EXCAVATIONS ON THE A40 BYPASS AT ROBESTON WATHEN PEMBROKESHIRE 2009

ymddiriedolaeth archaeolegol
DYFED
archaeological trust

INVESTOR IN PEOPLE
BUDDSODDWR MEWN POBL

DYFED ARCHAEOLOGICAL TRUST

RHIF YR ADRODDIAD / REPORT NO. 2010/4
RHIF Y PROSIECT / PROJECT RECORD NO. 98579

Tachwedd 2009
November 2009

EXCAVATIONS ON THE A40 BYPASS AT ROBESTON WATHEN PEMBROKESHIRE 2009

Gan / By

Duncan Schlee

YMDDIRIEDOLAETH ARCHAEOLEGOL DYFED CYF
Neuadd y Sir, Stryd Caerfyrddin, Llandeilo, Sir Gaerfyrddin SA19 6AF
Ffon: Ymholiadau Cyffredinol 01558 823121
Adran Rheoli Treftadaeth 01558 823131
Ffacs: 01558 823133
Ebost: info@dyfedarchaeology.org.uk
Gwefan: www.archaeolegdyfed.org.uk

DYFED ARCHAEOLOGICAL TRUST LIMITED
The Shire Hall, Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AF
Tel: General Enquiries 01558 823121
Heritage Management Section 01558 823131
Fax: 01558 823133
Email: info@dyfedarchaeology.org.uk
*Website: www.*dyfedarchaeology*.org.uk*

CONTENTS

FIGURES

PHOTOGRAPHS

PART TWO: ARCHAEOLOGICAL EVALUATION OF A FLINT SCATTER AND EARLY METAL WORKING AT CANASTON BRIDGE, PEMBROKESHIRE (PRN 98578)

CONTENTS

FIGURES

PHOTOGRAPHS

SUMMARY

The Dyfed Archaeological Trust were commissioned by Hyder Consulting Ltd. to undertake the excavation of two archaeological sites discovered during an archaeological watching brief undertaken by Hyder Consulting Ltd. on topsoil stripping on the route of the Robeston Wathen (Penblewin) A40 bypass section of the A40 Penblewin to Slebech Park Road Improvement Scheme. The two sites were discovered in locations crucial to the bypass construction programme. As a consequence, little time was available in which to undertake the excavation and recording of the features.

In a cwm to the east of Woodford Lane a large burnt mound was discovered. The mound contained well preserved deposits and associated cut features. Close to the mound was a stone lined roasting pit or oven. Carbon 14 dating evidence has indicated that the burnt mound is of Bronze Age date.

Close to Canaston bridge where the Narberth Brook joins the Cleddau River, a late Mesolithic/early Neolithic flint knapping site associated with cut features suggesting temporary structures, was identified. This site was evaluated with four hand-excavated trenches to characterise the site before suitable mitigation was formulated. During the evaluation, evidence of a possible Roman or early medieval bloomery iron smelting furnace was identified on the same site. A Bronze Age date was obtained from the post hole in Trench 4.

The results both excavations proved very interesting and are useful additions to the study of other such sites in the region.

ACKNOWLEDGEMENTS

Many thanks are due to Jon Davies and Rob Masters of Cresswell Associates; Roy Carroll, Phil Baker and everyone else at Costains; Jim Hunter, Jennifer Wylie, Sarah Woodget and Andy Shobbrook of Hyder Consulting Ltd.; Charles Hill, Hubert Wilson, Sikko Vanderbrug, Gwilym Bere, Hayley Nicholls, Richard Ramsey and Simon Ratty of the Dyfed Archaeological Trust, and finds specialists Elizabeth Walker, Tim Young, Dr. Mark Redknap, Dr Jana Horàk, Dana Challinor, Wendy Carruthers and the SUERC C14 lab.

INTRODUCTION

Dyfed Archaeological Trust Field Services were commissioned by Hyder Consulting Ltd. to undertake the excavation of two significant archaeological sites identified during an archaeological watching brief undertaken by archaeologists from Hyder Consulting during topsoil stripping along the route of the Robeston Wathen (Penblewin) A40 bypass section of the A40 Penblewin to Slebech Park Road Improvement Scheme (see maps 1 and 2).

The sites consisted of a burnt mound and associated features, and a possible prehistoric flint scatter site. The two sites were discovered in locations crucial to the bypass construction programme. As a consequence, little time was available in which to undertake the excavation and recording of the features.

Investigation of the burnt mound site was undertaken as an open area excavation (see map 3), while the flint scatter was investigated as an assessment (see map 4), to inform possible options for mitigating the impact of the development upon the site.

The results both excavations are presented within this report.

Project background

An archaeological assessment carried out in 1993 (James 1993) identified an area of archaeological potential on the south side of the village of Robeston Wathen. The report recommended a programme of further assessment, including geophysical survey adjacent to Woodford Lane. Geophysical survey (Barker 1997) was subsequently carried out as part of the Stage III Archaeological Assessment of the preferred route of the Robeston Wathen Bypass (Trethowen 1997). Other studies of the various route options for improvements to the A40 west of St. Clears have also outlined the archaeological potential of the Robeston Wathen to Canaston Bridge section (Page 2003 & 2004).

In 2006 another Geophysical survey (Sabin and Donaldson 2006) was undertaken in fields south of Robeston Wathen, to the east and west of Woodford Lane. An archaeological evaluation of a possible building was subsequently undertaken (Schlee 2006).

In accordance with recommendations for mitigation of the effects of the bypass upon the cultural heritage resource, an archaeological watching brief was undertaken (by Hyder Consulting Ltd.) during topsoil stripping along the bypass route, once the construction programme began in 2009.

Following the identification of the burnt mound, DAT - Heritage Management, visited the site to assess and discuss options for the mitigation of impacts upon the archaeological resource from the road construction.

DAT - Field Services were subsequently commissioned by Hyder Consulting Ltd. to produce a specification for a Written Scheme of Investigation (WSI) to address required mitigation of the effects of the development upon the archaeological features. An initial WSI was prepared for a site clean and mapping of the burnt mound area to ascertain the extent of the archaeological remains. A WSI for excavation was then prepared for excavation of the defined area. Both WSIs were approved by all parties prior to being implemented.

A WSI was also produced for an assessment of the area containing a flint scatter and possible settlement evidence of possible late Mesolithic date recovered at the 'Teardrop' site, adjacent to Canaston Bridge. DAT – Field Services were commissioned to undertake fieldwork on both of the sites on behalf of Hyder Consulting Ltd.. The WSI for all stages of work were approved by Dyfed Archaeological Trust – Heritage Management (DAT-HM) in their capacity as the

archaeological advisor to the Welsh Assembly Government (WAG), and thus, Highways schemes.

Primary Record Numbers have been given to the Burnt Mound (PRN 98577) and the 'Teardrop' site (PRN 98578). These numbers identify the archaeological sites on the Regional Historic Environment Record (HER)[1]. PRNs are also used within this report referencing other known sites within the area recorded on the Regional HER.

Historical background

Welsh elements in place names such as 'Wathen' and nearby 'Teglyn', hint at possible early medieval settlement in the area, but Robeston Wathen itself appears to be a nucleated Anglo-Norman settlement. The village is first recorded in 1282 as 'Villa Robert' (Charles 1992, 545).

The agricultural landscape across which the bypass runs, is partly the product of Anglo-Norman settlement in the area (displacing the previous native Welsh landowners) in the 12th century. Traces of an associated and long-lived 'open field' system of arable cultivation, with areas of common land in the valley bottom, and woodland, are still discernable in the present landscape to the south and east of the village.

Woodford Lane, a deep rock cut 'hollow way' running from Robeston Wathen down-slope to Woodford at a crossing of the Narberth Brook is possibly the oldest cultural heritage feature in the area, which may pre-date the Anglo-Norman field system. Some of the fields to the west of the hollow way may also be of pre Anglo-Norman origin.

The underlying geology is of Ordivician shales and mudstones containing thin bands of gritstone conglomerates. There are drift deposits of boulder clay to the east. The slopes from the A40 down to the Narberth Brook, are cut by several small cwms formed by streams rising from springs to the south of the present A40. The burnt mound was located in one such cwm, immediately east of the point where the route of the road scheme crosses Woodford Lane.

There are no known sites recorded on the Regional Historic Environment Record (as held by Dyfed Archaeological Trust) within the road corridor, although the area around Robeston Wathen is recognized as containing significant historic landscape elements.

Archaeological Background

Previous geophysical survey of the route corridor (Barker 1997), did not identify and define sites of obvious archaeological significance. Desk-top assessment identified the area to the south of Robeston Wathen as having historic landscape significance and some archaeological potential (Page 2003 & 2004). As a consequence, a second geophysical survey was undertaken (Sabin and Donaldson 2006), concentrating on the two fields to the south of Robeston Wathen, on either side of Woodford Lane. This identified a possible building of uncertain date or significance. Subsequent evaluation excavation confirmed the presence of the plough damaged remnants of a former building, but insufficient evidence survived to suggest the character or age of the building (Schlee 2006).

No further archaeological evaluation of the route was undertaken. A watching brief was, however, undertaken during topsoil stripping along the route in

[1] The Regional Historic Environment Record is held by the Dyfed Archaeological Trust, and contains records of known sites of archaeological and historical importance within Carmarthenshire, Ceredigion and Pembrokeshire

advance of construction with the aim of identifying and recording any hitherto unknown sites of archaeological significance revealed by topsoil stripping.

The route of the LNG pipeline crossed the route of the Robeston Wathen bypass, to the west of the Canaston Bridge flint scatter site (Cotswold Archaeology 2007). No archaeological features, however, were identified in that location during the pipeline watching brief.

Project objectives

Following preparation and approval of written schemes of investigation outlining the methodology for the cleaning and mapping, as well as excavation and recording of the burnt mound and flint scatter sites, the objectives were to undertake an archaeological investigation to provide an adequate record of the remains prior to the continuation of road construction.

Timeline

The following table illustrates the approximate dates for the archaeological periods discussed in this report:

PERIOD	APPROXIMATE DATE
PALAEOLITHIC	*c.*120,000 BC – *c.*10,000 BC
MESOLITHIC	*c.*10,000 BC – *c.*4400 BC
NEOLITHIC	*c.*4400 BC – *c.*2300 BC
BRONZE AGE	*c.*2300 BC – *c.*700 BC
IRON AGE	*c.*700 BC – *c.*43 AD
ROMAN	*c.*43 AD – *c.*410 AD
EARLY MEDIEVAL	*c.*410 AD - *c.*1066
MEDIEVAL	*c.*1066 - *c.*1536
POST MEDIEVAL	*c.*1536 – *c.*1750
INDUSTRIAL[2]	*c.*1750- *c.*1900
MODERN	*c.*1900 onwards

Table 1: Archaeological and historical timeline

[2] The regional Historic Environment Records include the Industrial Period within an overall Post-Medieval dating period

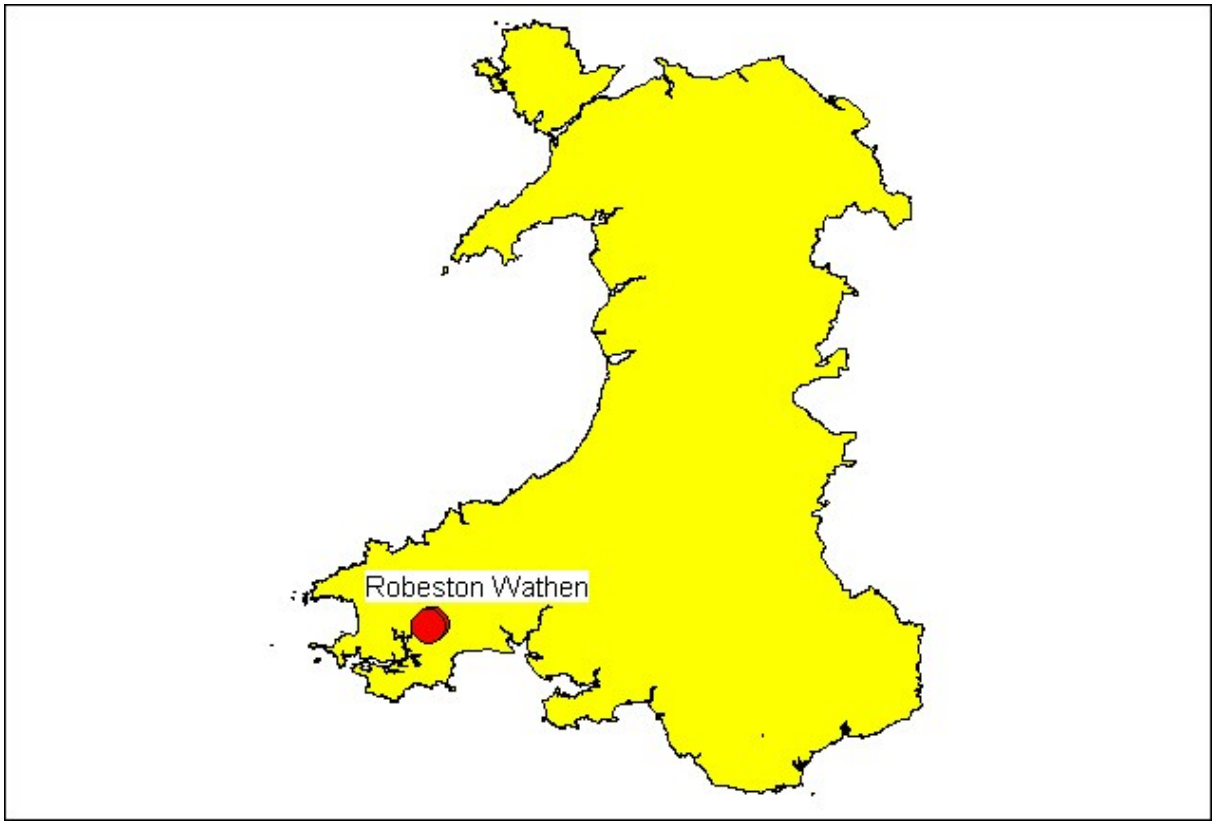


Figure 1: Location of Robeston Wathen

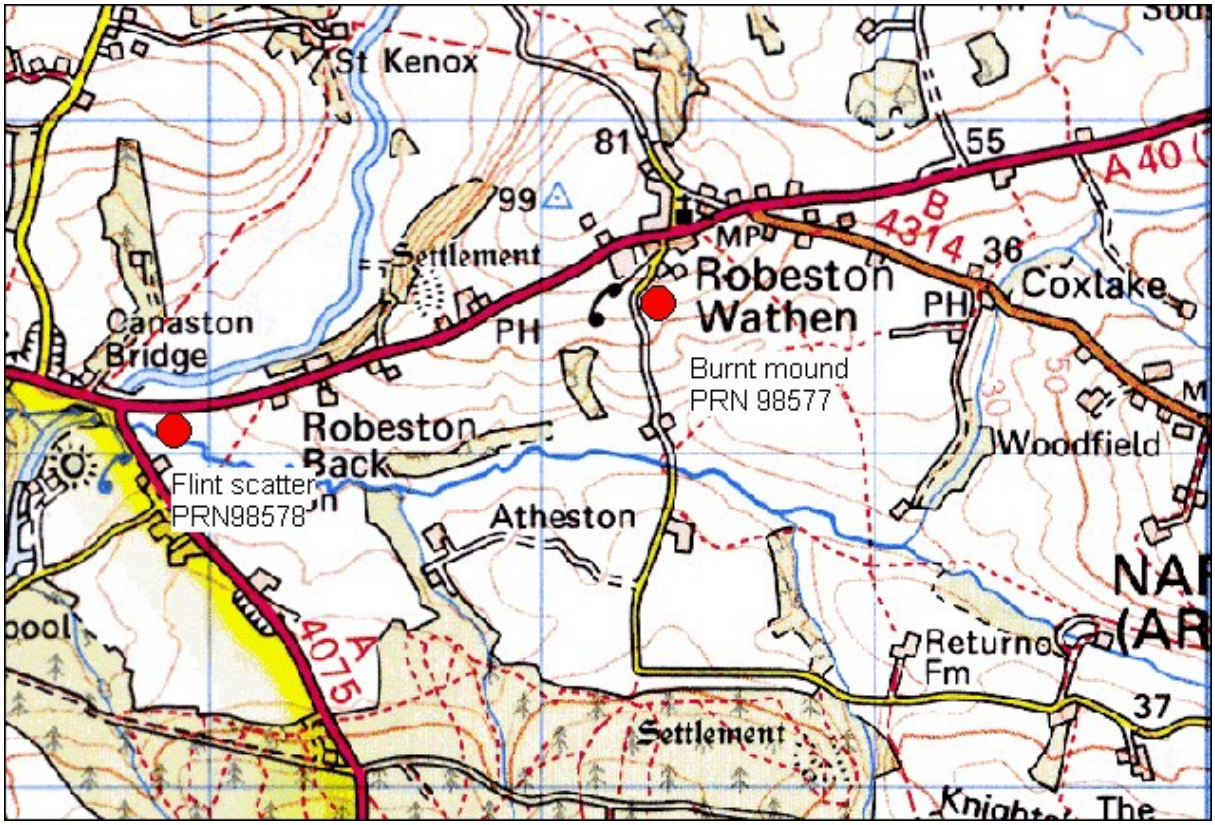


Figure 2: Location of excavated sites at Robeston Wathen

PART ONE:

ROBESTON WATHEN BURNT MOUND EXCAVATION (PRN 98577)

INTRODUCTION

What are burnt mounds?

Burnt mounds were first identified in the late nineteenth centuries by Cantrill and Jones during the Geological Survey in South Wales. Burnt mounds are accumulations of small stones of fairly uniform size. The stones are usually heat reddened and shattered, and are contained in a matrix of blackened, charcoal rich soil (James 1986). Where they survive as extant landscape features they are usually low in height in relation to their diameter, varying in size from a few meters to over 30m. In Britain burnt mounds occur in northern Scotland, Wales and western Ireland, and in the Midlands and the New Forest areas of England.

Burnt mounds are found throughout the Dyfed area, but their known distribution pattern is largely a result of survey bias corresponding to the original survey area investigated Cantrill and Jones, although since this work, several other sites have been recorded in other areas of Dyfed (Maynard 1993 and Davies 1997).

There are currently 364 burnt mound sites recorded on the Regional HER. Several of these are no longer considered to be burnt mounds, but the records have not yet been updated. Approximately 10 new burnt mound sites (some with multiple burnt mounds) were excavated on the route of the Milford Haven to Aberdulais LNG pipeline. In addition, full or partial excavation of 13 burnt mounds at 8 sites has been undertaken by DAT since 1977.

In attempts to produce a typology of burnt mounds, a variety of forms have been described and proposed, however, in west Wales at least, only three basic shapes are generally recognised: oval/circular, crescentric and kidney shaped. Most known examples are circular, although there is a recognised concentration of kidney-shaped burnt mounds in Carmarthenshire and east Ceredigion (Manning 1989).

Burnt mounds are invariably located close to fresh water sources. Sometimes these associated water sources are no longer apparent as visible features in the modern landscape. Although few artifacts are ever found in association with burnt mounds, there are often other features such as pits and troughs, which are usually considered to be associated with the activities that formed the mounds. The observation that burnt mounds are often located on marginal land may again be an artificial bias towards locations where less land-use change has resulted in the better preservation of, and easier recognition of burnt mounds.

Since their initial identification there has been much speculation as to what processes or activities lead to the formation of burnt mounds. While the most widely accepted theory is that they are prehistoric cooking sites, the burnt mounds being formed as a result of repeatedly heating stones in fires for use for bringing water to the boil. This process was possibly associated with ritual feasting or other periodic events. Other suggestions include metal ore processing, sweat lodges or saunas, fulling, felt making, brewing, producing steam to bend wood etc. It may be that burnt mounds as a group are the result of a variety of different activities that apparently share the need for hot water or steam, and also lack a need of complex material equipment, artifacts and structures.

The vast majority of burnt mounds for which reliable dating evidence is available date to the Middle to Late Bronze Age, although some dating evidence suggests

activities resulting in the formation of burnt mounds continue into the early medieval period.

Site location and description

The burnt mound feature at Robeston Wathen was discovered at a location referred to during the construction project as 'Culvert 9'. At this location (NGR SN 0832 1543) (see map 3), a considerable amount of ground preparation was required in advance of engineering works for the construction of a road bridge across Woodford Lane.

The engineering works required the stripping of topsoil and landscaping of the existing gradients of the cwm, to allow machine access for the removal of soil and the construction of a culvert to contain the watercourse. Subsequently, a level platform would be created upon which to place a piling rig and crane required for the construction of the road bridge. This engineering work would result in the total destruction of archaeological features within the construction corridor.

Following identification of the burnt mound material, the site area was machined using a toothless grading bucket to reveal the upper levels and the extent of the archaeological feature. The feature was not an extant mound but was obscured by a later field boundary. The effects of agriculture, previous earth-moving events and its location on the vegetation-covered banks of the cwm, have all obscured the presence of the feature.

An initial hand clean of the entire area defined the extent of archaeologically significant features more clearly. It was possible to demonstrate that the majority of potential features at the north end of the site were either of later post-medieval or modern origin.

The most significant feature identified was a single large burnt mound measuring approximately 18m x 13m, consisting of a large area of burnt and heat cracked stone, up to 1m thick. The bulk of the burnt mound material was located on the eastern side of the watercourse.

Following initial hand cleaning, a machine excavated cut was made across the burnt mound and cwm, to provide an east-west profile through the feature. Part of the east bank of the cwm, that was heavily disturbed by root growth, was also cut back to provide a partial north-south profile (see Figure 1).

The location of the site on the banks of the cwm, and the presence of an active stream running through the site (initially coupled with very wet weather), made cleaning and excavation difficult and spoil removal impractical. Apart from the burnt mound material itself, the natural soils were clays and silts, mostly waterlogged and slippery.

At the southern edge of the road corridor and excavation area, a sump had been excavated through the burnt mound material to form a silt trap to prevent silts being washed in to the Narberth Brook. This was done prior to the archaeological works commencing, a necessary ecological mitigation measure.

