on the two worked bone artefacts has been prepared (below). Analysis and fuller interpretation and publication are recommended.

## *Animal bones*

By Lorrain Higbee

### *Introduction*

A total of 103 fragments (173g) of animal bone was recovered from Test Pit 1, of which 54% came from Mesolithic deposits 105 and 106. Bone was recovered by hand during the course of the excavation and from the residues of bulk samples 1 to 3, and monolith 23.

### *Deposit 105*

Only eight of the fifty bone fragments recovered from Mesolithic deposit 105 can be identified to species. The majority of the rest are small undiagnostic fragments of mammal long bone shaft. Identified species include roe deer, red deer, beaver, water vole and possibly hare. The fragments of roe deer bone include a carpal (ON 41) and metatarsal (ON 137); the latter is from a neonatal animal. Red deer is represented by a fragment of metatarsal shaft (ON 228) that appears to have been used as a crude implement, possibly a hide scraper (see Foster, below).

Beaver (*Castor fiber*) is represented by a proximal fragment of right tibia (ON 142; **Figure 92**). The proximal epiphysis is unfused indicating that the bone is from a sub-adult animal. The angular edge of the crista tibia, which is quite prominent in rodents, appears to have been trimmed along its length, possibly when the last pieces of meat were filleted off the bone. However, the surface of the modified edge is smooth and flat in profile, which suggests that the prominent edge of the bone might have been used as some sort of rubbing implement. The lateral edge of the shaft and cortical surface (esp. on plantar aspect) also show signs of damage that might have been caused during butchery.



Figure 92: Victoria Park: beaver tibia (ON 142)

### *Deposit 106*

The small group of bone fragments recovered from this deposit includes water vole teeth and a fragment of femur shaft from a small species of bird (roughly small game bird-sized, eg quail). One piece of worked bone was also noted (ON 1112) but could not be identified to species because it is too finely worked. It appears to be part of an implement or personal item with a tapering shaft that has been polished smooth by repeated handling (see Foster, below).

### *Modern overburden deposits*

Identified species from these deposits (101, 102, 103 and 104) include sheep/goat, cattle, horse, dog and rabbit.

### *Conclusions*

Based on the evidence from Test Pit 1, animal bone occurs in low densities throughout Mesolithic deposit 105, and is scarce in deposit 106. The range of species identified indicates that the Mesolithic hunters of the Kennet Valley exploited a range of environments, taking deer and hares from the forests and beavers from the river. Similar evidence, including beaver bones, has been recorded from other sites along the Kennet Valley around Newbury including Thatcham (Wymer 1962) and Faraday Road/Greenham Dairy Farm (Ellis *et al.* 2003). Coles (2010, 108) has even suggested that during the Mesolithic “...people who settled for a while by the river chose to do so within beaver territory.”

### *Worked bone artefacts*

By Jennifer Foster

#### *228 TP1 Context 105. Length 76mm, width 24mm*

Split bone broken at the top end. The lower end, however, is worn, polished and rounded. This bone was not fashioned as a tool; it is a broken fragment that has been used and then discarded. There is also polish on the outer side of the bone, possibly due to its being held, and also on the lower split edges and on the inner marrow cavity, up to 30mm from the used end; this is probably due to contact, not where it has been held. The amount of rounding suggested forced smoothing over some hours; it was possibly used for processing skins, eg to rub fat into the surface.

At Tybrind Vig, a Late Mesolithic site in Denmark (4900–4300 BC), most of the bone tools, such as burins, points and fishhooks, were made from split deer metapodials (Andersen 2013, Abb 4.39). The waste from this process is remarkably similar to the used bone from Newbury (no 228) and, as at Newbury, these waste pieces were used without further modification, eg to make knives (ibid, 257). At the Late Mesolithic site at Goldcliff, Gwent (Bell 2007, 133–5) fragments of bone were used as scrapers; like this object, most have surface polish due to wear.

#### *1112 TP1 Context 106, sieving. Length 19mm, width 7–6mm*

Fragment of a bone tool shaped by trimming slivers from both sides of the upper face; however, it retains the shape of the original bones with a roughly rectangular section. There is one cut mark on the upper face with two small nicks on the lower end. It is very polished on most surfaces on both faces, probably due to handling over a long period of time. It is damaged at the lower end where two flakes have been removed, but there is polish over part of the break, so use continued until it broke again. The object is snapped off at the upper end so it is not possible to know its original length. The careful shaping and high polish indicating long use suggests that it was a valued hand-held tool. A retoucher is a possibility; a hard pressing movement would explain how the flakes were removed.

A similar carefully worked bone shaft, 9mm width and 65mm long and rectangular in section, was found during excavations at Victoria Park in 1963 (Newbury Museum NEBYM: 1964.11.38).

Bone and antler tools are generally only found on Mesolithic sites where preservation conditions are appropriate, such as wetlands. Where they are found, there are both carefully made objects as 1112 and reused fragments of bone as 228. At the waterlogged Early Mesolithic site at Thatcham, also in the Kennet Valley, 13 made objects were found (Wymer 1962, 351–3), along with used splinters, two bones and an antler. One of the used bones had a chipped edge and the other was worn all over. There are many antler and bone objects from Hardinxveld–Giessendam in the Netherlands, a Late Mesolithic site dating to 5500–5000BC. One hundred and seven are deliberately made artefacts, but a further 94 are used broken or split fragments (eg Louwe-Kooijmans 2001, Abb 11.16).

### *Flint*

By Phil Harding

All artefacts that were identified during the excavation were plotted using GPS, irrespective of size or material, and assigned individual Small Finds (SF) numbers.

Artefacts were recorded from all stratigraphic units 101–106, which marked the surface of the fluvial gravel sequence. Objects from contexts 101–103 were accompanied by fragments of pottery, clay pipe and CBM and represent topsoil, made-up ground or buried topsoil deposits. Additional material was collected from sieved residue.

All spoil from contexts 104, 105 and 106 was processed through a range of mesh sizes according to what was practical; 4 and 2mm mesh was used for context 105 with 7mm mesh adopted for context 106 which contained large quantities of clay. Artefact recovery in these clay rich deposits was maximised by chopping the sediment with a hand shovel to make it easier to sieve. In addition a representative sample of sediment (225l) was wet sieved on site through a 2mm mesh.

Additional residues were recovered by processing palaeoenvironmental sediment samples which were taken routinely as part of the project. Assessment of these residues suggest that reliable levels of artefact recovery can be anticipated from the 4mm and 2mm mesh sizes but that identification of microdebitage from the 1mm residues is hampered by the presence of naturally produced chips in the gravel.

This combined strategy of three-dimensional recording and sampling was adopted to maximise artefact recovery, facilitate reconstruction of artefact distribution and identify any artefacts that might be intrusive.

The worked flint assemblage has been quantified (**Appendix 4**). This shows, provisionally, that 380 pieces of worked flint were plotted in the trench or recovered on-site from the sieve, with a further 109 (29%) chips collected post excavation from wet sieved residue. The total also lists a blade that is probably of Mesolithic date from a geotechnical borehole, which was located immediately north of the

present café and was related to proposed redevelopment of the site. When the 'chips' from the wet sieved residue are excluded from the total the results show that the remaining 270 pieces were concentrated in the main body of the old land surface (105) which produced 155 (57%) pieces. The lower part of this unit (106) produced a further 70 (26%) artefacts.

All artefacts from the old land surface (105) were in a mint condition and unpatinated, although one small core was patinated. Isolated artefacts in the upper, less well stratified layers, principally two large anomalous artefacts from the buried turf line (102), which are unlikely to be Mesolithic, were lightly stained. Initial examination of the raw material from the Mesolithic assemblage indicates that it comprised good quality material, which, lacking clear signs of incipient cones of percussion on the exterior, may indicate that it was taken from the Chalk as freshly dug nodules.

The assemblage was recovered from two principal contexts: redeposited material from the made-up land overlying the undisturbed deposits, and the majority of the worked flint from the sealed old ground surface. The material from the upper layers was in most respects identical to that from the undisturbed deposits and probably relates to the redeposited marl (103) which overlies the old land surface (104) and which it is considered may have derived from the excavation of the boating pond. The excavated sample from Victoria Park therefore represents the first scientifically controlled excavation of the deposits and represents the true density and most representative artefact types from the area. At present it is assumed that all the material is of the same date; however re-examination of the old collections and archive held in Newbury Museum is recommended to assess whether they are the same or chronologically separate.

Initial inspection of the survey plots, supplemented by observations in the field, suggests that there is distinct patterning within the data (**Figure 93**). This distribution within the limited confines of the excavation area is likely to be related to site activity and suggests that the site is relatively undisturbed.



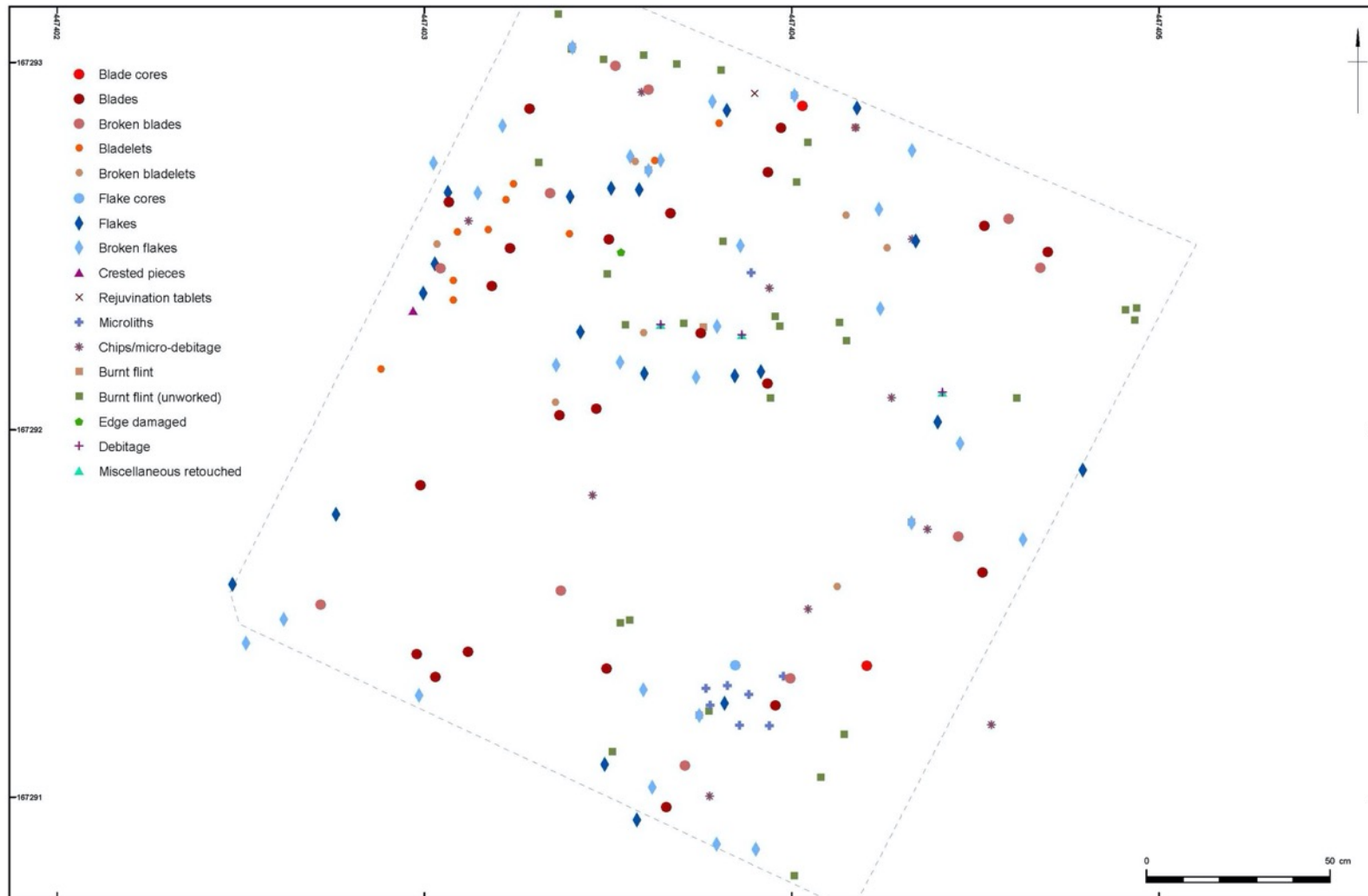


Figure 93: Victoria Park: lithic type distribution

It is currently unclear whether there is any potential for artefact refitting. This is an important consideration in understanding site taphonomy. Artefacts were collected from throughout context 105 and into 106. Vertical movement of this type is expected and can be linked to bioturbation and sediment cracking, processes for which there was clear evidence. Brick flecks were recovered from the 2mm sediment residue from sample 2 in context 105, confirming movement of artefacts through the soil profile.

Vertical artefact movement was limited to contexts 105 and 106. This limited vertical migration is undoubtedly linked to composition of the sediment. Vertical artefact migration is known to be less pronounced in clay-rich sediment than in sand.

The technology shows characteristics of a well-developed blade industry, with the whole reduction sequence represented. This includes core preparation, creasing, platform rejuvenation, platform abrasion and the use of soft hammers for blank manufacture. The assemblage also includes a representative selection of manufacturing snaps, which do occur during blade production. Quantification shows that broken and unbroken blades, bladelets and flakes account for 81% of the total assemblage of which the blades and bladelets comprised 44% of all blade/lets and flakes. The relative lack of preparation flakes, trimming waste and cores from the collection, together with the similar low frequency of chips is counterbalanced by retouched material (10%), especially microliths. This may be a consideration when considering the nature of the activities being undertaken in this part of the site.

Three cores were recovered. The most impressive of these comprised a well-worked blade core (105.84) with an unmodified cortical back. The core was prepared with one principal striking platform and an opposed striking platform that was probably used for remedial purposes. The other two cores comprised a broken blade core and failed micro-core.

The retouched tool component included 21 microliths, of which nine were plotted *in situ*. Initial assessment of these implements indicates that 16 were geometric microliths, with the remainder comprising three obliquely blunted points, the tip of a burnt backed point and a backed point. Large collections of small geometric microliths are normally indicative of Late Mesolithic assemblages. They can be found in association with obliquely blunted points, which occur throughout the period, but, when found in quantity, are often indicative of Early Mesolithic assemblages. There is nothing, currently, to suggest that the assemblage from Victoria Park is necessarily multi-phase, indeed it is likely that analysis will show that larger backed forms were found in direct association with geometric forms.

All phases of microlith production, use and rejection appear to be present. This includes the use of the microburin technique in microlith manufacture; a single proximal microburin was recovered during on-site sieving, with a Krukowski microburin recovered subsequently from the sieved residue. In addition, an obliquely blunted point retained traces of the microburin facet. A burnt fragment

from the tip of a broken point may indicate abandonment of a, perhaps broken, microlith.

This assessment has demonstrated the clear archaeological potential of the assemblage to provide information on human activity at Victoria Park to add to the palaeoenvironmental evidence. This small assemblage is nevertheless a significant addition to the archaeological story of Mesolithic activity in Newbury and elsewhere in the Kennet Valley. The current evidence suggests that the site is largely undisturbed, having been protected below a deposit of chalky marl.

The assessment of the worked flint assemblage suggests that the artefacts are of Late Mesolithic date. This is at odds with the radiocarbon dating, which places the site in the Early Mesolithic (above). Additional analysis of the extant collections from the site may help to clarify whether these collections form part of one contemporary occupation or renewed visits over time. Early Mesolithic activity has been documented from Faraday Road, 350m to the east-north-east, while excavations at Thatcham (Healy *et al.* 1992) revealed both Early and Late Mesolithic scatters on the same site.

### *Molluscs*

By Tom Walker

In April 2014 samples from small (*c.* 20cm) test pits were dug with a post-hole spade at each coring location prior to the power cores being taken (**Figure 94**). This was done to check there were no services, although the council map indicated none were present. Each sample was obtained from measured depths in each pit. There was inevitably some contamination from sediment falling into the pit from more superficial levels, but this was kept to a minimum and any obvious contaminating material was removed prior to placing samples in labelled bags. The samples were not quantitative, but each was between 400g and 600g in weight.

Samples were taken wherever possible tufa was seen or where the more silty samples contained molluscs visible to the naked eye, or with the aid of a hand lens.



Figure 94: Location of the boreholes and trench in Victoria Park, Newbury

#### *Trench mollusc column*

In July 2014 a mollusc column was taken from the north end of the west-facing section of the trench. Samples of approximately 1500g were obtained, although two were smaller (54–56cm and 56–58cm).

#### *Sample preparation and analysis*

All samples were wet-sieved using 4mm, 2mm, 1mm and 500 $\mu$ m sieves, following accepted procedures (Evans 1972). Sediments were disaggregated with H<sub>2</sub>O<sub>2</sub> (30% by volume) and Calgon (sodium hexametaphosphate). Molluscs were extracted and identified using a low power stereo microscope with x7 – x45 magnification. Identifications were made with the assistance of standard texts (Macan 1977; Killeen *et al.* 2004; Cameron 2008) and a personal reference collection.

#### *Results*

Summary tables (**Tables 7–8**) and mollusc diagrams (**Figures 95–7**) are shown below; full tables showing the numbers of molluscs obtained in each sample are included in the appendix (**Appendix 3**). The ecological preferences given for each species are for guidance in determination of habitat requirements but are not prescriptive or exclusive (Boycott 1934, 1936; Evans 1972).

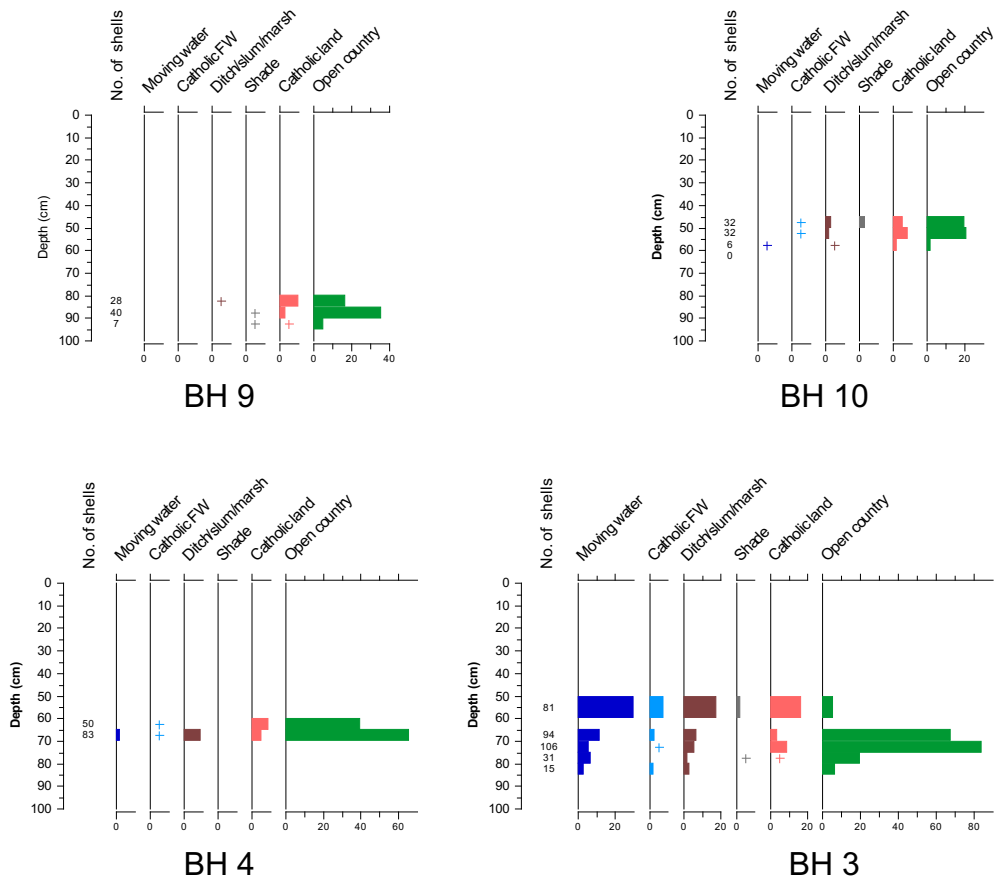


Figure 95: Mollusc diagrams for the Victoria Park boreholes (absolute numbers of shells; + = single specimen)

	BH 9			BH 10				BH 4		BH 3				
	80-85cm	85-90cm	90-95cm	45-50cm	50-55cm	55-60cm	60-65cm	60-65cm	65-70cm	50-60cm	65-70cm	70-75cm	75-80cm	80-85cm
<b>Moving water</b>						1			2	30	12	6	7	3
<b>Catholic freshwater</b>				1	1			1	1	8	3	1		2
<b>Ditch/slum/marsh</b>						1			3	10		3	2	3
<b>Shade</b>				1						4	1	1	1	
<b>Catholic land</b>	10	4	2	10	10	2		9	5	23	5	11	1	
<b>Open country</b>	18	36	5	20	21	2		40	72	6	73	84	20	7
<b>Burrowing</b>	4	3	1	4	7	4	8			13		2	1	

Table 7: Victoria Park: numbers of molluscs found in the borehole samples

<b>Context</b>	101		101/103			102		104		105		105		105		106		106		106		107		107		108		109		110		111																			
<b>Depth (cm)</b>	0-5		5-10			10-15		15-20		20-25		25-30		30-35		35-40		40-44		44-48		48-50		50-52		52-54		54-56		56-58		58-60		60-62		62-64		64-65		65-70		70-74		74-78		78-82		82-93		93-105	
<b>Sample weight (g)</b>	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0	150	0			
<b>Moving water</b>			4		13	31	43	4	43	245	184	44	16	2	3	2							2	1	1	1	1	1	1	1	1																				
<b>Catholic freshwater</b>			1		6	7	16	1	12	159	221	11	8			2	1						1	1	1	1	1	1	1	1	1																				
<b>Ditch/slum/ marsh</b>					15	16	23	3	46	100	170	20	5	4	3		3	7				3	4	1	8																										
<b>Shade</b>									1	15	31	5	2	8	7	11	29	12																																	
<b>Catholic land</b>			6		17	19	13	3	98	43	79	41	21	21	20	30	29	28						13	3	2	22	1																							
<b>Open country</b>	3	5	6		11	27	18	4	110	53	73	14	6	38	37	46	100	134					150	87	4	169	39																								
<b>Burrowing</b>					1	3	3	2	2	1	5	10	7	10	1		4	2					2	4																											

Table 8: Victoria Park: numbers of molluscs found in the trench mollusc column samples

The burrowing mollusc *Cecilioides acicula* was present in almost all samples; this species is found living up to 2m below ground surface (Evans 1972, 168); it is therefore of little use in environmental analyses and is excluded from the following discussion.

#### *Borehole 9*

Three samples were from a depth of 0.8–0.95m where the borehole sediment was identified as alluvium although from the molluscan evidence it is more likely to be a buried soil. These samples were the deepest of any mollusc-containing sediments and contained solely terrestrial molluscs. The majority were open-country species *Pupilla muscorum* and *Vallonia excentrica*, with some catholic species and specimens of *Discus rotundatus*, the latter suggesting some shade in the vicinity. This area, the furthest from the present river course, was clearly dry ground at the time of sediment deposition, with no suggestion of flowing water or overbank alluvium.

#### *Borehole 10*

Four samples were from depths between 0.45–0.65m and this was identified in the borehole as buried soil. The molluscs are mainly terrestrial, although with a few freshwater specimens which may derive from overbank alluvium. When these sediments accumulated the land was mainly open dry ground but with periods when the ground was wetter (*Vallonia pulchella*) with intermittent flooding. There is little evidence of shade, although this may have been developing in the upper part of this horizon (45–50cm), suggested by single specimens of *Discus rotundatus*, *Vitrea contracta* and *Clausilia bidentata*.

#### *Borehole 4*

This was from the location later selected as the test pit. The two samples were from a depth of 0.6–0.7m and this was identified in the borehole as tufaceous marl. They contain mainly land species, with open-country taxa (*Pupilla muscorum* and *Vallonia* sp.) predominating, although the presence of *Vallonia pulchella* suggests slightly damp ground, probably associated with intermittent flooding from the river, as some freshwater species are present.