Methodology

The size and location of the mound, its topographic location, and the thickness of the deposits, meant that the standard practice of dividing the site into quadrants and hand excavation of opposing segments, would not have been the most effective or informative methodology within the time available.

The excavation strategy instead focussed on obtaining as much information about the sequence of deposits apparent in the exposed sections, and excavation of

selected features and deposits to ascertain the sequence of events that formed the burnt mound (the excavation area and sections are shown in Figure 4).

As they were cleared of significant archaeological features, parts of the initial excavation area to the north of the burnt mound were made available to enable groundworks in advance of the road bridge construction to continue.

Recording of all archaeological features and deposits was undertaken in accordance with the Recording Manual used by Dyfed Archaeological Trust Field Services (as defined in the WSI for excavation and recording).

The excavation area was surveyed using an electronic distance measurer, with stations tied in to Ordnance Survey national grid.

Charcoal samples for radio-carbon dating and bulk samples for environmental analysis were taken from appropriate contexts.

EXCAVATION RESULTS

The burnt mound in plan

Following an initial clean of the site, it was ascertained that the majority, if not all of the apparent burnt mound material on the west bank of the cwm was redeposited, or disturbed, since modern metal, plastics and ceramics were occasionally encountered when the material was removed. Features originally thought to be possible troughs cut into the natural clay and filled with burnt mound material, proved on excavation to be machine tracks. Other dark deposits were not charcoal-rich, but were naturally formed organic-rich waterlogged deposits in the vicinity of a rising spring on the line of the stream bed.

The mound proper was almost entirely located on the east bank of the cwm. Although it appears in plan to be roughly semicircular, and may therefore originally have been an example of a crescentric mound, the location of the mound against the slope of the cwm has influenced the shape of the mound so that it does not conform to typical forms (Figure 4).

The landscape setting of the mound has probably changed considerably since it was formed. The main later landscape features in this location are Woodford Lane and the surrounding fieldscape, dating to the early medieval period onwards.

The east-west profile across the burnt mound, however, suggests that the mound may originally have been bigger. The course of the stream and the strength of its flow may have altered over time, resulting in erosion of parts of the mound, resulting in alteration of its shape. It may have extended westward, at least as far as cut 147.

Although the northern extent of the mound was established, its southern extent appears to extend beyond the limits of the excavated area and therefore remains uncertain. It is possible that there are other burnt mounds on the banks of the cwm to the south of the excavated area.

Other features

Feature 035/005 *(Figure 4)*

This was a probable post-medieval field boundary bank (035/005) with a ditch (039/002) on its eastern side cutting across the eastern edge of the burnt mound. The course of this boundary does not appear to have been influenced by the presence of the mound, suggesting the mound was not extant when the boundary was created.

Feature 015/046 *(Figures 4 and 6, photos 8 to12)*

This cut is a typical trough feature often found on burnt mound sites. The western edge of the trough has not survived, however, a slight rise at the west end of the feature may allow its former extent to be extrapolated (by continuing the rise of the base upwards). The feature may therefore have originally measured approximately 2.20m north-south, 1.60m (minimum) east-west, and a maximum of 0.80m deep.

The trough contains a deposit of stones (045). These stones are heat affected locally derived gritstone and sandstone fist-sized cobbles. Several of the stones have been shattered by heating and have become rounded by re-use (see photo 20).

Feature 047 *(photo 16)*

This cut feature was located on the western bank of the cwm. It measures 1.0m wide and survives to a maximum depth of 0.5m but its length is unknown. These dimensions, and its north-south alignment suggest that is not a trough feature (similar to 015/046).

Deposit 025 is burnt mound material that has slumped into the trough from the east. Deposit 024, does not appear to contain burnt mound material and may be derived from soil eroding from the west bank of the cwm.

Feature 020 *(Figure 6, photo 7)*

This was an apparently solitary post-hole or small pit base (with a diameter of 0.3m and a depth of 0.3m) located close to the stream edge. No other associated features were evident.

Feature 016 *(Figure 7, photos 2 to 5)*

This feature consists of a linear arrangement of flat stones beneath which is a deposit of substantial chunks of wood charcoal. The stones and charcoal are contained within a linear cut, the upper portions of which have been lost to later soil truncation (from plough activity). The original cut (016) containing the charcoal and stones measured 2.6m long, 0.65m wide and 0.16m deep and was aligned on a northwest-southeast axis.

Profile descriptions

The following descriptions are intended to provide initial explanation of the profile drawings.

The east-west profile A-B *(Figure 5, photos 14 and 16)*

030, 035,029 and 022 are topsoil deposits. 036, 040, 041 and 034/037 are burnt mound deposits containing heat shattered and denuded gritstone mixed with charcoal (see Appendix 6 for soil descriptions). 023, 026, 024 are fills of cut 047 which do not appear to have any burnt mound material in them.

These deposits appear to post-date a deposit of burnt mound material (025) that slumped into the cut soon after its last use and before it became infilled. 027 and 025 are deposits of burnt mound material that may be specifically associated with cut 047, or may derive from similar deposits lying against the east bank of the cwm.

Deposits 008, 033, 028, 032 and 031 all appear to be natural deposits (see Appendix 6 for soil descriptions) derived from the shifting channel of the watercourse within the cwm. A soil sample from deposit 028, was, however, found to contain charcoal.

The north-south profile C-D *(Figure 5, photos 6 and 8)*

005/035 is a field boundary bank/topsoil. 006 and 026 are the latest deposits of burnt mound material, and are darker (i.e. with a higher charcoal content) than other deposits of burnt mound material on the site. 010 and 007 are redeposited natural clay from the cutting or re-cutting of trough 015/046. 011 may derive from the use of trough 015. Deposits 009 and 014, are burnt mound material pre-dating trough 015, but distinguishable from, and later than burnt mound

deposits 036 and 040, 041 and 034/037 (see Appendix 6 for soil descriptions). 012 and 013 are fills of trough 015.

Profile E-F-G (Figure 5, photo 15)

The soil profile in section E-F-G shows a buildup of alternate layers of white clay and burnt mound material (042) between episodes of burnt mound material deposition (042 and 043). Deposits 042 and 043 are stratigraphically earlier than 040. Unfortunately, the ground conditions and the need to excavate a sump to prevent pollution of the watercourse, conspired to make further excavation of this area impossible.

FINDS and SPECIALIST ANALYSES

As has come to be expected at burnt mound sites of this type, there is a notable absence of evidence of material culture relating to the use or formation of the burnt mound features. This may be due to a general low-level use of durable materials at the time the site was used, a lack of necessity for durable materials in undertaking the activities practiced at burnt mounds, or even a specific avoidance of the use of materials of any kind. Which option one chooses, depends to some extent what one considers the function of these sites to be.

Although food preparation is considered to be the most likely function of these sites, no evidence of animal bone, ceramics or flint tools that might be associated with food preparation have been recovered from this, or other burnt mound sites in the Dyfed region.

The beehive quern *(photos 18 and 19)*

During earthmoving in advance of construction of a culvert to contain the watercourse running through the cwm, the top portion of a small hand rotary quern was discovered in a waterlogged deposit associated with an area of boggy ground to the north of the burnt mound, where a spring appears to rise (photo 17).

After the excavation, the lower portion of what appears to be the same quern pair was discovered by a machine driver during the moving of spoil tips. The exact location of this find is not known.

The quern stones were assessed by Mark Redknap and Jana Horak of the NMW in Cardiff (see full report, Appendix 7).

The neatly shaped profile of the Robeston Wathen upper stone is close in cross-section to a number of examples from Carmarthen. The lower stone, in essence a modified boulder designed to be anchored in the earth, is unlike the Carmarthen lower stones. In light of these comparisons an Iron Age or early Roman date seems likely for the Robeston Wathen examples. The lithologies of the two stones are locally derived, indicating that the quern-stones were not imported.

This discovery of the quern stones is interesting because it suggests both an association with food production and a late Iron Age/ Romano-British presence in the area, although no evidence of settlement or other activity of this period has yet been identified in the vicinity. The absence of associated features of this period may be a result of soil truncation.

The location of the querns within a boggy area around a spring points to the possibility that they have been deliberately deposited with votive intent in the boggy area. Elsewhere, querns often seem to be deliberately placed, associated with metalworking activity, the presence of significant pits and artefact deposits, and linked with 'transformative' processes, such as the transformation of ore to metal, or raw plant to cultured food. As a male (base) and a female (top) quern, they can also have loaded, engendered, meanings linked with fertility and reproduction.

Worked flint

A single later Mesolithic or early Neolithic cylindrical blade-core was recovered during the watching brief at the site. The core had two platforms both created by the removal of a flake across the pebble to create a flat striking platform. The second find from cleaning during excavation of the burnt mound is a possible cylindrical core made of siliceous mudstone of local, Pembrokeshire origin. No

blades have been retrieved from the site that were struck from this core. (for the full report see Walker, Appendix 3).

Charred Plant Remains

As is often the case, very few charred plant remains other than wood charcoal are ever recovered from burnt mound deposits.

Hazel and oak were the most represented woods, with a few hawthorn type charcoals, and a few ivy fragments. This indicates nearby oak woodland with an understorey of other species such as hazel and sloe which favour woodland margins. A single fragment of an acorn cup and a fragment of sloe stone were recovered from the burnt mound material. While both these species have been eaten in the past, in this context they are most likely to be shrivelled fruits on twigs burnt as fuel.

Much of the charcoal appeared to be from small round-wood, consistent with the gathering of branches, rather than large mature trunk-wood. The ivy may have been attached to other wood rather than being deliberately selected for fuel.

Context 21 produced several wood species and is likely to represent spent fuel, perhaps from a hearth rather than from the burnt mound material.

Context 19, from the roasting pit, was different from the other samples in that it was dominated by immature oak round-wood. This may reflect the specific function of this feature. (for the full reports on charred plant remains see Carruthers and Challinor, Appendices 1 and 2).

Carbon Dating

Charcoal samples from three different layers in the burnt mound were submitted for carbon 14 dating to the Scottish Universities Environmental Research Centre AMS Facility (SUERC). A sample from the 'roasting oven' was also dated. A post-hole from the Teardrop site was also dated.

Within either of the percentage probability options (68.2% or 95.3%), several date ranges may be possible. Where this occurs the percentage probability of each option is presented in brackets. The results are presented below:

Context	Carbon date range
Layer 041	*68.2% probability:* 1130BC to 1010BC (68.2%) *95.4% probability:* 1210BC to 970BC (93.8%) and 960BC to 940BC (1.6%)
Layer 028	*68.2% probability:* 2020BC to 1990BC (15.4%) *and* 1980BC to 1900BC (52.8%) *95.4% probability:* 2120BC to 2090BC (1.8%) *and* 2040BC to 1870BC (93.6%)
Layer 036	*68.2% probability:* 1430BC to 1370BC (46.1%) *and* 1530BC to 1310BC (22.1%)

	95.4% probability: 1440BC to 1260BC (*95.4%*)
Hearth fill 019	*68.2% probability:* 440AD to 450AD (2.0%) *and* 460AD to 490AD (10.1%) *and* 530AD to 600AD (56.1%) *95.4% probability:* 430AD to 620AD (*95.4%*)
Post hole fill 4005 (Teardrop site)	*68.2% probability:* 1110BC to 1100BC (3.0%) *and* 1090BC to 970BC (56.8%) *and* 960BC to 930BC (8.4%) *95.4% probability:* 1130BC to 910BC (*95.4%*)

Table 2: Radio-Carbon Dates (SUERC)

Layer 041 was deposited before cut 046, so it is curious that its date is later than that of layer 036. This may be due to a misinterpretation of the stratigraphy during excavation, or the result of burnt mound deposits becoming mixed during phases of spoil management as the site was used and developed through time. Either way, the dates are consistent with a Bronze Age date for the formation of the mound.

Layer 028 was beneath the burnt mound material, and was originally thought to be a naturally formed deposit. However, charcoal was recovered from this layer. The carbon date from 028 is relatively early compared to the burnt mound deposits, supporting the idea that it relates to an earlier different phase of activity at the site or in the vicinity. The date is, however, not unreasonable compared with those from other burnt mound sites, and may suggest that burnt mound related activity was occurring in the vicinity from that date, but located further up-hill towards Robeston Wathen.

'Cooking pit' (016) was originally thought to be a prehistoric feature associated with the burnt mound. Surprisingly, however, the date obtained from its fill (019) places the feature firmly in the early medieval period. No other features or sites of this period are known in the area, but this evidence suggests that there may have been an early medieval settlement nearby, presumably in Robeston Wathen.

INTERPRETATION and DISCUSSION

The burnt mound Phasing

The location and circumstances surrounding this excavation have probably not enabled the complete sequence of events and processes that formed the burnt mound to be fully understood. Because some stratigraphic relationships were lost during the initial clearance and profile cutting on the site, there is uncertainty about how the deposits in the southeast relate to those in the north and southwest. At least four phases of burnt mound activity are discernable in the soil profile through the mound.

Deposition before cut 015/046 *(Figure 5, photos 6, 8 and 9)*

Deposits 040/041, 009 and 014 were deposited before trough 015/046 was cut. 009 and 014 may derive from a different event to 040/041.

Deposition resulting from cut 015/046 *(Figure 5, photos 6, 8 and 9)*

Deposits 010 and 007 are assumed to derive from the cutting of trough 015/046. Deposit 011 may derive from the use of the trough. Deposit 036 may derive from a later phase of activity.

Deposition sealing cut 015/046 *(Figure 5, photos 6, 8 and 9))*

Deposits 006 and 036 both appear to seal fills of trough 015/046. 044 may represent a period of no burnt mound activity between the abandonment of the trough and the deposition of 006/036, suggesting they derive from a different phase and focus of activity.

Deposits preceding 040/041 *(Figure 5, photo 15)*

Deposit 028 was at first thought to be a natural clay rich deposit, formed by the watercourse. A soil sample from this layer was, however, found to contain charcoal. Carbon dating has shown that 028 is earlier than the burnt mound deposits.

Burn mound processes

The stones (045) contained within the trough feature 015/046, both outcrop at Robeston Wathen. Alternatively the stone could have been gathered from local stream beds. The appearance of the stones (see photo 20) suggests they may have been re-used several times for heating water. This type of stone breaks up easily, especially once heat affected. It may be this quality of the stone and its ready availability that has resulted in the accumulation of such a large burnt mound deposit. It also suggests that the durability and size of the stone used was not a primary consideration in the selection of stones for heating.

The stone deposit 045 is likely to be derived from the final use of the feature. Alternatively, the stone could have been deliberately dumped in the trough on abandonment of the site; if not as an attempt to tidy up, then perhaps as a ritual act. The quantity of rock within the trough would not have left much room for water to be heated, perhaps suggesting that steam production was the desired result.

It is doubtful that the upper portion of the trough which cuts through earlier burnt mound material would have been very water retentive. There was, however, no evidence of a clay lining to retain water within the trough. If the trough was indeed intended to hold water, it may have contained a wooden lining (perhaps incorporating a sluice at its western end). Although no evidence of a wooden trough lining was apparent at Robeston Wathen, evidence of wooden lined troughs has been found in association with burnt mounds elsewhere (Beamish 2009).

The trough represents an intermediate use of the burnt mound, since it is cut through earlier burnt mound material, and is sealed by later burnt mound material. This suggests a number of other earlier and later troughs were also previously present at the site. The lenses within deposit 042 may be the result of repeated cleanings out of a nearby trough (not identified in excavated area) or possibly from cut 047. This may suggest that it was desirable to keep the contents of the trough relatively clean but may also suggest that the trough was not wooden lined.

The absence of deposits of unheated stones in the vicinity of the mound may suggest that the mound was used intensively, but intermittently. Stones would perhaps have been brought to the site for each specific period of activity, rather than stockpiled to enable continuous or spontaneous use. During removal of soil following the excavation, what appeared to be a circular fireplace with a diameter of approximately 1m was identified close to the southeast corner of the trough. This may have been the location in which the stones were heated before being transferred to the trough.

As has been noted at other excavated burnt mound sites in Dyfed, no buried soil was evident beneath the burnt mound material. This absence has generally been attributed to the effects of trampling, ware, and possibly the effects of scorching associated with burnt mound activity, preventing the growth of groundcover.

Carbon dating has shown that 028 is earlier than the burnt mound deposits. This deposit may suggest either that burnt mound activity was occurring elsewhere (presumably up-stream) in the area before the excavated burnt mound was formed, or it may derive from a different activity, such as woodland clearance, or even settlement.

Water management

An alternative explanation for the alternating laminations of clay and burnt mound material (photo 15) within deposit 042 is that they may be waterlain. Changes in water level and water flow resulting from water management activities may have resulted in the periodic erosion of burnt mound deposits and deposition of clay. Another possibility is that the lenses suggest intermittent use of the burnt mound, interspersed with periods of localised flooding caused by wet weather.

The different alignment and dimensions of cuts 047 and 015/046 suggests they may have had different functions. Deposits 025 and 027 (Figure 2, photo16) indicate that 047 was open during a period of burnt mound activity, but the depth of cut 047 in relation to the present day streambed may suggest the feature is part of a water management system rather than a trough. 047 may have been used to channel water to other burnt mound sites further down the cwm.

Cooking pit 016 *(Figure 7, photos 2 to 5)*

This feature is thought to be the remains of a cooking pit, the sides of which have been truncated by later agricultural activity. The surviving stones and charcoal fuel would have lain in the base of the pit. Food would have been laid on top of the hot stones and charcoal before the pit was covered over with soil to contain the heat and cook the food.

Before the dating evidence was obtained, it was assumed that this feature was contemporary with the use of the burnt mound. The feature is now firmly attributed to the early medieval period. This suggests that there was probably early medieval settlement in the area, possibly beneath the present day settlement of Robeston Wathen.

The difference in date does not, however, alter the general interpretation of the function of the feature. It is possible that the oak wood used for fuelling this oven, was used as pre-prepared charcoal, but this could not be proved from the excavated deposits.

Examples of similar features were revealed on the LNG pipeline near Canaston Wood (Cotswold Archaeology 2007, Site 230, NGR: SN 07340 14939). At this site, four stone-lined oval pits, 2.5 to 4.5m in length, typically 0.8m in width and 0.3m in depth, were excavated. The pits were arranged in two adjacent parallel lines, each with two pits. There was abundant evidence of scorching to the lining stones. The fills contained varying quantities of charcoal. No dating evidence has yet been obtained from these features. The cooking pit features at Canaston Wood did not appear to be in the immediate vicinity of a burnt mound.

Several other small round hearths approximately 0.40m in diameter were found elsewhere on the road route during the watching brief on the topsoil strip. The date of these is not known, but, if prehistoric, they may be remnants of temporary camps.

Another site discovered nearby (Cotswold Archaeology 2007, Site 210, NGR SN 06803 16003) during the watching brief on topsoil stripping for the LNG pipeline, was a small hearth containing burnt flint (including a burnt core). The feature was badly damaged by the topsoil strip, but a Neolithic arrowhead was recovered from the immediate vicinity. This may represent another prehistoric temporary camp.

Feature 020

This was an apparently solitary post-hole or small pit base. The distance of this feature from the burnt mound trough may suggest the two features did not have a structural association. Although a C14 date could be obtained from this feature, it was not considered a priority since it offered little interpretive value.

Settlement

No evidence of Bronze Age settlement was identified during the excavation of the burnt mound. A group of post holes at the 'Teardrop' site, near Canaston Bridge, has, however, yielded a Bronze Age date, perhaps suggesting a Bronze Age settlement at this location.

The discovery of the Quern stones, of probable Late Iron Age or Romano-British date, suggests that there may have been a nearby settlement at that time. However, no other features of this date were identified during the excavation.

On the north side of the A40, northwest of Robeston Wathen, are two earthwork enclosures (PRNs 3585 and 8586) located at SN 0802 1573 and SN 0764 1555. Neither site has been excavated, but both are presumed of Iron Age date. Due to later quarrying, it is not known whether there was ever evidence of settlement on the hill summit immediately north of Robeston Wathen.

The presence of an early medieval 'cooking pit' may also suggest nearby settlement, although, again, no other evidence of settlement was identified during the excavation.

Despite the absence of definite settlement evidence, the burnt mound excavation has produced features and artefacts that are suggestive of settlement nearby. It is not unreasonable to suppose that present-day Robeston Wathen is situated in the same location as these earlier settlements. Such an assumption may serve as a model for many settlements in the region which may have pre-Norman roots, but for which the archaeological evidence remains obscured or destroyed by later settlement.

CONCLUSIONS

Although the excavation of the burnt mound at Robeston Wathen has not solved the mystery of what these sites were for, because it was so well preserved, the site has provided interesting details for comparison with other excavated examples of burnt mounds in the region.

The earliest carbon date from the site is between 2040BC and 1870BC. This date is approximately in the middle of the range of dates obtained from other Bronze Age burnt mounds that have been excavated in Wales (see Figure 8). At Robeston Wathen, the clear sequence of deposits suggests that the site was used frequently, and developed over time, rather than being the result of one intensive event, however, it is not certain that the early deposit (028) is the result of burnt mound activity.

There is a gap of approximately 400 years between the first date (from layer 028), and the earliest date obtained from the true burnt mound deposits (1440BC to 1260BC). These dates compare with the latest dates of the other sites, while the dates from context 041 at Robeston Wathen are later than all the other sites. The number of dates for comparison with those from Robeston Wathen will be greatly increased once dating evidence has been obtained from the numerous burnt mounds excavated along the route of the LNG pipeline (Cotswold Archaeology forthcoming).

Why this location was chosen is uncertain. It may have been selected for practical reasons, the reliability or strength of flow of the water supply; or because the stream was significant for ritual purposes. There may be other burnt mounds along the stream, to the south, and the shifting of centers of activity from one location along the stream to another, may have resulted in the gap of potentially hundreds of years between the dates of the two dated mound deposits.

The most likely explanation is that the water source was convenient, suggesting there may have been a settlement nearby, contemporary with the burnt mounds.