#### *Borehole 3*

Five samples came from 0.5–0.85m depth and these deposits were identified in the borehole as buried soil underlain by tufaceous marl. Open-country terrestrial species predominate, especially *Pupilla muscorum* and *Vallonia* sp, in all but the top sample. Freshwater species (mainly moving water and ditch species) increase and predominate at the top of the buried soil.

The table also includes molluscs obtained in 2011 from calcareous marl in an assessment trench about 200m north of the coring sites, which was dug in advance of the making of a skateboard area. The sample depth is not recorded, but was about 0.30–0.40m. This contained almost entirely land molluscs, with *Pupilla muscorum* strongly dominant, followed by *Vallonia* sp. (probably *V. excentrica*), consistent with open ground.

### *Excavation trench*

There were no shells found below 70cm in any of the three basal sand and gravel sediments [111, 110, 109]. The marl deposits [108, 107] contained moderate numbers of shells, the majority of which were open country species, with approximately equal numbers of *Pupilla muscorum* and *Vallonia* sp, both *V. pulchella* and *V. excentrica*. These findings are consistent with the bare ground above the gravels gradually becoming vegetated; some areas were sufficiently damp to support *V. pulchella*, while others areas were drier with *V. excentrica* (Evans 1972, 162). Only a few freshwater shells are present, probably washed in from the nearby River Kennet. Succineidae imply riverside vegetation. The uppermost portion of [107], however, was almost devoid of shells, suggesting a period of instability when the location was inhospitable for colonisation by molluscs.

The minerogenic soil [106] indicates a period of environmental stability. Mollusc numbers increase, with the assemblage closely resembling that found previously; the area is still open country. *Vallonia* sp. dominate, with *V. excentrica* gradually replacing *V. pulchella*, consistent with the ground becoming drier. Some shade species are present in the upper levels of this sediment, but all are able to live at the base of rank open country vegetation; there is little to suggest more substantial areas of shade. Virtually no freshwater molluscs are present, implying that flooding occurred only rarely. These conditions persist during deposition of the more organic silty soil [105], with closely similar molluscan assemblages in the lower horizons of this context. Only in the uppermost portions is there a change, with increase in freshwater molluscs (especially *Valvata piscinalis*) and decrease in *Vallonia* sp. Flooding episodes may well account for these changes, although displacement of shells by earthworms from overlying deposits may account for the presence of some of the freshwater shells.

The tufa with silt sediments [104] from 40-48cm are very rich in shells, of which 75-80% are freshwater species associated with all types of habitat, from clean flowing water (*Valvata piscinalis*, *Bithynia tentaculata*) to ditch/slum species (*Valvata cristata*, *Galba truncatula*), with a variety of catholic species (mainly *Radix balthica*, *Bathyomphalus contortus*, *Gyraulus crista*, *Pisidium nitidum*, *P. subtruncatum*); some of those present are able to withstand periods of drying and are regarded as amphibious (*Galba truncatula*, *Anisus leucostoma*, *Pisidium personatum*). It is likely that during the period that these sediments were deposited, the land was regularly flooded but with sufficient dry periods for land molluscs to survive, with open-country (especially *Pupilla muscorum* and *Vallonia excentrica*) and catholic species (mainly *Carychium* sp., *Cochlicopa* sp. and *Trochulus* sp.), as well as some requiring moderate shade (*Aegopinella pura*), although with few requiring the more dense shade associated with scrub woodland (*Discus rotundatus*, *Vitrea* sp.). The assemblages are consistent with dry ground during summer with areas of rank vegetation growth providing local shade but flooding during winter when the freshwater species are deposited in overbank alluvium.

The buried soil [102] shows a molluscan assemblage which varies with depth. The lower half contains high numbers of shells, although fewer than in the underlying tufa. Land shells now predominate (c.70%) indicating increased stability of the dry ground, with reduction of flooding episodes, perhaps because the river channel has



moved further from the sample site. *Vallonia excentrica* (open country), *Trochulus hispidus* and *T. striolatus* (catholic) dominate the land species. The freshwater molluscs are represented mainly by *Valvata cristata*, *V. piscinalis* and *Bithynia tentaculata*, showing that there is still some flooding, as these species thrive in slow flowing waters with muddy substrates. The upper portion of the buried soil, surprisingly, contains very few molluscs; there seems no ready explanation for this.

The subsoil with gravel and tufa [103] contained only moderate quantities of molluscs. This context may represent dumped material from the making of the boating pool. The proportion of freshwater shells decreases upwards consistent with reduced flooding episodes and gradual drying of the land. The freshwater assemblage (particularly *Valvata cristata*, *V. piscinalis*, *Bithynia tentaculata*, but with a good range of other taxa), is associated with a variety of habitats, from clean well-oxygenated flowing water to ditches with muddy substrates, all consistent with allochthonous assemblages deposited during flooding episodes.

The topsoil [101] contains very few shells, possibly due to modern management of Victoria Park as a leisure ground; no freshwater shells are present in the upper half of the topsoil, probably the result of canalisation of this section of the River Kennet with raising of the river banks leading to only very infrequent overbank flooding.

### *Discussion*

The samples from the borehole locations and the trench show similar molluscan assemblages at corresponding depths, although with slight variation from site to site; the method of sample collection at the borehole sites was not closely controlled and some inconsistency of depth and contamination from adjacent layers is likely. Borehole 9 contained land shells at a depth of 80–90cm while this depth in the trench was Pleistocene sand and gravels and it is probable that there is some undulation in the ground surface, as the borehole mollusc assemblage corresponds closely to that found at 65–73cm in the trench.

The assemblages, especially in the trench samples, show a changing environment of wetter and drier ground, with varying degrees of overbank alluvial deposition. The Pleistocene gravels and sand at the base of the trench did not contain molluscs, but the earliest Holocene levels [108/107] were largely dry ground with only very occasional flooding, shown by the paucity of aquatic species. Conditions remained stable and unchanged during the time when the minerogenic buried soils [106] accumulated, and radiocarbon dated from plant remains to 8700 BC. There were some flooding episodes, but these cannot have been more than occasional and small-scale.

The organic silty deposits [105] sealing the buried soil initially shows molluscan assemblages little changed from the underlying sediments, but over time they contain increasing numbers of freshwater shells indicating more frequent flooding episodes. Conditions then abruptly changed, with formation of a tufa horizon [104] containing very large numbers of freshwater shells, both with regard to the number of individual shells and to the number of species. Whether this is because the river course moved closer to the study site allowing greater quantities of overbank alluvium to be deposited or because of greater climatic instability with more severe

flooding cannot be determined from the molluscan analysis alone. There is an approximately equal number of flowing-water shells and catholic freshwater shells and those capable of living in ditch and slum habitats, as well as some 'amphibious' species able to withstand periods of desiccation. However, the presence of a wide variety of terrestrial shells implies that there were periods when the area was sufficiently dry for these survive, although some may be allochthonous, being transported by alluvial action from elsewhere.

The sediments above the tufa contain broadly similar molluscan assemblages, the lower deposits containing roughly equal numbers of freshwater and terrestrial shells, consistent with reduced flooding episodes but this did not cease until recent times. There will undoubtedly have been reduction in flooding during the 19th century when the river banks were raised during construction of the Kennet and Avon Canal.

### *Conclusions*

The mollusc assemblages confirm the varying wetter and drier alterations in the Kennet valley at Victoria Park associated with flooding by overbank alluvium. At no time was the actual river course itself at the location of the trench or boreholes. The earliest Holocene was generally dry, but during the period of Mesolithic occupation, as indicated by the artefacts in Context 105, this area of the Kennet valley was more regularly waterlogged, with maximal flooding occurring in the tufa/silt horizon [104]. Further dry periods ensued although with some regular flooding up to recent times when modification of the river banks effectively ended overbank flooding with absence of further freshwater mollusc deposition.

### *Plant macrofossils and wood charcoal*

by Catherine Barnett

The plant macrofossil assessment (**Appendix 4**) enables some limited discussion of vegetation and landscape contemporary with the artefact horizons (contexts 105–106). Wood charcoal was plentiful. The assemblage from bulk samples spanning the full thickness (80mm) of context 105 included *Betula* sp. (birch), Pomoideae (Pomaceous fruit types, eg whitebeam, hawthorn) and these were accompanied by occasional fragments of hazelnut shell (*Corylus avellana*). The macrofossils from 10mm slices through this context include various small fragments of wood and twig, both charred and waterlogged, some of the narrow pieces being spiny and resembling bramble or immature hawthorn, also seeds of *Brassica* (mustard family) and *Carex* (sedge). The types found indicate a mix of habitats in the immediate area including open colonising woodland and edge environments as well as the wetlands indicated by the presence of sedge.

Remains from the underlying context (106) include both waterlogged and charred wood in the upper portion of the unit, declining with depth as minerogenic alluvial input increased. The charcoal pieces identified for dating from both bulk samples from this context were of *Pinus sylvestris* (pine), and charred hazelnut shell was also recovered from this layer. No recognisable seeds were found in the 10mm slices through this unit. Preservation may be variable due to the decline and fluctuation in water levels at the site recorded from the 18<sup>th</sup> century onwards following

canalisation of the adjacent river and reclamation of the land for use as a park (Hadcock and Millson 1990), also evidenced by the lack of collagen in all the animal bones tested for dating. The presence of pine with hazel indicates a relatively early Holocene date, probably Early Mesolithic: modelling of the radiocarbon dates from context 106 suggests that it dates to *8430–8240 cal BC (95% probability; context\_106; Figure 98)* and probably *8330–8250 cal BC (68% probability)*. The same taxa (pine, birch and hazel) occur in the assemblage from the West Berkshire Museum archives for the adjacent flyover site excavated in the 1960s by Sheridan.

### ***Radiocarbon dating***

by Peter Marshall

As described, specific samples were evaluated with a view to providing the best possible samples for radiocarbon dating. The samples selected for dating are given below (**Table 9**).

The objectives of the radiocarbon dating programme were:

- to precisely date activity at the site;
- to clarify the chronological relationship of the site at Victoria Park with other Late Upper Palaeolithic-Mesolithic sites in the area; and
- to directly date the sediments in order to highlight the high potential of particular strata for association with Mesolithic remains and contemporary palaeoenvironmental material and to add detail to the wider Kennet sedimentary model.

Lab. No.	Sample ref.	Material and Context	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)	Calibrated Date (95% confidence)
UBA-27306	(105) <1>	Charcoal, <i>Betula</i> sp. twig, large single piece, 4 yrs old, fractured, (C Barnett, Wessex Archaeology) from Context 105, a peaty artefact horizon sealed by reworked tufa and modern soil. It overlies Context 106, a peaty deposit that is increasingly minerogenic down profile to peaty alluvium.	8688±52	-25.7	7940–7590 cal BC
SUERC-57163	(105) <2>	Charcoal <i>Pomoideae</i> (fractured, single fragment) (C Barnett, Wessex Archaeology), as UB-27306	8563±31	-29.6	7600–7550 cal BC
UBA-27308	(105) <4>	Charcoal, <i>Betula</i> sp. single piece, (C Barnett, Wessex Archaeology), as UB-27306	8662±70	-26.6	7940–7580 cal BC
UBA-27307	(105) <23>6–7cm sample A	Charcoal, spiny twig, single fragment (cf. hawthorn) (C Barnett, Wessex Archaeology), as UB-27306	8663±41	-27.8	7760–7590 cal BC
SUERC-57164	(105) <23>6–7cm sample B	<i>Corylus avellana</i> nut (single fragment) (C Barnett, Wessex Archaeology), as UB-27306	9231±31	-25.2	8570–8310 cal BC
SUERC-57183	(105) <23>6–7cm sample C	Organic-rich sediment, humic acid as UB-27306	6680±30	-27.0	
SUERC-57184	(105) <23>6–7cm sample C	Organic-rich sediment, humin acid as UB-27306	6771±30	-27.1	
		Organic-rich soil $T^*=4.6$ ; $v=1$ ; $T^*(5\%)=3.8$	6726±22		5670–5620 cal BC
UBA-27309	(106) <7>sample A	<i>Corylus avellana</i> nut (single fragment) (C Barnett, Wessex Archaeology), from Context 106 underlying peat to peaty alluvium, decreasing artefacts and increasingly minerogenic with depth. Unit is sealed by Context 105 (peaty artefact horizon), with reworked tufa and modern soil sealing the top of this whole sequence	9085±46	-27.5	8340–8240 cal BC
SUERC-57165	(106) <7>sample B	<i>Pinus sylvestris</i> (single fragment) (C Barnett, Wessex Archaeology), as UB-27309	9368±31	-27.1	8740–8560 cal BC
UBA-27310	(106) <8>	<i>Pinus sylvestris</i> (single fragment) (C Barnett, Wessex Archaeology), as UB-27309	9325±43	-27.1	8710–8460 cal BC
SUERC-57166	(106) <17>	<i>Corylus avellana</i> nut (single fragment) (C Barnett, Wessex Archaeology), as UB-27309	9185±31	-23.8	8540–8290 cal BC

Table 9: Victoria Park radiocarbon results

### Samples

A pre-screening programme was undertaken to determine whether any of the bones were suitable for radiocarbon dating. As it was likely that the deposits containing artefacts had undergone periodic wet/dry episodes since their deposition, collagen survival might have been variable.

Samples from six bone fragments were submitted for %N measurement to the Oxford Radiocarbon Accelerator Unit (ORAU). The results (**Table 10**) show that none of the samples had %N measurements >0.76%. The %N content of whole bone has been shown by Brock *et al.* (2010) to have an 84% likelihood of correctly predicting if a bone is suitable for dating if %N is greater than 0.76%.

Sample	Identification	% N	%N>0.76%
Newbury A	TP1 (105) animal bone	0.14%	Fail
Newbury B	TP1 (105) animal bone	0.17%	Fail
Newbury C	TP1 (105) animal bone	0.12%	Fail
Newbury D	TP1 (105) animal bone	0.35%	Fail
Newbury E	TP1 (106) NW sieved animal bone	0.18%	Fail
Newbury TP1 05	Beaver tibia with ?modification	0.31%	Fail

Table 10: Victoria Park %N results

As none of the bone samples were candidates for dating (and given the likelihood of this being the case for all bone from the site) an alternative sampling strategy was employed. Charred and occasional waterlogged material had been recovered from a number of samples taken from the test pit, all in close association with well-stratified Mesolithic artefactual material. It was decided therefore to submit a series of charcoal samples from the two contexts (105–6) that contained the flint artefacts and animal bone (**Table 9**). Although it could not be demonstrated that the charcoal and artefacts were related, the latest date obtained from the charcoal from each context provides as a minimum a reasonable *terminus post quem* for its formation.

A bulk sediment sample from the organic-rich context (105) was also submitted for dating. Dating of the humic and humin fractions of this deposit was not undertaken to help in answering the primary aims of the dating programme outlined above but to illustrate the folly in not identifying single-entity samples when dating such deposits. In general, soil organic matter, including charred organic matter, consists of a conglomerate of organic materials with different turnover times and, therefore, in different stages of decomposition (Scharpenseel and Becker-Heidmann 1992). As such a significant offset between the dated charcoal and organic-rich sediment was expected.

### Interpretation

Four single-entity charcoal samples were dated from the basal artefact-bearing deposit (106) and although these measurements are not statistically consistent ( $T^*=34.5$ ;  $v=3$ ;  $T^*(5\%)=7.8$ ), given the deposit would not be expected to have formed as a single event this is not unforeseen. Five single-entity charcoal samples were dated from the organic-rich horizon (105) and excluding the one evidently residual sample (SUERC-57164; **Figure 93**) the remaining four determinations are statistically consistent ( $T^*=6.5$ ;  $v=3$ ;  $T^*(5\%)=7.8$ ) suggesting that they could be of the same actual age or more probably from a very short phase of activity.

Measurements on the humic and humin fraction of the bulk sediment sample from layer 105 are statistically consistent at 99% confidence ( $T^*=4.6$ ;  $v=1$ ;  $T^*(1\%)=6.6$ ) and a weighted mean,  $6726 \pm 22$  BP (organic-rich soil), has been taken as providing the best estimate for its age (**Figure 94**).

### *Chronological modelling*

The radiocarbon dates from Victoria Park clearly fall into two coherent groups (**Figure 96**). Simple visual inspection of the calibrated radiocarbon dates does not allow us to assess the date of Mesolithic activity at Victoria Park accurately, since the calibration process does not allow for the fact that this group of radiocarbon dates are related – they all come from the same site. Bayesian statistical modelling is required to account for this dependence (Buck *et al.* 1992; Bayliss *et al.* 2007), which has been undertaken using OxCal v.4.2 (Bronk Ramsey 1995; 1998; 2001; 2009). The date ranges from this model are given *in italics* to distinguish them from simple, calibrated radiocarbon dates.

A chronological model incorporating the radiocarbon dates, but excluding SUERC-57164 (see above) and the stratigraphic relationship between them, has good overall agreement ( $A_{\text{model}}=110$ ; **Figure 98**). Calculating the last dated event from each context allows us to estimate the date of formation of both contexts and therefore an indication of the age of the material found within them. Context 106 is estimated to date to *8430–8240 cal. BC (95% probability; context\_106; Figure 98)* and probably *8330–8250 cal. BC (68% probability)* and [105] to *7615–7545 cal. BC (95% probability; context\_105; Figure 98)*.

The offset between the bulk sediment and estimate for the date of context 105 is surprisingly large: *1880–1985 years (95% probability; Figure 99)* and probably *1925–1970 years (68% probability)*. Interpreting the meaning of the offset is problematic, other than demonstrating that bulk sediment dates can be importantly wrong for a number of reasons:

- The statistically consistent humic and humin results. The humic fraction of organic-rich sediments is usually younger than other bulk fractions due to the downward movement of humic acids.
- While the humin fraction, which is probably the more stable organic compound and, theoretically, the oldest is usually interpreted as being representative of the soil age (Becker-Heidmann *et al.* 1988).

Scharpenseel and Becker-Heidmann (1992), reviewing 25 years of attempts to date soils, concluded that a single sediment fraction could not be identified to yield reliable ages of soil formation independent of other supporting evidence and it is clear that such advice should be heeded.

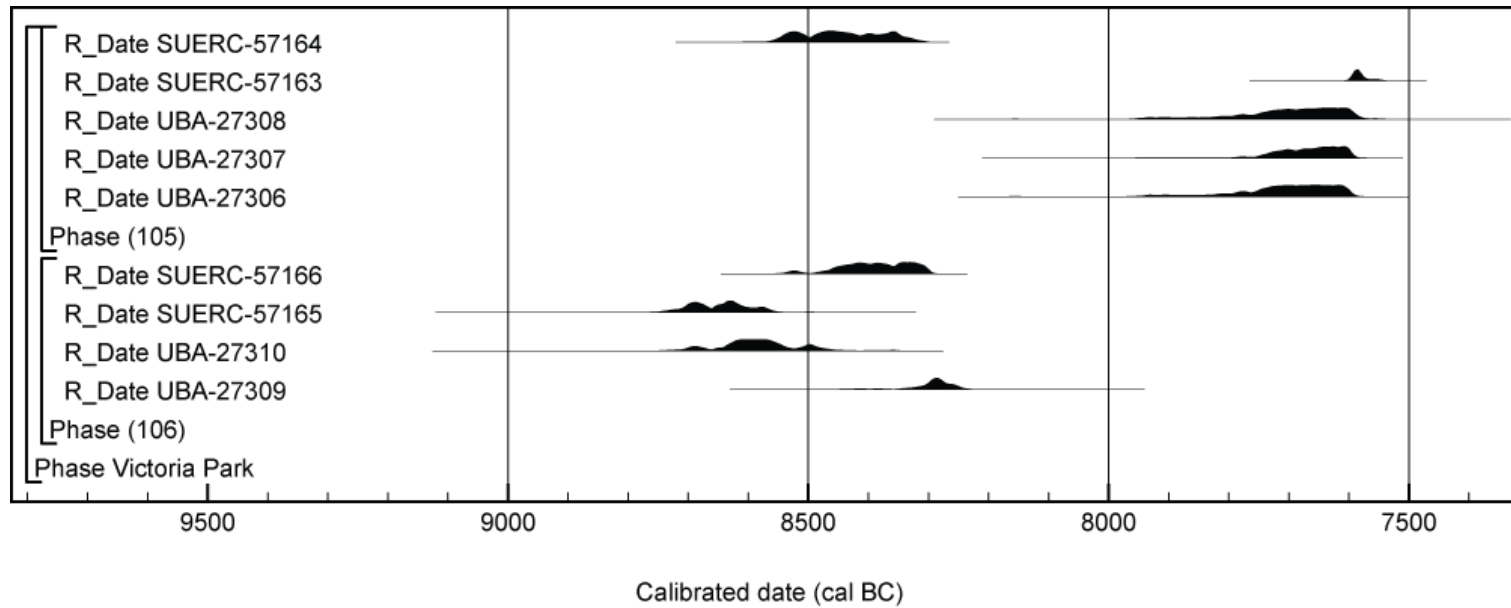


Figure 96: Probability distributions of dates from Victoria Park, Newbury. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

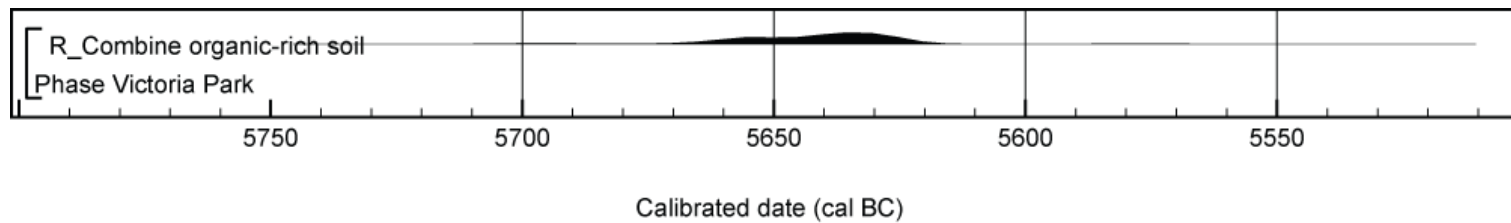


Figure 97: Probability distribution of the date of the organic-rich soil from Victoria Park, Newbury. The distribution is the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

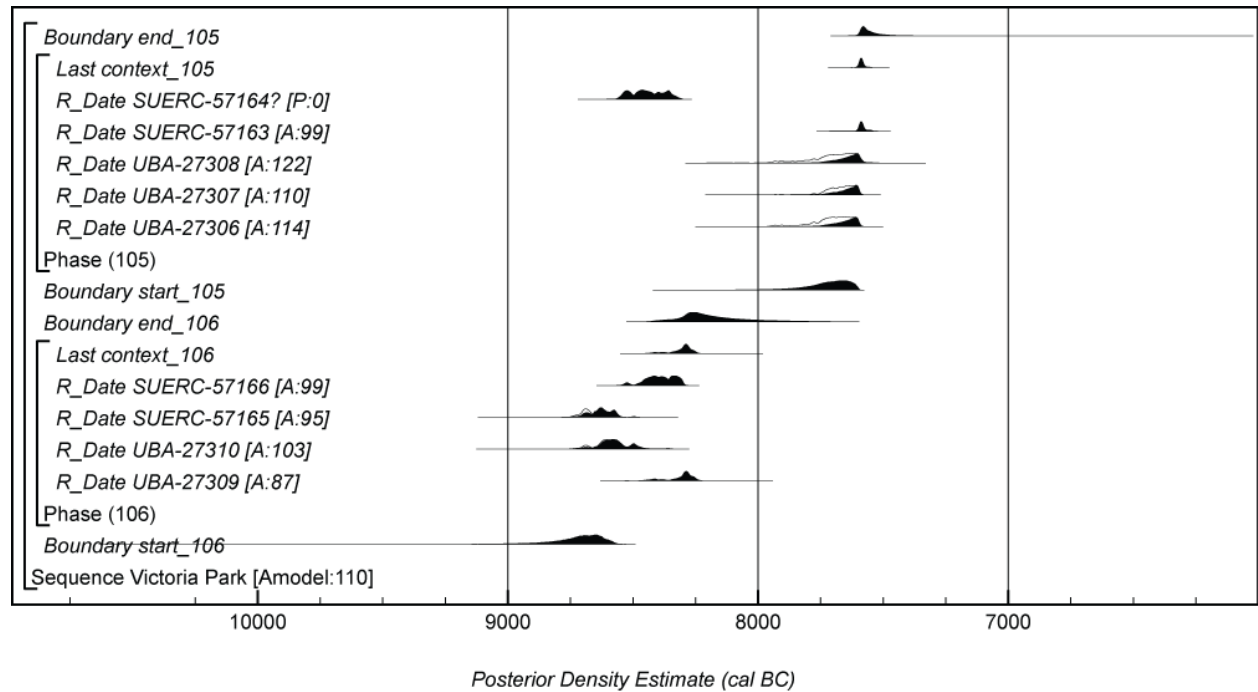


Figure 98: Probability distributions of dates from Victoria Park, Newbury. Each distribution represents the relative probability that an event occurs at a particular time. For each radiocarbon date, two distributions have been plotted: one in outline which is the result of simple radiocarbon calibration, and a solid one based on the chronological model used. The other distributions correspond to aspects of the model. For example, the distribution 'Last context\_106 is the estimate for the formation of context (106). The large square brackets down the left-hand side of the diagram and the OxCal keywords define the overall model exactly.

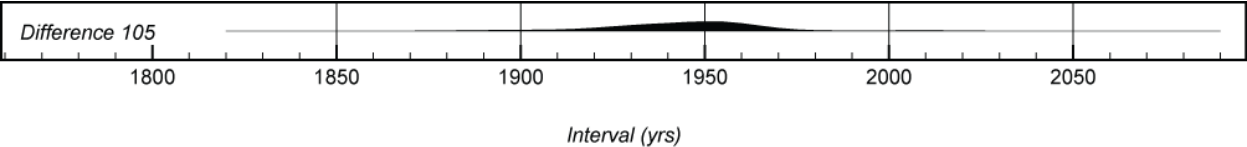


Figure 99: Probability distribution showing the number of calendar years difference between the date of the buried soil and the estimated date for its formation. The distribution is derived from the parameters organic-rich soil (Figure 94) and context\_105 (Figure 98).



### *Newbury A339 flyover*

by Martin Bell

Work by the Newbury District Field Club in 1963 in advance of construction of the A339 flyover 25–50m south-east of the 2014 excavations in Victoria Park (West Berkshire HER EWB513; SU 47427 67290), found a comparable sedimentary sequence. A single photograph in the museum collection shows a section which can by comparison with the 2014 trench be provisionally interpreted as follows from top to bottom: (i) made ground; (ii) stone free palaeosol; (iii) tufaceous gravel; (iv) palaeosol with black organic peaty top; (v) sandy marl. The main artefact horizon, the 'black layer', contained a microlithic flint assemblage together with well-preserved charred hazelnuts and charcoal.

In West Berkshire Museum there are 30 bags of finds and a short report of four pages, two notebooks listing finds and one photograph from excavations in 1963. The museum catalogue lists the artefacts and has a photograph of each one (accession number NEBYM:1964.11.1-61). The excavations were by R. Sheridan, P. Hassell, D. Munson and E.G. Creed. The photograph shows a section where the dark buried soil produced stratified Mesolithic material. Other areas of the site were described as disturbed. The following is based on a rapid assessment of the finds by MB on 30.6.14; full analysis of the assemblage should be undertaken alongside that from the Victoria Park excavation, as part of the programme of analysis and publication of that site.

The finds total 53 artefacts as follows:

- microliths 10;
- microburin 1;
- serrated blades 6 (some with gloss);
- scrapers 11;
- notched blade 1;
- blades 4;
- cores 14;
- core rejuvenation flake 1;
- tranchet axe sharpening flake 1;
- flint fragments 2;
- worked bone ? point 1;
- bone 1;

Along with:

- charred hazelnut 3 (several frags);
- charcoal 3 containers.

Since most of the material comprises tools with only a few blades and waste flakes it is likely that most of the debitage was not retained.

The Museum has a fine example of a tranchet axe found by W.E. Harris and separately accessioned (OA.118, this is from SU 475 673). Froom (2012, figs 4.2 1–9, Fig 4.3–4) illustrates a collection of material from Victoria Park: the microliths

he illustrates appear mostly to be from the 1963 excavation rather than the original boating pond discovery (Froom 2012, 124); his illustrations include the tranchet axe (Froom 2012, Fig 4.3.1). The microliths from the 1963 excavations and those illustrated by Froom appear to be Early Mesolithic types. The presence of six serrated blades, some with probable gloss, is significant because it is likely to indicate the use of plant resources. The worked bone (1964.11.38) may be from a point similar to examples from Thatcham (Wymer 1962, Plate L).

### Samples

by Peter Marshall

In order to clarify the chronological relationship of the A339 flyover site with that recently excavated at Victoria Park three samples (**Table 11**) were submitted from the archive held by West Berkshire Museum. Replicate measurements on a charred hazelnut shell (SUERC-56980 and UBA-27300) are statistically consistent ( $T'=0.3$ ;  $v=1$ ;  $T'(5\%)=3.8$ ) and a weighted mean of  $9233\pm 24$  BP (NEBYM1964.11) has been calculated as providing the best estimate for the age of the sample.

Laboratory Number	Sample reference	Material & context	Radiocarbon Age (BP)	$\delta^{13}C$ (‰)	Calibrated Date (95% confidence)
UBA-27301	NEBYM 1964.11.2 Site 1 sample A	Charcoal, <i>Pinus sylvestris</i> , single fragment (C Barnett, Wessex Archaeology) from an occupation horizon discovered during the building of the flyover for the A339 to the east of Victoria Park.	9286 $\pm$ 58	-24.5	8710–8310 cal BC
SUERC-56981	NEBYM 1964.11.2 Site 1 sample B	Charcoal, <i>Betula</i> , single fragment (C Barnett, Wessex Archaeology), as UBA-27301	8578 $\pm$ 30	-27.2	7610–7580 cal BC
SUERC-56980	NEBYM1964.11 – sample A	Carbonised hazelnut shell, single fragment (C Barnett, Wessex Archaeology), as UBA-27301	9237 $\pm$ 25	-23.4	
UBA-27300	NEBYM1964.11 – sample B	Carbonised hazelnut shell, single fragment (C Barnett, Wessex Archaeology), as UBA-27301	9199 $\pm$ 70	-24.3	
Weighted mean	NEBYM1964.11	$T'=0.3$ ; $v=1$ ; $T'(5\%)=3.8$	9233 $\pm$ 24		8560–8325 cal BC

Table 11: Newbury flyover A339 radiocarbon results

### Interpretation

The results suggest two distinct episodes of Mesolithic activity in the mid-9th millennium cal. BC and 8th millennium cal. BC (**Figure 100**). Although the depth and exact location of the material from the site are not known, and few site records are currently available (although more may be located in the Museum store as items are transferred into the newly reopened museum), the chronological similarities between the A339 flyover and Victoria Park are striking.

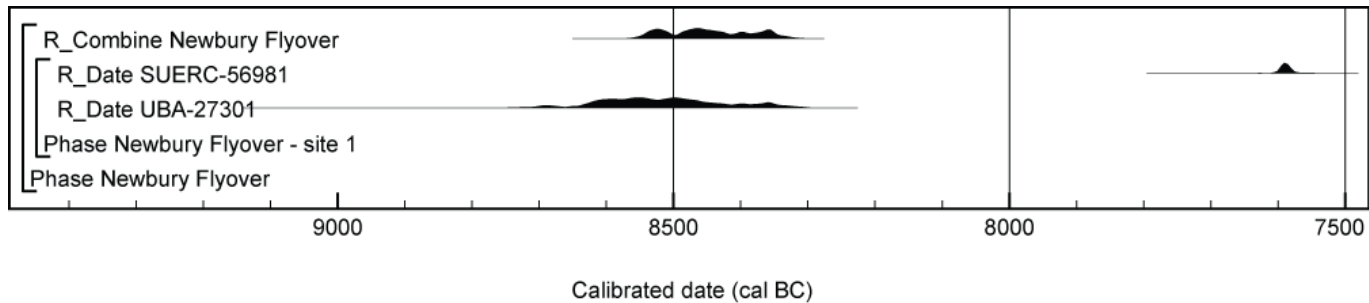


Figure 100: Probability distributions of dates from Newbury Flyover. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

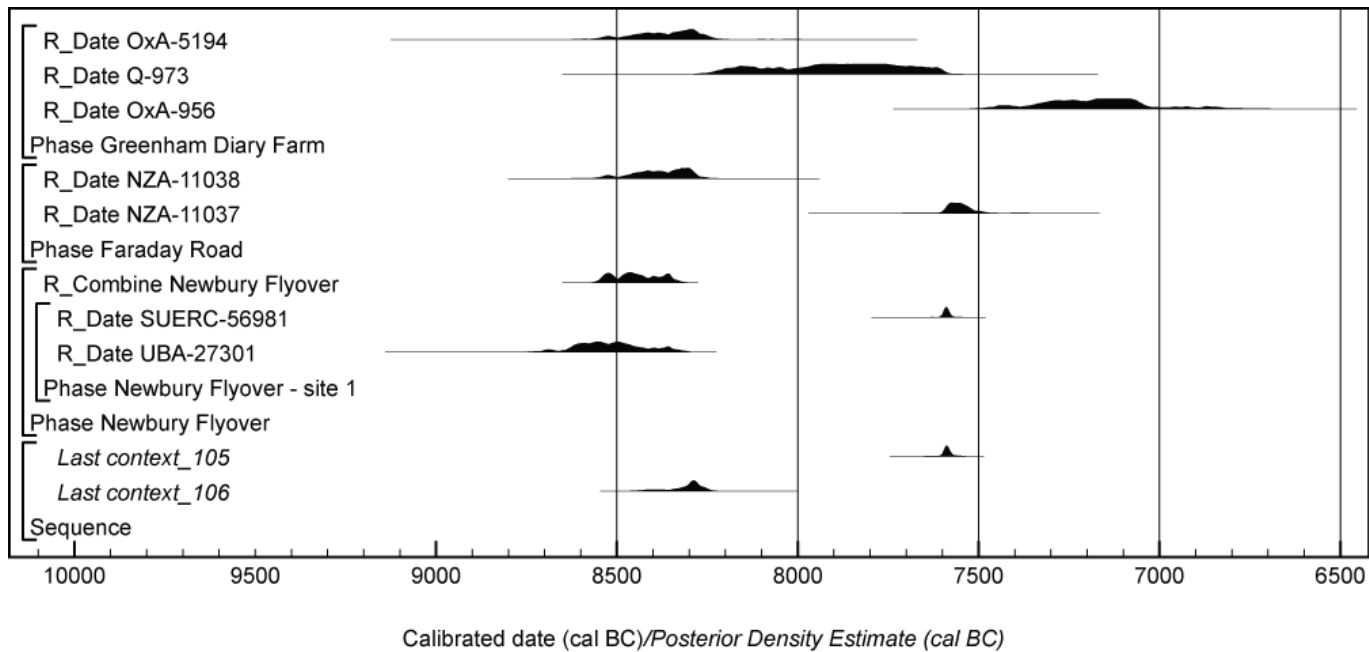


Figure 101: Probability distributions of dates from Mesolithic activity either side of the Newbury Flyover. The distributions are the result of simple radiocarbon calibration (Stuiver and Reimer 1993).

### *Mesolithic activity in and around Victoria Park, Newbury*

Some 250m further to the east of Victoria Park and the A339 flyover a number of other Early Mesolithic sites have been excavated at Greenham Dairy Farm (Sheridan *et al.* 1967) and Faraday Road (Ellis *et al.* 2003) – the radiocarbon determinations from these two sites are given in **Table 12**. The section drawing from Greenham Dairy Farm (Sheridan *et al.* 1967, fig 1) shows the same ‘organic-rich’ Mesolithic occupation layer below a shell marl.

Lab. No.	Sample ref.	Material and Context	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)
<b>Faraday Road (Ellis <i>et al.</i> 2003)</b>				
NZA-11037	1124 NE	Pig bone, from occupation surface 1124 NE	8510±60	-21.3
NZA-11038	1124 s2009	Carbonised <i>Corylus avellana</i> nut fragments from occupation surface 1124 2009	9148±60	-24.0
<b>Greenham Dairy Farm (Hedges <i>et al.</i> 1988; 1996; Sheridan <i>et al.</i> 1967; Switsur and West 1973)</b>				
OxA-956	1964-12	Red deer antler from occupation surface	8160±100	-
Q-973		Red deer bone from 15cm layer of fine silt stratified with Mesolithic artefacts	8779±110	-
OxA-5194	GDF-1	Carbonised <i>Corylus avellana</i> nuts from occupation surface	9120±80	-23.2

Table 12: Newbury Faraday Road and Greenham Dairy Farm radiocarbon results

The emerging picture is of two distinct phases of Early Mesolithic activity taking place in the mid-9th millennium cal. BC and 8th millennium cal. BC (**Figure 101**) along a considerable stretch of the floodplain from Victoria Park to Faraday Road.

### *Discussion and recommendations for future work*

It is clear that the same strata in which this newly found Mesolithic site occurs continue beyond the bounds of the trial pit and area of Boreholes 3–4, with similar layers found in Boreholes 7, 9 and 10. The potential for more sites or a continuation of this one is also highlighted by the Mesolithic finds made during the construction of the flyover to the immediate east and west and boating lake (above).

Furthermore, observations of the sinking of a single screw auger hole for geotechnical purposes 150 yards to the north-west of the trial pit noted the existence of organic sediments and a single struck flint recovered from the base of the hole (Bell pers. comm.).

## The Project-Wide Findings

### *Radiocarbon dating and chronological modelling*

by Peter Marshall

Thirty-one radiocarbon determinations were obtained from the following sites: Newbury Flyover (four); Newbury, Victoria Park (11); Thatcham reedbeds (five); Ufton (nine); and Wawcott (two).

The 17 samples dated at The Queen's University Belfast were processed and dated by Accelerator Mass Spectrometry (AMS) as described in Reimer *et al.* (2015).

Fourteen samples were dated at the Scottish Universities Environmental Research Centre. The charcoal and waterlogged plant remains were processed using an acid-alkali-acid pre-treatment as described by Stenhouse and Baxter (1983). CO<sub>2</sub> obtained from the pretreated samples was combusted in pre-cleaned sealed quartz tubes (Vandeputte *et al.* 1996) and then converted to graphite (Slota *et al.* 1987). The samples were dated by AMS as described by Freeman *et al.* (2010). For the organic-rich soil both the alkali-soluble ('humic acid') and alkali- and acid-insoluble ('humin') fractions were dated.

Both laboratories maintain continual programmes of quality assurance procedures, in addition to participating in international inter-comparisons (Scott 2003; Scott *et al.* 2010). These tests indicate no significant offsets and demonstrate the validity of the precision quoted.

### *Radiocarbon results*

The results (**Tables 1, 5–9 and 11**) are conventional radiocarbon ages (Stuiver and Polach 1977), and are quoted in accordance with the international standard known as the Trondheim convention (Stuiver and Kra 1986).

### *Radiocarbon calibration*

The calibrations of these results, which relate the radiocarbon measurements directly to the calendrical time scale, are given in **Tables 1, 5–9 and 11** and in **Figures 43–4, 73, 83–4, 98–9 and 102**. All have been calculated using the datasets published by Reimer *et al.* (2013) and Hua *et al.* (2013) and the computer program OxCal v4.2 (Bronk Ramsey 1995; 1998; 2001; 2009). The calibrated date ranges cited are quoted in the form recommended by Mook (1986), with the end points rounded outward to 10 years or five years if the error is <25. The ranges in **Tables 1, 5–9 and 11** have been calculated according to the maximum intercept method (Stuiver and Reimer 1986); the probability distributions shown in **Figures 43–4, 73, 83–46, 98–9 and 102** are derived from the probability method (Stuiver and Reimer 1993).

### *Early Mesolithic activity in the Middle Kennet Valley*

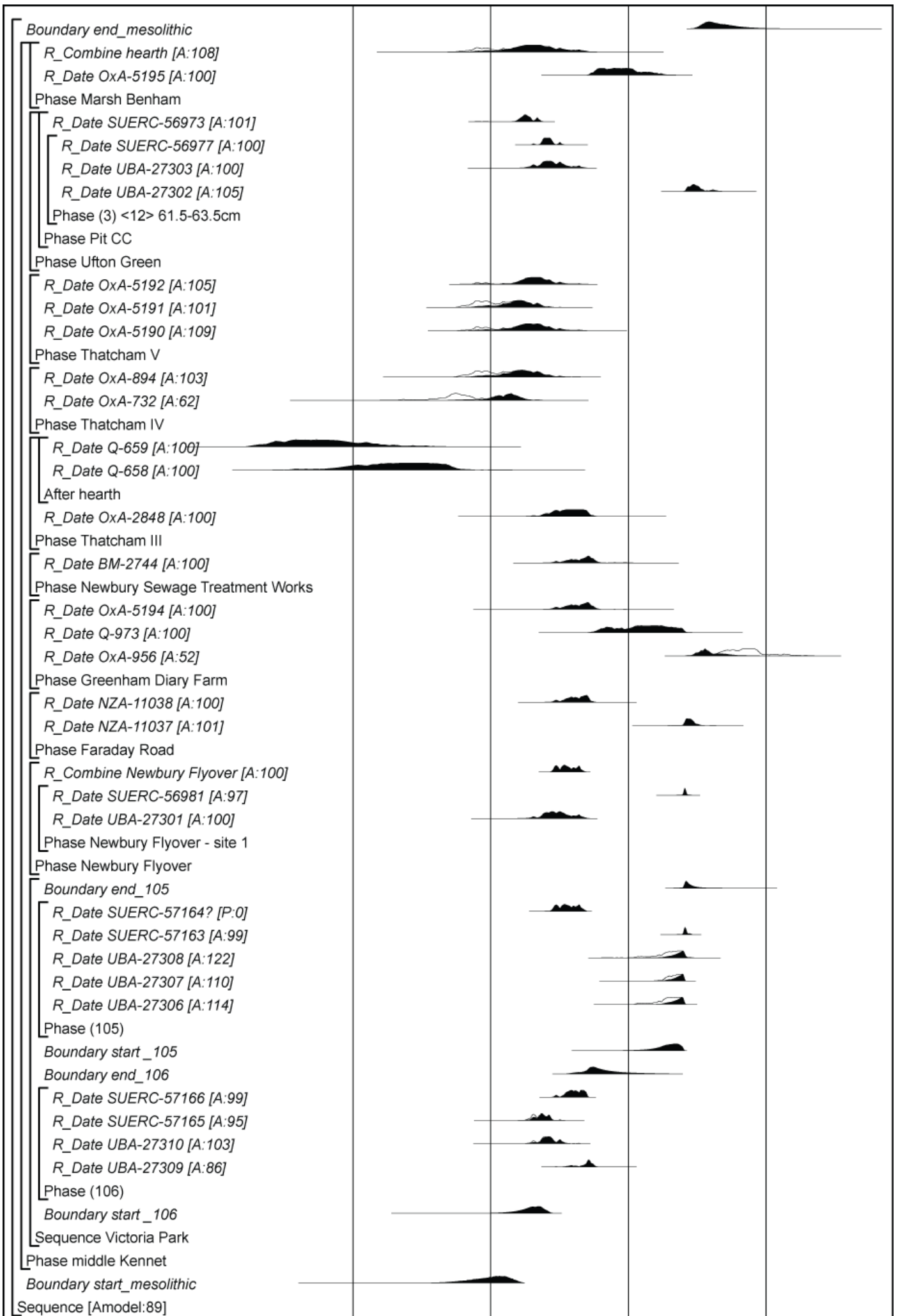
A preliminary chronological model (see above for details) for Early Mesolithic activity in the middle Kennet Valley is shown in **Figure 102** (details of additional radiocarbon dates included from Marsh Benham are given in **Table 13**). This model has good overall agreement (Amodel=89) and estimates that the first Mesolithic

activity dates to 9315–8780 cal BC (95% probability; *start\_mesolithic*; **Figure 102**) and probably 9115–8835 cal BC (68% probability). The end of this phase of activity took place in 7520–7070 cal BC (95% probability; *end\_mesolithic*; **Figure 102**) and probably 7475–7265 cal BC (68% probability).

Lab. No.	Sample ref.	Material and Context	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)
<b>Marsh Benham (Reynier 2011)</b>				
OxA-5195	MB1-1	Carbonised <i>Corylus avellana</i> nut (single) from Layer 2 (1994 excavation) of a 1m <sup>2</sup> excavation adjacent to 1972 trenches. Early Mesolithic artefacts ere found in close association with sample	8905±80	-23.7
Q-1129		Charcoal, unidentified and carbonised <i>Corylus avellana</i> nuts from putative hearth area during 1972 excavation	9300±150	
Q-1380		As Q-1129	9690±240	

Table 13: Marsh Benham radiocarbon results

Mesolithic activity focused on the floodplain of the Kennet is likely to have been intermittent rather than continuous and thus the chronological model only provides an estimate over the period when the floodplain was being used (**Figure 103**). Individual site biographies such as Victoria Park give a better indication of the chronology of what are most probably going to have been short-lived phases of activity in specific places.



### *The Predictive Model*

by Michael Grant

As explained in the introduction to the project, an overall sedimentary model for the Middle Kennet Valley has been developed using the known geological evidence, the commercial and other borehole records, and the more detailed evidence from previous archaeological investigations supplemented by the borehole and test pit evidence synthesised or carried out as part of the present project. This was done in order to facilitate prediction of areas of particular significance for recovery of Upper Palaeolithic and Mesolithic archaeological evidence.

The predictive model will remain static unless further funding for its periodic updating can be secured. This will have varying effects on the model's continued relevance: the sedimentary sequences are very comprehensive, and are unlikely to need revision in the foreseeable future. New palaeoenvironmental and archaeological information could be incorporated with relative ease, with find-spots added from data submitted to the HER. More significantly difficult will be the mapping of risk and potential mapping which would require periodic revision in the light of new information in order to stay up to date.

Even in its static form, the predictive model will be used by West Berkshire Council in a variety of ways. First and foremost, the model can operate alongside other datasets as part of the development control process within the National Planning Policy Framework, for example by feeding into a suite of constraint mapping elements. These can not only be used by the Archaeological Officer to identify the presence of Holocene deposits and thus inform potential archaeological conditions on planning applications, but can also be used by non-archaeological personnel (such as planning officers) as a trigger for consultation. Crucially, the model can inform on the potential for deposits to be present, as well as known archaeology, which will allow for strategic planning as well as responsive action.

For example, the model can directly influence local planning policy strategies, particularly for minerals and waste extraction as these have the highest potential to adversely affect deposits containing Holocene archaeology or environmental evidence. The model can be used to scope potential extraction sites for existing or potential deposits, allowing for pre-application advice on mitigation strategies to be given. This method could potentially be applied to organisations outside of West Berkshire Council, for example flood mitigation work carried out by the Environment Agency, or wetland site management by Natural England. Lack of awareness of archaeological sites at risk, particularly those that are below ground or ephemeral in nature, can contribute to the unintentional destruction of important remains. Synergy of the predictive model with other datasets, for example SSSIs, can help to mitigate against this, as well as offer opportunities for cross-organisational work.



### *The relationship between key sedimentary layers and early prehistoric remains*

by Michael Grant, Martin Bell and Catherine Barnett

The occurrence of particular early Holocene strata were found to be much better guides than broad landscape characteristics when considering potential for presence, preservation and association with environmental remains. The overarching sedimentary model showed distinct patterning to some of these deposits which helps to further define areas of raised potential. A simplified and stylised stratigraphic scheme for these early layers was given above.

The key layers identified as being chronologically and physically associated with early prehistoric remains represent the terminal late glacial, transitional and early Holocene sedimentary environments. The occurrence of these layers at any given site should be taken to indicate high potential for associated remains until proven otherwise. The key stratigraphic contexts, arranged from earliest to most recent, can be summarised as follows:

#### *Pleistocene river gravels*

These are widely represented and have been extensively extracted for aggregate. There have been a number of finds of Lower Palaeolithic handaxes at, for instance, Thatcham (Wymer 1999). The surface of the gravels is undulating and marked by successive bars and multiple phases of intersecting channels generally considered to be a product of peak snowmelt discharges under Pleistocene conditions. The gravel surface has been planned by geophysics at Ufton Bridge (Mansfield 2007) and also discussed in the context of the Thatcham sewage treatment work excavation by Healy *et al.* (1992).