Although the burnt mound excavation has produced no direct evidence of settlement, some features and artefacts are suggestive of settlement nearby. A possible location for a Bronze Age settlement contemporary with the burnt mound, is suggested by the post hole at the 'Teardrop' site near Canaston Bridge (see below). The 1130BC to 910BC date range obtained from this feature compares well with the 1210BC to 970BC range from burnt mound context 041.

The pair of quern stones discovered during the excavation suggests that there may have been later settlement located nearby during the Iron Age or Romano-British periods. The stone from which the querns were made was probably quarried locally, possibly from the outcrop to the north of Robeston Wathen. The early medieval cooking pit is also suggestive of nearby settlement.

It is not unreasonable to suppose that settlements from all these periods are located beneath the present-day village of Robeston Wathen. Such an assumption might serve as a model for many settlements in the region which may have pre-Norman roots or precursors, but for which the archaeological evidence remains obscured or destroyed by later settlement.

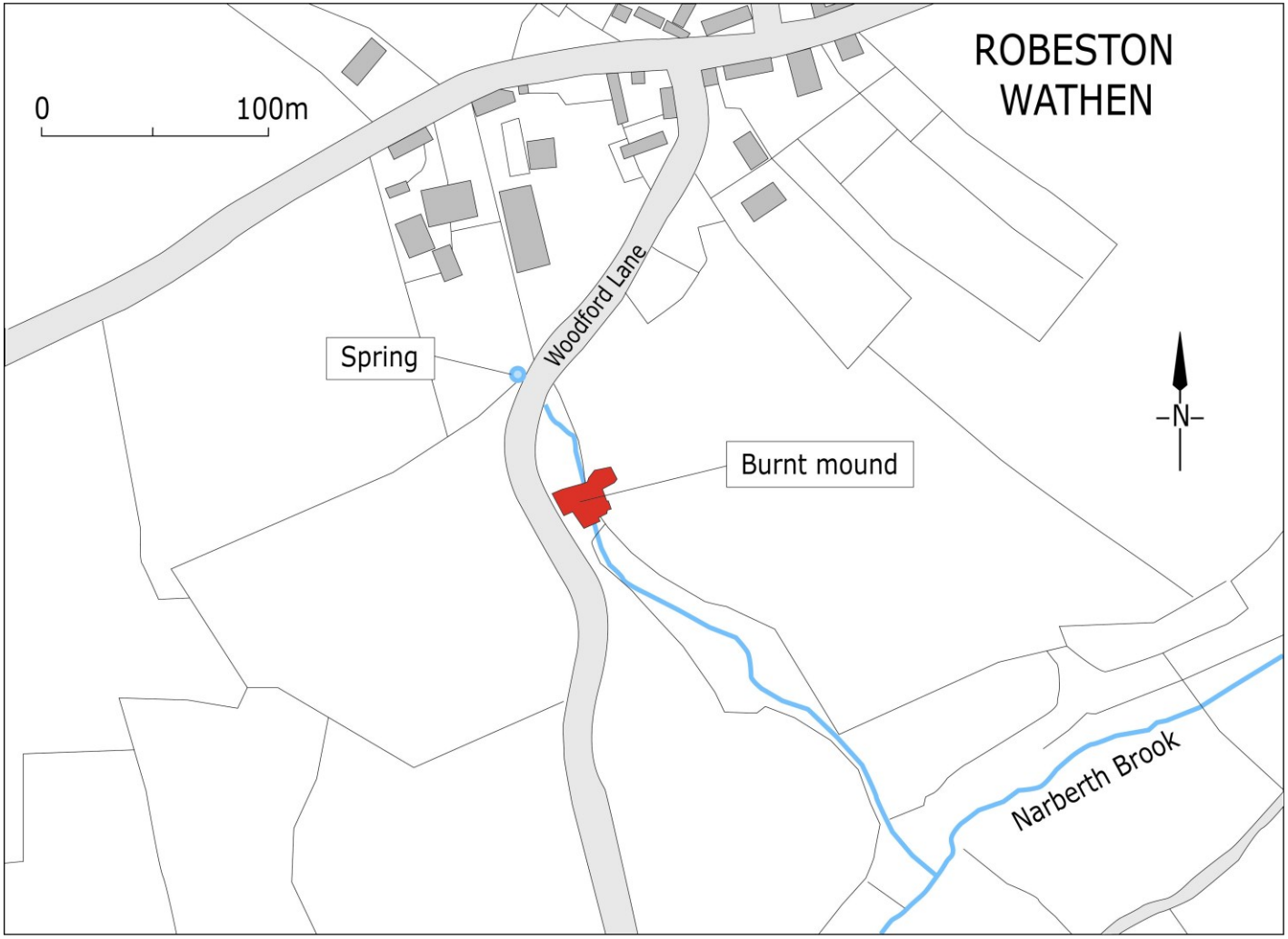


Figure 3: Location of burnt mound excavation

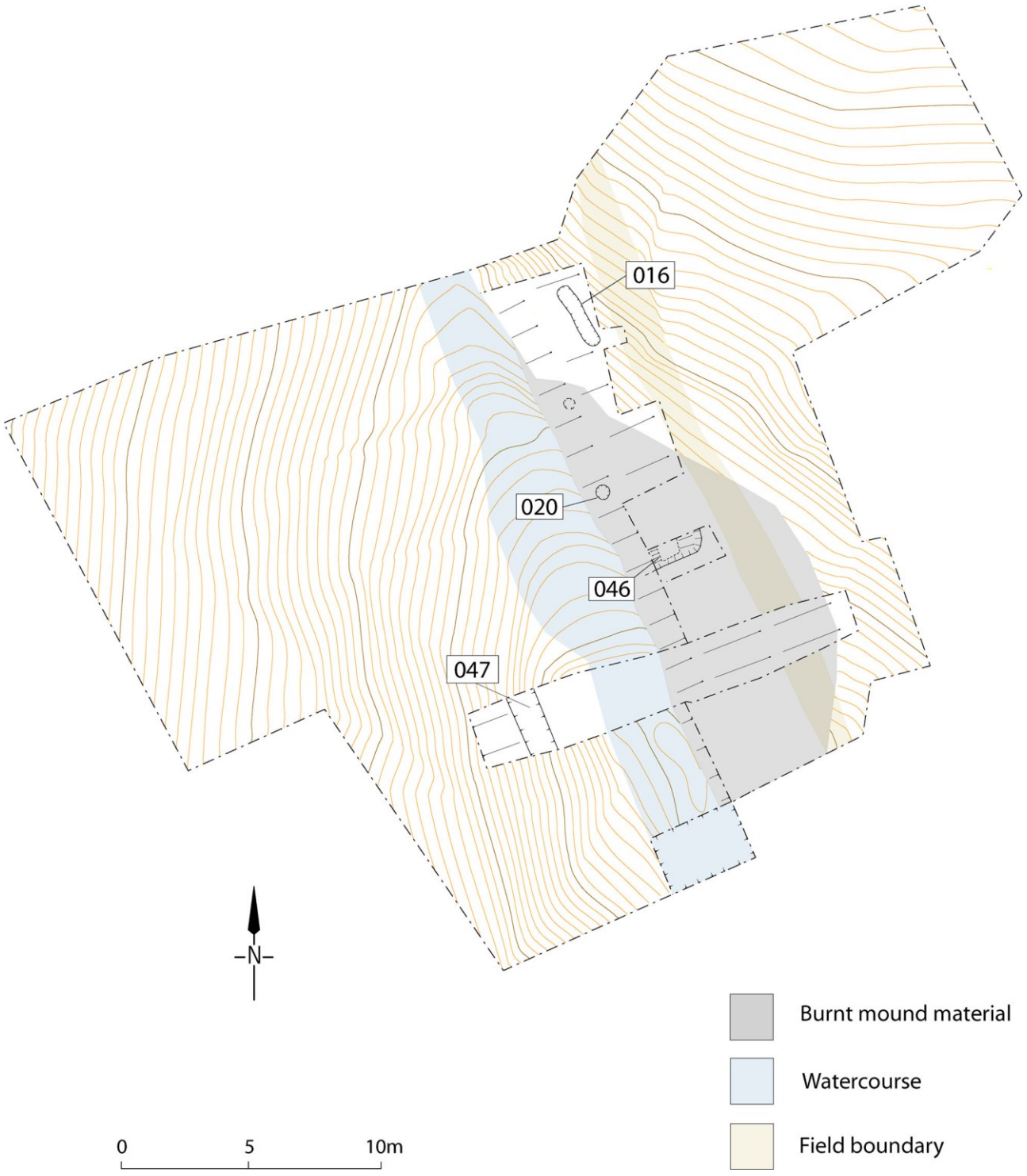


Figure 4: Burnt mound PRN 98577 plan showing contours and location of features and excavated areas

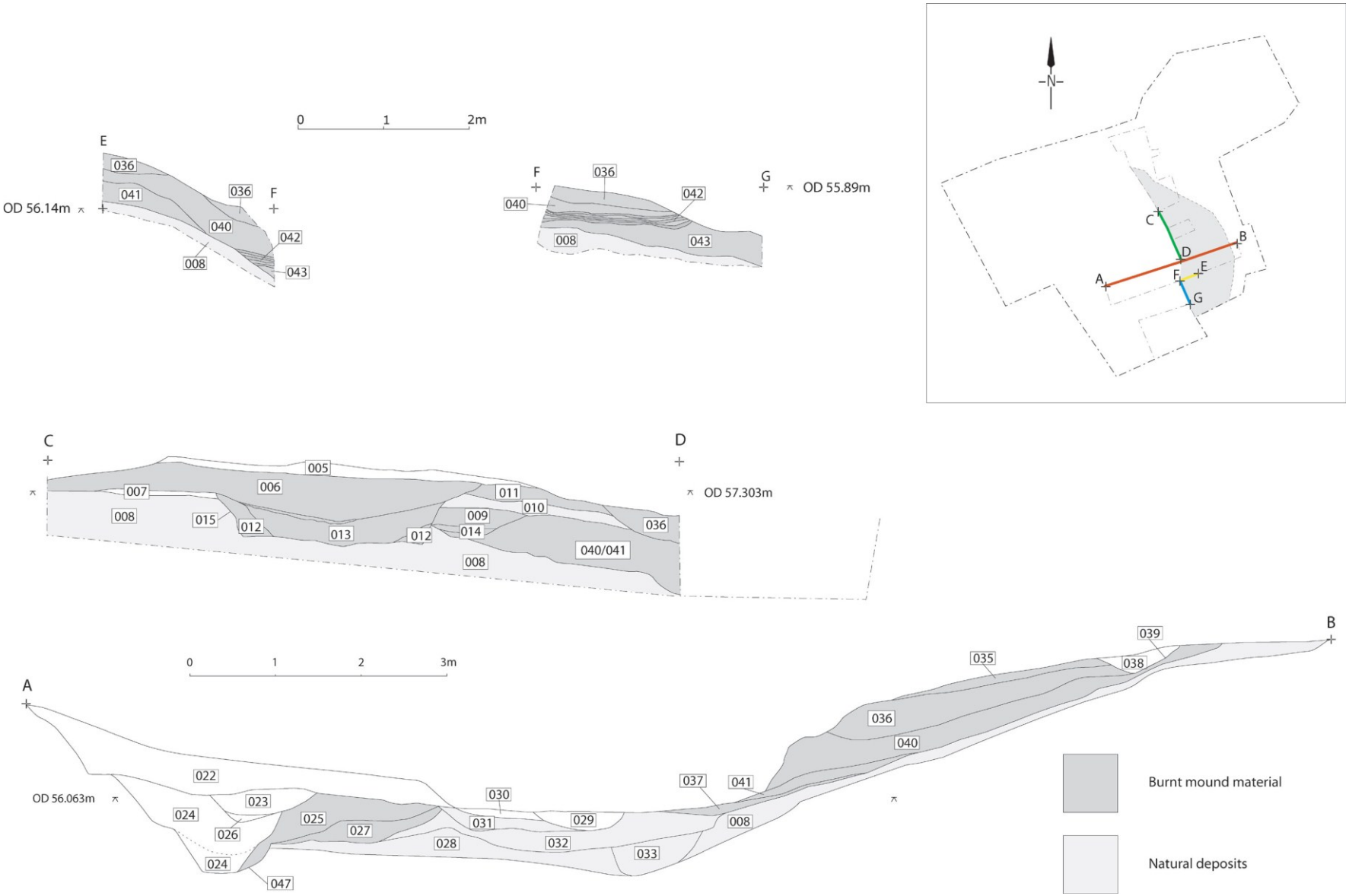


Figure 5: Profiles through the burnt mound

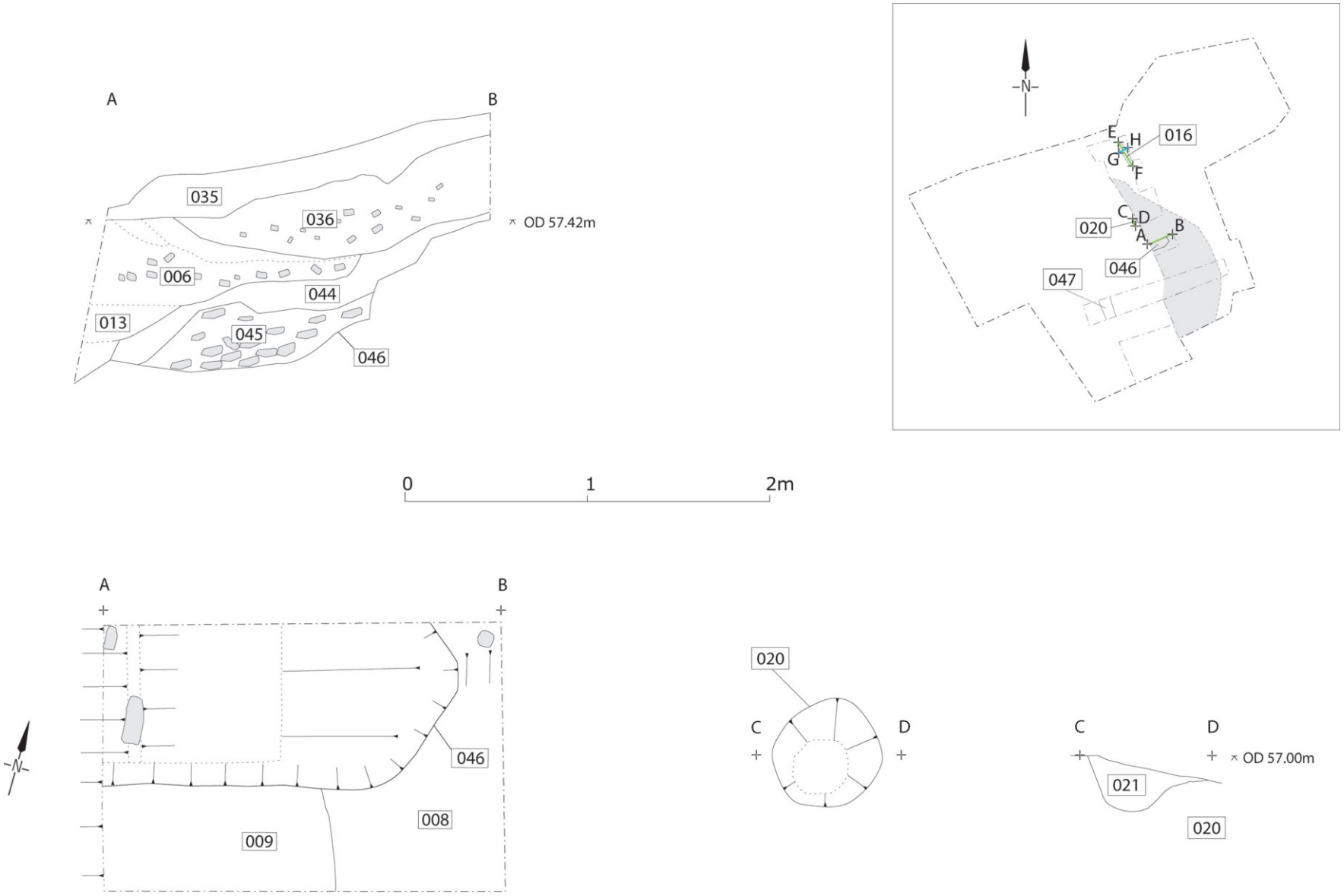


Figure 6: Plans and sections of features 046 and 020

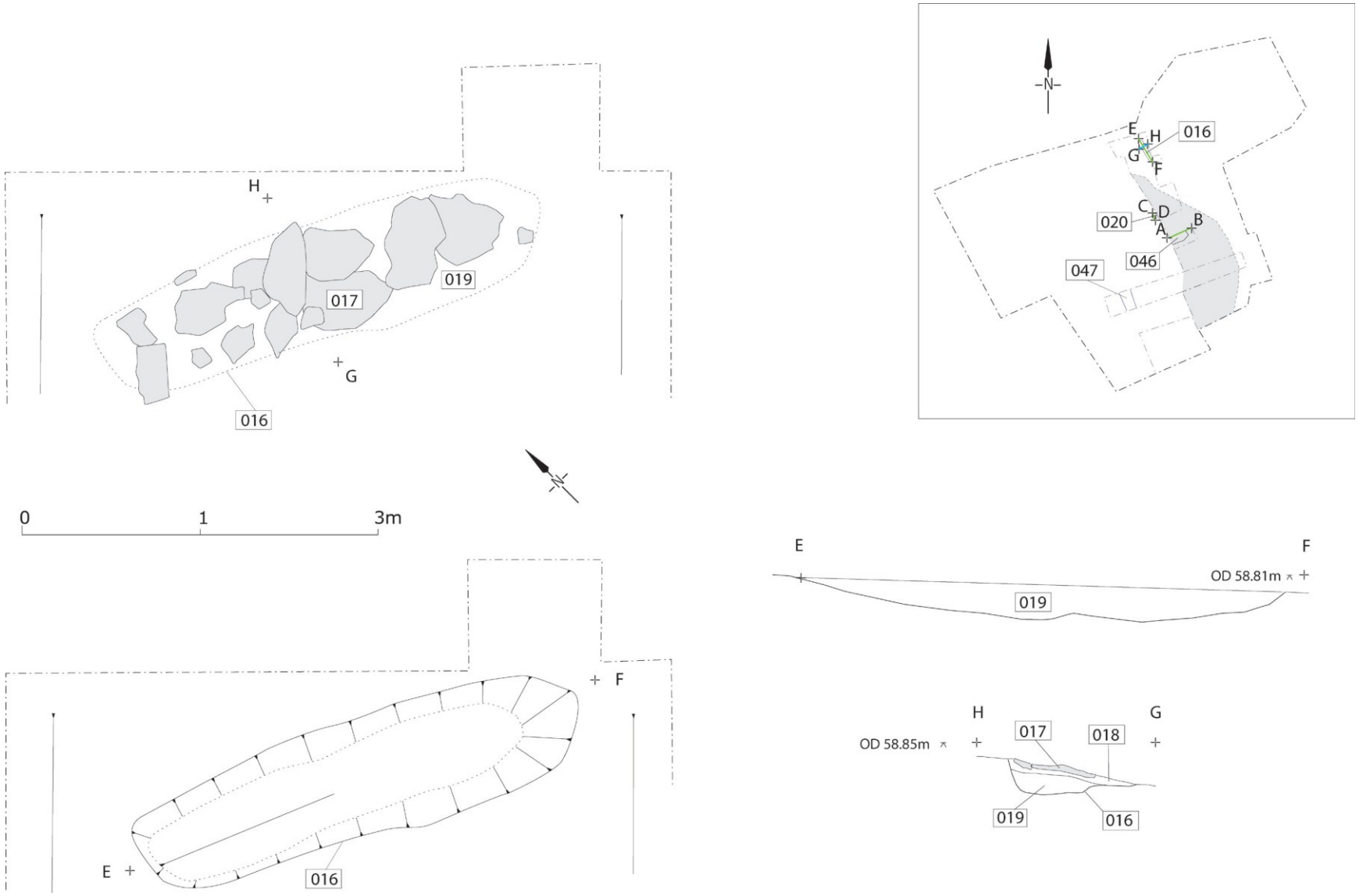


Figure 7: Plans and sections of feature 016

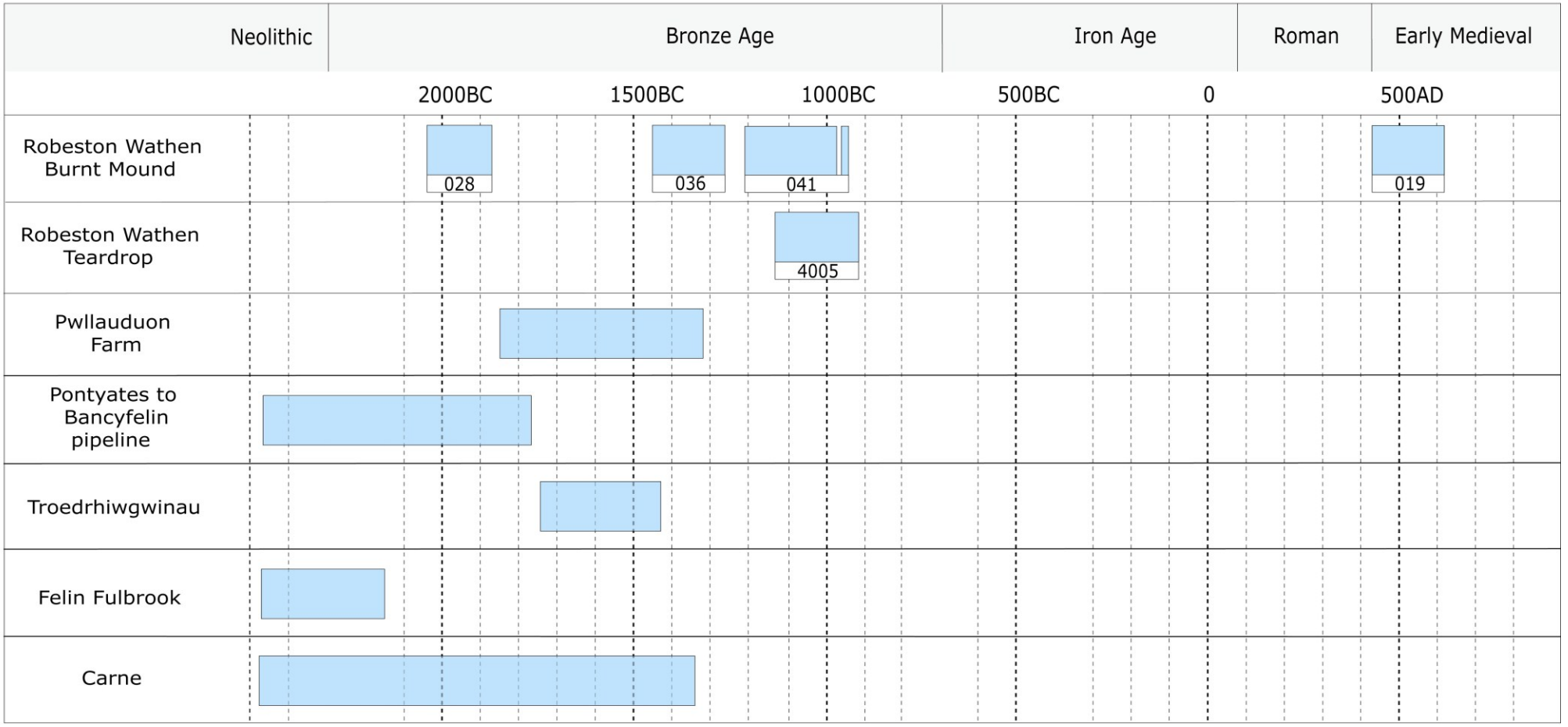


Figure 8: Carbon 14 dates from Robeston Wathen compared with other dated burnt mound sites from the region

Photo 1: General view of the burnt mound looking east

Photo 2: 'Cooking pit' feature 016.
Charcoal deposit 019 is sealed below the flat stones

Photo 3: Cross section through the cooking pit revealing the lump charcoal fuel deposit below the stone slabs

Photo 4: Cut 016, with the cooking stones and charcoal fill removed

Photo 5: Feature 016 (pre-excavation) in relation to the burnt mound deposits

Photo 6: The burnt mound feature following initial machining, cleaning and cutting of profiles. Note the clear sequence of earlier burnt mound material cut by a later feature (trough 046), itself filled with more burnt mound material

Photo 7: Possible pit or post hole 020

Photo 8: Trough 046 before excavation (Profile C-D)

Photo 9: Part of the edge of the trough revealed by removal of later burnt mound material

Photo 10: Trough 015/046 looking west

Photo 11: Trough cut 046 following removal of fill 045. Looking east

Photo 12: Profile (A-B) through trough 046, showing stoney fill 045 and later overlying burnt mound debris looking north

Photo 13: Detail of burnt mound material 026 looking east

Photo 14: East end of east-west profile (A-B) of burnt mound material

Photo 15: South end of north-south profile (F-G) through burnt mound material, looking east

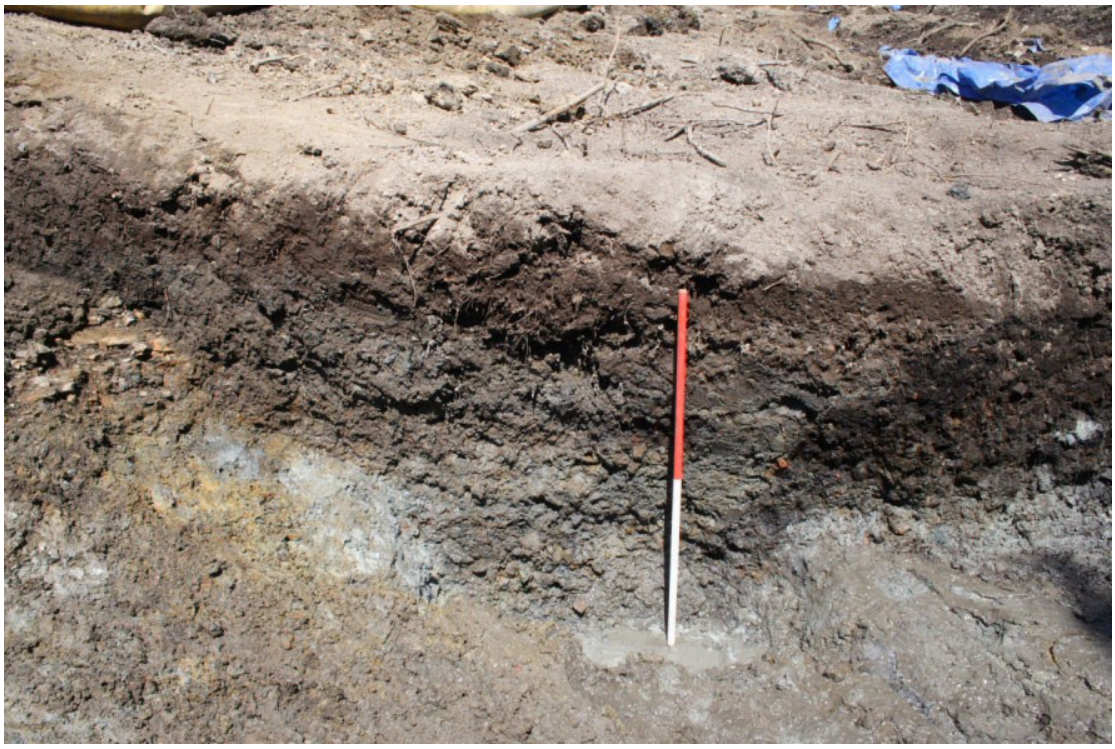


Photo 16: West side of east-west profile (A-B) through burnt mound, showing possible cut of water channel. Note burnt mound material to right

Photo 17: Waterlogged deposits to the north of the burnt mound from which the beehive quern was recovered during machine excavation

Photo 18: Top half of the beehive quern

Photo 19: Bottom half of the beehive quern

Photo 20: Sample of stones from fill 045

PART 2:

ARCHAEOLOGICAL EVALUATION OF A FLINT SCATTER AND EARLY METAL WORKING AT CANASTON BRIDGE, PEMBROKESHIRE (PRN 98578)

INTRODUCTION

An archaeological watching brief was undertaken by Hyder Consulting on all topsoil stripping associated with the A40 Penblewin Road Improvement Scheme, as discussed above. An area of the development near Canaston Bridge (known on the project as the 'Teardrop' due to the shape of the site), several archaeological features were identified, including a flint scatter, two possible hearths and a posthole. The site is located at NGR SN 0692 1513, *c.*120m to the east of the junction between the A40 Trunk Road and the A4075 at Canaston Bridge. An initial assessment of the flint material suggested it was of likely late Mesolithic or early Neolithic date (*c.*5000 – 2500BC). Such sites are very rare in the region, and, coupled with possible evidence of associated hearths and cut features, this site was considered to be of potential national importance.

Project background

In order to inform a decision on appropriate mitigation further information was required about the archaeological remains to ascertain their date, character, extent, state of preservation and significance. To provide this information an archaeological evaluation of the remains was proposed.

DAT-FS were commissioned by Hyder Consulting to undertake the archaeological evaluation of the site to inform the need for further mitigation. Following consultation with DAT-HM, the archaeological advisor to the WAG an appropriate strategy for the evaluation was agreed and implemented.

Specialist analysis of the flint recovered confirmed the late Mesolithic-early Neolithic date. In addition, Slag nodules recovered from Trench 1 proved to be of some considerable interest, perhaps suggesting Roman or early medieval iron smelting was undertaken in the vicinity. The results of the evaluation concluded that there was little to be gained from further excavation of the site.

Site location

The site (NGR SN 0692 1513) was located close to the Canaston Bridge Junction of the A4075 with the A40, to the west of Robeston Wathen (Figure 9). Part of the evaluated area was on the route of the new road, but the majority of the site was in an area intended for the storage of topsoil generated by the construction of the new route. Because of its shape, this area was referred to the 'Teardrop'.

This location is close to the point where the Narberth Brook flows into the Cleddau River. There are no previously identified archaeological sites within the immediate vicinity of the 'Teardrop', but to the north of the A40, two earthwork enclosures (PRNs 3585 and 8586) of presumed Iron Age date are located at SN 0802 1573 and SN 0764 1555. Canaston Wood is situated less than 1 km to the south.

Methodology

After the discovery of the site during the watching brief on the topsoil strip in the area, and following on-site discussions, an initial trial trench evaluation scheme was designed to provide further information about the site.

The full extent of the flint scatter was not known, but finds and features were observed across the entire area of the 'Teardrop'. Until this area was made available, progress elsewhere on the route of the A40 improvements could not proceed unless additional costs for removing large quantities of soil off-site were to be incurred. The route of the new road was immediately to the south of this area, so although no finds or features were apparent in this area, it was included in the evaluation.

Trench 1 (Figure 9 and 10), measuring 15m x 2m, was located within the centre of the proposed road line an area previously machined under watching brief conditions. The purpose of this trench was to confirm that no archaeological remains, associated with the other features and finds to the north, were present within the road corridor.

Due to the apparent absence of features and the need for road construction to proceed, the trench was initially machine excavated to reveal any changes in soil characteristics. Four test pits spaced evenly along the length of the trench were then hand dug in 5cm spits until it was decided the deposits comprised undisturbed natural geology (Figure 10). The trench was then backfilled to allow construction traffic to drive along the road route.

Within the area to the north, three trenches were located to coincide with features identified during the watching brief and sampling a proportion of the remaining area (Figure 9 and 10). Trenches 2 and 4 measured 15m x 2m, with Trench 3 measuring 20m x 2m.

The trenches were hand excavated to remove any remaining topsoil or other deposits to reveal the extent of the surviving archaeological features. The trenches were initially divided up in a 'checker-board' fashion with alternating 3-4m x 1m test sections excavated along the length of the trenches. Alternate areas were excavated in spits with the aim of detecting any variation in the distribution of flints, that might suggest whether the deposits were in-situ and undisturbed, or to identify any discrete concentrations resulting from flint knapping events. These zones were given letter identifiers to enable location of flint collection to each area (Figure 10). Cut features were half sectioned and sampled.

RESULTS

Trench 1 *(Figure 9 & 10, photo 21)*

Trench 1 was initially machine excavated to a depth of *c.*0.2m down to a level at which the underlying silt deposits were paler and slightly more compact than those around. At this level, four equally spaced 1m wide test pits were hand dug in 5cm spits through the silt until finds ceased to be recovered.

Numerous flint flakes were recovered from the test pits. The character of these worked flits was visibly distinguishable from much of the material recovered from the other trenches to the north. The silt deposits from which the flints were recovered were also different, being paler, finer, softer and more homogenous than the deposits to the north. No clear horizons could be discerned to suggest a buried land surface, only a gradual compaction and coarsening of the silts with depth. Although no direct evidence was revealed within the excavated area, these silts containing worked flint were considered to represent re-deposited material that had been eroded from nearby deposits (colluvium) or washed downstream from elsewhere.

Also found in this material were numerous pieces of ferrous slag. This too suggested that the material within the silts was re-deposited, but from a nearby source. A small area of burnt silt immediately north of Trench 1 was investigated, but no coherent feature could be defined.

Trench 2 *(Figure 9 & 10, photos 22, 23 & 29)*

Initial cleaning of the 2 x 15m site of trench 2 (removed as context 2001) revealed a number of probable modern plough marks suggesting that a certain amount of disturbance may have occurred to the deposits containing the worked flint. A probable posthole was identified and excavated during the topsoil stripping (cut 2004 and fill 2005; photo 2). The posthole was circular, concave, approximately 0.43m in diameter and 0.14m deep. The fill contained several probable packing stones.

An initial spit of 0.05m depth was removed below the initial cleaning layer (2002). All the finds from this trench were contained within this spit, with none surviving within the plough-disturbed layer. There was no obvious change in soil characteristics to suggest that the finds were lying within a buried soil horizon and, apart from a gradual increase in compaction with depth. Little significant difference between the excavated spit and what was considered to be undisturbed natural (2003) could be distinguished. No further archaeological features or deposits were revealed in Trench 2.

At the eastern end of the trench, the silt was observed to contain patches of grey clay. These were investigated as possible clay filled cuts, but were found to be naturally formed lenses within the layer. A small area of this material was removed at the eastern end of the trench and the clay was found to run below a layer of shale cobbles. This seems likely to be the edge or base of a small palaeo-channel apparently running in a roughly north/south direction.

A total of forty-nine pieces of worked flint were recovered from the trench. These were primarily concentrated in the central area of the trench. Towards the east end of the trench further flints were recovered, these appeared to be of a coarser nature than those recovered from the central area. Specialist analysis of the assemblage has identified three later Mesolithic tools from this trench: a microlith, a scraper, and a possibly burned broken blade. The remainder of the assemblage consisted of cores, flakes, and a single undatable blade (see Appendix 3 for full report).

Trench 3 *(Figure 9, 10 & 11, photos 24, 25, 30, 31 & 32)*

Trench 3 measured 20m x 2m and was hand excavated in a 'checker board' fashion comparable to Trench 2. The Trench was located to include two areas of burning, in order to ascertain whether they might be hearths, and contemporary with the worked flint. The westernmost burnt area (3003) was approximately 0.35m in diameter. The feature was half-sectioned, but apart from the area of burnt soil, no form could be discerned.

At the eastern end of the trench another area of burnt soil was investigated. This proved to have survived to a greater degree, apparently consisting of a circular hollow [3004] of burnt soil (approximately 0.55m in diameter and up to 0.15m deep) containing a flat stone (measuring approximately 0.40m by 0.40m), which did not appear to be burnt. Leading from this hollow in a southwesterly direction was a linear area of burning (approximately 0.60m long, 0.40m wide and 0.08m deep). Following excavation, these features together formed a 'keyhole' shaped cut, considered to resemble a hearth base and flue (Figure 11; photos 30, 31 & 32). The 'fill' of these features appeared to be burnt earth, with little or no evidence of charcoal. A sample of the excavated 'fill' (3004) of the possible furnace was taken and retained for further analysis. No evidence of ferrous slag was recovered from the fill or the vicinity of this feature.

In the absence of any clear evidence, it was decided that the hearth was not associated with the flint material, but was a later feature. Small fragments of glazed pottery and a fragment of clay tobacco pipe recovered from this trench suggest that the deposits containing the flint material have been mixed with later material through plough action. This has also destroyed virtually all of the structural evidence of the possible hearth and flue, essentially leaving only a distinctive shape of burnt earth.

As with Trench 2, no evidence of a buried ground surface was identifiable. After initial cleaning (3001), one 5cm thick spit of soil was removed (3002) down to a more compact natural deposit containing numerous shale cobbles.

Sixty-four pieces of worked flint and stone were recovered from Trench 3. Of this assemblage a single lanceolate microlith of late Mesolithic date was identified along with an undatable blade. The remainder of the assemblage consisting of blade cores and other debitage (see Appendix 3 for full report).

Trench 4 *(Figure 9 & 10, photos 26, 27 and 28)*

Trench 4 measured 15m x 2m and was again hand excavated. The trench was located to include a possible area of burnt soil. Initial cleaning (4001) led to the recovery of numerous flint flakes. A 5cm deep spit of clay silt from which further flints were recovered was removed (4002). Removal of this layer revealed several features cut into the natural clay silt. In the middle part of the trench this natural silt was overlain by a 0.15m deep deposit of fine silty gravel.

Posthole [4005] was *c.*0.35m deep and 0.30m in diameter. It contained a mid orange brown clay silt fill (4004) containing occasional charcoal flecks and a single flint flake. A concentration of charcoal flecks was present in the central area of fill (4004), which may be evidence of a former post pipe. Assessment of the charcoal also suggests that it may be derived from a single piece of charred wood. Close by, to the southeast of the posthole, were two small stakeholes [4006] and [4007]. A single flint flake was recovered from stakehole fill (4006).

The 'burnt' area [4008] was also investigated. It was roughly 0.35m in diameter but was found to be insubstantial to allow meaningful interpretation. Although the fill of feature [4008] initially contained some charcoal, and numerous flint flakes, its form was amorphous and was eventually interpreted as probably a heavily root damaged pit [4009]. No further archaeological features or deposits were

revealed in trench 4.

Several flint blades and a single adze/axe sharpening flake suggest a late Mesolithic/early Neolithic date for the features (see Appendix 3 for full report). The remainder of the flint was not reliably datable, but is likely to be of similar date.

FINDS and SPECIALIST ANALYSES

Late Mesolithic culture pre-dates the use of pottery. As a result, the only evidence of material culture likely to be found from this period is worked stone. Only under exceptional circumstances of preservation, under waterlogged conditions, is any evidence of organic material such as bone or plant matter preserved. Organic matter that has been burnt or charred, however, can survive. As a consequence it is sometimes possible to ascertain what plants were gathered, and what was used as fuel. These in turn can tell us about the environmental conditions in the area at the time. The charred material also provides dating evidence. Analysis of the excavated flints and slag was undertaken. Soil samples were processed to recover charred plants and wood. Samples were also sent for C14 dating.

Charred Plant Remains

Environmental samples were taken from the post-hole in Trench 4 and the two possible hearths in Trench 3. The sample from an area of burnt earth, context 3003, produced a single large non-oak fragment of charcoal and a small fragment of chess (*Bromus* sect. *Bromus*) seed. Chess is a common tall-grass weed of arable land that became particularly frequent during the Iron Age and Romano-British periods. This may suggest an Iron Age or Romano-British date for the furnaces.

Sample 4004 from the fill of a possible late Mesolithic post-hole contained frequent fragments of oak charcoal, perhaps the remains of a single post burnt *in situ*. Fragments of Hazelnut shell (*Corylus avellana*) were also recovered. The results are explored in the discussion section and the full report is included as Appendices 1 and 2.

Worked flint

During the watching brief, all flints from the subsequent excavation area were numbered 018 by archaeologists from Hyder Consulting. During the excavation, surface finds beyond the excavated trenches were labelled as 'unstratified'. A comprehensive analysis of the flint assemblage was undertaken. The results confirm the original assessment that the flints were attributable to the late Mesolithic / early Neolithic period, and identified some evidence for different flint knapping activities occurring in different parts of the site. The results of this analysis are explored in more detail in the discussion section. The full report is included as Appendix 3.

Metallurgy

Samples of slag recovered from Trench 1 were examined. The characteristics of the fragments were sufficiently distinctive to identify them as pieces of 'tapped' iron-smelting slag from a bloomery furnace. One piece of slag was either formed in the base of the furnace or within its 'tapping arch'. Another fragment contained reduced-fired clay, probably fragments of furnace floor, or clay used to block the 'tap-arch'. There were no pieces of slag characteristic of iron smithing rather than smelting. This technology was introduced to Britain in the late pre-Roman Iron Age and, although carbon dating has not been possible, this material is most likely to be of Roman or earlier medieval date.

A fragment of slag containing piece of unreacted iron ore, has been sent for further analysis to try and identify the source of the ore, which is as yet unknown in this period in this part of Wales. The results of this analysis are explored in more detail in the discussion section. The full report is included as Appendix 4.

Carbon Dating

Only one charcoal sample from the 'Teardrop' site was carbon dated. The charcoal (a fragment of Hazelnut shell) was selected from the fill (4004) of a posthole in Trench 4. This posthole was thought possibly to be associated with the Mesolithic flint scatter. The date obtained, however, was from between 1130BC and 910 BC, suggesting the posthole originated in the Bronze Age (Figure 5 on Page 24, and Appendix 5).

Specialist analysis of the charcoal and plant remains suggested the possibility that fragments of oak charcoal within fill 4004 were derived from a charred post. This did not, however, appear to be the case during excavation of the feature. While the presence of presumably intrusive Mesolithic flint flakes suggests there is intrusive material within the fill of the posthole, there is no particular reason to suppose that the posthole has later origins than the Bronze Age.

No material suitable for carbon dating was recovered from the hearth features in Trench 3.

DISCUSSION

The flint assemblage

Stone tool production techniques changed and developed throughout prehistory. The Mesolithic period is characterised by the use of smaller and finer tools referred to as 'microliths'. During the Mesolithic these changed from broad blade microliths from earlier periods which were developed into more refined narrow blade microliths during the later Mesolithic. With the transition from the hunter gathering societies of the Mesolithic to the more sedentary farming society of the Neolithic, the uses of flint changed and less care and skill appears to have been used in flint tool production. These changes become even more apparent in the Bronze Age. As metal tools gradually began to supersede the use of flint for many tasks, a smaller range of less well manufactured flint tools were produced (Butler, 2005, 25-6). These changes in the methods and styles of flint tool production enable flintworking sites to be dated.

The Robeston Wathen A40 bypass work has generated an interesting group of worked flint artefacts. The assemblage is typical of a flint-knapping site for the production of blades, rather than of habitation or use localities (such as a hunting camp), where more evidence of actual tools would be expected.

The deposits containing the worked flint appear to have been at least partially disturbed by plough action. This has destroyed any evidence of buried soil horizons or occupation surfaces associated with the flint and with other later periods of activity on the site. A certain degree of differentiation appears to be possible between material recovered from the different trenches.

The assemblage from Trenches 1 and 3 suggests the site was where the flint nodules were processed into 'cores' by removing the outer surface or 'cortex'. Blades could then be struck from them at another location. Trench 2 has produced tools typically of later Mesolithic age, also found at other Pembrokeshire sites, including the later Mesolithic site of Nab Head Site II (David 2007, 138).

Trench 4 is similar in characteristics to that of Trench 3. A sharpening flake from an adze or axe was recovered, which have been attributed to an early Mesolithic date but they could equally date to the later Mesolithic based upon evidence from excavations at the Severn Estuary Levels site at Goldcliff, Monmouthshire (Barton 2007, 117).