Holocene stratigraphy is generally shallow on the crests of gravel ridges/bars and deeper sequences are preserved in low lying areas and former channels. For instance at Thatcham Sewage Treatment Works there was 0.2m of Holocene soil over a gravel ridge and 1m in a former channel (Healy *et al.* 1992, 44–46). At Ufton Bridge there is 0.4m of Holocene stratigraphy in the excavation trench, an expanded 0.75m sequence 8m north and a 3m deep Holocene channel 20m away. An undulating basal gravel surface cut by Holocene channels is also seen at Wawcott (Froom 2012) in the borehole transects across sites XXX and XXIII and the transect studied by Fern (2004). Some former channels reflect Pleistocene riverine processes others were cut in the Holocene.

#### *Soliflucted chalk and chalky gravels*

These have been identified at the base of the valley slope at the Wawcott XXX transect in this study and in Fern's (2004) transect at Wawcott, where what is probably soliflucted chalk overlies fluvial gravel.

#### *Calcareous marl*

Highly calcareous marl of algal origin with some sand and gravel (which may, from observations in Victoria Park 2014, be intruded as a result of periglacial processes) appears to be Pleistocene in date (**Figure 104**). At the Victoria Park skateboard site a patchy veneer of this deposit was associated with a particularly large and distinctively Pleistocene form of the mollusc *Pupilla muscorum*. The marl underlies

Mesolithic horizons at Ufton and Victoria Park. The Long Blade site at Wawcott XII appeared to lie on the surface of a patchy veneer of this sediment. Marl has also now been found in one part of Thatcham, at Wawcott XXX and at Victoria Park, all immediately underlying artefacts of Early Mesolithic date and therefore presumed to be of raised potential for terminal Upper Palaeolithic remains (though not directly found during fieldwork).

These algal marl (potential lake/slow water) deposits appear to be present in clear clusters along the floodplain and tend to coincide with the distribution of tufa (potential vigorous spring) deposits (**Figure 104**), which are also present in discrete patches along the floodplain, with the latter stratigraphically overlying the marl. It should be noted, however, that determination of a marl, as opposed to a tufa, is not straightforward with many borehole logs recording a bed of 'algal marl' which, when the associated description also states these contain calcium carbonate concretions, is actually a tufa (Worsley 2009, 119). Several suggestions have been made that these marls might relate to lakes (eg Cornwall 1968; Evans 1975), although Collins *et al.* (2006) state that the marl itself is derived from tufa and that its distribution reflects settling within slow flowing water rather than a lake environment *per se*. The apparent discrete clustering of these deposits within the floodplain does, however, illustrate spatial variability in the general stratigraphy of the Middle Kennet Valley and may point to areas where standing/slow water bodies were most prevalent.

Elemental analysis of basal samples from old land surfaces and some underlying marls at Wawcott, Ufton Bridge and Victoria Park highlight the very high proportion of calcium in these sediments. Particle size analysis of the sediments underlying Wawcott XXIII show a very high proportion of very fine sand with silts but no coarser sand. This suggests that aeolian processes contributed to this highly calcareous late Pleistocene deposit. Froom (2012, 17) had previously suggested that calcareous marl underlying Wawcott XXX may be wind-blown chalk dust.

Finds of beaver (*Castor* sp.) bones within the study area, some made in the 19<sup>th</sup> century (eg Blake 1903, 83; White 1907, 110; Peake 1935, Coles 2006; Worsley 2009 and at Victoria Park, this project), seem to coincide with the areas identified as containing marl and tufa. Although the bones tend to be stratigraphically higher than the earliest marls, it is feasible that the beaver provided processes (dam construction) capable of creating sizeable areas of standing water within the Early Holocene floodplain.

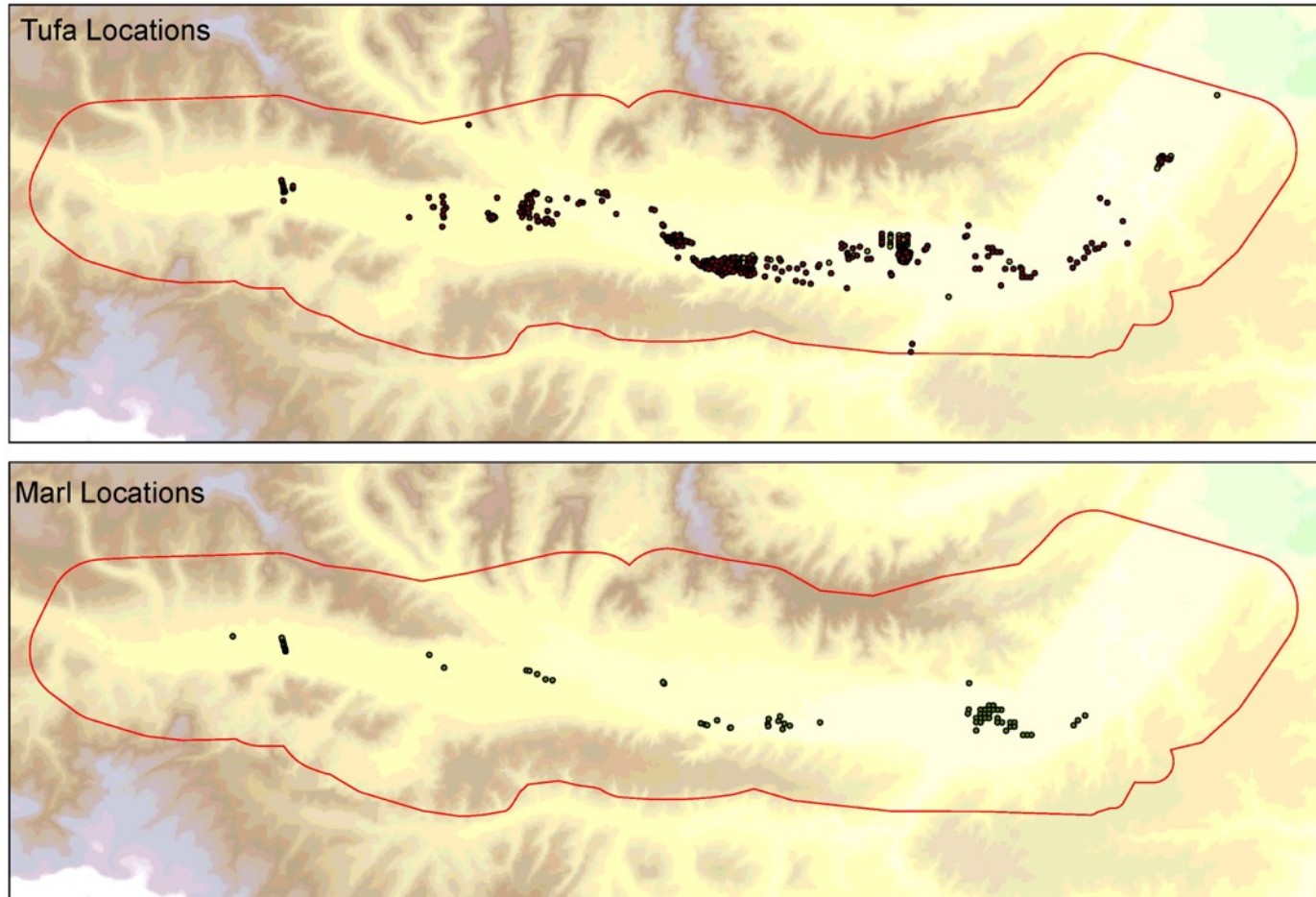


Figure 104: Tufa and marl locations (graphic M. Grant)

### *Alluvial clays and silts*

The wide-scale sedimentary model shows that minerogenic deposits are well distributed across the length of the floodplain (**Figure 105**), while organic clays and silts show more discrete distributions (**Figure 106**). However, this may be due to variations in the nature, and purpose, of sediment descriptions during site investigations (splitting or lumping contexts). The Long Blade site at Avington VI was in the upper part of a clay horizon (Froom and Cook 2005, fig. 2.2). This clay overlay a dark grey-black layer 100mm thick with a high organic content. The section drawing shows this as wavy and discontinuous, The possibility should be considered that it is an Allerød stabilisation surface. No artefacts are recorded from this horizon. It was underlain by clay with iron staining above gravel. The Mesolithic site at Wawcott XXIII is also in the upper part of a brown silt. The main Mesolithic artefact horizon at Thatcham Sewage Treatment Works is described as in an almost stone-free sandy loam of alluvial origin. Micromorphology produced little evidence of soil development (Healy *et al.* 1992). At Marsh Benham (1km east of Wawcott XXIII) Early Mesolithic artefacts were in grey-orange loam over gravel and below peat (Reynier 2011). Wawcott III Mesolithic finds derive from a terrace location in clay and particularly in overlying sandy silt. Pit features were present, and dates were Late Mesolithic and Neolithic (Froom 1976). At Faraday Road Mesolithic artefacts occurred in a soil overlying alluvial clays (Ellis *et al.* 2003).

### *Minerogenic soil*

An immature palaeosol formed on the top of the undulating Devensian fluvial gravel surface (Ufton Pit CC) or calcareous sandy marl (Victoria Park; Ufton Bridge excavation trench; Wawcott XXXIII and parts of Wawcott XXX); some of these calcareous early Holocene sediments may have had an alluvial origin as suggested at Faraday Road. This minerogenic soil precedes deposition of wetland peats and tufa and minerogenic alluvium. The soil was identified and dated at Thatcham, and at Victoria Park and several Wawcott sites (especially XXIII and XXX) on the floodplain proper and occurs with Mesolithic artefacts. At Wawcott XXX Mesolithic artefacts were within a buried soil with marl and in places gravel below and marl above (Froom 2012, fig 2.3 and 2014 coring transect). At Wawcott XXVIII a buried soil with Mesolithic artefacts is stratified between gravel and peat (Froom 1970, 2012).

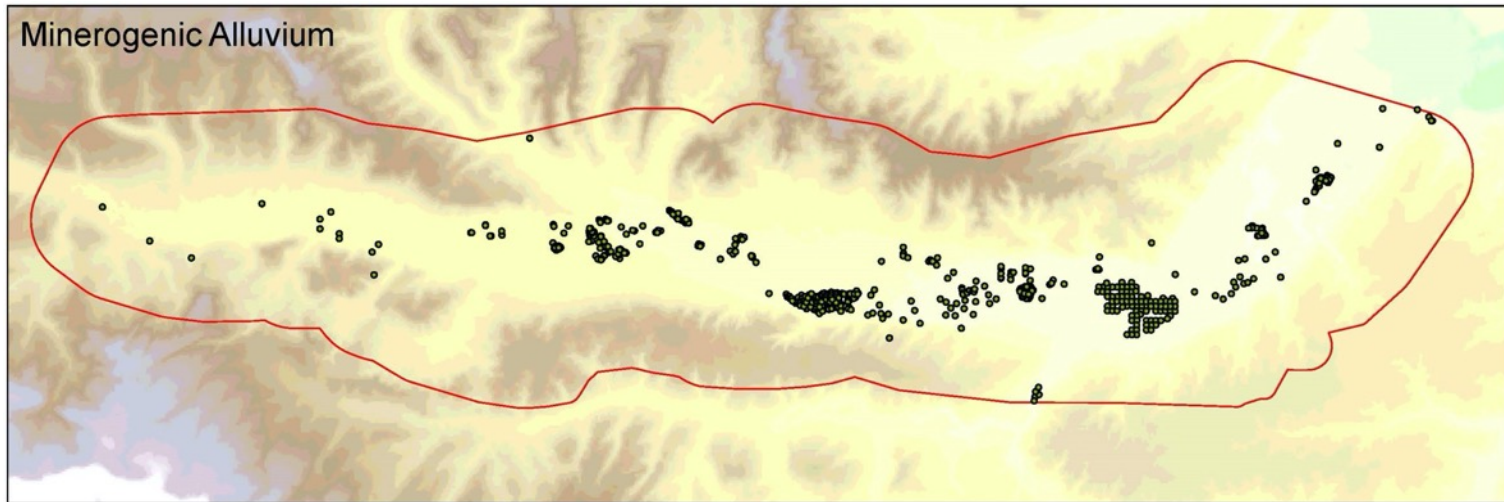


Figure 105: Minerogenic alluvium (graphic M. Grant)

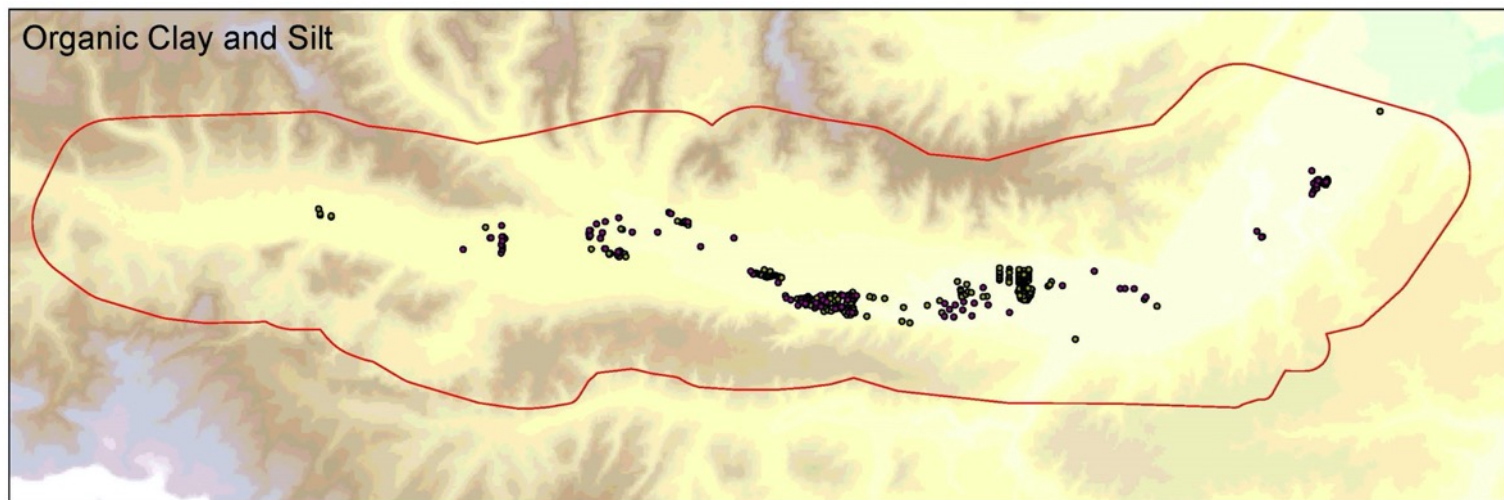


Figure 106: Organic clay and silt (graphic M. Grant)

### *Organic black silt*

This occurs on the top of the minerogenic soil and is generally little more than 100mm in thickness. In places at Ufton there are clay laminations indicating periodic flooding. This is the horizon most frequently associated with Mesolithic activity in the Kennet Valley although the artefacts are in different stratigraphic relationships to the layer. Some sections at Thatcham (eg Wymer 1962, plate XLVIII: lower plates showing sections of sites I and III) show an organic clay overlying the artefacts. A humic clay/peat is described overlying the main Early Mesolithic occupation horizon at the Thatcham Sewerage Treatment Works (Healy *et al.* 1992, 46). At Faraday Road the Mesolithic layer was sealed by very dark grey humic silty loam the lower part of which also contained Mesolithic artefacts, the upper part subject to disturbance by cultivation (Ellis *et al.* 2003, 112).

At Wawcott XXX the artefact horizon was in silts which were sealed by an organic-rich black layer. At Wawcott IV artefacts and a hearth were in a horizon which in places was a very dark black clay with charcoal below peat (Froom 2012, fig 3.3). At Victoria Park the main concentration of Mesolithic artefacts was in the upper part of an organic silt (Context 105) with lesser numbers in the underlying minerogenic old land surface. A black stabilisation within organic silty clays at Wawcott IX was revealed by the 2014 coring exercise which contained charcoal with dating potential (boreholes 110–150m) and might be a similar deposit. At Wawcott XV a firm dark clay above marl and below peat is described but its relationship to the artefact horizon is not clear as most of the artefacts were from fieldwalking (Froom 1970, 1972a, 2012).

Micromorphological investigation of this layer has taken place at Ufton Bridge and Victoria Park. The apparently widespread occurrence of highly organic generally thin silty layers on palaeosols in various topographic locations, not necessarily coeval, during the Mesolithic suggests a widespread factor leading to waterlogging of floodplain soils. The most likely factor may be disruption of drainage as a result of beaver activity. Bones of beaver are known from several Kennet Valley sites (Coles 2006). The growth of tufa may also have contributed to the disruption of drainage. This organic clay appears to represent a valuable marker horizon for some of the key Kennet Valley Mesolithic sites, sometimes containing the Mesolithic artefacts, sometimes sealing artefacts in underlying minerogenic soil/silt.

### *Peat*

A body of fibrous fen peat has been described in numerous interventions in the Kennet. Where dated (eg at Thatcham), this has proven to be of Early and possibly Late Mesolithic date to its top, although truncation occurs often, with the overlying material found to be of Roman or later date. Some truncation by increased channel or spring activity is indicated at Thatcham and Woolhampton but extensive peat cutting to this point is also evidenced. The peat has repeatedly yielded artefactual and palaeoenvironmental material, including preservation of calcium based remains such as Mollusca and bone due to its relatively high pH alongside excellent preservation of plant materials by waterlogging.

The soil sometimes develops into a peat where wet conditions and organic accumulation have continued. The peat generally overlies the Mesolithic activity but

it is to be expected that evidence of continuing Mesolithic activity in adjacent raised areas will be reflected in continued artefact deposition in adjacent peats. For instance, at Thatcham it is clear that peats were accumulating in the reedbeds from early in the Mesolithic (c. 9250–8600 cal BC) above a land surface with Mesolithic artefacts (Chisham 2004). Thus, although Mesolithic discoveries so far in the Kennet Valley have generally underlain peat, the basal peats offer the greatest potential for the finding of organic artefacts, bones and palaeoenvironmental evidence especially in wetland-edge contexts where peat deposition occurs adjoining activity areas on gravel rises. The potential of peats is further highlighted by discovery of a human skull in peat near some red deer antlers at Halfway, Wawcott (Peake 1935; Froom 2012). However, peat formation is likely to have continued in parts of the Kennet Valley into later prehistory and perhaps beyond, although in many areas the later peats may well have been cut away, given the evidence for peat cutting in some areas such as Wawcott (Froom 2012) and Woolhampton. Mesolithic potential focuses on the basal peats adjoining rises with known Mesolithic activity. Thatcham demonstrates, however, that Mesolithic activity also occurred on the floodplain itself and can be sealed by considerable thicknesses of peat. The distribution of peat deposits demonstrates some notable spatial variability with an absence of peat around the confluence of the Rivers Kennet and Enborne. The distribution of peat is also heavily influenced by past peat cutting, with an intermittent presence recorded in areas of known peat extraction such as Wawcott and Midgham.

#### *Calcareous algal marl or tufa*

Algal marls at Thatcham Site V were associated with the deposition of Mesolithic artefacts and bones (Churchill 1962). Given the description of the nodular character of this deposit it is not entirely clear why Churchill described this as an algal marl rather than a tufa. Algal marls are likely to have been deposited in bodies of calcium charged standing water or perhaps, as Churchill inferred at Thatcham, in slow flowing channels. Such contexts may have been most extensive in the early Holocene before fully vegetated conditions obtained. Mesolithic artefacts occurred within algal marl (gravel below, peat above) at Wawcott XIV (Froom 1970; 2012). Algal marl underlay the Mesolithic horizon at Wawcott IV (Froom 2012). However algal marl deposition also occurred in later periods and algal marl, described as reworked, overlay peats at Thatcham (Churchill 1962). At Ufton Bridge East Field Pit 2, algal marl overlay an artefact horizon with Iron Age pottery and a worked bone object.

#### *Tufa*

In low-lying areas this often overlies the old land surface and the organic black clay and thus it generally overlies Mesolithic artefact horizons. It occurs in this position at Ufton Bridge Pit CC. However, because tufa is associated with springs it is frequently associated with sites favoured for Mesolithic activity as at Blashenwell, Dorset; Prestatyn, North Wales; and Mendip sites where occupation surfaces are sealed by the extension of tufa deposits from adjacent springs and channels. Tufa deposits are frequent near springs in the Kennet Valley. Tufa is often redeposited in channels which may be similar in date to its formation or later. Tufa deposits are excellent for molluscan and bone preservation and where they occur adjacent to and

immediately overlying Mesolithic activity areas are of palaeoenvironmental importance.

#### *Minerogenic alluvium*

This is generally found overlying algal marls, peats, and tufa, for instance in the pits and cores at Ufton Bridge. As generally in lowland Britain this deposit is thought to originate in later prehistory from about the Middle Bronze Age when arable activity became extensive and sediment supply increased in the river valleys. However, it should be noted that there were earlier periods of alluvial clay deposition in the Kennet, although further work is needed in order to establish the extent to which these sediments are the result of riverine, lacustrine or in some cases aeolian deposition (see above). The Long Blade site at Avington is in the top of a clay layer (perhaps reflecting deposition in a lake). Wawcott IX Mesolithic artefacts occur within alluvial silts (Froom 2012, fig 6.3). At Wawcott, coring in 2012 (Site XXIII transect boreholes 110–150m) revealed a black stabilisation with wood and charcoal (with dating potential) within the alluvial sequence. The Mesolithic site at Wawcott XXIII is also on top of brown silt (which may partly be wind-blown). The Sewerage Treatment Works Mesolithic site at Thatcham is also in alluvial silts. An analytical priority is to establish if late Pleistocene silty clays and the later prehistoric alluvium can be distinguished on the basis of analytical properties, eg particle size, carbonate content or contained biological evidence, so that it will become more feasible to distinguish those silty clay alluvia which are of particular late Pleistocene and early Holocene potential from those which are later prehistoric. Particle size and elemental ICP OES analysis at Ufton Bridge, Victoria Park and Wawcott have helped to clarify the origin of these sediments but further work is required.

#### *Valley side colluvial sediments*

There is crop-mark evidence of later prehistoric settlement and fields on the gravel terraces a little above the Kennet floodplain. Slopes down to the terrace edge are likely to be associated with alluvium-edge colluvial deposits which frequently form lynchets enhancing Pleistocene terrace edges. Generally, these colluvial deposits will be the result of extensive arable cultivation in the Middle Bronze Age and later. These colluvial deposits have been investigated in the Upper Kennet at West Overton (Evans *et al.* 1993). The section of the terrace at Wawcott III (Froom 1976, fig 4b) suggests that this feature might have been enhanced by colluviation; this could have resulted in reworking of Mesolithic artefacts from parts of the site upslope (it is not suggested that the Wawcott III site as a whole is reworked).

#### *Palaeochannels*

These have been frequently noted above in the context of the sediments they contain which may provide some clues to date. The radiocarbon dating of channels adjacent to the Mesolithic sites at Ufton, Wawcott XXX and Wawcott XXIII is a priority in order to establish if they are channel-edge sites. Palaeochannels of Mesolithic date may also contain Mesolithic artefacts, particularly wooden structures and objects such as fish traps, canoes or perhaps platforms. Trackways are also possible, although no certain examples are known from Mesolithic Britain or Europe (Bell 2020).



### *Pits or possible tree throw features*

Mesolithic artefacts are present in shallow pits at some sites. At Wawcott I the stratigraphy has characteristics which suggest a tree-throw feature (Froom 1972b, fig 4). The fill contains a hearth, suggesting a tree-throw has been used as an improvised shelter. Pit-like features are also described from Wawcott I (Froom 1972b, fig. 4), III (Froom 1976) and Wawcott IV (Froom 2012, 93).

### *Topsoil*

In many cases the present soil is developed on alluvial silts as seen for instance in all pits at Ufton Bridge.

### *Other contexts and sites*

Not all Kennet Valley sites can be related to a clear sequence of stratigraphic units, in part perhaps because of the effects of cultivation or extractive processes which have removed layers, or disrupted stratigraphy.

- **Wawcott I.** The gravel is overlain by sandy sediments with artefacts on the surface overlain by silts, thus activity may be on a surface within minerogenic alluvial sediments.
- **Wawcott II.** Site damaged by plough; stratigraphic context unclear (Froom 1963b, 1970).
- **Wawcott V, VI, VII, VIII.** Fieldwalking sites; finds without stratigraphic context (Froom 1963b, 1970, 2012).
- **Wawcott XI.** Artefacts in silt loam underlain by sterile silt (Froom 1970, 2012).
- **Wawcott XIII.** Plough-damaged, sequence of clay gravel overlain by tenacious greasy silt, then peat (Froom 1970, 2012).
- **Wawcott XVI, XVII, XVIII, XIX, XXI, XXII.** Surface collection only (Froom 1970, 2012).
- **Wawcott XXIV, XXIV.** Flint scatter; no stratigraphic context (Froom 1970, 2012).
- **Wawcott XXVI.** Stratigraphy from bottom of gravel/marl, silt, peat similar to Wawcott IV but unclear if artefacts from silt (Froom 1970, 2012).
- **Wawcott XXVII.** Disturbed by agriculture; stratigraphic context of artefacts unclear (Froom 1970, 2012).
- **Wawcott XXIX.** Surface collection; no stratigraphic context (Froom 2012).
- **Wawcott XXXI.** No stratigraphic information (Froom 2012).
- **Wawcott XXXII.** No stratigraphic or finds information (Froom 2012 - location only).
- **Wawcott XXXIII.** No stratigraphic information (Froom 2012).

It should be noted that the project has mapped potential for the occurrence of Late Upper Palaeolithic and Mesolithic strata and sites. A site has been defined as any occurrence of stratified or stray artefactual material. Only locations with direct evidence have been targeted: sequences where the only evidence is burning (eg Woolhampton) have been excluded, although this is perhaps an arguable point and has been considered further under EH project MAIN 7032 (Wessex Archaeology 2015).

## Achievements and Recommendations

### *Critique of the approach and methods used and consideration of their wider applicability*

The project has used a carefully staged approach as described above. To summarise, there have been six core stages:

1. Desk-based assessment, compilation and careful filtering of all available archaeological, palaeoenvironmental, chronological and lithological data for the case study area.
2. Preliminary modelling to provide a solid and current picture of the Late Upper Palaeolithic-Mesolithic sedimentary architecture and archaeological distribution.
3. Gap analysis to identify data problems, gaps in the data, true gaps in potential (eg quarried out areas) and where further targeted work might fill those gaps and better inform the model.
4. Targeted fieldwork using a staged approach, including ERT and GPR geophysical survey and interpretation, with validation of these techniques by coring and detailed geoarchaeological description, and (in the case of Victoria Park) test pitting. The careful application of radiocarbon dating and evaluation of palaeoenvironmental remains has refined the findings.
5. The sedimentary model was then refined and detail added in light of these results. Predictive elements introduced to the model, enabling the prediction of areas of raised potential and risk beyond the areas immediately investigated as an end product.
6. Review of the methods, techniques and their success or otherwise enabling the production of best practice guidance to better inform future work in this and other areas.

Importantly, it is felt that this staged approach will work on all scales, be it individual site/development level, a wider network of sites/sub-regionally (as here), or on a regional level. The importance of using the methods and techniques to find and/or protect ephemeral and sometimes deeply buried early prehistoric archaeology has been clearly demonstrated. The process of data compilation and gap analysis brought to the fore the advisability of filling the data gaps near central Newbury and highlighted the potential of Victoria Park. At Ufton Bridge, the focus began with a spatially limited flint scatter, only found there due to a very locally shallow sequence on the crest of a gravel ridge where flints were brought up by ploughing. Only through coring coupled with geophysical survey then excavation, did the full potential of the site become apparent. This was due to the occurrence of channels and deepening sequences, still containing artefactual material but also valuable associated palaeoenvironmental sequences. The revisiting of Wawcott using geophysics, coring, palaeoenvironmental evaluation and dating has allowed the excavated sites to be put into a wider sedimentary context and heightened the significance of the major concentration of Mesolithic sites identified by Froom at Wawcott.

The direct combination of techniques on the same ground has been essential. For instance, GPR geophysical survey has proved adept at identifying boundaries and

edges (eg channel sides and sedimentary layer boundaries such as gravel tops at depth). ERT, alternatively, has proved invaluable in identifying low resistance deposits of particular interest and, in the case of Thatcham, where surface penetration would be possible with coring equipment. The combination of the two has enabled subsequent field investigations to be better informed and targeted.

Validation of the geophysical results via coring has been essential, and in two test site cases was sufficient to fill the gaps in understanding. At Ufton Bridge and Victoria Park, however, coring was itself key to defining exactly where further work, in the form of test pitting, was needed. These sites can then be used as a case study to inform both commercial archaeological contractors and developers/extractors of how, and why, these approaches should be taken, strengthening the position of the local curators when requesting appropriate mitigation.

The outcome of the project is a set of tools and demonstrably valid guidance to strengthen the development control process, so ensuring that the most appropriate mitigation is applied and ensuring that vulnerable Late Upper Palaeolithic and Mesolithic sites are dealt with in the best way possible in the face of development, dewatering and aggregate extraction in the area. Clearly this is directly applicable to other low-lying and wetland areas and, on a regional scale, the same approach can and should be taken in, for instance, the Blackwater, Loddon, Lea and Colne Valleys – areas where potential is already known to be high. Similar sedimentary sequences have also been identified in the upper reaches of the Wiltshire Avon in the Vale of Pewsey (Bell unpublished). A similar approach using a combination of geophysics, boreholes and keyhole test pit excavation has been successfully applied to locating the Mesolithic of the wetland edge in the Somerset Levels (Bell *et al.* 2015; Bell 2015). There is no reason why the staged approach and techniques used in the Tracing Their Steps project cannot be applied to all low-lying areas where early prehistoric remains might occur.

### ***Delivery of products and project outcomes***

As specified in the Project Design, this project aimed to generate the following products in addition to the fieldwork:

- Product P1 (from Stage 1 and 2): an integrated model comprising a comprehensive database of the LUP (Late Upper Palaeolithic) and Mesolithic resource in the case study area, a deposit model, and a chronological model for LUP and Mesolithic archaeology and sedimentary history within the Kennet Valley within a GIS allowing the user to predict the potential for, and occurrence of, LUP and Mesolithic remains and related environmental sequences in the area, as well as areas at risk; this is now embedded in the West Berkshire HER and is in active use;
- Product P2 (Stage 3): best practice guidance for dealing with LUP-Mesolithic wetland and wetland edge archaeology in the Kennet Valley for West Berkshire Council; leaflet reproduced here as **Appendix 1**;
- Product P3 (Stage 3): publication of the chronological model, new radiocarbon dates and one detailed case study (Ufton Bridge) in the context of the enhanced sedimentary and archaeological understanding of the study area (this report).

One further product has been added to the project following a Variation Order:

- Product P4 (Stage 3): a statement of significance for the Thatcham Reedbeds wetlands.

### *Recommendations*

On a local level, the Kennet Valley is under sustained development and extraction pressures, as described above, leaving the Late Upper Palaeolithic and Mesolithic resource at high risk, particularly where its nature and location is uncertain. The project has strengthened protection through the provision of an enhanced and more coherent picture of Late Upper Palaeolithic – Mesolithic activity in the Kennet Valley case study area, and a robust and useable model for curators.

Full publication has been limited to the sedimentary aspects of one test site (Ufton Bridge) with only the brief discussion of the wider project and associated radiocarbon dating. Further analysis followed by full publication is warranted for all four sites.

### *Heritage management*

by Martin Bell

One of the main challenges for Mesolithic studies has been locating well-preserved sites with environmental and economic evidence and survival of organic artefacts. The paucity of such sites goes a long way towards explaining the relative neglect of the Mesolithic period until recently. We have argued (Bell *et al.* 2006) that the answer lies in adopting a geoarchaeological approach to identify the key sedimentary contexts, particularly in riverine and coastal situations with a high potential for outstanding preservation. That argument was developed in the case of coastal sites in the Severn Estuary (Bell 2007). The development of that theme in a river valley context took place at Ufton Bridge and was subsequently expanded to the Lower Kennet Valley as a result of this project. There was also a linked project in the Somerset Levels (Bell *et al.* 2015a; Bell 2015). These two projects have attempted to identify a toolkit of methods which can be applied to the investigation of wetland Mesolithic sites in river valleys.

The approach as applied at Ufton Bridge has involved the staged application of a range of techniques such as the geophysical methods used by Carol Mansfield and Dan Alyward. No one technique revealed anything like the full picture, each identifying different aspects of the buried Mesolithic and later landscapes. For example, the broad-scale palaeochannel features were most clearly identified using electrical conductivity survey (**Figure 10**). The ditch and possible trackway features were most clearly identified from the GPR time slices (**Figure 13**) and in the East Field from the resistivity survey (**Figure 19**). Boreholes were used to ground-truth the geophysics, as demonstrated particularly clearly by comparison of borehole and GPR transects in **Figure 15**. Boreholes also established the sedimentary sequence, which was highly variable across the site, and were used to model the underlying Pleistocene gravel topography (**Figure 30**) which was a key influence, both on the

areas selected for activities in the Mesolithic and medieval periods, and also greatly influenced early Holocene sedimentary history. These non-destructive, or minimally destructive, methods were then complemented by small scale excavation on the original Mesolithic find-spot and six test pits where deeper stratigraphy was within reach of test pit investigation. It was the test pits (especially Pit CC) which proved invaluable in understanding the sequence and obtaining samples for dating and environmental analysis. This exercise, together with work as part of the same project at Victoria Park, Newbury (Bell 2015), and related work on the Somerset Levels (Bell *et al.* 2015a), has highlighted the benefits of complementing borehole investigation with very carefully situated test pits.

Together the range of techniques employed has revealed a buried landscape below the Kennet floodplain. The most archaeologically significant aspect of that buried landscape relates to the Early Mesolithic site at Ufton Bridge. Geophysical evidence in the East Field has revealed ditches and a possible trackway; these seem to be oblivious to the present road, field boundary and ditches and seem to be significantly earlier than those features. Some of the features may be associated with the Iron Age evidence found in Pits E2 and E3 and some may relate to medieval artefacts in and around Pit E1.

The Kennet and Somerset projects both adopted a geoarchaeological approach to finding Mesolithic sites and, as it has turned out, the two areas proved very complementary. In the Kennet the sites are mainly Early Mesolithic, with evidence of later Mesolithic activity on some sites especially in the Wawcott area (Froom 2012). In the Somerset Levels the flint scatters on sandy burtle islands were thought to be mainly Early Mesolithic but the investigation and dating of wetland edge contexts has produced evidence that activity continued to the very end of the Mesolithic and into the Neolithic.

### *Interfaces*

It is worth reviewing here how the project has been enabled and indeed how it has fed directly into other projects. The Interface summary from the Project Design is given in **Table 14**, with additional comments in italics.

<b>Source</b>	<b>Purpose</b>
West Berkshire HER	Provision of data, draft results and points of clarification relating to the Late Upper Palaeolithic – Mesolithic resource for the case study area, including (for instance) findings related to the Kennet Valley Gravels Archaeological Assessment project. <i>All data has been transferred in both directions without problem. In addition it is clear that commitment and the full immersion of Archaeology Service staff in the project team has been key to the successful conclusion of the work. A strong working relationship and full understanding of the expectations and requirements of all parties means that all have benefitted.</i>
The Kennet Valley Fieldwalking Survey Project	Provision of data, draft results and points of clarification relating to the Late Upper Palaeolithic – Mesolithic resource for the case study area, predominantly via the HER. <i>All data included</i>

<b>Source</b>	<b>Purpose</b>
Stephen Allen	Provision of data, draft results and points of clarification relating to the Late Upper Palaeolithic – Mesolithic resource for the case study area. <i>Mr Allen has unfortunately not been available to liaise with the project team, however he had kindly provided a summary of his fieldwalking work across the Kennet Valley and specifically his flint work at Ufton Bridge previously</i>
Roy Froom	Provision of data, draft results and points of clarification relating to the Late Upper Palaeolithic – Mesolithic resource for the case study area. <i>Mr Froom has been closely involved in the detailed location of coring and geophysical surveys at Wawcott and has also visited the other test sites with us, providing invaluable data, memories of past work and advice throughout the project as well as allowing us access to both his published and unpublished work and is owed a debt of gratitude.</i>
Environment Agency	Provision of LiDAR data. <i>LiDAR data has been consulted and interrogated (but not reproduced) for the purposes of the project via West Berkshire Council HER</i>
Ordnance Survey	Mapping and historic mapping (quarrying extent etc.). <i>OS data, notably topographic and extent of quarrying, has been consulted and interrogated (but not reproduced) for the purposes of the project via West Berkshire Council HER</i>
British Geological Survey	Geological mapping, borehole data, geotechnical and sedimentary surveys. <i>Substantial data has been made available and is included within the sedimentary model</i>
Various	Geotechnical and sedimentary data from borehole surveys for commercial development in the area. <i>Substantial data has been made available and is included within the sedimentary model</i>
Various	Aerial photographs of the case study area. <i>APs have been examined by the GIS officer (but not reproduced) for the purposes of the project via West Berkshire Council HER</i>
The Jacobi Archive Project	Provision of data, draft results and points of clarification relating to the Late Upper Palaeolithic-Mesolithic resource for the case study area. <i>All data has been included from the Jacobi archive</i>
Chantal Conneller, University of Manchester	<i>The project team has provided help to Nick Overton (under the supervision of Dr Conneller) in understanding the stratigraphy and taphonomy at Thatcham Reedbeds for his PhD thesis. He and Dr Conneller have kindly provided the project with full details of the new radiocarbon dates generated during his study</i>
Carol Mansfield	<i>Dr Mansfield produced a PhD thesis at the University of Reading in 2007: 'Reconstructing Buried Alluvial Landscapes: the application of multiple geophysical and geoarchaeological techniques'. One of the case studies in this thesis was Ufton Bridge, a Mesolithic site within the study area of this project. Dr Mansfield has contributed a synthesis of her work to the Ufton Bridge case study via Prof Martin Bell.</i>
EH Project 6240, Gill Campbell	<i>Activity 3A5 Wetland and Waterlogged Survey, and specifically Project 6240 Identifying priority vulnerable sites is of relevance to the project. The project team have discussed the project with Gill Campbell and produced a Statement of Significance for the Thatcham Reedbeds wetland areas</i>
The EH Regional Scientific Advisor	<i>Dr Jane Corcoran, Regional Scientific Advisor for the South-east has proved valuable comment and advice regarding the sedimentary modelling and took the opportunity to visit Victoria Park during excavation</i>

<b>Source</b>	<b>Purpose</b>
The EH Dating Team	<i>Dr Alex Bayliss provided initial comments on the PD and subsequently Dr Peter Marshall has met with the project team on several occasions and provided a great deal of help and advice in approach and sample selection, as well as testing the bone and facilitating all the radiocarbon submissions</i>
The EH Geophysics team	<i>Dr Neil Linford has been very supportive of the project, and has undertaken GPR surveys and interpretation</i>

Table 14: Interface summary

### Ownership

As stated in the Project Design, the parent organisations for the contributing core team will retain full copyright of data, documents, drawings and photographs that it prepares in the course of the project, except where copyright of original material is vested in the institution from which the material was obtained. Licences will be agreed between the core team and HE for HE use of copyright material arising from the project. Copyright in pre-existing data will be retained by the original copyright holder.

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# APPENDIX 1: DEVELOPMENT CONTROL LEAFLET

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## LATE UPPER PALAEOLITHIC AND MESOLITHIC ARCHAEOLOGY

The Late Upper Palaeolithic and Mesolithic are two successive archaeological periods dating from 14,000 to 6,000 years ago. These were a time of great and sometimes rapid change in climate and environment, with the end of the last ice age and sudden switch to warm conditions occurring around 11,300 years ago. Hunter-gatherer people had to adapt their technology, lifestyle and food sources in response to these changes. Artefacts from these periods include flint tools ranging from long blades to tiny microliths, worked bone and, where they survive, worked wood and objects such as fish traps and baskets. Analysis of associated remains such as animal bones, pollen, snails and seeds tells us about people's diet and the contemporary landscape.



Microliths and blades from Victoria Park

### WHY ARE THEY SO IMPORTANT?

Remains from these periods are relatively rare in the UK. Where they do occur they are ephemeral, very fragile and often hard to find, either because they consist of lithic scatters or buried soils without obvious structures, or due to erosion or deep burial. West Berkshire has one of the highest known concentrations of these remains in Europe, with sites such as Wawcott and Thatcham Reedbeds being of national significance. At present these vulnerable sites are not eligible for designation (scheduling) due to a lack of structures, but are protected via the local authority planning process. There are certainly many more to be found and if not properly recorded before the evidence degrades or is removed, we lose the only way to understand more about this part of our heritage or indeed learn lessons about how people can adapt to climate change.



Geophysical Survey in Victoria Park, Newbury

### HOW DOES DEVELOPMENT AND AGGREGATE EXTRACTION AFFECT REMAINS?

Without appropriate mitigation, the following can occur:

- Destruction during extraction or construction
- Compression during and after construction
- Dewatering, which causes waterlogged organic remains to rot

A small footprint can have a wide impact.

### HOW CAN WE BALANCE ARCHAEOLOGY WITH DEVELOPMENT AND EXTRACTION?

The National Planning Policy Framework provides a context for conserving and enhancing the most significant parts of the historic environment. There are a number of techniques to help assess the significance of heritage assets. Used in combination, they can make the archaeological resource more predictable and reduce the risks to both the archaeology and the proposed scheme.

#### A Staged Approach

1. **Consultation** with the West Berkshire Council Archaeological Officer and use of the Historic Environment Record (HER) as early as possible in the design process will improve outcomes (contact details below).
2. **Assessment** using appropriate expertise by a competent archaeological practitioner. This will generally start with a Desk Based Assessment (DBA) but may include fieldwork. A link to organisations registered with the Institute for Archaeologists is given overleaf.
3. **Mitigation** design, where any potential of or risk to early prehistoric remains is identified. A scheme of archaeological mitigation will be designed to form part of the planning application, and will need approval from the West Berkshire Council Archaeological Officer. The scheme will need to employ fieldwork methods appropriate to the nature of Late Upper Palaeolithic and Mesolithic archaeology. Useful guidance specifically for aggregate extraction can be found in the document "Assessment of the Archaeological Resource in Aggregate Areas of West Berkshire" (MoLAS 2014), link overleaf.
4. **Public benefit** can arise from this process in furthering understanding of our past and protecting important remains for the future. Outreach or public participation can be good publicity for an application or development.

### Best Practice and Methods for Mitigation

Best practice makes use of all or some of the following techniques as deemed appropriate.

**Geophysics:** techniques such as Electrical Resistivity Tomography, Ground Penetrating Radar and Magnetometry surveys can alone or in combination identify buried land surfaces, structures or landforms such as old river channels over large areas quickly and without disturbing the ground, to narrow down where suitable deposits occur and where people may have been active in the landscape. Guidelines can be found at: <http://www.english-heritage.org.uk/publications/geophysical-survey-in-archaeological-field-evaluation/>

**Coring:** use of hand held or powered coring equipment allows the examination of deep sediments, which when repeated across a targeted area will further narrow down the existence of important layers and potential preservation of early prehistoric remains. Guidelines can be found at: <http://www.english-heritage.org.uk/publications/gearchaeology-earth-sciences-to-understand-archaeological-record/>

**Test Pitting:** is used to further evaluate whether archaeological remains are present and are at risk. Small trenches are opened by machine or hand excavation by an archaeological team, and sequences, features and artefacts recorded and sampled to inform any further work. Hand digging and sieving are critical for the recovery of artefacts of these periods.

**Excavation:** larger scale archaeological excavation, recording and sampling tends to proceed by hand for sites of these periods, since large scale mechanical stripping destroys lithic scatters contained in the topsoil.

**Environmental Sampling, Assessment and Analysis:** a key part of our understanding of Upper Palaeolithic and Mesolithic lifestyles comes from knowledge of the contemporary environment and people's impact on it. This comes from appropriate sampling, processing and assessment/analysis of a range of indicators such as pollen, seeds, wood, snails and bone. These may be preserved for many thousands of years by waterlogging or charring. Guidelines can be found at: <http://www.english-heritage.org.uk/publications/environmental-archaeology-2nd/>

### Watching Brief:

is appropriate in some cases, where an archaeologist will observe and record any archaeological deposits encountered while construction, piling or extraction is already underway. Any such programme would need to allow opportunity for sieving and sampling if lithics were encountered.



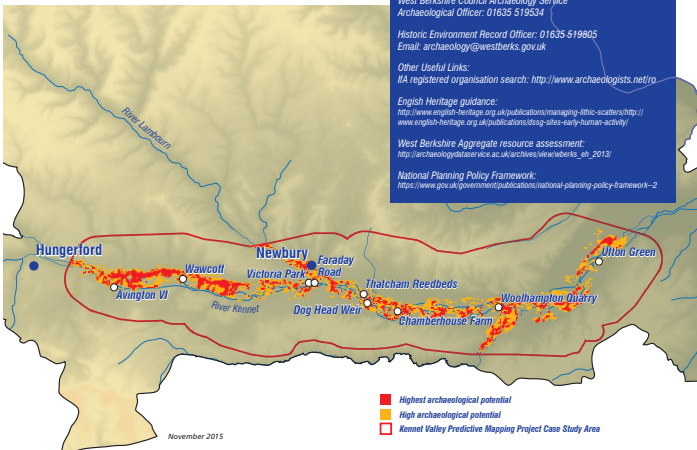
Monolith sampling at Victoria Park, Newbury

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### HOW HAS THIS GUIDANCE ARISEN?

There has been an increasing awareness of the vulnerability and importance of early prehistoric remains coupled with improvements in the techniques for their investigation. This document is particularly informed by the results of the English Heritage funded Kennet Valley Predictive Mapping Project, co-authored by Wessex Archaeology, West Berkshire Council archaeology service and the University of Reading. Existing knowledge of Upper Palaeolithic-Mesolithic finds, sediments and environmental data has been coupled with areas of known past extraction in order to produce a predictive map of areas of high potential and risk. The map below shows the potential for encountering Late Upper Palaeolithic and Mesolithic archaeology in the study area based on our current understanding. It can be used to help predict the likelihood of encountering this type of archaeology beyond the study area where we have less data.

Map to show West Berkshire and Areas of High Potential for Upper Palaeolithic and Mesolithic remains identified in the Kennet Valley Predictive Mapping Project.



#### WHO TO CONTACT

West Berkshire Council Archaeology Service  
Archaeological Officer: 01635 519534  
Historic Environment Record Officer: 01635 519805  
Email: [archaeology@westberke.gov.uk](mailto:archaeology@westberke.gov.uk)

Other Useful Links:  
IPA registered organisation search: <http://www.archaeologists.net/ro>  
English Heritage guidance:  
<http://www.english-heritage.org.uk/publications/managing-lithic-scatters/>  
<http://www.english-heritage.org.uk/publications/desig-dates-early-human-activity/>  
West Berkshire Aggregate resource assessment:  
[http://archaeologydataservice.ac.uk/archives/view/westberks\\_ph\\_2013/](http://archaeologydataservice.ac.uk/archives/view/westberks_ph_2013/)  
National Planning Policy Framework:  
<https://www.gov.uk/government/publications/national-planning-policy-framework-2>

## Late Upper Palaeolithic and Mesolithic Archaeology and Environment in West Berkshire: A Best Practice Guide for Developers and Environment



Thatcham reed bed bog today

ENGLISH HERITAGE  
Wessex Archaeology  
University of Reading  
West Berkshire Council

## APPENDIX 2: REVIEW OF CURRENTLY AVAILABLE ABSOLUTE DATES FOR THE KENNET STUDY AREA

### Methodology

Dates are calibrated against the IntCal09 Northern Hemisphere radiocarbon curve (Reimer *et al.* 2009) using the program OxCal 4.1 (Bronk Ramsey 1995; 2001). The calibrated date is quoted as calibrated years BC/AD, with date ranges quoted using the  $2\sigma$  calibrated range (95.4%) and end point rounded outwards to 10 years (Bayliss *et al.* 2008) except for dates >20k (Brimpton) which are rounded outwards to 50 years. The two measurements on date Q-652 have been combined using the R\_combine function. Dates that are post-Mesolithic in age but derived from material in a Mesolithic / Palaeolithic context are included. Dates that were included in the broad phasing employed by Collins *et al.* (2006) for the Kennet are identified as such with the phasing employed included to allow comparison. All dates, where available, have been checked against the original laboratory reports contained within the journal *Radiocarbon*. This includes the re-issuing of dates obtained produced by the British Museum during the 1980s (see Bowman *et al.* 1990). As a result some dates may differ from their original published source.