The material from Trench 1 is also represented by coarse flakes and cores associated with initial preparation of flint. homogenous and less compact character of the soils in Trench 1, however, may suggest that the flint material in this location is derived from nearby (in the vicinity of Trench 3), but has been re-deposited by the erosion of river bank deposits.

The site location

The location of the flint knapping site at Canaston Bridge is situated close to where the Narberth Brook flows into the Cleddau River (Figure 9). Such a location would be considered typical for such sites. Although the landscape and environment of the area in Mesolithic times would have been very different to the landscape today, it is possible to envisage a temporary camp on the banks of the river, from which coastal waters could be accessed, and perhaps at a point that the river could be crossed easily. It would have been an ideal place for hunting and fishing forays as well as being fertile land for early agriculture. In some respects the location of the site mirrors that of some sites in Monmouthshire where valley locations were favoured for use as settlement and processing sites (Walker 2004, 50).

The river provides a routeway for transporting raw materials such as the prepared

flint cores to or from this location. It has been suggested that people at this time would have found the river valleys to be much easier for movement than travelling by foot (Taylor 1980, 117). Therefore the river valleys and coast would have been the favoured locations for settlements. Evidence for this is also present in Pembrokeshire where the majority of the sites are either situated in valley locations or on coastlines (David 2007; Walker forthcoming).

The Mesolithic period

The Mesolithic (Middle Stone Age) is the name given to the period of prehistory that followed on from the Palaeolithic (Old Stone Age). It spans a period from *c.*10,000 to 4,400 BC. The Mesolithic period was characterised by a warmer climate than that of the Palaeolithic. This led to rising sea levels and afforestation of the landscape that was colonised by a diversity of plant and animal life (Rees, 1992, 5). As the climate continued to improve, and the diversity and quantity of natural food resources increased, groups of hunter-gatherers were attracted to the newly accessible landscape, favouring in particular the more open areas along the coasts and rivers. These areas would have offered Mesolithic hunter-gatherers abundant food resources fish and shellfish from marine and fresh water environments, and birds and larger game from marsh and inland environments. The surrounding forests providing a variety of plant resources such as hazelnuts (Aldhouse-Green, 2000,27-28).

Coastal and river environments were also important because in these locations glacial deposits of flint pebbles, which are the only known source of flint material in the region, are exposed on beaches and river beds, where they could be collected for the production of stone tools.

The Mesolithic population was nomadic, moving through the landscape to exploit seasonally available food and other resources in different environments. They constructed temporary camps, probably living in hide-covered tents.

In West Wales, the majority of known archaeological sites of Mesolithic date are located on the coastal fringes and river valleys of Pembrokeshire. The reasons for this distribution are debatable, and may be the result of a bias in the collection of data, rather than a true reflection of the distribution of Mesolithic sites.

The nomadic Mesolithic lifestyle and seasonal movement across the landscape to exploit different resources in different environments at different times, means that the surviving evidence of Mesolithic sites is very scant. The only artefacts that survive are worked flints, charred plant remains and very occasionally, evidence of temporary structures and hearths, where a temporary settlement was established.

Some sites were visited repeatedly, for specific reasons, and as a result, the archaeological evidence that survives may be characteristic when compared to another site at which a different activity was undertaken. The flint assemblage from Robeston Wathen has been shown to have a distinctive character that not only helps to date it to the late Mesolithic / early Neolithic, but also suggests that the specific activity of 'core preparation' was undertaken there.

No obvious local sources of flint pebbles are immediately apparent in the modern landscape, but they may have been in the Mesolithic period. Alternatively, this location on an inland waterway may suggest that material was transported here from the coast, for processing before distribution to other sites where the cores were transformed into smaller and specialised tools for a variety of everyday uses.

The Mesolithic was followed by the Neolithic period, which spans a period from *c.*4,400 to 2,300 BC. At this time there was a change from nomadic hunter-gatherer lifestyle to a sedentary agricultural lifestyle. Traditionally this change has

been thought to occur suddenly as the 'Neolithic Revolution'. More recently it has been argued that the change to agriculture was a more gradual process, resulting from an increasing manipulation of the environment for food resources that evolved into agricultural management of the land. As this change happened, the style of flint tool manufacture continued to change and develop to meet changing needs.

In Pembrokeshire, archaeological sites of late Mesolithic/early Neolithic date are more widespread, and occur further inland along river valleys than earlier sites. This may reflect the exploitation of new environments for agriculture.

Posthole 3005

The posthole revealed within Trench 4 was initially considered to be contemporary with the flint scatter, but following C14 dating of a hazelnut shell recovered from the fill (a foodstuff found commonly on Mesolithic sites (Moffett *et al,* 1989) it has been shown that the feature is more likely to date from the Bronze Age. The fact that a presumably bronze Age posthole contains residual Mesolithic worked flint suggests that the fill of the posthole contains intrusive material. There is no particular reason, however to suppose that the posthole may have had later origins than the Bronze Age. With the adjacent stake holes it is considered most likely that the features represent the remains of Bronze Age occupation and is possibly contemporary with the burnt mound site to the east.

Metalworking

When the 'Teardrop' site was originally identified, three discrete areas of burnt soil were thought to represent possible evidence of prehistoric settlement associated with the flint scatter. The two possible hearth sites in Trench 3 are now thought to be of a later date.

Clear evidence of the character of these features was lacking, due to truncation from previous agricultural activity (and as a result of the topsoil strip) which appears to have removed all evidence of any fills or super-structures associated with the features, leaving only areas of burnt earth from below and around the features. Only hearth area 3004 was sufficiently well preserved for any observations on its form to be made. The flat stone that appeared to be placed in the hearth feature may be part of the original structure, but did not appear to be heat affected. The surrounding soil did, however, show evidence of having been heated to a considerable degree. Furthermore, the shape of the burnt soil mark was suggestive of a circular hearth with a possible flue leading to it. These characteristics indicated the feature was very unlikely to be of Mesolithic origin, but of a later date of construction and of possible industrial function. Because of truncation from plough activity, there was no surviving evidence of fuel, ash or slag associated with the feature.

It is now considered that feature 3004 (and possibly 3003) may represent the bases of a possible bloomery furnace which usually consists of a pit or chimney with associated flue to allow malleable iron to be tapped before being processed into wrought iron. The bloomery furnace represents the earliest form of iron smelting which was in use from the Iron Age up until the adoption of the blast furnace during the 16th century (Riden, 1993, 6).

Specialist analysis of the slag recovered from Trench 1 suggests that the vast majority of it is most likely derived from a bloomery furnace. This evidence, coupled with the apparent size and shape of the hearth feature is suggestive of a Roman or early medieval date. Evidence of bloomery smelting is hitherto unknown in this part of south west Wales and the material analysed be worthy of further investigation (Young, 2010).

Despite this lack of evidence, a possible date and function for the feature is suggested by the recovery of metalworking slag from nearby Trench 1. Samples of this slag were examined by Dr. Tim Young, a specialist in archaeological metallurgy.

As noted above, most of the slag fragments collected during the excavation were pieces of 'tapped' iron-smelting slags from a bloomery furnace. One piece of slag was either formed in the base of the furnace or within its 'tapping arch'. Another piece of slag contained a piece of unreacted iron ore. Another fragment contained reduced-fired clay, probably fragments of furnace floor, or clay used to block the 'tap-arch'. There were no pieces of slag characteristic of iron smithing rather than smelting.

Considered together, the iron slags are indicative of iron-smelting in a slag tapping furnace. The source of the ore being smelted remains unknown and a number of sources seem to have been exploited in Pembrokeshire (Young 2010a, c).

Slag tapping (bloomery) furnaces were introduced into the Bristol Channel Orefield probably late in the pre-Roman Iron Age. They were used in various forms until the 16th century when blast furnace technology was adopted (Riden, 1993, 6).

The material from this excavation most closely resembles slag from a fairly small furnace and the most likely date range is Roman to earlier medieval. The presence of bloomery iron smelting in this part of Southwest Wales was not previously known and is therefore of considerable significance. Further explanation and experiments in bloomery furnaces can be viewed at http://www.geoarch.co.uk/experimental/smelts.html.

Bloomery furnaces were usually located close to woodlands to ensure a ready supply of timber to produce charcoal for fuel. It has been suggested that half an acre of woodland would be required to produce a ton of iron (Jones, 2006, 33-34).

The earliest documentary reference to iron smelting in the Canaston Bridge area comes from a document of 1635 leasing the mill at Canaston to George Mynne of Woodcote, Surrey along with permission to erect buildings for smelting iron (Claughton, 2004).

Canaston and nearby Minwear Woods were both in existence during the medieval period when both were granted to the Knights Hospitaller of the Order of St John of Jerusalem who owned an important Commandery at Slebech. Iron ore deposits also exist within the area and are known to have been mined at Minwear during the 18th century (PRN 25488), further mining activity is recorded in the area around Canaston Bridge but iron ore is not specifically mentioned (Claughton, 1999).

It seems that the evidence from the 'Teardrop' excavation may therefore suggest an earlier association of the area with iron production than has hitherto been known. The choice of this location is presumably a consequence of the presence of readily available fuel supplies, a possible local source of ore, and potential for river transport of smelted iron and raw materials.

The evidence for early iron smelting in this location is of significance despite the fact that it has not been possible to demonstrate a direct association of the residual slag residues from Trench 1, with the possible furnace base in Trench 3.

Reliable dating of the possible furnace and the slags is also problematic. The presence of a single seed of 'Chess', a species most commonly associated with the Iron Age or Romano-British periods may be the only dating evidence available (although inconclusive). Further analysis would clarify the source of the ore being smelted.

No evidence of other features associated with iron smelting was identified along the route of the road scheme. A furnace would represent a considerable investment in time and materials and would require constant attention and maintenance, so associated structures nearby might be anticipated. Such evidence may lie beyond the area investigated, or may have been lost through agricultural activity.

Several other small round hearths were recorded along the road corridor, but the dating of these is at present unknown.

CONCLUSIONS

The archaeological evaluation identified a late Mesolithic or early Neolithic flint scatter. The paucity of finished tools within the recovered flints may suggest that the site was a knapping and processing site rather than a settlement or hunting camp. The partially processed flint may have been transported from the site, possibly by river to be worked into finished tools at other locations. This evidence is an interesting addition to our knowledge and understanding of the Mesolithic period in Southwest Wales.

The posthole and stakeholes revealed within Trench 4 may suggest the remains of Bronze Age occupation in the area. Potentially this may be contemporary with the Burnt Mound to the east of the site (see above).

The base of a possible bloomery furnace [3005] was revealed in Trench 3. Analysis of slag recovered from Trench 1 suggests that this may date from the Roman or early medieval period. This is significant as it suggests an association of the Canaston Bridge area with iron smelting from a much earlier date than documented, and is also the earliest evidence for such activities in this part of South West Wales.

Mitigation

The initial archaeological investigation was undertaken to assess the archaeological potential and significance of the flint scatter site and to determine mitigation measures. Having excavated the four test trenches, it was considered that although the site was of considerable significance, no additional features or deposits for further investigation had been identified, and apart from the features in Trench 4, no other evidence indicating that the site was an undisturbed settlement site was observed. The site area had been subject to significant truncation from ploughing.

Further excavation would undoubtedly have yielded a larger assemblage of flint, and although some zoning of the characteristics of the material could be identified across the site, it was considered that the character of the site had been compromised as it appeared to be mixed with evidence from other periods through plough action.

As a consequence of these considerations it was decided that further excavation of the site at this stage was unnecessary. The 'Teardrop' area was covered with a geotextile membrane to protect the remaining deposits and was overlain with a substantial depth of soil generated from the road construction. The remaining unexcavated areas of the site should remain preserved beneath the spoil mound.

Outreach

In addition to the archaeological investigations, information was provided by DAT for inclusion on the website for the road scheme at http://www.a40robeston-wathenbypass.com/ A short presentation on the why the excavations were important, and what was found, was also made to Costain's employees.

Copies of the report will be circulated to various archives and will be publically accessible at the regional HER. Information about the excavations will also be presented on the DAT website http://www.dyfedarchaeology.org.uk/

The results of the excavations will be published in an appropriate archaeological journal, and may be presented at other public events in the region.

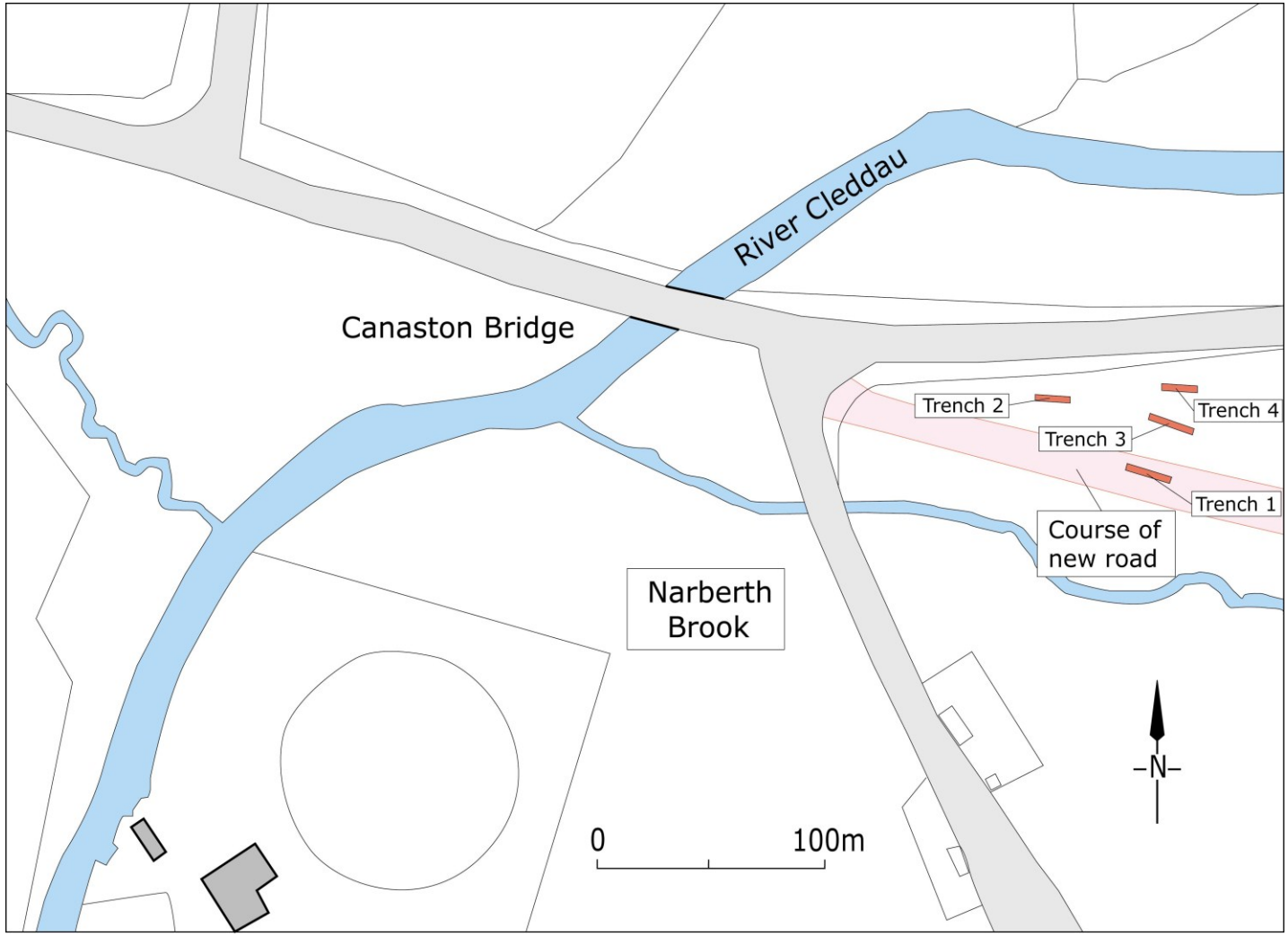


Figure 9: Location of Flint scatter site

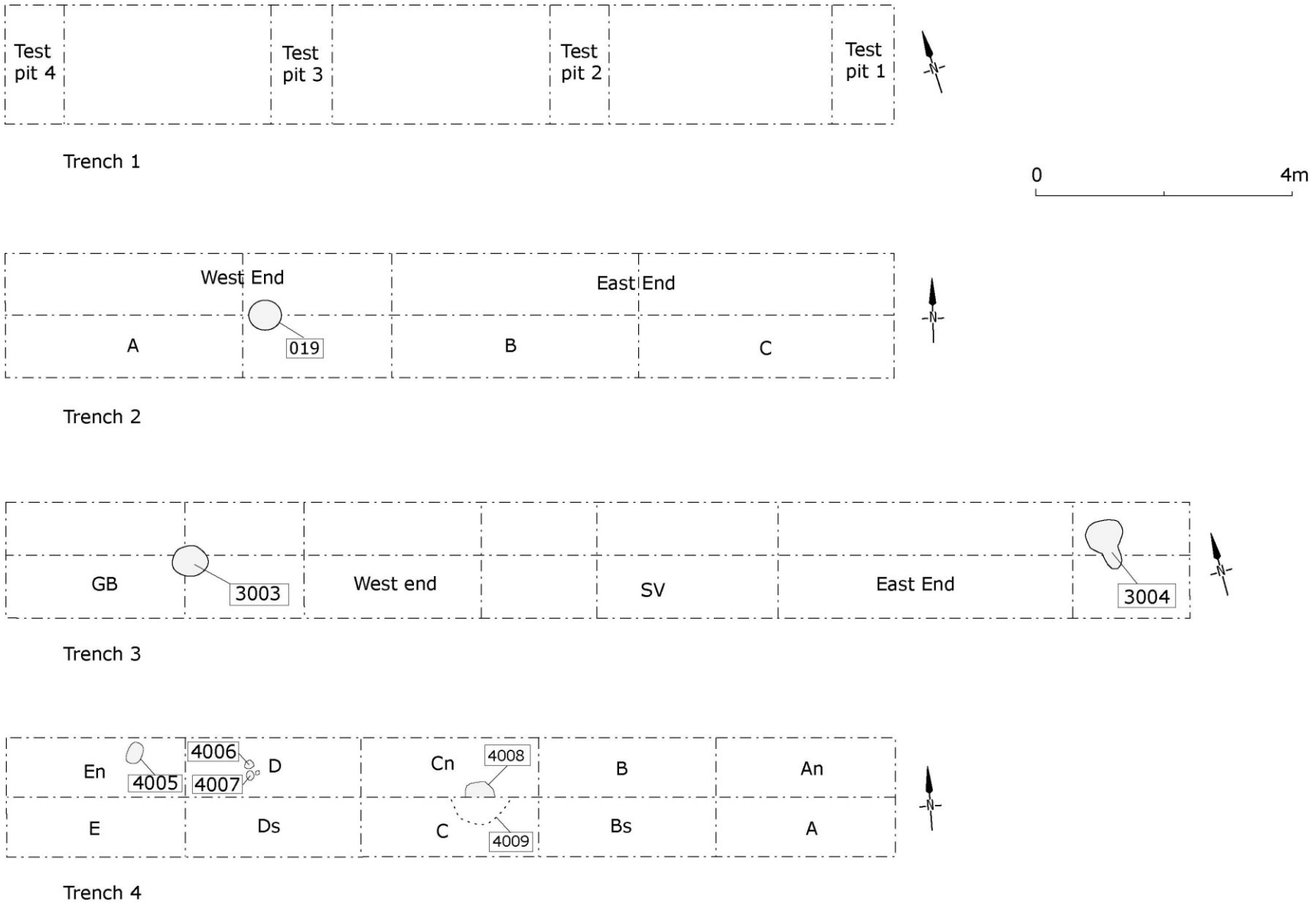


Figure 10: Trench plans showing letters used to identify the locations of flint collection

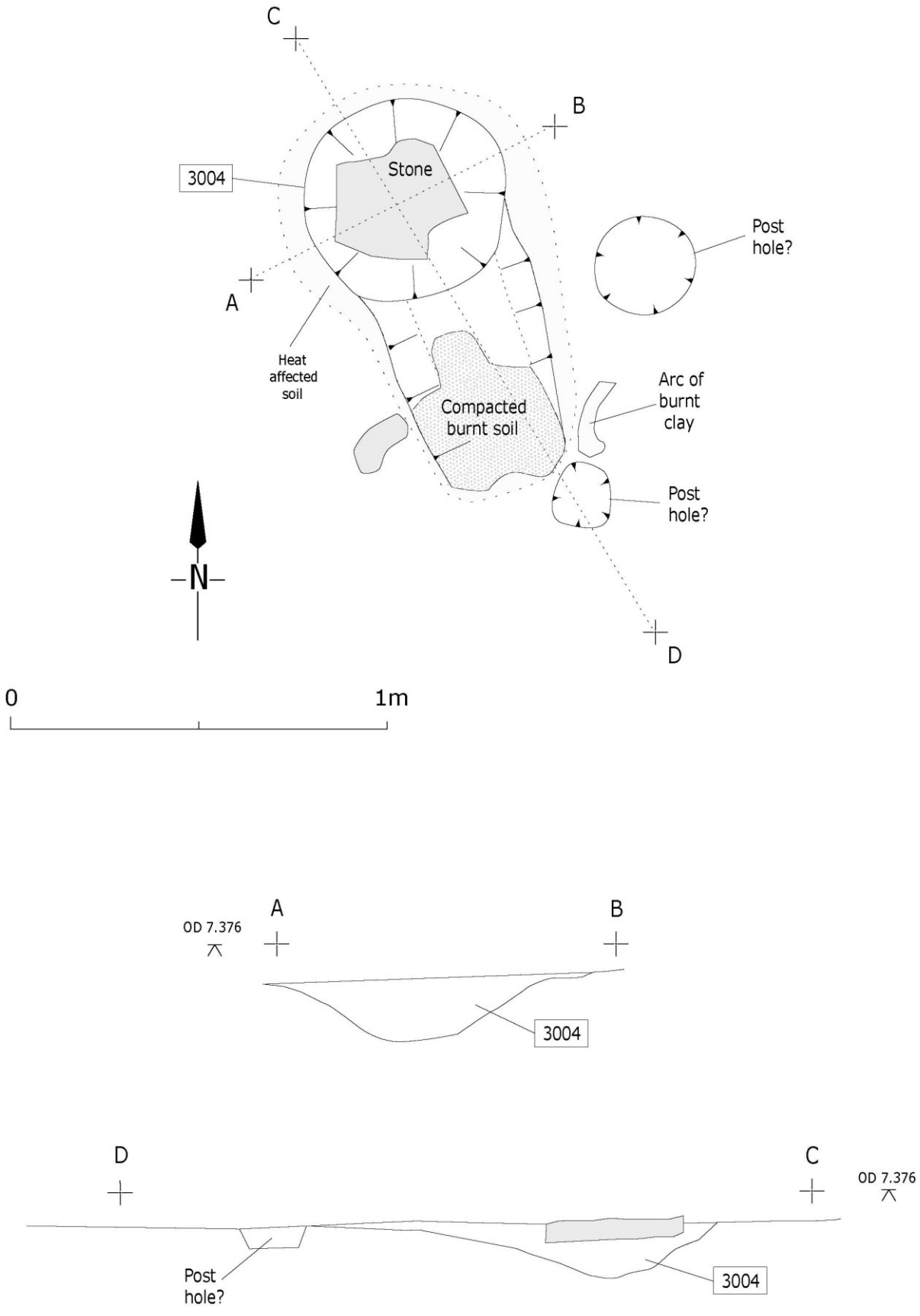


Figure 11: Plans and sections of possible Bloomery furnace [3004]

Photo 21: Trench 1 looking west

Photo 22: Trench 2 looking east

Photo 23: Trench 2 looking west

Photo 24: Trench 3 looking west (furnace 3004 in foreground)

Photo 25: Trench 3 looking east

Photo 26: Trench 4 looking east

Photo 27: Trench 4 looking west

Photo 28: Trench 4 looking west. Posthole 4005 and stakeholes 4006 and 4007 (other holes are not features)

Photo 29: Trench 2. Feature 019 looking south

Photo 30: Trench 3. Furnace feature 3004

Photo 31: Trench 3. Furnace feature 3004 without flat stone

Photo 32: Trench 3. section excavated through furnace flu to show extent of burnt soil colouration.