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
<b>Faraday Road MWB16102 / EWB248</b>									
NZA-11037	W2473 1124 NE	Pig bone	1124 NE: occupation surface		8510±60	-21.31		7640–7460	Ellis <i>et al.</i> 2003
NZA-11038	W3473 1124 s2009	<i>Corylus avellana</i> nut	1124 s2009: occupation surface		9148±60	-23.98		8550–8260	Ellis <i>et al.</i> 2003
<b>Greenham Dairy Farm MWB3495 / MWB3500</b>									
OxA-956 <sup>a</sup>	1964 - 12	Red deer antler	occupation surface		8160±100	-		7480–6820	Hedges <i>et al.</i> 1988
Q-973		Red deer bone	15cm layer of fine silt stratified with Mesolithic artefacts		8779±110	-		8210–7600	Sheridan <i>et al.</i> 1967; Switsur & West 1973
OxA-5194	GDF-1	Charred <i>Corylus avellana</i> nuts	Occupation surface		9120±80	-23.2		8570–8210	Hedges <i>et al.</i> 1996
<b>Newbury Sewage Treatment Works MWB15670 / EWB103</b>									
BM-2744		Charred <i>Corylus avellana</i> nuts	Layer 3 in grid square 108/510 at its north-western edge:	MM1	9100±80	-23.3		8570–8000	Healy <i>et al.</i> 1992, 44
<b>Thatcham Reedbeds</b>									

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
BM-1459	DTH-a5-40cm	<i>Pinus sylvestris</i> wood	Location 5: base of irregular band of tufa fragments within humified fen peat (1.0m bgl; 0.40m above gravel)	MM3/4	9097±69	-28.5		8550–8210	Burleigh <i>et al.</i> 1982; Holyoak 1980, 87
BM-1460	DTH-a5-16cm	Indet. wood	Location 5: “flint gravel with interstitial silt and organic material” (1.25m bgl; 0.15m above gravel)	HLM4	10647±900	-25.0		13300–7970	Burleigh <i>et al.</i> 1982; Holyoak 1980, 87
BM-1635R***	DTH Tha6d	Indet. wood	Location 6: towards base of tufa deposits (1.1m bgl; 0.30m above gravel)	MM3	9700±280	-27.1		10080–8340	Burleigh <i>et al.</i> 1982; Holyoak 1980, 99
BM-1634R***	DTH Tha6h	Indet. charcoal	Location 6: tufa deposits (0.75m bgl; 0.65m above gravel)	MM3	8300±570	-27.1		9120–6060	Burleigh <i>et al.</i> 1982; Holyoak 1980, 99
BM-1636R***	DTH ThaBj	<i>Betula</i> wood	Location 8: “flint gravel with interstitial silt and organic material” (0.05-0.10m above gravel)	MM1/2	9520±120	-26.6		9240–8570	Burleigh <i>et al.</i> 1982; Holyoak 1980, 71
BM-1637R***	DTH Tha8o	<i>Pinus</i> wood	Location 8: “blackish humified fen peat” (0.50-0.60m above gravel)	MM2	9320±170	-25.0		9160–8240	Burleigh <i>et al.</i> 1982; Holyoak 1980, 71
BM-1402	G9aDTH	Mainly <i>Salix</i> wood	Location 9: silt lens in main gravel body, c. 0.8m below top of gravel; 66.1m OD)	HLM4	9909±75	-14.4		9750–9250	Burleigh <i>et al.</i> 1982; Holyoak 1980, 60
BM-1358	PW/1	Rooted <i>Betula</i> stump	Rooted in top of gravel	MM1/2	9280±89	-26.7		8740–8290	Holyoak 1980, 123; Burleigh <i>et al.</i> 1982
BM1388 <sup>b</sup> -		Calcium carbonate	From extensive 2m thick tufa deposit overlying peat at Thatcham reed beds		11930±80	-8.7		12050–11550	Burleigh <i>et al.</i> 1982
SUERC-56991	BH3 - 0.8–0.81m	<i>Phragmites</i> culm node, charred	near the base of the upper fen peat at 0.80–0.81m			-24.9		cal AD 1968–1972	This project
UBA-27335	BH3 -1.28–1.29m	Waterlogged juvenile wood, unidentified	near the base of the lower fen peat at 1.28–1.29m		9494±44	-29.5		9130–8650 cal BC	This project



Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
SUERC-56992	BH3 -1.44–1.45m	Waterlogged juvenile wood, unidentified	near the base of the lower fen peat at 1.44–1.45m		9378±29	-29.4		8740–8560 cal BC	This project
UBA-27336	BH3 -1.51–1.52m	Waterlogged twig, unidentified	near the base of the peaty alluvium at 1.5–1.51m		9273±62	-28.7		8710–8300 cal BC	This project
UBA-27334	BH5 – 1.88m	Waterlogged twigs (x3), unidentified	a band of slightly humic calcareous alluvium/marl within fluvial gravel at 1.88m		9414±44	-29.1		8810–8570 cal BC	This project
<b>Thatcham Reedbeds TRA</b>									
AA-55303	TRA-1	Indet. twig wood	Transition sands and gravels: 2.05-2.06m bgl		9480±68	-28.6		9140–8610	Chisham 2004
AA-55304	TRA-2	Indet. twig wood	Organic sands and gravels: 1.85-1.86m bgl		9528±80	-30.0		9200–8630	Chisham 2004
AA-55305	TRA-3	Indet. twig wood	Woody peat: 1.69-170m bgl		9436±81	-27.5		9140–8480	Chisham 2004
AA-55306	TRA-4	Charred <i>Carex</i> seed and indet. twig wood	Woody peat: 1.24-1.25m bgl		9134±65	-28.6		8550–8240	Chisham 2004
AA-55307	TRA-5	Indet. twig wood	Woody peat: 1.05-1.06m bgl		8982±64	-29.3		8300–7960	Chisham 2004
AA-55308	TRA-6	Indet. twig wood	Near top of woody peat: 0.94-0.95m bgl		8629±82	-28.6		7940–7530	Chisham 2004
<b>Thatcham I EWB335</b>									
OxA-6658 <sup>c</sup>	ARC 1970.3013	Horse tooth	Well stratified in Mesolithic deposits		285±40	-21.5		cal AD 1480–1800	Kaagan 2000, 344
<b>Thatcham II EWB335</b>									
BM-65		Indet. charcoal	Charcoal from hearth, layer 2		8100±180			7530–6630	Churchill 1962, 370; Barker & Mackay 1960, 29
Q-1130			Peat overlying Thatcham II site		8580±100			7960–7450	Switsur & Jacobi 1979, 57
<b>Thatcham III EWB335</b>									
OxA-1201 <sup>a</sup>	F3/12 4	Beaver femur			5100±350	-		4720–3020	Hedges <i>et al.</i> 1988
OxA-940 <sup>a</sup>	G3/5 4	Pig humerus			6550±130	-		5730–5230	Hedges <i>et al.</i> 1988
OxA-2848	213.62/717	Resin on lithic of Deepcar type	same layer as pig bone		9200±90	-28.8		8640–8260	Hedges <i>et al.</i> 1994; Roberts <i>et al.</i> , 1999; Reynier in press

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
Q-658		Charcoal and <i>Corylus avellana</i> nuts	Wood partly converted to charcoal and broken shells of hazel nuts ( <i>Corylus avellana</i> ) from Mesolithic hearth in occupation layer – balk F3-4, layer 4	MM1/2	10030±170			10430–9220	Churchill 1962, 370
Q-659		Indet. charcoal	Charcoal from Mesolithic hearth; box G5, layer 4	MM1/2	10365±170			10680–9460	Churchill 1962, 370
<b>Thatcham IV EWB335</b>									
OxA-732	213.62/100	Red deer antler	Red deer antler beam with bevelled end	HLM3/4 or MM1	9760±120	-		9660–8780	Gowlett <i>et al.</i> 1987, 127; Jacobi 1987
OxA-894	S.M.	Elk antler	Burnt antler from “shell marl”	HLM3/4 or MM1	9490±110	-		9230–8550	Gowlett <i>et al.</i> 1987, 127; Jacobi 1987
<b>Thatcham V EWB335</b>									
Q-651		<i>Betula</i> and <i>Pinus</i> wood	From 0.75-0.88m below top of algal marl (1.94-2.10m bgl)	MM3	9840±160			10010–8800	Churchill 1962, 370; Godwin & Willis 1964
Q-677		Indet. Wood	Fresh wood from centre of marl: same level as Q-650 (1.72m bgl)	MM3	9780±160			9820–8730	Churchill 1962, 370; Godwin & Willis 1964
Q-650		Indet. Wood	Duplicate sample of wood from same level as Q-677 (1.72m bgl)	MM3	9670±160			9660–8600	Churchill 1962, 370; Godwin & Willis 1964
Q-652		<i>Pinus</i> wood	0.23m below top of marl (1.33m bgl)	MM3	a) 9480±160 b) 9500±160		9490±114	9230–8550	Churchill 1962, 370; Godwin & Willis 1964
OxA-1022	T IV	Rabbit tibia	0.23cm below top of marl surface (cf. Chisham 2004) – ?same level as Q-652		270±180	-		cal AD 1390 - modern	Gowlett <i>et al.</i> 1987
OxA-5190	TH5-2	Roe deer bone			9430±100	-22.2		9160–8450	Hedges <i>et al.</i> 1996
OxA-5191	TH5-3	<i>Cervus elaphus</i> bone			9510±90	-21.8		9200–8620	Hedges <i>et al.</i> 1996
OxA-5192	TH5-6	Charred <i>Corylus avellana</i> nuts			9400±80	-23.3		9130–8350	Hedges <i>et al.</i> 1996
OxA-26538	TH5-3	<i>Sus scrofa</i> bone			9580±45	-22.38			Conneller pers. comm.
OxA-26539	TH5-4	<i>Cervus elaphus</i> bone			9560±45	-22.81			Conneller pers. comm.

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
OxA-26540	TH5-5	<i>Cervus elaphus</i> bone			9675±45	-22.27			Conneller pers. comm.
<b>Avenell's Cottages</b>									
BM-1135 **		<i>Salix</i> wood	Black humified fen peat: 1.49m deep	MM1	8929±71	-25.5		8290–7830	Cheetham 1975; Burleigh & Hewson 1979
BM-1136 **		<i>Salix</i> wood	[Base of] Black humified fen peat: 1.59m	MM1/2	9223±100	-27.8		8720–8270	Cheetham 1975; Burleigh & Hewson 1979
<b>Woolhampton Quarry</b>									
SRR-4955	W7	<i>In situ</i> root	Wasing Sand Bed – large channel	HLM2	11725±45			8290–7830	Collins 1994; Collins <i>et al.</i> 1996
AA-11971	W6	Detrital terrestrial plant remains	Wasing Sand Bed – large channel	HLM2	11280±85			8720–8270	Collins 1994; Collins <i>et al.</i> 1996
SRR-4509	W5	Indet. wood	Wasing Sand Bed – large channel	HLM2	11590±45			11790–11460	Collins 1994; Collins <i>et al.</i> 1996
AA-11975	W11	Detrital terrestrial plant remains	Wasing Sand Bed – large channel	HLM2	11145±75			11400–10980	Collins 1994; Collins <i>et al.</i> 1996
SRR-4508	W4	Detrital plant remains including semiaquatic mosses	Wasing Sand Bed – large channel	HLM2	13980±145			11660–11340	Collins 1994; Collins <i>et al.</i> 1996
AA-11970	W3	Detrital terrestrial plant remains	Wasing Sand Bed – large channel	HLM2	10790±120			11280–10820	Collins 1994; Collins <i>et al.</i> 1996
SRR-4954	W2	Indet. wood	Wasing Sand Bed – large channel	HLM2	11505±55			15550–14830	Collins 1994; Collins <i>et al.</i> 1996
AA-11969	W1	Detrital terrestrial plant remains	Wasing Sand Bed – large channel	HLM2	11655±80			11110–10480	Collins 1994; Collins <i>et al.</i> 1996
AA-11976	W12	Detrital plant remains	Upper Gravels – base of tilted channel	HLM2	11130±110			11540–11280	Collins 1994; Collins <i>et al.</i> 1996
AA-11972	W8	Detrital plant remains	Upper Gravels – top of tilted channel	HLM2	11365±90			11780–11370	Collins 1994; Collins <i>et al.</i> 1996
AA-11977	W13	Detrital plant remains	Upper Gravels – base of small channel	HLM3	9900±100			11310–10770	Collins 1994; Collins <i>et al.</i> 1996
AA-11973	W9	Detrital plant remains	Upper Gravels – top of small channel	HLM3	10230±75			11480–11140	Collins 1994; Collins <i>et al.</i> 1996
AA-11974	W10	Detrital wood	Upper Gravels: top of point bar deposit	HLM4	9900±70			9820–9210	Collins 1994; Collins <i>et al.</i> 1996
Beta-84057		<i>Salix</i> stump	<i>In situ</i> on top of peat	MM2	9610±90			10430–9670	Collins <i>et al.</i> 1996
<b>Brimpton. Note calibrations are to nearest 50 years (due to spacing of IntCal09 calibration curve)</b>									

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
BM-1638	DTH Br 64	Woody-stem, leaf fragments, some seeds	Upper gravel unit		27400±1250	-24.4		33100–27800	Holyoak 1980, 43
BM-1874	-	<i>Salix</i> twigs	Silty clay forming Channel fill at top of London Clay, beneath 2m of bedded river gravels.		29500±460	-27.0		33050–31100	Burleigh <i>et al.</i> , 1982
<b>Wawcott I MWB3860</b>									
BM-449		Indet. charcoal	Large piece of Charcoal from a hearth stratified within middle pit feature interpreted as a hut (cf. HER MWB3860		5260±130			4350–3790	Froom 1971
<b>Wawcott III</b>									
BM-767		Indet. charcoal	Pit 2 at the level of spits E-F associated with numerous flints		6120±134			5360–4720	Froom 2012, 237; Froom 1976; Burleigh <i>et al.</i> 1976, 31
<b>Wawcott XXIII</b>									
BM-826		Indet. charcoal	Charcoal from hearth		6079±113			5300–4720	Froom 2012, 237; Burleigh <i>et al.</i> 1976, 31
UB-27332	50m_0.56–0.68cm	Mature wood, single fragment	coring transect at 50m (ie within about 5m of Froom's (2012) excavated site)		7026±37			6000–5830 cal BC	This project
UB-27332	110m_2.6–2.7m sample A	Herbaceous stems, 2 fragments, charred	coring transect at 110m		9920±49	-29.9		9650–9280 cal BC	This project
GU35795	110m_2.6–2.7m sample B	Twig, charred, unidentified	as UB-27332		Failed insufficient carbon				
<b>Wawcott XXX</b>									
BM-2718		Collagen from bone (distal metacarpal, <i>Alces</i> and femur, <i>Bos primigenius</i> )	Square Q7, area with concentration of bone and Mesolithic flint. It is also possible that bones used for BM-2718 could be derived from underlying late glacial gravel.		10960±100	-22.5		11150–10690	Froom 2012; Ambers & Bowman 1994

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
BM-2719		Collagen from bone (tibia, <i>Bos</i> sp.)	Square Q6, area with concentration of bone and Mesolithic flint.		6130±100	-21.8		5310–4800	Froom 2012; Ambers & Bowman 1994
TL date		Burnt flint			7.9±1.2ka				Froom 2012
TL date		Burnt flint			8.8±1.0ka				Froom 2012
<b>Marsh Benham MWB3744 / EWB564</b>									
OxA-5195	MB1-1	Charred <i>Corylus avellana</i> nuts	Associated with lithics assemblage		8905±80	-23.7		8280–7780	Hedges <i>et al.</i> 1996
Q-1129		Indet. charcoal	Charcoal		9300±150			9140–8240	Froom 2012
Q-1380		Indet. charcoal	Charcoal		9690±240			10020–8450	Froom 2012
<b>Kennet Centre EWB921</b>									
Beta-252890		Peat	106: 0.75-0.76m (74.36-74.37mOD)		8540±50	-27.9		7650–7510	Wessex Archaeology 2009
<b>Victoria Park</b>									
UBA-27306	(105) <1>	Charcoal, <i>Betula</i> sp. twig, large single piece, 4 yrs old, fractured	Context 105 a peaty artefact horizon is sealed by with reworked tufa and modern soil.		8688±52	-25.7		7940–7590 cal BC	This project
SUERC-57163	(105) <2>	Charcoal Pomoideae(fractured, single fragment)	as UB-27306		8563±31	-29.6		7600–7550 cal BC	This project
UBA-27308	(105) <4>	Charcoal, <i>Betula</i> sp. single piece	as UB-27306		8662±70	-26.6		7940–7580 cal BC	This project
UBA-27307	(105) <23>6–7cm sample A	Charcoal, spiny twig, single fragment (cf. hawthorn)	as UB-27306		8663±41	-27.8		7760–7590 cal BC	This project
SUERC-57164	(105) <23>6–7cm sample B	<i>Corylus avellana</i> nut (single fragment)	as UB-27306		9231±31	-25.2		8570–8310 cal BC	This project
SUERC-57183	(105) <23>6–7cm sample C	Organic-rich sediment, humic acid	as UB-27306		6680±30	-27.0			This project
SUERC-57184	(105) <23>6–7cm sample C	Organic-rich sediment, humic acid	as UB-27306		6771±30	-27.1			This project
		Organic-rich soil			6726±22			5670–5620 cal BC	This project
UBA-27309	(106) <7>sample A	<i>Corylus avellana</i> nut (single fragment)	Context 106 underlying peat to peaty alluvium, decreasing artefacts and increasingly minerogenic with depth		9085±46	-27.5		8340–8240 cal BC	This project

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
SUERC-57165	(106) <7>sample B	<i>Pinus sylvestris</i> (single fragment)	as UB-27309		9368±31	-27.1		8740–8560 cal BC	This project
UBA-27310	(106) <8>	<i>Pinus sylvestris</i> (single fragment)	as UB-27309		9325±43	-27.1		8710–8460 cal BC	This project
SUERC-57166	(106) <17>	<i>Corylus avellana</i> nut (single fragment)	as UB-27309		9185±31	-23.8		8540–8290	This project
<b>Newbury flyover A339</b>									
UBA-27301	NEBYM 1964.11.2 Site 1 sample A	Charcoal, <i>Pinus sylvestris</i> , single	Occupation horizon discovered during the building of the flyover for the A339 to the east of Victoria Park		9286±58	-24.5		8710–8310 cal BC	This project
SUERC-56981	NEBYM 1964.11.2 Site 1 sample B	Charcoal, <i>Betula</i> , single fragment	as UBA-27301		8578±30	-27.2		7610–7580 cal BC	This project
SUERC-56980	NEBYM1964.11 – sample A	Carbonised hazelnut shell, single fragment	as UBA-27301		9237±25	-23.4			This project
UBA-27300	NEBYM1964.11 – sample B	Carbonised hazelnut shell, single fragment	as UBA-27301		9199±70	-24.3			This project
Weighted mean	NEBYM1964.11	T'=0.3; v=1; T'(5%)=3.8			9233±24	-24.5		8560–8325 cal BC	This project
<b>Ufton excavation trench</b>									
SUERC-56978	Do2 Char 1 (2)	Charcoal, <i>Rhamnus cathartica</i> . single fragment	Context 2, a black organic silty layer sealing the main artefact horizon			-27.2		cal AD 1959–1962 (26%) or 1980–1983 (69%)	This project
UBA-27304	Do3 Char 1 (2)	Charcoal, Pomoideae. single fragment	Context 3, an organic silty clay marl-artefact horizon			-27.4		cal AD 1969–1970	This project
UBA-27305	Unit 3_0.68m	Charcoal, <i>Betula</i> sp. single fragment	Main trench unit 3, depth 0.68m, from the sandy Old Land Surface which was sealed by an organic silty clay		1194±33	-26.5		cal AD 710–950	This project
<b>Ufton pit cc</b>									
SUERC-56973	(2) <11> 55.5–61.5cm sample A	Charcoal, <i>Salix/Populus</i> sp. single fragment	[2] <11>, a black organic silty clay marl that seals the artefact horizon		9455±30	-25.5		8820–8630 cal BC	This project

Lab No.	Sample ref.	Material	Context	Collins <i>et al.</i> (2006) phasing	Radiocarbon age (BP)	$\delta^{13}\text{C}$ (‰)	Weighted mean (BP)	Calibrated date range (cal BC) (95% conf.)	Source
UBA-27302	(3) <12> 61.5–63.5cm sample A	Charred tuber	3] <12>, a organic silty clay 'artefact horizon'		8440±55	-26.4		7590–7380 cal BC	This project
UBA-27303	(3) <12> 61.5–63.5cm sample B	Charcoal, <i>Salix/Populus</i> sp. single fragment	as UBA-27302		9311±60			8740–8340 cal BC	This project
SUERC-56977	(3) <12> 61.5–63.5cm sample 3	Charcoal, Pomoideae. single fragment	as UBA-27302		9323±28	-25.2		8700–8480 cal BC	This project
<b>Ufton core 13</b>									
UBA-27739	2.21–2.29m	<i>Chenopodium</i> seeds (x12)	Core 13					cal AD 1956–1957 (22%) or 2007–2010 (73%)	This project
SUERC-56979	2.5m	<i>Phragmites</i> , charred, single fragment	Core 13		9836±29	-27.9		9320–9250 cal BC	This project

### OSL dating

Lab No.	Context	Palaeodose (Gy)	a-value	Dose-rate (mGy / year)	Age (years ka)	Source
<b>Avington VI</b>						
1523a	Unit 1b – Grey-brown sandy loam with numerous Late Mesolithic artefacts and burnt flints	11.40±0.63	0.06	2.19±0.08	5.2±0.8	Barton <i>et al.</i> 1998
1523b	Unit 2 – Orange-brown fine silty clay with grey hydromorphic patches and little sandy beds. Late-glacial brushed blade assemblage is located about 5cm below top of this unit	28.78±0.47	0.06	2.81±0.07	10.25±1.1	Barton <i>et al.</i> 1998
1523c	Unit 6 – Grey-green, non-calcaeous sandy clayey silt with numerous oxidised patches	38.30±1.66	0.07	2.95±0.07	13.0±1.35	Barton <i>et al.</i> 1998

\* Hedges *et al.* 1988 suspected this to be too young due to reduced collagen level. Date which is accepted as being unreliable guides of age of the context, even though it has sound radiocarbon measurements (i.e. context and item relation doubt) (Housley 1991)

\*\* Sample BM-1135 was given the standard acid-alkali pretreatment but sample BM-1136 was more extensively treated to isolate the cellulose (Cheetham 1975; Burleigh and Hewson 1979).

\*\*\* Corrected dates; re-issued in Bowman *et al.* (1990)

a indicates dates which are accepted as being unreliable guides to the age of the context, even though many are sound radiocarbon measurements of the submitted sample. Contextual doubts exist for some of the other samples (Housley 1991)

b Calcium carbonate from central zone of compact oblate tufa nodule, mean diameter c. 25cm, from extensive tufa deposit, c. 2m thick, overlying valley peat and gravel at Thatcham reed beds. (Coli 1977) and submitted by Richard Burleigh to obtain estimate of apparent age of tufa. Comment (RB):  $\delta^{13}C$  value suggests no major dissolution or precipitation occurred after initial deposition; subtracting 5570 yr for 50% contribution by dead carbon gives crude age of c. 6400 yr for tufa (Burleigh *et al.* 1982)

c Grigson (1978) notes that the Site I horse specimens are well-stratified in Mesolithic deposits while the Site II specimen has doubtful stratigraphy. This, however, contradicts another view that the Site I canine is "definitely Mesolithic" while the Site I upper cheek tooth is "probably intrusive" (Neil, 1977). This highlights the possibly uncertain stratigraphy associated with the horse teeth. To complicate matters further, Campbell (1977) notes Wymer's opinion that the teeth may instead have come from the underlying river gravels (i.e. they may be late glacial or older). In view of these potential chronological and stratigraphical problems, Kaagan (2000) proceeded with the radiocarbon dating of one tooth (Site I) and obtained an unexpected recent date ( $270 \pm 180$  BP; OxA-1022).