Photo 33: Example of flint flakes

Photo 34: Example of flint cores

SOURCES

Aldhouse-Green S 2000 'Palaeolithic and Mesolithic Wales' in Lynch *et al* 2000 Prehistoric Wales. Stroud. Sutton Publishing

Barfield, L. and Hodder, M. 1987. Burnt Mounds as Saunas, and the prehistory of bathing. *Antiquity 61*, 370-379

Beamish, M., 2009 **'**Island visits: Neolithic and Bronze Age activity on the Trent valley floor. Excavations at Egginton and Willington, Derbyshire 1998-1999'**.** *Derbyshire Archaeological Journal* **129,** 17-172

Bell, M. 2007, 'Prehistoric Coastal Communities: The Mesolithic in western Britain'

CBA Research Report 149

Benson, D. G, 1990, Excavations at Stackpole Warren, Dyfed', *Proceedings of the Prehistoric Society, Vol 56*, p179-245

Buckley, V. (ed), 1990, *'Burnt Offerings: International contributions to Burnt Mound Archaeology'*, Dublin

Butler, C. 2005, *Prehistoric Flintwork.* Stroud. Tempus

Cantrill, T.C, and Jones O.T, 1906, 'The Discovery of prehistoric Hearths in South Wales', *Archaeologia Cambrensis* 6th Series, Vol. **VI**, p17-34

Cantrill, T.C, and Jones O.T, 1911, 'Prehistoric Cooking Places in South Wales', *Archaeologia Cambrensis* 6th Series, Vol. **XI**, part 3, p203

Caseldine, A. E. and Murphy, K. 1989. A Bronze Age Burnt Mound on Troedrhiwgwinau Farm, near Aberystwyth, Dyfed. *Archaeology in Wales 29*. p1-5

Charles, B, G. 1992, 'The placenames of Pembrokeshire'

Claughton, P. 1999, *A List of Mines in Pembrokeshire and the adjoining parts of Carmarthen and Ceredigion*

http://people.exeter.ac.uk/pfclaugh/mhinf/pembs1.htm

Claughton, P. 2004, *Charcoal Fired Blast Furnace Site in Canaston Wood near Blackpool Mill, Pembrokeshire.*

http://people.exeter.ac.uk/pfclaugh/mhinf/bp_iron.htm

Cotswold Archaeology, 2007. Milford Haven to Aberdulais Natural Gas Pipeline Archaeological Fieldwork preliminary report Vols 1 and 2. Report no. CA 07089

Crane, P. 2002, Pontyates to Bancyfelin Pipeline archaeological watching brief and excavation. Cambria Archaeology report no.2007/7 PRN42760

Crew, P. 1995, *Bloomery Iron Smelting Slags and Other Residues*. Archaeology Data Sheet 5. Historical Metallurgy Society

David, A. 2007, *Palaeolithic and Mesolithic Settlement in Wales.* BAR British Series 448

Davies, J. F, 1997, 'Some recent archaeological discoveries in the Aberystwyth district' *Ceredigion*, Vol XIII

Groom, P, and Wilson, H. 2004 'Archaeological Recording of a Burnt Mound Site at Pwllauduon Farm, Tregaron'. Unpublished Cambria Archaeology Report no. 2004/40, PRN 50625

Hodder, M. A and Barfield, L. H (eds), *'Burnt Mounds &Hot Stone Technology: Papers from the 2nd International Burnt Mound Conference'*, Sandwell Metropolitain Borough Council

James, H. 1986. Excavations of Burnt Mounds at Carne, Nr. Fishguard, 1979 and 1981. *Bulletin of the Board of Celtic Studies 33*, 245-365

James, H. 1993, *Robeston Wathen Bypass: Preliminary Environmental Assessment.* HER PRN 32483

Jones, W. 2006, *Dictionary of Industrial Archaeology.* Stroud. Sutton

Lynch F, Aldhouse-Green S, Davies J L 2000 *Prehistoric Wales.* Stroud. Sutton

Manning A. and Crane P., 1989, 'The Burnt Mounds of Dyfed: The 1997-8 Archaeological Assessment Survey', Cambria unpublished report PRN35377

Maynard, D, 1993, 'Burnt mounds in the St. Dogmaels area of north Pembrokeshire', *Archaeology in Wales* No. 33, p 41-43

O' Kelly, M. J., 1954. Excavations and Experiments in Ancient Irish Cooking Places, *Journal Royal Society Antiquaries Ireland 84*, 105-155

Page N 2002, A477(T) *Sageston-Redberth Bypass: excavation of a Neolithic occupation site, 2001*. Unpublished Cambria Archaeology Report

Page, N. 2003. *A40(T) St. Clears – Fishguard: Archaeological Stage 1 Appraisal*. Llandeilo. Cambria Archaeology report for TACP

Page, N. 2003. *Prehistoric undefended settlements project, southwest Wales: a review of the lithic evidence from the regional SMR*. Llandeilo. Cambria Archaeology report for Cadw

Page, N. 2004. *A40(T) west of St. Clears proposed improvements: archaeological desk-based assessment*. Llandeilo. Cambria Archaeology report for TACP

Page, N. 2004. *Prehistoric Undefended Settlements Project, Southwest Wales: a review of the lithic evidence from the regional SMR*. Llandeilo. Cambria Archaeology report 2004/53

Rees S 1992 *A Guide to Ancient and Historic Wales: Dyfed.* London. HMSO

Riden P 1993 *A Gazetteer of Charcoal-fired Blast Furnaces in Great Britain in use since 1660.* Cardiff. Merton Priory Press

Sabin, D. & Donaldson, K. (2006). *Robeston Wathen, Pembrokeshire: magneto-meter survey*. Castle Combe. Archaeological Survey Report: Ref.144 for Cambria Archaeology

Schlee, D. 2006, 'An archaeological Evaluation at Sunnyside Farm, Robeston Wathen, Pembrokeshire'. Cambria Archaeology Report no 2006/108

Trethowan, M (1997). *A40 (T) Robeston Wathen Bypass preferred route: Archaeological Stage 3 Investigation*. Llandeilo. Cambria Archaeology report for Ove Arup & Partners

Welsh Assembly Government Transport Wales. A40 Penblewin to Slebech Park Improvement Environmental Statement Volume 2 Technical Appendix 2 – Cultural Heritage

Williams, G. H., 1985. A Group of Burnt Mounds at Morfa Mawr, Aberaeron. *Ceredigion 10*, p181-188

Williams, G. H., Taylor, J. A., Hunt C., Heyworth, A. and Benson D. G., 1987. 'A Burnt Mound at Felin Fulbrook, Tregaron, Ceredigion'. *Bulletin Board of Celtic Studies **34***, p228-243

Williams, G. H., 1986. 'Recent Work on Bronze-Age Sites in South-west Wales', *Archaeology in Wales No **26***, p13

Young, T. 2006, *Evaluation of Archaeolmetallurgical Residues from South Hook LNG Terminal, Dyfed.* GeoArch report 2006/14

Young, T. undated, *Smelting Experiments*

http://www.geoarch.co.uk/experimental/smelts.html

Young, T. 2010a. Archaeometallurgical residues from the South Hook LNG Terminal. *GeoArch Report 2010/03*, pp

Young, T. 2010b. Fuel ash slags from corn-drying kilns, South Hook LNG Terminal. *GeoArch Report 2010/04*

Young, T.P. 2010c. Analysis of archaeometallurgical residues from Brownslade, Pembrokeshire. *GeoArch Report 2010/07*

Maps

Tithe map and Schedule 1841 Robeston Wathen

1st Edition Ordnance Survey 1 inch map 1832

2nd Edition Ordnance Survey 1:25000, 1907

Geological Survey Map 228 Haverfordwest: Solid and Drift

APPENDIX 0NE

ASSESSMENT OF THE CHARRED PLANT REMAINS

By Wendy Carruthers

INTRODUCTION

Excavations carried out in 2009 by Dyfed Archaeological Trust (DAT) on two sites at Robeston Wathen, Pembrokeshire, revealed a burnt mound (site code RWBM09) and a prehistoric flint scatter (site code RWTD09). Soil samples were taken from a variety of features for the recovery of environmental information. The samples were processed by DAT staff, using standard methods of floatation (0.25mm, 2mm and 5mm sieves). Flots and some residues from eight samples were sent to the author for assessment and charcoal extraction, as listed in Table 1.

METHODS

Some of the flots contained large amounts of silt, which would have made scanning difficult and ineffective. These flots were re-floated onto a 250 micron meshed sieve, and where residues were present, these were re-floated.

Once the flots had been air-dried, they were coarse-sieved (using a 2.5mm sieve) for the recovery of large, identifiable charcoal. The coarse fraction was sorted for large macrofossils such as fragments of hazelnut shell (HNS), before being quantified (approximate volume in ml; see Table 1), bagged and sent to the charcoal specialist for assessment. Although species diversity was not assessed by the author, where it was obvious that oak was dominant, this was noted in Table 1.

The remaining fraction was further divided into fractions (using 500 micron and 250 micron meshes) in order to make scanning more efficient. The fractions were rapidly scanned at x10 under an Olympus ZX7 stereoscopic microscope. Where charred plant macrofossils were observed, the remains were placed in glass tubes. Because it was soon apparent that plant macrofossils were scarce and further analysis would not be worthwhile, scanning was carried out in a more thorough fashion than for most assessments, and the complete flot was scanned rather than a subsample. Full identification was carried out on the few plant macrofossils recovered.

RESULTS

The results of the assessment are presented in Table 1. Context information was provided by Duncan Schlee (DAT).

Site	sample context number	sample volume (litres soil)	context description (pre-C^{14} dating)	flot and residue descriptions	charcoal	charred plant macrofossils	further potential
RWTD09 'Teardrop'	3003	15	Area of burnt earth	Re-floated. 10ml orange silty flot with modern rootlets. 1 large frag charcoal & a few small. Residue stony with some slate.	1 large frag (not oak) not yet extracted	1 frag chess (*Bromus* sect *Bromus*)	Very little potential - small flot sorted. At least MBA because of chess, most likely IA or RB (periods when chess most common).
"	4005	15	Fill of possible late Mesolithic post hole	Re-floated. 150ml flot with abundant flaky charcoal in orange/brown silt. Abundant slate fragments in residue.	primarily silt-encrusted flaky oak, 50ml lge charcoal extracted	3 poor, silt encrusted, small frags hazelnut shell; (8mm, 5mm, 3mm max. diameter)	Charcoal ID. Should be able to radiocarbon date HNS. No further seed potential
RWBM09 burnt mound	19	15	Charcoal-rich fill of cut [016] - possible prehistoric rectangular roasting pit with flat stones. Possibly contemporary with burnt mound.	c. 1 litre flot with c. 500ml large charcoal & concreted charcoal lumps.	500ml orange (iron?) encrusted	nil	charcoal ID only
"	21	15	Fill of post hole [20], close to stream, solitary.	abundant modern rootlets, frequent charcoal, Residue: grey stones with some reddened burnt concretions	20ml large charcoal	nil	charcoal ID only
"	25	15	Probable slumped natural mixed with burnt mound material ?	200ml flot with abundant rootlets, frequent chunky charcoal. Residue: grey, angular sandstone frags, with common pinky burnt stones & concretions, common charcoal (failed to float).	25ml mixed species charcoal	nil	charcoal ID only. Could re-float residue if need more charcoal.
"	28	15	Natural deposits derived from shifting watercourse?	abundant grey silt, fine rootlets with occasional medium charcoal	c. 10 medium frags could be extracted if required	nil	charcoal ID
"	36	15	burnt mound material	Refloated flot & residue. C. 1.5 litres flot with rootlets.	60ml chunky mixed charcoal	nil	charcoal ID only
"	41	15	burnt mound material	200ml flot, abundant encrusted orange stained charcoal, rootlets	100ml charcoal	1 frag acorn cup (*Quercus* sp.); 1 sloe stone frag (*Prunus spinosa* L.)	2 datable items, charcoal ID

DISCUSSION

Although charcoal was common in some of the samples (particularly those from the burnt mound), fruits and seeds were extremely scarce. In addition, the state of preservation of the charred remains was very poor in most samples, with silt encrustation and surface erosion making identification difficult in some cases. The following results, however, provide a little environmental information, as well as providing material which could be radiocarbon dated if required.

The Teardrop (Site Code RWTD09)

The sample from an area of burnt earth, context 3003, produced a single large non-oak fragment of charcoal and a small fragment of chess (*Bromus* sect. *Bromus*) seed. Chess is a common tall-grass weed of arable that became particularly frequent in spelt crops during the Iron Age and Romano-British periods (Godwin, 1975, p.403). Although it has been found in some earlier and later periods, the likelihood is that this area of burning was created sometime around those periods. Whether this activity was related to cereal processing, preparation or consumption is more difficult to determine from such scant evidence.

Sample 4005 from the fill of a possible late Mesolithic post-hole contained frequent fragments of flaky oak charcoal, perhaps originating from a single post burnt *in situ* (but see charcoal report by Dana Challinor). Three medium-sized fragments of Hazelnut shell (*Corylus avellana*) were recovered in a very poor state of preservation, with eroded surfaces and rounded edges indicating weathering. These remains could indicate the collection of wild foods for food. Hazel commonly grows in oak woodlands, and produces fruits most prolifically along woodland margins and areas of scrub, where the light encourages flowering. Sample 4005 was later C^{14} dated to the Bronze Age period.

The Burnt Mound (Site Code RWBW09)

Sample 19 from a rectangular cut [016] that appears to have been a roasting pit produced frequent silt-encrusted charcoal, but no other plant macrofossils.

Sample 21 from the fill of post-hole [020] located close to the stream and burnt mound also produced charcoal but no other plant macrofossils.

The three samples 25, 41 and 36 from the burnt mound, produced frequent charcoal (see report by Dana Challinor) but only two identifiable plant macrofossil fragments. The largest quantity of charcoal came from context 41, towards the base of the southern section of mound material (although the full extent of the mound was not excavated). This sample also produced the two plant macrofossils: a fragment of acorn cup (*Quercus* sp.) and a fragment of sloe stone (*Prunus spinosa*). It is quite likely that these remains represent shrivelled fruits on twigs being burnt to heat the stones, rather than food remains, since burnt mounds rarely produce much economic evidence. Both fruits have been consumed in prehistoric times, but acorns require roasting first (Schneider, 1990) and are usually considered to be more of a famine food than something frequently eaten by choice. Either of the two identified items could be radiocarbon dated if required. Their presence ties in with the occurrence of oak woodland in the area, with some under-storey shrubs such as hazel and sloe. As with the hazel, the sloe or blackthorn shrubs must have been growing in more open areas of the woodland in order to flower well and produce fruits.

Sample 28 came from a natural silty deposit lying below the burnt mound material. These silts probably derived from the shifting watercourse. It contained

a few medium-sized fragments of charcoal that may represent redeposited material.

CONCLUSIONS

Evidence for the existence of oak woodland with some under-storey or scrub in the area was recovered from scarce plant macrofossils. Much more detail of the character of the woodland will be provided by the charcoal report (see Challinor, this volume). In addition, radiocarbon dates are required to place these features firmly within a time-frame. No obvious evidence for arable agriculture was found in the samples, but perhaps this is not surprising considering the nature and possible dates of the features. The few plant macrofossil fragments recovered from two of the samples, 4005 and 4001, could be used for accelerator dating, if required. Apart from possible dating, no further work is required on the plant macrofossils in these samples.

REFERENCES

Godwin, Sir Harry (1975) *History of the British Flora*. Cambridge University Press.

Schneider, M, (1990) Acorns as a Staple Food – Different Types and Change of Exploitation Through Time*. Sonderdruck aus die Bodenkultur*. Heft 1, 81-88

APPENDIX TWO

ASSESSMENT OF WOOD CHARCOAL

Dana Challinor, MA (Oxon), Msc

INTRODUCION AND METHODLOGY

The charcoal from six contexts was submitted for examination; context 4005 came from a possible Mesolithic posthole at site RWTD09, and the others came from features associated with a possible Bronze Age burnt mound at site RWBM09.

The charcoal was scanned at low magnification (up to x45), with 20-50 fragments subsequently selected for full identification. Fragments were fractured and identified using a Meiji incident-light microscope at up to x400, and with reference to modern comparative material and identification texts (Hather 2000, Scheweingruber 1990). The aim was to provide a guide to species diversity and abundance, and for the selection of suitable fragments for dating purposes.

RESULTS

The results by fragment count are presented in Table 1. The preservation of the charcoal was generally quite poor, friable and heavily infused with sediment, which obscured the anatomical structure. All the samples produced reasonable quantities of charcoal (>100 identifiable fragments). Context 19 also contained a large quantity of concretions and the charcoal was badly stained. A limited range of four taxa were positively identified: *Quercus* sp. (oak), *Corylus avellana* (hazel), Maloideae (hawthorn, pear, apple, service etc.) and *Hedera helix* (ivy). There was no confirmed alder in the samples, but the condition of the charcoal prohibited distinction from hazel in some fragments.

The maturity of the wood was noted where possible, and it was apparent that several samples were dominated by roundwood, indicated by the curvature of the rings, but without complete stems. There was also some oak heartwood, identified on the presence of tyloses, but the determination of sapwood was not possible owing to the preservation.

	Site code	**RWTD09**	**RWBM09**				
	Context number	**4005**	**019**	**021**	**025**	**041**	**036**
Quercus sp.	oak	19h	19r	29r	15r	7h	8r
Corylus avellana L.	hazel	1		12r	5r	7r	7r
Alnus/Corylus	alder/hazel		1r	7r		5	1
Maloideae	hawthorn group			2		1	
Hedera helix L.	ivy						4
Total identified		**20**	**20**	**50**	**20**	**20**	**20**

h=heartwood; r=roundwood

Table 1: *Results of the charcoal analysis (by fragment count)*

DISCUSSION

Site Code RWTD09 ('Teardrop Site')

The single sample from this site came from a probable post-hole thought to date to the Mesolithic or early Neolithic period (later C^{14} dated to the Bronze Age). The assemblage was dominated by oak charcoal, with many fragments of heartwood. As suggested by Carruthers (assessment report), this may represent the remains of a single oak timber post. If so, the presence of a single fragment of hazel charcoal with presumably associated hazel nutshell suggests that other, intrusive material (including Mesolithic flints) may have entered into the deposit. At the time of excavation, however, no suggestion of an in situ post was apparent.

Site Code RWBM09 (Burnt Mound)

With the exception of context 19, the samples were associated with or of burnt mound material and produced more mixed assemblages. Hazel and oak were most frequent, with a few hawthorn type charcoals, and a few ivy fragments. The ivy may have derived from its attachment to an oak tree, rather than being deliberately selected for fuelwood. Context 21 produced several wood species and is likely to represent spent fuelwood, rather than the remains of a single post. It is notable that a significant quantity of the fragments appeared to be from small roundwood, consistent with the gathering of branches, rather than large mature trunkwood.

Context 19 from a rectangular roasting pit, was unusual in that it was dominated by oak, superficially similar to the assemblage from 4005 at site RWDT09. However, there was a notable quantity of heartwood in the latter assemblage, whereas the oak from context 19 tended to be of immature roundwood, more akin in character to the burnt mound assemblages.

The charcoal assemblage concurs with the few plant macro remains recovered from these samples (Carruthers, assessment report) and indicates oak woodland with an understorey of hazel and probable other scrub type species. There was no blackthorn/cherry noted in the charcoal, but further identification might reveal additional species. The predominance of oak and hazel suggests that these trees were both readily available but also favoured for use as fuel.

RECOMMENDATIONS FOR FURTHER WORK

Further analysis is unlikely to provide much additional information, although the identification of more fragments from the specific burnt mound contexts of 41 and 136 might augment the species list. Pending the results of the radiocarbon dating programme, the significance of this material and necessity for further work should be re-addressed in discussion with the excavator. As a minimum, the results of this assessment should be included in the final publication with some reference to comparable sites. No further work on 4005 is recommended.