## Appendix 2a Uranium-Series Dating Methodology by Stuart Black

### Methodological approach

#### *Gamma spectrometry*

U-Series dating by gamma spectrometry has been reported previously by Yokoyama and Nguyen (1981), Barton and Stringer (1997), Berzero *et al.* (1997), Simpson and Grun (1998) and Schwarcz *et al.* (1998). This study was carried out at The University of Reading for  $^{230}\text{Th}$ ,  $^{238}\text{U}$ ,  $^{234}\text{U}$ ,  $^{235}\text{U}$ ,  $^{226}\text{Ra}$ ,  $^{210}\text{Pb}$  and  $^{228}\text{Ra}$  measured directly by g-spectrometry using the peaks identified in Table 1 on the assumption that the short-lived daughters will be in equilibrium with their parent isotopes. However, diffusion loss of the intermediate daughter  $^{222}\text{Rn}$  (between  $^{226}\text{Ra}$  and  $^{214}\text{Pb}$ ) from fine-grained material can affect  $^{214}\text{Pb}$  activities; to overcome this all samples were sealed in airtight plastic bags. Samples were counted on a Harwell Instruments, Broad Energy, BE5030 high purity germanium coaxial photon detector. This detector has an ultra-low background set up (detector and cryostat) with a 0.5mm thick carbon-epoxy window and remote detector chamber. Detector specifications were FWHM @ 5.9 keV = 0.45 keV, FWHM @ 1.3 MeV = < 1.2 keV. To keep self-absorption differences negligible, standard samples were used to calibrate the detectors using a carbonate rock standard. A secondary standard was also made in the form of a disc (80 mm diameter) from the same material to which the detector had been calibrated previously.

The ( $^{230}\text{Th}/^{238}\text{U}$ ) activity ratio was determined from the activities at the 67.7 keV and 63.3 keV -ray peaks. In addition, the activity of the ( $^{226}\text{Ra}(\text{ }^{214}\text{Pb})/^{230}\text{Th}$ ), using the 295, 352 and 67.7 keV -rays, and the ( $^{226}\text{Ra}(\text{ }^{214}\text{Bi})/^{238}\text{U}(\text{ }^{234\text{m}}\text{Pa})$ ) ratios using the 609 and 1764 keV -rays for  $^{214}\text{Bi}$  and 1001 keV -ray for  $^{234\text{m}}\text{Pa}$  were also determined.

Samples were counted for approximately 2-10 days each in order to reduce the uncertainties by accumulating a large number of counts in each analyte peak. Most analyte peaks were > 10,000 net counts (i.e. < 1% uncertainty). External reproducibility was checked using international standards.

#### *Mass Spectrometry*

Small sub-samples (100-500 mg) were also taken from the carbonates for destructive analysis for determination of the  $^{234}\text{U}/^{238}\text{U}$ ,  $^{235}\text{U}/^{238}\text{U}$  and  $^{230}\text{Th}/^{232}\text{Th}$  ratios. These were undertaken using a Thermo-fisher iCAPQ Inductively Coupled Plasma Mass Spectrometer. The mass ratio of the  $^{234}/^{238}$  is low (< 1%) and  $^{230}/^{232}$  very low (<0.1%) but the counts were increased by running the mass spectrometer in isotope ratio mode using 10 replicate analyses, an increased dwell time (100 ms) together with an average of 45 passes per replicate sample for  $^{234}/^{238}$  and increased replicates for  $^{230}/^{232}$ . This brought the uncertainty of the ratios to within a tolerable level (< 1.5% for  $^{234}/^{238}$  and <2% for  $^{230}/^{232}$ ). External reproducibility was checked using international standards (NIST SRM 3164) and by monitoring the ( $^{235}/^{238}$ ) ratios in the samples to be within the naturally abundant ratio (137.5). Uranium, thorium, barium and a range of trace elements were also determined via mass spectrometry using the same instrument.

#### *Quality Assurance*

Accuracy of the gamma spectrometry data was assessed in several ways: i) by running several bone samples that were known to be older than 75,000 years, (Pleistocene mastodon teeth from the Kennet Valley, U.K. These showed  $^{230}\text{Th} = ^{226}\text{Ra} = ^{210}\text{Pb}$  within uncertainty (mean +/- 0.98%); (ii) by running several NIST (SRM) international reference materials. NIST SRM 4356, 3159, 3164, which were within 0.64-0.98 % specific activities for all nuclides peaks.

Determination of  $^{232}\text{Th}$  by mass spectrometry is very accurate ( $< 0.1\%$  uncertainty). However, determination of the  $^{230}/^{232}$  mass ratio using a single collector instrument poses problems of detecting enough of the low mass abundance  $^{230}$  and long count times can lead to instrumental drift. Samples were analysed on the mass spectrometer and on the gamma detector such that a comparison of the calculated  $^{230}\text{Th}$  concentrations could be compared. There was a clear linear correlation between the two independent sets of data indicating that the mass spectrometry data was indeed accurate and that little mass drift was occurring during analysis.

### ***Age determination – U-Th***

The U-Th ages determined using the equations above for samples with  $^{232}\text{Th}$  (detrital) concentrations lower than 25 g/kg. Isochrons were also constructed for some samples to check the integrity of the ages. Sub-samples of the same age from the same sample will show variations in  $^{238}\text{U}/^{232}\text{Th}$  or  $^{234}\text{U}/^{232}\text{Th}$  but the  $^{230}\text{Th}/^{232}\text{Th}$  will only vary as a function of time and therefore plots of  $^{238}\text{U}/^{232}\text{Th}$  versus  $^{230}\text{Th}/^{232}\text{Th}$  will produce linear correlations which can be used to determine the age. ISOPLOT (v. 4.15) was used to construct 3D isochrones. Correlated errors were reduced by calculating isochron ages in ISOPLOT v4.15 (Ludwig, 2008).

## APPENDIX 3: THATCHAM ASSESSMENT TABLES

### Thatcham Reedbeds Lithology and Macrofossil Assessment of Cored Sediments and Sub-samples

#### Borehole locations and maOD

<b>Easting</b>	<b>Northing</b>	<b>m aOD</b>	<b>Identification</b>
450214.4	166759.3	69.715	Borehole 1
450211.9	166747.3	69.611	Borehole 2
450205.5	166679.9	68.696	Borehole 3
450209.9	166680.8	68.634	Borehole 4 (abandoned)
450211.6	166681.5	68.744	Borehole 4a
450215.2	166682.4	68.659	Borehole 5
450223.4	166683.8	68.593	Borehole 6
450196.3	166678.7	68.842	Borehole 7
450183.3	166690	68.791	Borehole 8

<b>BH1 Hand dug pit, impenetrable</b>				
<b>ocm= 69.715m aOD</b>				
<i>Depth (m)</i>	<i>14C samples</i>	<i>Mollusc samples</i>	<i>Full sediment description</i>	<i>Interpretation</i>
0-0.2			Mixed, poorly sorted gravels in humic loam	Made ground
0.2-0.7			Coarse fluvial sand and gravels 10mm	Fluvial sand and gravels, possibly upcast quarry spoil

<b>BH2 Hand dug pit, impenetrable</b>				
<b>ocm= 69.611m aOD</b>				
<i>Depth (m)</i>	<i>14C samples</i>	<i>Mollusc samples</i>	<i>Full sediment description</i>	<i>Interpretation</i>
0-0.2			Mixed, poorly sorted gravels in humic loam As Bh1	Made ground
0.2-0.7			Coarse fluvial sand and gravels 100mm	Fluvial sand and gravels, possibly upcast quarry spoil

<b>BH3 Vibrocore NB 14C samples are 10mm thick, with depth given being top of the slice</b>				
<b>ocm= 68.696m aOD</b>				
<i>Depth (m)</i>	<i>14C samples</i>	<i>Mollusc samples</i>	<i>Full sediment description</i>	<i>Interpretation</i>
0-0.79			(0-0.3 compression) 10YR 3/1 very dark grey & 10YR 5/4 yellowish brown Mixed and mottled humic loam, peats and lumps of calcareous (?tufa, 10YR 6/3 pale brown). Stones up to 50mm and occ CBM. Abrupt boundary	Made ground/ dump

0.79-1.15	* <b>0.80</b> (3 small twigwood charcoal frags, 1 large <i>Phragmites</i> culm node) 0.81 (Phrag stems, twig x4, charcoal x3 but too tiny, 1 small frag charred <i>Phrag</i> stem) * <b>0.83</b> (3 bigger frags of charred <i>Phrag</i> stem, several uncharred and 2 frags twigwood)		(0.93-1.09 coring contamination) 10YR 3/1 very dark grey crumbly but firm and well preserved peat. Visible <i>Phragmites</i> stems, no stones 1.09-1.15m slightly paler, 10YR 3/2 very dark greyish brown, rare stones up to 10mm Good preservation, both organic and molluscs. NB one 2mm piece CBM at 0.81m. Small charcoal frags found 0.80-0.85m. Daphne eggs (water flea) and unid cocoon at 0.83m Clear boundary	Fen peat (upper)
1.15-1.26			10YR 3/1 very dark grey peat as above 10YR 6/2 pale brown lumps of tufa and occasional sand Gradual boundary	Fen peat with reworked tufa
1.26-1.46	1.27 (1 small seed, molluscs) * <b>1.28</b> (Phrag stems, twigwood frags, micro charcoal) * <b>1.44</b> ( <i>Alnus</i> wood frag, <i>Phrag</i> stem)		10YR 3/1 very dark grey peat, 1 lump of tufa. Increased silt to base. <i>Trochulus hispidus</i> and <i>Cochlicopa</i> sp. x1 at 1.27m, <i>Vallonia</i> sp. at 1.34m Clear boundary	Fen peat (lower)
1.46-1.61	* <b>1.50</b> (2 twig frags, 4 unid wood frags) 1.51 (Phrag stem, 3 juvenile wood frags)		10YR 3/1 very dark grey peaty silt with sandy tufa fragments. Highly organic but increasing tufa to base. True peat at 1.49-1.52 only. Crumb structure (weathered?) apparent from processed sample 1.45-1.51). Unid insect fragment at 1.51m Clear boundary	Peaty alluvium and peat
1.61-1.91			10YR 7/3 very pale brown tufa with large well concreted nodules up to 20mm with humic staining in c.20mm bands	Tufa
1.91-2.0			LOSS including boundary	
2.0-2.12			(no matrix for colour) clast supported fine gravel, very clean, coarsening upwards	Fluvial gravels
2.12-2.32			10YR 5/2 greyish brown fine gravel fining upwards to sands and gravel <3mm	Fluvial sands and gravels
2.32-2.38	NB small fragments of CBM and a piece of modern grass introduced to this layer during coring and only small scraps of stem and root recovered to date	2.32-2.38	10YR 3/2 dark greyish brown gravels in a humic sand matrix. Clear mat of fine rootlets and stems: apparently a mat of in situ vegetation. <i>Vallonia</i> sp. x1, 4 possible pieces of microdebitage at 2.32m	Fluvial sand and gravels with possible <i>in situ</i> vegetation
2.38-2.78		2.38-2.48 2.48-2.58 2.58-2.68 2.68-2.78	10YR 7/3 very pale brown soft silty marl/ tufa with coarse subrounded-subangular gravel up to 30mm	Marl and fluvial gravel
2.78-3.0		2.78-2.88	(no matrix for colour) clast supported gravel, very clean, stones 5-40mm	Fluvial gravels (Holocene channel bed or Devensian gravels?)

<b>BH4A (NB 0-0.5m described from gouge in the field, 0.5-2.5m vibrocores ocm= 68.744m aOD)</b>				
Depth (m)	14C samples	Mollusc samples	Full sediment description	Interpretation
0-0.50			0-0.14m Dark brown coarse sandy clay loam, common small stones to base 0.14-0.30 dark brown coarse sandy clay loam with small calcareous fragemtns 0.30-0.50 as above but decr stones and tufa fragments	Made ground/ soil

0.50-1.02			10YR 4/3 brown disturbed mixed humic loam with c.40% gravel rounded-angular unsorted Brick at 0.55-0.56m, burnt flint at 0.85m, calcareous lump at 0.87m Abrupt boundary	Dump, possibly backfill from Wymer's excavation?
1.02-1.89	1.02 ( <i>Phrag</i> stem, twig wood) 1.03 ( <i>Phrag</i> node, twig wood) 1.21 ( <i>Phrag</i> node, twig wood) 1.74 ( <i>Phrag</i> stem, twig wood) *1.75 (Charcoal frags, twig frag) 1.88 ( <i>Phrag</i> stem only)		1.02-1.70m 10YR 3/1 very dark grey fibrous horizontally layered poorly humified peat, incl visible <i>Phragmites</i> and fibrous root frags, tiny charcoal fragments recovered 1.02-1.05, 1.20-1.22. Possible microdebitage at 1.02-1.04m and 1.43m. Increasingly calcareous from 1.22-1.29. Slightly sandy calcareous band at 1.29-1.31, v abrupt boundary top and bottom. <i>Vallonia costata</i> x2 and <i>Ancylus fluvialtilis</i> x1 at 1.42-1.44m [sloppy recovery 1.48-1.62m] 1.70-1.89m peat with increased calcareous input, firm 5mm wide calcareous tufa/ marl bands 10YR 6/3 at 1.74m, 1.77m, 1.85m. Charcoal <2mm at 1.75-1.76m. <i>Pisidium</i> valve frag at 1.88m Gradual boundary	Peat with intercalating tufa/ marl
1.89-2.46			1.89-2.00 10YR 4/3 brown sandy silty clay, some lumps of tufa <4mm Gradual boundary to 2.0-2.46m 10YR 5/4 greyish brown silty clay with <i>Phragmites</i> stems, 1 30mm stone at 2.2m with specks of possible comminuted charcoal 2.21-2.22m 10YR 5/2 greyish brown sandy tufaceous band 2.22-2.23m 10YR 5/2 smooth silt band with abrupt boundaries 2.23-2.30 10YR 5/4 greyish brown mixed humic silts 10YR 5/6 yellowish brown silt as above with 10% gravel	Alluvium with occasional tufa
2.46-2.5			10YR 5/1 grey 80% gravel in clay silt matrix	Fluvial gravels

<b>BH5 Vibrocore</b> <b>ocm= 68.659m aOD</b>				
Depth (m)	14C samples	Mollusc samples	Full sediment description	Interpretation
0-0.20			0-0.11 Loss or compression 0.11-0.20 10YR 2/2 very dark brown well rooted humic crumbly silty loam, occ small stones <2mm Gradual boundary	Modern soil profile
0.20-0.32			10YR 4/3 brown humic crumbly mixed tufa and loam	Mixed ?dump
0.32-0.42			Loss and 1 large stone 60mm	-
0.42-0.49			10 YR 2/1 black humic soft sticky silty clay with occ small rounded stones and modern roots Clear boundary	Pedogenically altered humic alluvium
0.49-0.65			10YR 3/2 very dark greyish brown humic sandy silt, banded with calcareous sand. 15% stones 5-50mm Clear boundary	Alluvium
0.65-0.96			10YR 3/1 very dark grey sticky black silty peat. Well preserved inc <i>Phragmites</i> but mixed with occ fragments of tufa, rooted and somewhat dried out (likely not safe to date)	Fen peat
0.96-1.13			Loss/ compression	

1.13-1.33	1.27 ( <i>Euphorbia</i> seed x1)		10YR 4/1 dark grey sandy peat, gradual increase in minerogenic content to 1.27 then increased humic content again. Fibrous herbaceous plant matter throughout, macro and molluscs preservation good. <i>Bithynia tentaculata</i> at 1.27-1.28m, <i>Bithynia operculum</i> and <i>Vallonia costata</i> at 1.28-1.29m, <i>Trochulus hispidus</i> x2 at 1.29-1.30m, <i>Pupilla muscorum</i> and 1x possible microdebitage at 1.30-1.31m, Clear boundary	Peat with alluvial input
1.33-1.39		133-139	10YR 6/2 dark brownish grey slightly humic calcareous silty sand and gravel <10mm Sharp boundary	Alluvium
1.39-1.60		1.44-1.47	10YR 3/1 very dark grey fibrous silty peat with 2x 10mm bands of concreted tufa 10YR 7/2 light grey. Small tufa fragments throughout the unit. Occasional <i>Phragmites</i> stems. <i>Valvata cristata</i> x2 1.39-1.41m, <i>Radix balthica</i> and <i>Trochulus hispidus</i> at 1.40-1.41m, <i>Pisidium</i> valve at 1.42-1.43m, <i>Lymnaea</i> and <i>Vallonia excentrica</i> at 1.43-1.44m, <i>Trichia</i> sp. at 1.55-1.56m, <i>Punctum pygmaem</i> , <i>Vallonia costata</i> and <i>Anisus leucastoma</i> at 1.59-1.60m. NB one tiny piece of CBM at 1.40m. Tiny fragments of charcoal at 1.47-1.48m, 1 piece possible microdebitage at 1.53-1.54m, 3 pieces at 1.56-1.57m, and 3 pieces at 1.59-1.60m. Clear boundary	Peat and intercalating tufa
1.60-1.79			10YR 4/2 dark greyish brown and patches of 10YR 7/2 light grey gravel in a humic sandy silt matrix. Increasingly minerogenic/ decreasingly humic to base 10YR 5/3 brown with occ tufa up to 40mm 10YR 8/2 very pale brown Abrupt boundary	Fluvial gravels
1.79-1.90	1.88 (Several pieces twig wood, mollusc shell)	1.80-1.88	2.5Y 6/2 light brownish grey sandy silt slightly humic calcareous sandy silt. <i>Phragmites</i> stem and twigs possibly <i>in situ</i> at base but unit only slightly humic. Could consider 14C tho tricky given context. <i>Anisus leucastoma</i> at 1.88-1.89 (amphib, seasonal flooding) Clear boundary	Alluvium/ marl
1.90-2.22		2.00-2.11 2.11-2.22	10YR 5/3 brown relatively clean flint gravel <5% stones up to 30mm, fining to base (1-2mm). Notably, defined layer of reeds and rootlets within the gravels: apparently an <i>in situ</i> mat of vegetation Gradual transition	Fluvial gravels
2.22-2.33		2.22-2.32	10YR 3/2 very dark greyish brown slightly humic calcareous sandy gravelly silt Clear boundary	Alluvium
2.33-2.56			10YR 4/2 dark greyish brown clean subrounded gravels in <5% humic silt. Notable accumulation of fine roots and stems, apparently stable mat of veg (consider 14C ex aquatics and obligates but nothing suitable recovered). 3 pieces possible microdebitage at 2.52-2.53m Sharp boundary	Fluvial gravels
2.56-2.65		2.56— 2.65	10YR 5/2 greyish brown slightly calcareous sandy subrounded gravel up to 50mm. NB number of possible small struck flints (in centre not outside of core), Clear boundary	Fluvial sands and gravels
2.65-3.38			2.5Y 7/4 pale yellow very clean well sorted soft sand, slightly calcareous	Fluvial/ Aeolian sand? Likely Lateglacial, cf. Wasing Bed at Woolhampton

**BH6 Vibroc core to 1m described in lab, powered gouge 1-1.72m described in field  
ocm= 68.593m aOD**

Depth (m)	14C samples	Mollusc samples	Full sediment description	Interpretation
0-0.06			10YR 3/2 very dark greyish brown dry crumbly humic sandy loam, defined crumb structure, mixed with large tufa nodules, 25% rounded-subrounded stones, rare CBM Clear boundary	Modern soil

0.06-0.15			10YR 6/3 pale brown loose crumbly calcareous silty tufa, slightly mixed and humic/ dirty. 1 piece ?burnt flint Sharp boundary (dump?)	Loose tufa (dump?)
0.15-0.48			10YR 2/2 very dark brown soft crumbly humic loam, well rooted c.30% stones and occ. tufaceous nodules Sharp boundary	Soil profile on/ in top of peat. Possibly relatively modern
0.48-0.53	0.52 (1 small charred seed, damaged, cf. <i>Rubus</i> or <i>Ranunculus</i> type		10 YR 2/1 black highly humic smooth peaty clay silt, dry and humified. NB tiny fragments of CBM in processed samples at 0.49-0.51m. <i>Trochulus hispidus</i> at 0.48-0.49m, <i>Helicella</i> sp. frag at 0.50-0.51m. 1 piece possible <u>struck flint</u> at 0.50-0.51 and struck ?chert at 0.48-0.49m Abrupt boundary	Peat with alluvial input
0.53-0.57		0.53-0.57	5Y 5/2 olive grey pale and Fe mottled clay silt, rare stones <3mm. occ modern roots to this depth Abrupt boundary	alluvium
0.57-1.67			0.57-0.66m 10YR 5/2 greyish brown gravel in c.5% sandy silt matrix, stones 2-30mm 0.66-1.23m 10YR 5/6 yellowish brown ferruginous sandy gravel, stones 2-30mm, becoming slightly humic at depth 1.23-1.62 10YR 6/6 brownish yellow coarse sands and gravels up to 60mm (most to 30mm), fining down profile Clear boundary	Fluvial gravels (Devesian?)
1.67-1.72			10YR 7/2 light grey soft fine sandy calcareous marl. Occasional fine stones 10% to base	Marl (Devesian? Lateglacial transition cf Woolhampton ?)

<b>BH7 Hand dug pit, impenetrable</b> <b>ocm= 68.842m aOD</b>				
Depth (m)	14C samples	Mollusc samples	Full sediment description	Interpretation
0-0.1			Mixed, poorly sorted gravels in humic loam	Made ground
0.1-0.5			Coarse fluvial sand and gravels 10mm	Fluvial sand and gravels, possibly upcast quarry spoil

<b>BH8 Gouge</b> <b>ocm= 68.791m aOD</b>				
Depth (m)	14C samples	Mollusc samples	Full sediment description	Interpretation
0-0.63			10YR 3/1 dark grey sandy silt 15% stones up to 25mm, most 5mm. Possible charcoal at 0.60m Sharp boundary	Gravelly alluvium
0.63-1.09			10YR 2/1 black highly organic clay silt with occ tufa nodules up to 15mm, most 3mm, increasing to base. Gradual boundary	Alluvium
1.09-1.30			10YR7/1 light grey loose, coarse tufa with sand, c.30% sharp highly concreted nodules Abrupt erosive boundary	Tufa
1.30-1.44			10YR5/6 yellowish brown soft pale silty peat. Wood at 1.39m	Peat
1.44-1.75			10YR 7/4 very pale brown tufa with sand nodules up to 10mm, some around stones Sharp boundary	Peat

1.75-2.00			Loss	-
2.00-2.05			10YR 8/2 very pale brown fine sandy tufa and fine flint gravel	Tufa
2.05-3.00			Repeated loss but still not in clean fluvial gravels as one tufa covered stone jammed in at 2.95m with possible small struck flint attached	Tufa?