REFERENCES

Hather, J G, 2000. *The Identification of Northern European Woods; A Guide for Archaeologists and Conservators*, London, Archetype Publications

Schweingruber, F H, 1990. *Microscopic wood anatomy*, 3rd Edition, Swiss Federal Institute for Forest, Snow and Landscape Research

APPENDIX THREE

AN ASSESSMENT OF THE LITHIC ARTEFACTS

Elizabeth A. Walker

Curator of Palaeolithic & Mesolithic Archaeology,
National Museum Wales

INTRODUCTION

Excavations at the Robeston Wathen A40 bypass sites have generated an assemblage comprising a total of 326 worked lithics. Of these, two came from the burnt mound; and the rest were from the Teardrop Site. Two hundred and twenty-two worked lithics came from the four trenches at the Teardrop Site where 50 more were found during Machine Watching and 51 were unstratified finds. Table 1 below provides a summary of the lithic assemblages divided by area and Table 2 shows the debitage component broken down in more detail.

METHODOLOGY

The assemblage has been examined macroscopically in accordance with Andrefsky's published methodology involving the examination of each individual piece with the eye under good, directional light (Andrefsky 2005). Any evidence for retouch and for use along fine edges is detectable in this way. All the pieces in the assemblage have been listed individually in the catalogue of finds appended to this report. Each piece was assessed to determine whether or not it was humanly worked. If so, a basic identification of the raw material has been provided and due to some considerable variation in colour, particularly within the flint, this too has been noted. An approximation of the coverage of cortex on each piece has also been established due to the observation that many of the pieces within the assemblage have at least some traces of cortex surviving on them.

All the artefacts have been described in more detail than the knapping debitage has. These have been categorised wherever possible, using basic British Prehistoric artefact typologies (cf. Butler 2005). The only specific typologies used were Jacobi's microlith classification scheme (Jacobi 1978) and a typology for blade-cores (Ballin 1999). All artefacts have been measured using the methodology proposed for measuring debitage by Andrefsky (2005, 99–101). This ensures standardisation across the measurements taken and is a method used by the analyst for all lithic assemblages studied. Weight has also been taken using a balance of an accuracy of 0.1g. Retouch has been described in accordance with Odell's scheme recording how invasive it is across the edge of the tool (Odell 2004).

Cores have also been measured and weighed. As the majority of the cores are blade-cores the methodology proposed by Andrefsky for measuring these has been used (Andrefsky 2005, 145). The knapping debitage has been separated, as far as possible, using a basic visual descriptor. This has generated groupings of flakes and blades; blades defined as being at least twice as long as they are wide. The term spall has been used for small flakes of generally less that 10mm in both length and width. Blade fragments are defined here determined by a narrow width and the presence of remnant longitudinal scars running at right angles to the width of the piece. The fragment is then described according to whether it is the proximal (bulbar), mesial or distal ends of the blade that are present (Andrefsky 2005, 19). If it has been impossible to determine whether the piece under examination is a flake, blade or a possible core fragment it has been

classified under the generic term of general knapping debitage. Any pieces found to display no evidence for working, in that there are no conchoidal fractures evident have been deemed natural and disregarded in the analysis of the assemblage, although are listed in the catalogue of finds.

Post-manufacture and post-burial change and damage are noted. This includes whether or not the piece has been burned or not. Most of the burnt pieces either show a light pinkish colouration, if heat has been moderate in temperature; or a heavy white, crazed appearance on the flint surface where stronger heating has been experienced. Other such characteristics noted are where it is evident that damage has been caused in recent times, possibly in the course of the machining of the site or during excavation itself. In this assemblage few tools show evidence for patination, however, this can sometimes help to separate out artefacts of different ages amongst less securely stratified groups.

RAW MATERIALS

The raw material identifications have also been undertaken macroscopically and have mostly been determined by the lithic analyst. Five of the artefacts have also been examined by Dr Jana Horàk, Head of Petrology, Amgueddfa Cymru – National Museum Wales, who undertook visual identifications using a hand-lens. The dominant raw material present in this assemblage is flint. This flint has considerable variation in colour amongst it. This is, however, not unusual for beach or river-bed groups of flint, where the original incorporation of flint into sources from erosion, or scouring of land by ice sheets may well provide such wide variations. The origin of the flint is the Irish Sea ice drift deposits, and the assemblage probably incorporates flint from Antrim, North Western Scotland and the Irish Sea. The flint has been reworked into river-bed or beach deposits from where they have been collected for use as raw material for knapping in prehistory.

All the pieces examined show cortex that displays typical water-rolled and stone chattered surfaces. Chert is the second most dominant rock in the assemblage; this also displays a variety of colours and could originate locally in the Pembrokeshire limestones. This has also been collected as river-bed or beach pebbles. One piece of worked siliceous mudstone has been worked into a core; however, there is no evidence in the assemblage for any struck blades from it. Four flakes or flake fragments made of volcanic tuffs are also present in the assemblage. The rocks would be locally available in Pembrokeshire.

THE COMPOSITION OF THE ASSEMBLAGE BY AREA OF THE SITE

Site Code RWBM09 – Burnt Mound

The machine watching generated one worked flint. This is a later Mesolithic or early Neolithic cylindrical blade-core with two platforms both created by the removal of a flake across the pebble to create a flat striking platform. This blade-core has some recent damage to it, presumably caused during the machining of the site. The second find from cleaning during excavation of the burnt mound is a possible cylindrical core made of siliceous mudstone of local, Pembrokeshire origin. If indeed it is a core, then it is exhausted, in that it has been worked as far as it would be possible to take it for the removal of blades. However, no blades have been retrieved from the site that have been struck from this core, it being the only piece of this rock discovered at the site. The striking platforms of this core are both natural cortical surfaces.

Site Code RWTD09 – 'Teardrop' Site

Trench 1

Twenty-six worked pieces of flint and stone were discovered in Trench 1. None of these are finished artefacts; there are five cores present and the rest of the assemblage comprises knapping debitage. The cores consist of four single-platform blade-cores made on water-rolled small pebbles, each of which has had a single flake detached from it to create a striking platform. Three of these cores are made of flint; the other is of pale grey chert. A further worked piece of pebble flint may also be a core fragment of undetermined form. There are more flakes than blades found in this trench, several of which have been noted as cortical. There is a range of raw materials present including two flakes made of chert and one of a volcanic tuff.

Trench 2

Forty-nine pieces of worked flint were found in Trench 2, including three later Mesolithic tools. The most diagnostic and therefore dateable of these is a microlith. The microlith is of obliquely blunted point form with straight retouch backing along one length and leading-edge retouch at the tip of the other. There is a transverse fracture at its proximal end suggesting it was made using the microburin technique and was snapped at the base, rather than at the tip. Obliquely blunted points can be found in both early and later Mesolithic assemblages. Using the Jacobi classification for microliths it is possible to suggest that this one is of later, rather than of early Mesolithic age, despite being just above the average microlith width for such tools in Wales (Jacobi 1978, 16).

One scraper is also present in the assemblage. This was made on a cortical flake that was modified with steep retouch at its end to form a scraping edge. This is of a slightly irregular form; however, it is very typical for cortical flakes and blades to be modified into scrapers in this way in Mesolithic Glamorgan and Pembrokeshire (David and Walker 2004). A third tool, a later Mesolithic truncated blade has also been found, this may also have been burned. The blade has a deliberate termination at its distal end. Four blade-cores are present in the assemblage, two of these are cylindrical cores of flint struck from both ends and two are single-platform cores struck from a prepared platform at one end with blades detached by blows struck down from this one edge. A thick flake may also be a core fragment; this was struck from one side and may have been struck from a core in order to seek to rectify the striking platform and thus may be a rejuvenation flake.

One utilised flint blade is also present in the assemblage, this has an irregular series of small chips or serrations running along one edge, typical of use-wear, this could be of any Prehistoric date. The rest of the assemblage from this trench comprises blades and flakes along with all the debitage typical of knapping events. Posthole context number 019 had a single cortical primary flake found beside it. This is a first flake removal struck when preparing the core for further working and it could be of any date, although given the type of cores present at this site could easily be within the size range of the later Mesolithic and early Neolithic cores found elsewhere in Trench 2.

Trench 3

Trench 3 has generated a group of 64 pieces of worked flint and stone. Just one of these is of a tool form diagnostic to type, a steeply retouched lanceolate microlith form of typically later Mesolithic age. The microlith is of narrow-blade form and has straight retouch running along one length and some leading edge retouch towards the tip of the other length. The tip and base are both missing

from this tool. An undated single utilised blade fragment made of a pale grey chert is also present amongst the group. This blade has a natural backing to it formed from a previous blade removal from the core that provides a blunt edge to the tool. The other length has irregular small chips removed from along the surviving length typical to its having been used as a cutting tool. As well as these tools the group also contains a number of cores; three blade-cores all of single-platform type made on water-rolled pebbles of flint. An abandoned core made on a poor quality piece of pebble flint has been abandoned as the flint was too internally flawed presumably from chattering in the water that has given the pebble-surface a smooth form. There is evidence that this was a single-platform core as a flake removal from it appears to have been used as a platform for the removal of one flake. The rest of the assemblage from this trench comprises knapping debitage with a high proportion of flakes.

Trench 4

Trench 4 has generated just one tool that could be dated, a tranchet flake that may have been struck as a sharpening flake for a Mesolithic adze or axe. The flake has evidence for cortex on one edge but it is carefully flaked and has the twisted tranchet appearance typical of such sharpening flakes. One undated utilised blade has been found at the site, this has a natural cortical backing to one length and a series of irregular chipping running along the other length of the blade. Four blade-cores found at this site indicate some knapping activities here. The core forms are a cylindrical bladelet core of small size; one exhausted, and one non-exhausted, blade-core; both of which have been worked from a single striking platform.

A further core has been struck from one platform and then rotated 90° and an earlier blade removal has been used as a striking platform for the removal of further blades. The rest of the assemblage comprises knapping debitage, with the largest quantity of pieces found in this trench. These are typically blades and flakes and there is a higher proportion of blades to flakes found in this trench. Three features excavated within the trench have generated knapping debitage but no finished stone tools that are dateable with any certainty.

Machine watching and unstratified finds

One hundred and two lithic artefacts were found during machining or unstratified during work at the Teardrop Site. Three of these are later Mesolithic in date. These comprise two microlith fragments; one of which is of scalene triangle form and is a form typical to the later Mesolithic (Jacobi 1978, 16); the other is an obliquely blunted point with a straight back retouched along most of its length. Both microliths are missing their tips. A later Mesolithic flint truncated blade is also present amongst this group, the distal end of which has been trimmed across a snapped end. The machine watching generated two finds of Neolithic date; an awl and a knife. The awl has a structured point at the distal end of a flint flake. The flint knife is made on an irregularly shaped cortical flake which has deliberate scalar retouch running along one edge and has a natural cortex backing to the other, offering protection for its use as a knife.

A scraper fragment found during machining has marginal, yet steep retouch. It is too fragmentary to be able to attribute to any specific period on the basis of its typology. Other unstratified finds include fifteen blade-cores and one other core. The blade-cores can be grouped according to their forms. There are ten single-platform blade-cores; two cylindrical cores; three cores each struck from one platform and then turned through 90° and worked further using a flake removal as a platform; one possible core and a further possible core fragment of undetermined form. The rest of the finds comprise knapping debitage of all types.

DISCUSSION – 'Teardrop Site'

The assemblage from Trench 1 suggests the site was a core processing area dating to the later Mesolithic or early Neolithic periods. The cores were prepared here with nodules having cortex removed from them and then blades struck from them.

Trench 2 has produced tools typically of later Mesolithic age, including an obliquely blunted point with leading edge retouch. Such microliths have been identified by David at other Pembrokeshire sites, including the later Mesolithic site of The Nab Head Site II (David 2007, 138). The scraper and truncated blade also have parallels at The Nab Head Site II, as well as at other Pembrokeshire sites. The cores all fall within the size range typical of Welsh later Mesolithic or early Neolithic cores (Ibid, 164). This site only really differs from Trench 1 with the presence of three later Mesolithic finished tools and one undated utilised blade that might hint at some limited tool use as well as manufacture of tools at this location.

The assemblage found at Trench 3 has different characteristics to it than those in the assemblages from Trenches 1 and 2. The material is larger in size, generally more cortical and less refined. The pieces clearly display hard-hammer technology characteristics and the impression is that this is an early stage core processing area. Perhaps people prepared nodules here for more refined working elsewhere? The single finished, although damaged, tool found in Trench 3 is a later Mesolithic microlith.

The assemblage found at Trench 4 is similar in characteristics to that of Trench 3. Here again just one single dateable find was discovered, a sharpening flake from a core adze or axe. Traditionally core adzes/axes have been attributed to an early Mesolithic date, on the basis of the fact that all the adze/axes found in Pembrokeshire from sites have such contexts (David and Walker 2004, 323). However, Barton has argued differently suggesting that they could equally date to the later Mesolithic based upon evidence for manufacturing flakes for such tools found securely stratified in later Mesolithic layers from excavations at the Severn Estuary Levels site at Goldcliff, Monmouthshire (Barton 2007, 117). The three features excavated within Trench 4 have all generated knapping debitage, but no finished stone tools that can aid the dating of these contexts, although the dominance of blades might imply a later Mesolithic or early Neolithic age for these features.

The unstratified and machine watching finds all sit neatly within the later Mesolithic and early Neolithic time framework provided by the finds excavated from the trenches. The finished tools comprise two microlith forms and a truncated blade of typical later Mesolithic age and a Neolithic awl and knife. A scraper fragment might be of either date too, although is too fragmentary to be able to date more accurately on its typological characteristics.

CONCLUSIONS

The Robeston Wathen A40 bypass work has generated an interesting group of lithic artefacts. The assemblages are typical of flint-knapping and lithic processing sites, rather than of habitation or use localities. The bulk of the assemblage comprises knapping debitage with very few finished stone tools. Of the finished stone tools present, the majority are fragmentary; all but one of the microliths is missing its tips and one scraper is a fragment. As the bulk of the assemblage is unpatinated it is however, uncertain when this damage took place.

The location of the site in between the main River Cleddau and the Narberth Brook, a tributary that joins the Cleddau at Canaston Bridge, is a location that might well have been used during the later Mesolithic and early Neolithic periods.

It would be an ideal place for campsites that could be used as bases for hunting and fishing forays as well as being fertile for early agriculture. In some respects the location of the site mirrors that of some of the sites in Monmouthshire where valley locations were favoured for use as settlement and processing sites (Walker 2004, 50). It is curious, however, that the excavations along the route of the A40 bypass have not revealed more tools and the main settlement associated with this processing area, For it seems that we are dealing here with a knapping and processing site, rather than a camp where people made and used tools.

It is likely that the trenches uncovered a production site for blades, perhaps intended to be taken elsewhere for modification into finished tools. The fact that very few spalls and the finer component of a knapping assemblage associated with tool manufacture are missing from this site might also give support to this suggestion. Possibly the location of the site at a prime location where water transport is easily available makes transporting good local raw-materials or alternatively providing a routeway for raw materials and prepared cores to be taken to or from this location for processing. It has been suggested that people at this time would have found the river valleys to be much easier for movement than travelling by foot (Taylor 1980, 117). Therefore the river valleys and coast would have been the favoured locations for settlements. Evidence for this is also present in Pembrokeshire where the majority of the sites are either situated in valley locations or on coastlines (David 2007; Walker forthcoming).

The assemblage therefore appears to be a processing site located on a riverside location where there is easy transportation, easy access to a food resource and to good agricultural land.

REFERENCES

Andrefsky, W. Jr. 2005. *Lithics: macroscopic approaches to analysis.* Second edition. Cambridge, Cambridge University Press.

Barton, R.N.E. 2007. Goldcliff Lithic Artefacts. In M. Bell, *Prehistoric Coastal Communities: The Mesolithic in western Britain*, 103–124. York, Council for British Archaeology Research Report 149.

Butler, C. 2005. *Prehistoric Flintwork*. Stroud: Tempus Publishing Ltd.

David, A. 2007, *Palaeolithic and Mesolithic Settlement in Wales: with special reference to Dyfed*. Oxford: Hadrian Books Ltd. BAR British Series 448.

David, A. and Walker, E.A. 2004. Wales during the Mesolithic period. In A. Saville (ed.) *Mesolithic Scotland and its Neighbours*. Edinburgh: Society of Antiquaries of Scotland, 299–337.

Jacobi, R.M. 1978. The Mesolithic of Sussex. In P.L. Drewett, (ed.) *Archaeology in Sussex to AD 1500*. London: Council for British Archaeology Research Report 29, 15–22.

Odell, G.H. 2004. *Lithic Analysis*. New York: Kluwer Academic/Plenum Publishers.

Taylor, J.A. 1980. Environmental changes in Wales during the Holocene period. In J.A. Taylor (ed.), *Culture and Environment in Prehistoric Wales*. Oxford: British Archaeological Report British Series 76, 101–130.

Walker, E.A. 2004. The Mesolithic: the final hunter-gatherer-fisher societies of south-eastern Wales. In M. Aldhouse-Green and R. Howell (eds), *The Gwent County History Volume I: Gwent in Prehistory and Early History*. Cardiff: University of Wales Press, 29–55.

Walker, E.A. Forthcoming. The Palaeolithic and Mesolithic hunter-gatherers of Pembrokeshire in T. Kirk (ed.) The Pembrokeshire County History Volume I.

	RWBM09	RWTD09 - TEARDROP SITE					
	Burnt Mound	**Trench 1**	**Trench 2**	**Trench 3**	**Trench 4**	**Machine watching**	**Unstratified**
Microliths			1	1			2
Truncated blades			1				1
Mesolithic scrapers			1				
Adze/axe sharpening flakes					1		
Awls						1	
Neolithic knives						1	
Scraper fragments						1	
Utilized blades			1		1		
Utilized blades of chert				1			
Utilized blade fragments						1	
Blade-cores	1	4	4	3	4	12	3
Blade-cores of siliceous mudstone	1						
Other cores				1		1	
Core fragments		1	1			1	
Core rejuvenation blades			1	3	1	2	2
Core rejuvenation blades chert		1					
Core tablets				1			
Other Debitage (listed on Table 2)		20	39	54	77	30	43
Totals	2	26	49	64	84	50	51

Table 1 showing the tools, cores and general composition of the assemblages by site

	RWBM09	RWTD09 - TEARDROP SITES					
	Burnt Mound	Trench 1	Trench 2	Trench 3	Trench 4	Machine watching	Unstratified
Blades		1	8	6	16	11	9
Burnt blades			1		1		
Chert blades					1		
Cortical blades		2	4	3	10		
Burnt cortical blades		1			1		1
Chert cortical blades				1			
Blade fragments		4	6	3	10	4	6
Burnt blade fragments							1
Cortical blade fragments				3	2	1	
Flakes		5	8	18	13	4	15
Burnt flakes			2		2	2	
Chert flakes		2				1	
Cortical flakes		3	2	6	6	5	2
Burnt cortical flakes				1			
Chert cortical flakes				1			
Tuff flakes		1	1				
Flake fragments			1	4	5	1	5
Chert flake fragments				1			
Tuff flake fragments			1				
Cortical flake fragments				1			
Chert cortical flake frag				1			
General knapping debitage		1	5	2	4	1	
Burnt knapping debitage					5		
Spalls				2	1		4
Burnt spalls				1			
Totals		**20**	**39**	**54**	**77**	**30**	**43**

Table 2 showing the debitage components of the assemblage divided by site.

Catalogue of finds

(018) ***flint found at bottom of Canaston Field near Bridge***

- later Mesolithic or early Neolithic bladelet core made on a split water-rolled pebble of pale grey flint. The blades have caused a step fracture in the core and it has been discarded as it would not be possible to detach any further blades from this. Length = 32.0mm; Width= 24.3mm; Thickness= 10.7mm; Weight =7.5g
- Possible later Mesolithic or early Neolithic bladelet core made on a water-rolled cortical flint pebble of black flint. A flake has been detached from the top of the core and used as a striking platform from which bladelets have been detached. L = 27.8mm; W = 20.0mm; Th = 31.0mm; We = 20.8g
- ? Mesolithic or Neolithic core platform rejuvenation blade made of black flint. The artefact has traces of cortex at the distal end on the dorsal surface.
- Prehistoric flint flake of black flint. The flake has a hinge fracture.
- Prehistoric flint blade made of pale grey flint. The blade is an early removal from a core as it is very cortical.
- A large cortical flint flake of pale grey flint. The pebble surface is water-rolled. The ventral surface has a 90% coverage of cortex.
- A water-rolled, unworked flint pebble.
- Later Mesolithic or early Neolithic blade-core with a single-platform. Made on pale grey flint on a water-rolled pebble. Traces of cortex survive on one edge of the pebble.

L = 32.9mm; W = 33.5mm; Th = 33.2mm; We = 45.3g

- Later Mesolithic or early Neolithic blade-core with a single-platform. Made on pale grey flint and worked around the entire edge the core has been worked to exhaustion.