## APPENDIX 4: VICTORIA PARK ASSESSMENT TABLES

### Appendix 4a Victoria Park: context descriptions and sample assessment table

Context Descriptions (CB July 2014) and subsampling for dating purposes <23>

<b>Top of described section=74.364m aOD</b>					
<b>Top of &lt;23&gt;=top of context 105 in NW corner at 73.854m aOD (0.51m below ground level)</b>					
<i>Depth (m)</i>	<i>Context</i>	<i>Macro ass/ 14C samples</i>	<i>Other samples [mollusca idd during macros ass]</i>	<i>Full sediment description</i>	<i>Interpretation</i>
0-0.17	101			10YR 3/2 very dark grey brown Crumbly fine sandy silty humic loam, distinct blocky structure on drying. Well rooted, rare stones, only to 2mm. Clear boundary	Modern soil (A&B horiz)
0.17-0.28	103 (NB context reversal, overlies 102)			10YR 3/2 very dark grey brown Loose soil (as above) mixed with tufa, including small nodules and fine silt matrix in patches (10YR 3/2 very pale brown). Occ rounded stones up to 40mm. Sharp boundary	Dump, possibly canal or boating pond diggings
0.28-0.40	102			10YR 3/1 very dark grey humic sandy silt soil, defined crumb structure, rooting and worm burrows. Occ stones up to 30mm, occ charcoal and post Medieval finds. Clear boundary	(Recent, post Medieval) buried soil
0.40-0.43	104			Band of tufa (5Y 7/2 light grey), mainly large concretions in a humic silty loam matrix (c.30%, 10YR 3/2 very dark greyish brown). Some evidence of pedogenesis. NB 2 fragments uncharred hazelnuts noted. Sharp (possibly erosive) boundary	Spring activity nearby with incorporation of tufa into an active soil horizon

Top of described section=74.364m aOD					
Top of <23>=top of context 105 in NW corner at 73.854m aOD (0.51m below ground level)					
0.43-0.48 /0.51 in NW corner as per dating and ass samples	105	(0.43m=) 0-1cm 3 small frags wood, I poss tiny nutshell fragment 1-2cm 2 small wood frags, I frag charcoal * <b>2-3cm</b> Numerous small charcoal fragments, including 1 charred twig, several wood frags 3-4cm 1 small charcoal frag * <b>4-5cm</b> several small frags charcoal incl very fine twigwood with narrow spines (?bramble/ hawthorn) * <b>5-6cm</b> 16 small charcoal frags, 1 cf. <i>Brassica</i> seed * <b>6-7cm</b> numerous small charcoal frags incl spiny twigwood (cf. hawthorn) and burnt root frag, 2 frags charred hazelnut shell, small mammal bones * <b>7-8cm</b> 3 small mammal bones, 2 charcoal frags, 2 tiny seeds cf. <i>Brassica</i> 8-9cm 4 small bone frags, 1 tiny <i>Carex</i> seed, specks of charcoal	[0-1cm <i>Pisidium</i> , <i>Vertigo</i> , <i>Vallonia</i> , <i>Valvata pisci analis</i> , <i>V.</i> <i>crystata</i> , cf. <i>Succinea</i> , <i>Bithynia</i> operculum] [1-2cm <i>Vallonia</i> , <i>Pisidium</i> , <i>Bithynia</i> op., <i>Carychium</i> , <i>Valvata</i> both, <i>Ancylus</i> , <i>Gyrulus crista</i> ] [2-3cm 1x <i>Vertigo</i> only] [3-4cm <i>Valvata cristata</i> , <i>Vallonia</i> sp., <i>Bithynia</i> op.] [5-6cm <i>Ceciloides</i> , <i>Bithynia</i> op.]  [6-7cm <i>Valvata cristata</i> , cf. <i>Trochulus hispidus</i> , also small mammal bones and claw] [8-9cm <i>Trichia</i> ]	10YR 3/1 very dark grey stiff, sticky black silty peat. Well humified, not fibrous. Very charcoal and artefact rich. Slight rooting from above but relatively little disturbance. Occ small tufaceous tiny CBM frags and iron nodules in upper part. Apparent in sieving that sand and fine gravel occur in small quantities through this unit. Gradual boundary to below (could group 105 and 106 as one continuous context with increasing peat accumulation upwards). NB one poss broken blade tip recovered from sieving 1cm slice at 8-9cm (0.59m) to add to ex assemblage	Prehistoric occupation horizon: Peat with substantial overbank alluvial input (but in situ accumulation of organics)
0.48/0.51- 0.54/ 0.59	106	* <b>9-10cm</b> c.15 small frags wood charcoal * <b>10-11cm</b> 5 small frags charcoal, 2 small mammal bones * <b>11-12cm</b> 1 frag charcoal, 1 bone 12-13cm 1 tiny piece burnt bone, nothing to date 13-14cm specks of charcoal, nothing to date * <b>14-15cm</b> 1 small piece charred bone (and specks of charcoal) 15-16cm 1 rodent tooth, 3 tiny specks of charcoal, nothing to date 16-17cm 1 small piece ?charred bone 17-18cm nothing to date	[9-10cm <i>Bithynia</i> operculum] [10-11cm 2 <i>Vallonia</i> sp., <i>Valvata</i> <i>piscinalis</i> , <i>Vitrina</i> sp., <i>Cochlicopa</i> , + member of the Zonitadeae (woodland) [11-12cm Limacidae plate, <i>Carychium</i> ] [12-13cm <i>Trochulus hispidus</i> ] [13-14cm <i>Cochlicopa</i> , <i>Vitrea</i> sp] [14-15cm <i>Carychium</i> , <i>Vallonia</i> , Limacidae plate] [15-16cm 2 <i>Vallonia</i> sp.] [16-17cm <i>Vallonia</i> ]	10YR 4/2 dark greyish brown Humic clay-rich soil, common macropores and flecks of calcareous matter. Small quantities of sand and fine gravel found throughout the unit in sieving, increasingly coarse to base. Very charcoal and artefact rich. Little disturbance but rare rooting and burrows from surface. NB large struck flint flake in 1cm sample processed at 17-18cm	Prehistoric occupation horizon cont. Stable buried soil with overbank alluvial input
0.59-0.65	107	18-19cm 1 small frag bone, 1 charcoal too small to date? 19-20cm 1 tiny <i>Carex</i> seed, 1 tiny piece charcoal, too small to date?	[18-19cm <i>Carychium</i> , <i>Vallonia</i> , <i>Cochlicopa</i> ] [19-20cm <i>Cochlicopa</i> ]	NB desc from here down are solely from pit cut into base of trench in NW corner 10YR 6/3 pale brown Grey and orange (Fe) mottled (7.5YR 5/8 strong brown) stiff dense massive silty clay alluvium with Fe stained worm burrows. Rare charcoal in upper portion (moved down worm burrows?). Rare large	

<b>Top of described section=74.364m aOD</b>					
<b>Top of &lt;23&gt;=top of context 105 in NW corner at 73.854m aOD (0.51m below ground level)</b>					
				subrounded stones up to 70mm. Clear polygonal marks on cleaned upper surface, likely large scale structures from drying/ weathering. Abrupt boundary	
0.65-0.78	108			10YR 3/2 very pale brown Pale calcareous silt marl, massive and smooth but with c.5% very large stones, up to 80mm and increasing in size into 109. Occ Fe mottles along rooting and occ burrows to top. Sharp boundary	
0.78-1.0	109			Coarse sand and pea grit with c.10% calcareous silt matrix (10YR 3/2 very pale brown), few inclusions but occ very large stones up to 200mm. Undulating and variable unit	

Appendix 4b Victoria Park: finds summary by context

Layer	Material	No	Wt
101	ANIMAL BONE	7	30
101	CERAMIC BUILDING MATERIAL	8	50
101	CLAY PIPE	1	2
101	GLASS	1	5
101	IRON	1	3
101	OTHER METAL	2	6
101	POTTERY	5	15
101	SYNTHETICS	4	2
102	ANIMAL BONE	31	58
102	CERAMIC BUILDING MATERIAL	56	553
102	CLAY PIPE	10	11
102	COPPER ALLOY	1	14
102	GEMSTONES	1	3
102	GLASS	10	25
102	IRON	10	44
102	MINERAL AGGREGATES	11	9
102	POTTERY	15	27
102	SLAG	3	10
103	ANIMAL BONE	3	20
103	CERAMIC BUILDING MATERIAL	1	1
103	GLASS	1	15
103	POTTERY	1	1
104	ANIMAL BONE	6	7
104	CERAMIC BUILDING MATERIAL	3	3
105	ANIMAL BONE	49	52
106	ANIMAL BONE	5	4

Appendix 4c Victoria Park: animal bone assessment

Test Pit	Context	Recovery	ON	Sample No	mesh size	Species	Element	Comments	Wt (g)	Preservation
1	105	HR	41			??roe deer	carpal		1	1
1	105	HR	107			large mammal	long bone shaft frag		1	1
1	105	HR	89			large mammal	long bone shaft frag		1	1
1	105	HR	192			large mammal	??prox ulna or cranial articular surface atlas vertebra frag		1	1
1	105	HR	173			rodent	incisor		<1	1
1	105	HR	100			mammal	long bone shaft frag		<1	1
1	105	HR	142			Castor sp. Beaver	right tibia	photos showing possible cut marks in digital project archive	5	1
1	105	HR	71			mammal	small frag		<1	1
1	105	HR	137			??roe deer	metatarsal shaft frag (neonate)	unfused half Cac Mt shaft	<1	1
1	105	HR	82			mammal	vertebra process frag		<1	1
1	105	HR	104			mammal	long bone shaft frag	cut mark (filleting)	<1	1
1	105	HR				mammal	small frag		<1	1
1	105	HR				mammal	long bone shaft frag		<1	1
1	105	HR				mammal	small frag		<1	1
1	105	HR				mammal	small frag		<1	1
1	105	HR				mammal	long bone shaft frag		<1	1
1	105	HR				large mammal	shaft fragment	??neonate metatarsal (unfused along midline)	3	1
1	105	HR				mammal	long bone shaft frag		<1	1
1	105	HR				large mammal	long bone shaft frag		2	1
1	105	HR				large mammal	long bone shaft frag		5	1
1	105	HR				large mammal	long bone shaft frag	possible faint cut mark, slight surface sheen	4	1

1	102	HR				horse	incisor			1
1	103	HR				mammal				1
1	105	SR				mammal	small frag			1
1	105	SR				mammal	small frag			1
1	105	SR				??lepus	long bone shaft frag			1
1	105	SR	1113			mammal	small frag	charred with slight surface sheen		1
1	105	SR	1114			mammal	long bone shaft frag	??ulna shaft		1
1	101	SR				mammal	small frag			1
1	101	SR				large mammal	rib shaft			1
1	101	SR				sheep/goat	1st phalanx			1
1	101	SR				sheep/goat	1st phalanx			1
1	101	SR				sheep/goat	metatarsal distal shaft and articulation	cut marks volar distal shaft		1
1	102	SR				mammal	small frag			1
1	102	SR				rabbit	2x metapodium			1
1	102	SR				rabbit	vertebra			1
1	102	SR				large mammal	vertebra frag			1
1	102	SR				dog	metapodial unfused distal epiphysis			1
1	102	SR				mammal	small frags, one charred			1
1	103	SR				dog	atlas vertebra			1
1	102	SR				mammal	small frag			1
1	102	SR				large mammal	long bone shaft frags			1
1	102	SR				dog	pelvis (illium frag)			1
1	102	SR				sheep/goat	1st phalanx			1
1	102	SR				cattle	skull frag (R orbit)			1
1	104	SR				large mammal	long bone shaft frags			1
1	105	SR		1	1mm	vole	tooth	plus other small frags		1
1	105	SR		1	2mm	mammal	small frags			1
1	105	SR		1	4mm	mammal	small frags			1
1	105	SR		1	4mm	small mammal	carpal			1

1	105	SR		2	1mm	rodent	incisor teeth and long bones			1
1	105	SR		2	2mm	mammal	small frags			1
1	105	SR		2	4mm	mammal	small frag			1
1	105	SR		2	4mm	rodent	femur and vertebra			1
1	105	SR		3	1mm	vole	2x teeth			1
1	105	SR		3	2mm	small mammal	long bones			1
1	105	SR		3	4mm	mammal	small frag			1
1	106	SR				mammal	small frag	charred		1
1	106	SR				large mammal	long bone shaft frag			1
1	106	SR		7	2mm	rodent	incisor			1

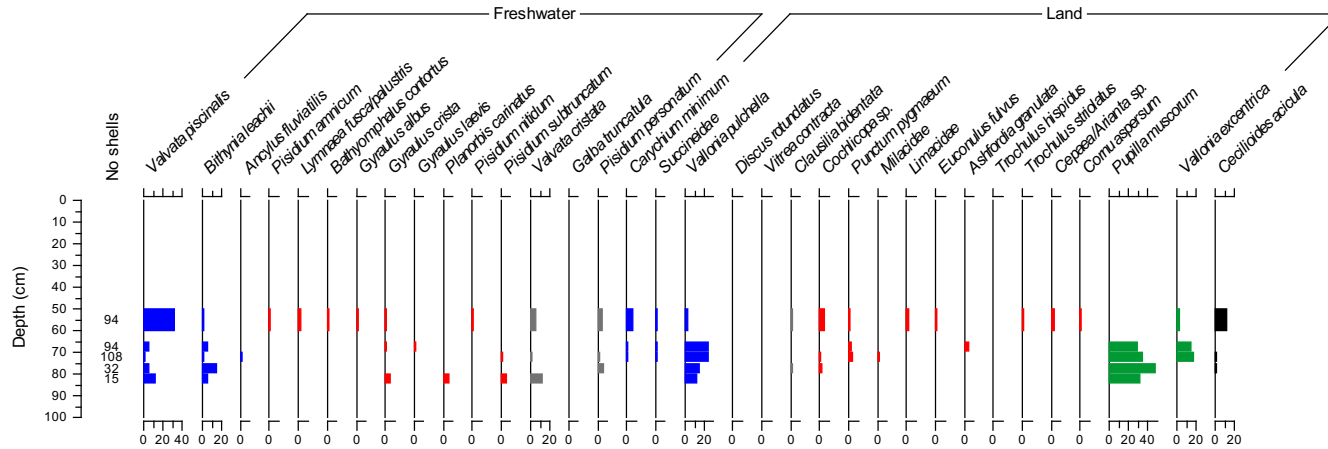
Appendix 4d Victoria Park: Numbers of molluscs found in the trench mollusc column samples

Context	101	101	101	101/103	103	103	102	102	104	104	105	105	105	105	105/106	106	106	106	106	107	107	108	109	110	111
Depth (cm)	0-5	5-0	10-15	15-20	20-25	25-30	30-35	35-40	40-44	44-48	48-50	50-52	52-54	54-56	56-58	58-60	60-62	62-64	64-65	65-70	70-74	74-78	78-82	82-93	93-105
Sample weight (g)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1497	1345	1180	1495	1500	1500	1495	1500	1500	1500	1500	1500	1500
<b>Moving water</b>																									
<i>Theodoxus fluviatilis</i>					2		1																		
<i>Valvata piscinalis</i>		4	8	18	26		29	192	126	34	15	1	2	2			1	1			1				
<i>Bithynia leachii</i>					2																				
<i>Bithynia tentaculata</i>			5	11	15	2	13	48	50	10	1	1	1				1		1		1				
<i>Ancylus fluviatilis</i>						1		5	8																
<i>Pisidium supinum</i>						1																			
<b>Catholic</b>																									
<i>Radix balthica</i>								95	110	7	4														
<i>Bathyomphalus</i>			1		2		3	24	54	2	3			1											
<i>Gyraulus albus</i>							1																		
<i>Gyraulus crista</i>		1	3	3	2			16	29	1							1	1	1	2					
<i>Gyraulus laevis</i>			2				1							1											
<i>Planorbis planorbis</i>							1	3	1		1														
<i>Pisidium amnicum</i>								1	1																
<i>Pisidium milium</i>					2	3	1	4	5							1									
<i>Pisidium nitidum</i>					1	2	2	15	10	1															
<i>Pisidium</i>					1	3		1	7																
<i>Pisidium sp.</i>						4	1	1		4															
<b>Ditch/slum/marsh</b>																									
<i>Valvata cristata</i>			12	14	21	2	33	44	82	10	1							1			1				
<i>Galba truncatula</i>			1			1	8	49	75	9	4	3	3		1		2	2	1	1					
<i>Anisus leucostoma</i>							1	6	8																
<i>Pisidium personatum</i>									1																

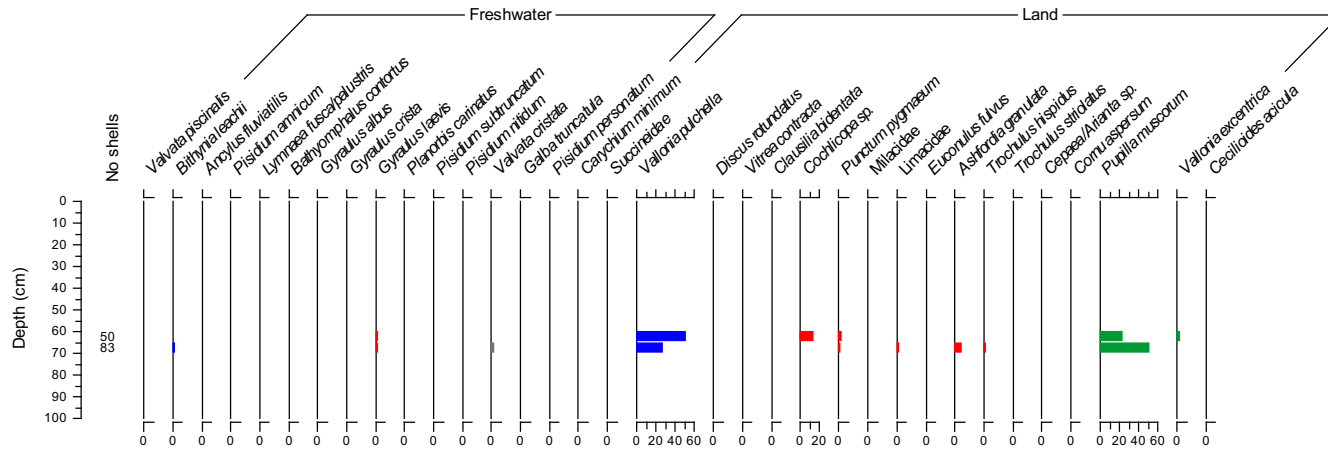




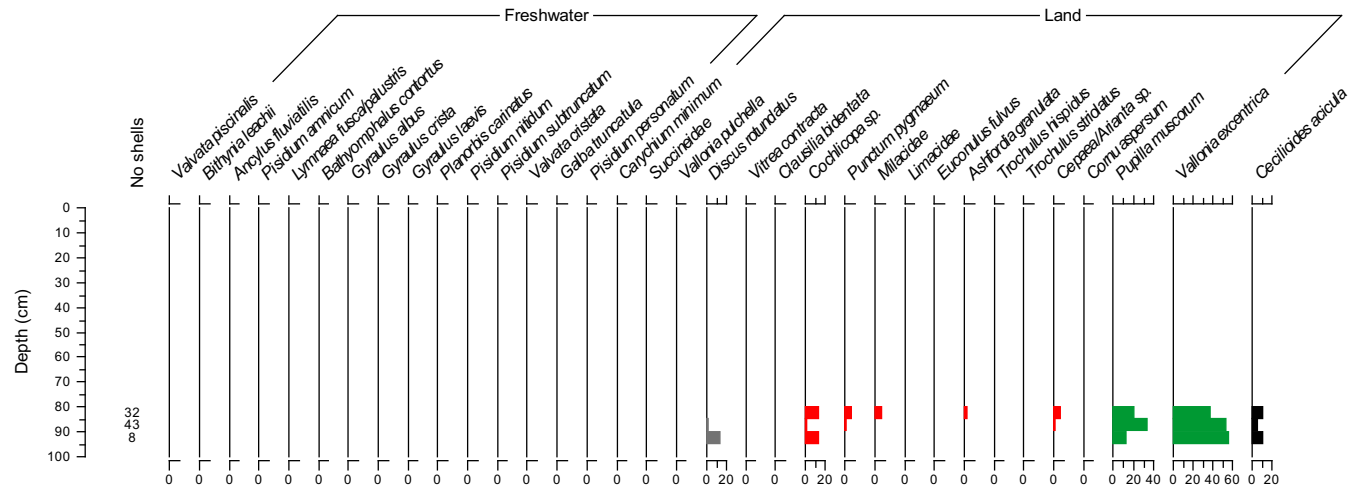
# Appendix 4e Victoria Park: coring mollusc analysis



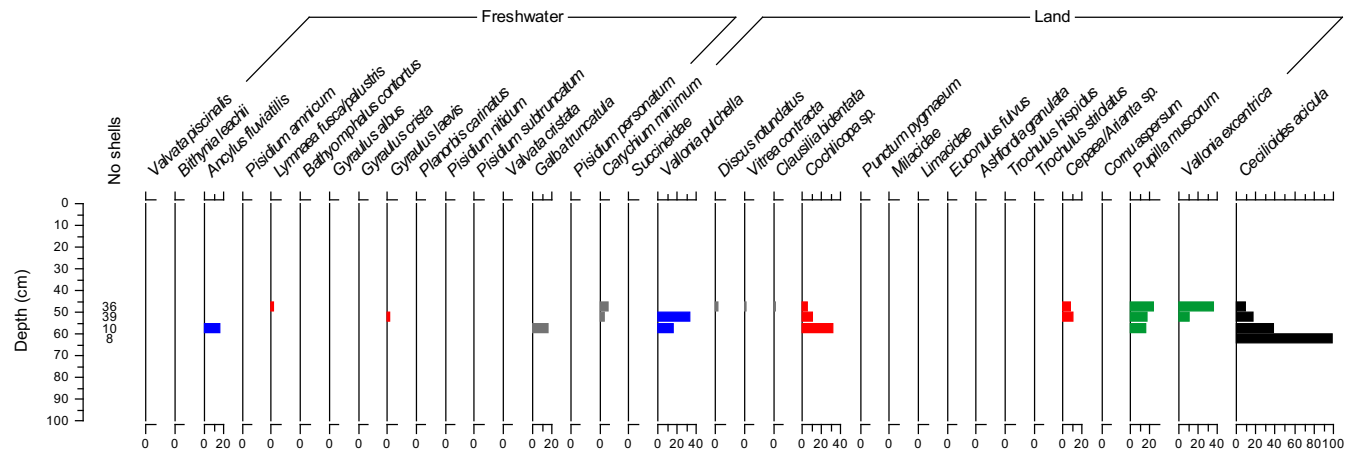
**BOREHOLE 3**



**BOREHOLE 4**



**BOREHOLE 9**



**BOREHOLE 10**

Appendix 4f Victoria Park: Numbers of shells found in the bore hole samples

Depth (cm)	BH 9			BH 10				BH 4		BH 3				
	80-85	85-90	90-95	45-50	50-55	55-60	60-65	60-65	65-70	50-60	65-70	70-75	75-80	80-85
<b>Moving water</b>														
<i>Valvata piscinalis</i>										27	6	3	2	2
<i>Bithynia tentaculata</i>								2	2	2	6	1	5	1
<i>Ancylus fluviatilis</i>						1						2		
<b>Catholic freshwater</b>														
<i>Lymnaea fusca/palustris</i>				1						3				
<i>Bathymphalus contortus</i>										1				
<i>Gyraulus albus</i>										1				
<i>Gyraulus crista</i>										1	1			1
<i>Gyraulus laevis</i>					1			1	1		2			
<i>Pisidium amnicum</i>										1				
<i>Pisidium nitidum</i>										2				
<i>Pisidium subtruncatum</i>												1		1
<b>Ditch/slum/marsh</b>														
<i>Valvata cristata</i>									3	5		2		2
<i>Galba truncatula</i>						1								
<i>Anteus leucostoma</i>														
<i>Planorbis carinatus</i>														1
<i>Pisidium personatum</i>										5		1	2	
Succineidae										2	1	1		
<i>Euconulus alderi</i>										1				
<i>Ashfordia granulata</i>	1								6		5			
<b>Shade</b>														
<i>Discus rotundatus</i>		1	1	1										
<i>Vitrea contracta</i>				1										
<i>Clausilia bidentata</i>				1						2			1	
<b>Catholic land</b>														
<i>Carychium minimum</i>				2						2	1	2		
<i>Carychium</i> spp.				1	2					4				
<i>Cochlicopa lubrica</i>		1	1	1	3									
<i>Cochlicopa</i> spp.	4			1	1	2		7		5		3	1	
<i>Punctum pygmaeum</i>	2	1						2	2	2	4	5		
Milacidae	2											1		
Limacidae								2	3					

<i>Trochulus hispidus</i>								1						
<i>Trochulus striolatus</i>									1					
<i>Cepaea/Arianta</i> spp.	2	1		3	4				4					
<i>Cornu aspersum</i>									1					
<b>Open country</b>														
<i>Pupilla muscorum</i>	6	14	1	8	6	1		12	43		29	37	15	5
<i>Vallonia excentrica</i>	5	13	1	3	2			1		1	5	9		
<i>Vallonia pulchella</i>					5			11	5	1	8	12	1	
<i>Vallonia</i> spp.	6	9	3	9	8	1		16	18	4	26	26	4	2
<b>Burrowing</b>														
<i>Cecilioides acicula</i>	4	3	1	4	7	4	8			13		2	1	