L = 24.5mm; W = 23.7mm; Th = 16.7mm; We = 8.8g

- Blade-core rejuvenation blade. Made on a pale grey flint the edge of the striking platform of the core has been detached with a blow struck to the side of the edge to refresh it.
- Blade fragment of a grey flint that is developing a white patination. The blade is thick and has split along its length.
- Distal end of a flint blade made on a honey coloured flint.
- Blade or flake fragment with a thermally fractured dorsal surface. The flint is pale grey in colour.
- Primary cortical flake of black flint with a water-rolled pebble cortex.
- Flake of pale grey flint with a pebble cortex through which there is one removal on the dorsal surface.
- 1 Blade of black unpatinated flint with traces of a pebble cortex
- at the distal end of the dorsal surface.
- 2 Blade of black unpatinated flint with traces of a pebble cortex
- along one side of the length of the dorsal surface.
- 3 Blade of black unpatinated flint with traces of cortex on the dorsal surface.
- 3 Blade of black unpatinated flint with traces of a pebble cortex
- at the distal end of the dorsal surface.
- 4 Flake of pale grey flint with a water-rolled pebble cortex on one edge and at the distal end of the flake.
- 5 later Mesolithic bladelet core made on a water-rolled pebble of grey flint. The piece has a single striking platform. L = 27.2mm; W = 18.3mm; Th = 11.4mm; We = 6.6g
- Cortical flint flake of pale grey water-rolled pebble flint. There is one thermal fracture on the dorsal surface.
- Fragment of a primary cortical flint flake made of water-rolled pebble black flint.
- 6 Possible later Mesolithic bladelet core made on a water-rolled cortical flint pebble of black flint. A flake has been detached from the top of the core and used as a striking platform from which bladelets have been detached. L = 30.3mm; W = 19.8mm; Th = 31.8mm; We = 22.2g
- 7 Scraper fragment. Made on a thick flake struck from a plain striking platform. The tool is broken along its length. The retouch is steep yet marginal and is only present at the distal end of the tool. L = 29.3mm; W = 25.0mm; Th = 12.6mm; We = 9.3g
- small burnt flint flake with some thermal fracturing on the ventral surface and damage from the fire at one edge.
- 10 Neolithic flint awl. A black unpatinated flint flake struck with a hard hammer from a plain striking platform shaped into an awl at its distal end. L = 38.0mm; W = 29.0mm; Th = 11.0mm; We = 9.1g

- 11 Cortical piece of general flint knapping debitage. Made on black unpatinated flint, three irregular removals suggest this may be a fragment of a flake. The cortex is indicative of pebble flint.
- 12 Cortical blade fragment. The blade has cortex surviving along both its lengths, although the central dorsal surface is clear. It is made of a mottled grey flint and the cortex is of pebble origin.
- Later Mesolithic or early Neolithic blade-core made on a water-rolled cortical small pebble of grey unpatinated flint. A flake has been detached from the top of the pebble and used as a platform for the removal of blades. L = 28.8mm; W = 37.1mm; Th = 27.5mm; We = 35.2g
- Later Mesolithic or early Neolithic blade-core made on a small water-rolled pebble of grey unpatinated flint. A flake has been detached from the top of the pebble and two areas of removals are apparent from this with a cortical area in between. L = 24.2mm; W = 30.3mm; Th = 29.0mm; We = 22.9g
- Later Mesolithic bladelet core made on a water-rolled pebble of pale grey, unpatinated flint. The core is of cylindrical form with removals top and bottom. A few of the removals have hinged slightly at their distal end but the core has more potential and is not exhausted. L = 24.3mm; W = 19.8mm; Th = 19.0mm; We = 11.0g
- Blade-core made on a water-rolled flint pebble of grey unpatinated flint. The core has the remains of a few deep blade removals from it struck from a platform that was a flake from the top of the core. L = 24.0mm; W = 24.5mm; Th = 20.7mm; We = 12.4g
- ?Blade-core fragment made on a small water-rolled pebble of yellowish-grey unpatinated flint. The piece has three removals from a platform prepared by removing a flake from the top of the pebble. L = 22.5mm; W = 22.8mm; Th = 15.8mm; We = 8.5g
- Exhausted bladelet core of black unpatinated flint. The cylindrical core retains a small amount of an original pebble surface. The piece has been struck from two platforms although there are only traces surviving of the second as the last blade removed has taken much of the platform away with it. L = 26.4mm; W = 14.7mm; Th = 10.6mm; We = 5.1g
- Exhausted bladelet core fragment. Bladelets have been struck down from a single-platform the edge of which retains traces of a pebble cortex. The flint is grey and unpatinated. L = 26.4mm; W = 33.8mm; Th = 12.5mm; We = 9.3g
- Possible core made on a yellowish-grey unpatinated piece of small water-rolled pebble flint. The core has been prepared as if to start to remove blades with a flake struck at the top and at the base, yet no blade removals have been taken from it. L = 26.0mm; W = 36.5mm; Th = 22.6mm; We = 28.1g
- Neolithic flint knife. Made on an irregular cortical flake of rough cortical flint of an unpatinated black colour. The retouched edge is straight and the retouch scalar in form but marginal. The cortex provides a natural backing to the tool. L = 36.1mm; W = 28.9mm; Th = 7.0mm; We = 6.2g
- Distal end of a utilised flint blade of a pale pink colour. The blade has very irregular very small areas of potential use damage to both its edges. L = 34.0mm; W = 14.1mm; Th = 3.3mm; We = 1.9g
- Primary cortical flint flake of water-rolled pebble flint of a creamy white colour.
- Primary chert flake struck from a water-rolled pebble. The chert is yellowish-black in colour and very granular in texture.
- Very cortical burnt flint flake. The piece has had previous flake removals from the dorsal surface but these are largely through the cortex. It has been struck with a hard hammer from a plain striking platform.
- Flint flake of black unpatinated flint. No cortex traces are present.
- Cortical mottled grey flint flake fragment. The proximal end is missing and the dorsal surface has remnants of a water-rolled pebble flint cortex surviving on it.
- Three pale grey, two black and one brown flint blades. Two of these show evidence for being removed with a hard hammer as they have very highly pronounced bulbs of percussion.
- Distal end of a yellowish-grey unpatinated flint blade with traces of a cortex surviving on the very edge of one of the lengths.
- Cortical black unpatinated small piece of general flint knapping debitage. The cortex is indicative of a water-rolled pebble.
- A natural orange-stained piece of gravel flint with evidence for mechanical fracturing. Near posthole (019)
- Primary flint flake of pale grey unpatinated flint struck from a very water-rolled pebble.

RWBM 09 Cleaning

- Possible exhausted stone core of a purple coloured fine-grained silicified mudstone. If a core it has cortex surviving at both ends which should be the position of the striking platforms. L = 25.2mm; W = 15.5mm; Th = 8.2mm; We = 3.8g

RWBM 09 Machine watching

- Later Mesolithic or early Neolithic cylindrical blade-core made on a water-rolled pebble of mottled grey flint. The platforms are opposite each other and are from flakes struck off each end. The core has been used from both ends. But has some possible more recent damage to it at both ends, possibly caused by the machining.

  L = 30.3mm; W = 27.2mm; Th = 16.4mm; We = 17.0g

RWTD09 Unstrat.

- Later Mesolithic microlith fragment. A microlith of scalene triangle form missing its tip. The tool is made of unpatinated pale grey flint and has steep retouch forming an angle for hafting. There is very marginal shallow retouch on the straight edge too. L = 13.0mm; W = 4.8mm; Th = 2.8mm; We = 0.2g
- Later Mesolithic microlith missing its tip. Of obliquely blunted form it has a straight back which is retouched along most, but not its entire length. The tip is missing. The opposite length is unmodified. It is made of unpatinated pale grey flint. L = 21.0mm; W = 7.3mm; Th = 3.2mm; We = 0.5g
- Later Mesolithic flint truncated blade. Made of mottled grey unpatinated flint. The distal end of the blade has been trimmed across a snapped end. L = 25.7mm; W = 13.0mm; Th = 5.9mm; We = 1.8g
- Later Mesolithic or early Neolithic blade-core. Made on a water-rolled cortical pebble of pale grey unpatinated flint. The core has some iron staining on it particularly on its flake scars. A flake has been detached from the top of the core and used as a striking platform. L = 38.4mm; W = 30.0mm; Th = 23.1mm; We = 32.2g
- Later Mesolithic or early Neolithic cylindrical blade-core that has been turned through 90° and struck from this platform. The core has been made on an older white patinated tool and traces of the older patination survive just on one edge. The flint itself is pale grey, unpatinated. L = 30.3mm; W = 31.2mm; Th = 20.2mm; We = 22.4g
- Later Mesolithic or early Neolithic blade-core. Made on a water-rolled cortical flint pebble of grey unpatinated flint. The core has two striking platforms that are at right angles to each other. Both have had a small number of removals taken from them. L = 24.5mm; W = 28.7mm; Th = 15.8mm; We = 11.4g
- Later Mesolithic or early Neolithic blade-core. Made on a water-rolled flint pebble of yellowish- brown unpatinated flint. The core has two striking platforms that are at right angles to each other. Both have had a small number of removals taken from them. There is just a small area of cortex on the core. L = 25.0mm; W = 25.3mm; Th = 15.3mm; We = 11.8g
- Later Mesolithic or early Neolithic burnt flint core rejuvenation blade. The flake has been struck from the base of the core to rectify the angle of the striking platform.
- Later Mesolithic or early Neolithic flint core rejuvenation blade. Made of grey unpatinated flint there are traces of cortex on the dorsal surface.
- Two flint blades of yellowish white colour with orange iron stain spots, one has traces of cortex around its edge.
- Three pale grey unpatinated flint blades.
- One brown flint unpatinated blade with a cortical edge.
- Three unpatinated mottled black flint blades with cortex on the dorsal surface and edge.
- Cortical burnt flint blade.
- Proximal ends of two creamy white flint blades.
- Proximal ends of three grey unpatinated flint blades.
- Distal end of a grey unpatinated flint blade.
- Burnt flint blade fragment.
- Two primary cortical flint flakes, one of creamy white and the other of brown unpatinated flint.
- Seven unpatinated grey flint flakes, all but one with traces of cortex
- One white unpatinated flint flake
- Four pale grey unpatinated flint flakes each with some.
- Two black unpatinated flint flakes both with some cortex on.
- Burnt non-cortical flint flake.
- One grey and three pale grey flake fragments all with traces of cortex on.
- One non-cortical pinkish white, probably lightly burned flake fragment.
- Four small black unpatinated flint spalls.

RWTD09 Trench 1 Test Pit 1

- Proximal end of a brown flint blade developing a white patination.
- Grey unpatinated flint flake with a small area of cortex on one edge.
- Pale grey unpatinated flint flake with traces of a water-rolled cortical pebble surface on the dorsal surface towards its distal end.

- Proximal end of a black chert flake.
- Natural water-rolled and unstruck flint pebble.

RWTD09 Trench 1 (B)

- Later Mesolithic or early Neolithic single-platform blade-core. Made on a water-rolled unpatinated cortical grey flint pebble from which a flake has been struck to create the striking platform. L = 27.7mm; W = 32.9mm; Th = 28.1mm; We = 29.1g
- Water-rolled and cortical piece of pale grey unpatinated flint possibly a core fragment or general piece of knapping debitage.
- A flake of grey unpatinated flint struck from a water-rolled cortical flint pebble that has traces of cortex surviving around much of its edge.
- A burnt primary cortical flint blade of flint with a water rolled cortex.
- A creamy white flint blade with a water-rolled smooth cortical pebble surface covering most, but not all of, its dorsal surface.
- An irregular, lightly burnt piece of general flint knapping debitage.
- A creamy white, naturally thermally fracture piece of cortical flint.
- An irregular natural stone.

RWTD09 Trench 1 (C)

- Later Mesolithic or early Neolithic flint blade-core. Made on a small black chalk pebble flint that has a water-rolled cortical surface. A flake has been detached from the top of the core and then it has been struck down from that platform. Several of the removals have hinged close to the platform probably causing it to be abandoned. L = 26.8mm; W = 31.0mm; Th = 17.2mm; We = 15.5g
- Later Mesolithic or early Neolithic flint blade-core. Made on a piece of grey pebble flint that has a water-rolled cortical surface. A flake has been detached from the top of the core and then it has been struck down from that platform. A small crystalline fossil area within the flint has been exposed. L = 25.4mm; W = 23.9mm; Th = 20.4mm; We = 13.2g
- Primary cortical flint blade of grey unpatinated flint.
- A grey flint blade with a speckled white patination developing over it. All evidence for cortex has been removed.
- Three proximal ends of grey flint blade. One has a speckled white patination developing over it.

RWTD09 Trench 1 (C)

- Three primary cortical flint flakes of black unpatinated flint. All have a water-rolled cortex. One has two small thermal flake removals on its ventral surface.
- An irregular flint flake of black unpatinated flint without traces of cortex surviving on it.
- A grey flint flake with a fairly cortical dorsal surface. Unpatinated.
- A stone flake made of volcanic tuff with traces of a pebble surface on it.
- A honey coloured flake of volcanic tuff with evidence for its pebble surface on its dorsal face.

RWTD09 Trench 1 (D)

- Later Mesolithic or early Neolithic chert single-platform blade core. Made on a water-rolled chert pebble that has had a flake removed from the top and had blades detached down from this platform. The chert is a grey colour with some iron stain spots on it. L = 39.0mm; W = 35.5mm; Th = 25.3mm; We = 40.2g
- A long honey coloured chert core rejuvenation blade.

RWTD09 Trench 2 2001 c

- Later Mesolithic flint microlith of obliquely blunted form. The tool has straight backing along the right hand length and leading edge retouch at the tip on the left hand edge. There is a transverse fracture on the ventral surface similar to that found on a microburin, which suggests that the proximal end was snapped off, although there is also some evidence for core preparation on the dorsal surface here. L = 21.3mm; W = 6.3mm; Th = 2.8mm; We = 0.4g
- Pale grey unpatinated flint blade
- Yellowish-grey unpatinated flint blade with traces of cortex towards the distal end.
- Mottled grey flint core rejuvenation blade.
- Cylindrical blade-core of pale grey flint. The tool has iron staining on its flake scars. The core has been struck from both ends, although one end has a less clearly defined striking platform than the other. The core has some evidence for edge damage and crushing to it. L = 45.6mm; W = 26.5mm; Th = 24.8mm; We = 29.7g

RWTD09 Trench 2 Cleaning (2001)

- Later Mesolithic flint scraper. Made on a cortical flake there is marginal steep retouch at the distal end. The retouch forms a point. The flint is white and the water-rolled cortical pebble. L = 26.4mm; W = 18.7mm; Th = 8.8mm; We = 4.3g

- Core fragment. A fragment of a blade that on detachment has removed a thick area of the striking platform of a core. The edge of this has core preparation work on it and the blade has been struck at a diagonal angle. The material is a lightly burned flint with an edge of cortex surviving. L = 18.7mm; W = 27.9mm; Th = 10.2mm; We = 3.3g
- Blade of grey unpatinated flint with much of its dorsal surface covered with cortex.
- Black unpatinated flint blade struck from an older white patinated flint.
- Pale grey flint blade unpatinated flint with cortex at both proximal and distal ends.
- Thick burnt flint blade struck from a cylindrical core. The blade is missing its proximal end.
- Proximal end of a black unpatinated flint blade.
- One proximal and one distal ends of pale grey unpatinated flint blades.
- Primary cortical flint blade of grey unpatinated flint.
- Large thick flint flake of pale grey unpatinated flint. The dorsal surface is heavily cortical and there is a break at the distal end.
- Five small flint flakes. Two are creamy white, one is pale grey with some cortex at the proximal end, one is mottled dark grey with an edge of cortex to it. One flake is heavily burnt.
- Two pieces of general flint knapping debitage. One is black and unpatinated, the other dark grey and unpatinated.
- One natural piece of quartz.

RWTD09 Trench 2 (2001 W. end)

- Later Mesolithic truncated blade. The truncation is on the distal end of a cortical blade. It has been deliberately steeply retouched, although the retouch is shallow. The cortex is water-rolled and the blade is a grey unpatinated colour with a tinge of pink suggesting it may have been lightly burned. L = 20.6mm; W = 13.6mm; Th = 4.4mm; We = 1.4g
- Utilised flint blade. A dark grey unpatinated flint blade with an irregular series of serrations along part of one edge typical of its having been used. L = 31.5mm; W = 9.8mm; Th = 3.0mm; We = 1.0g
- Grey unpatinated flint bladelet.
- Distal end of a black unpatinated flint bladelet.
- Cortical flint blade of unpatinated black flint.
- Cortical flint blade of grey unpatinated flint.
- Stone flake fragment made of volcanic tuff.
- Burnt flint flake with a cortical edge on one side.
- A creamy white piece of general flint knapping debitage with a water-rolled cortex covering and some iron staining on flake scars.
- A black piece of general flint knapping debitage with remnants of a water-rolled cortex. The flint is black and unpatinated.

RWTD09 Trench 2 2002 (B)

- Proximal end of a dark grey unpatinated large flint blade. The distal end has been snapped off.
- Flake fragment of pale grey unpatinated flint.

RWTD09 Trench 2 2002 East end

- Later Mesolithic bladelet core on a cortical water-rolled flint
- pebble of pale grey flint. The core has had a flake removed to create a platform. This has been used to remove a series of bladelets. The core has also been turned through 90^{o} and worked from a cortical platform. L = 31.8mm; W = 29.2mm; Th = 25.5mm; We = 13.9g
- A thick flake of water-rolled pebble flint with a banded and mottled appearance. The flake is thick and seems to have been struck to clear a core striking platform. The dorsal surface showing several removals all struck from the same platform.
- A large stone flake made of possible volcanic tuff with a cortical edge running around the edges of the dorsal surface.
- Two bladelets of pale grey unpatinated flint with cortical surfaces of water-rolled pebbles on the dorsal surface.
- Distal end of a dark grey unpatinated flint blade. There is an edge of cortex of a water-rolled surface along one edge.
- Flake of a pale grey unpatinated flint with a water-rolled cortical surface through which one earlier flake removal is evident.
- Burnt piece of grey general flint knapping debitage.

RWTD09 Trench 2 (2002) (below cleaning)

- Later Mesolithic or early Neolithic cylindrical blade-core of dark grey unpatinated flint made on a water-rolled cortical pebble. The core has two platforms at both ends but the bladelets have all hinged on hitting an area of cortex on one face. Attempts to remove this cortex appear to

have failed and the core was abandoned. L = 30.0mm; W = 29.1mm; Th = 17.8mm; We = 16.2g

- Later Mesolithic small bladelet core. The core is made of dark grey unpatinated flint and has been struck from a single striking platform. There is an edge of cortex to the core, but the cortex has mostly been removed. L = 29.8mm; W = 20.5mm; Th = 15.5mm; We = 8.8g
- Primary cortical flake of pale grey unpatinated flint.
- Primary cortical blade of pale grey unpatinated flint.
- Large flint flake of lightly burnt flint of pink hue developing a white patination. The flake has been hard-hammer struck from a plain striking platform.

RWTD09 Trench 3 3001 West end

- Later Mesolithic flint microlith. Made on a pale grey unpatinated flint blade. The retouch is along a straight end and is steep. There is some leading edge retouch towards one end. The tips are snapped close to their terminations at both ends. L = 22.6mm; W = 3.9mm; Th = 2.1mm; We = 0.2g
- Blade of dark grey mottled flint. Stuck from a plain platform with a hard hammer the blade has a very pronounced bulb of percussion. The flint is unpatinated.

RWTD09 Trench 3 3001 West end cleaning

- Distal end of a flint blade with a cortical pebble surface of pale grey unpatinated flint.
- Distal end of a white unpatinated flint blade.

RWTD09 Trench 3 3001 West end

- Core tablet of grey unpatinated flint. The striking platform of a blade-core has been detached to create a new striking platform. The edge of the original striking platform has traces of cortex wound it. And core preparation scars are evident on the struck edge.
- Proximal end of a cortical flint blade fragment of grey unpatinated flint.
- Primary cortical flint flake of pale grey unpatinated flint.
- Cortical flint flake with a water-rolled pebble surface and evidence for the removal of an earlier flake from the dorsal surface. The flint is black and unpatinated and the cortex is a typical chalk nodule.

RWTD09 Trench 3 3001 east end

- Proximal end of a chert utilised blade. The blade has been made on a pale grey chert struck from a plain striking platform. One edge is naturally backed where a previous blade removals has formed an edge to the blade. The other length has evidence for very marginal, irregular fine chipping along it, typical of its having been used as a knife or other cutting tool. L = 27.7mm; W = 22.2mm; Th = 7.5mm; We = 4.6g
- Later Mesolithic or early Neolithic blade-core made on a water-rolled flint pebble of a pinkish grey coloured unpatinated flint. The core has been struck from a single striking platform created y removing one flake from the top of the core. L = 23.5mm; W = 29.5mm; Th = 23.8mm; We = 21.2g
- Abandoned flint core made on a poor quality, internally fractured grey flint developing a mottled white patination. The pebble has a cortical pebble surface and evidence for a flake detached to create a striking platform, however, the core is internally flawed and on being struck has split leaving an irregular face. L = 38.7mm; W = 42.0mm; Th = 21.5mm; We = 33.6g
- Core rejuvenation flake struck from the upper edge of a blade-core. The flint is dark grey and is thick at the platform edge. There are traces of cortex on one side of the flake.
- A cortical flake from a water-rolled pebble of dark grey unpatinated flint.
- Pale grey unpatinated thick flint blade with cortex at the base and around the side. Struck from a plain striking platform.
- Irregularly shaped cortical pale grey unpatinated flint blade.
- Distal ends of two black unpatinated flint bladelets.
- Distal end of a yellow chert cortical blade.
- Distal end of a black unpatinated flint cortical blade.
- Primary lightly burned cortical flake of a pinkish grey unpatinated flint flake possibly thermally fractured.
- Primary pale grey unpatinated cortical flint blade.
- Primary pale grey unpatinated cortical flint flake
- Primary grey cortical chert flake
- Large flint flake of mottled flint. Struck with a hard hammer from a plain striking platform there are traces of a cortical edge running around the flake.
- One black two pale grey and one pinkish grey unpatinated flint flakes each with some cortex on the edges.
- Pale grey unpatinated flint flake fragment. Struck with a hard hammer from a plain striking platform. Half the dorsal surface is covered with a water-rolled cortex.

- Small pinkish grey unpatinated flint flake fragment.
- Two pale grey unpatinated flint spalls.
- One burnt or thermally fractured black flint spall.
- A small piece of general flint knapping debitage of black flint made on a previously burned piece of flint of pinkish cortex.
- Possible natural piece of stone.

RWTD09 Trench 3 3002 S.V.

- Later Mesolithic or early Neolithic flint pebble core with a single striking platform created by the removal of a flake from the top of the core. The pebble is water-rolled and of pale grey unpatinated flint.
- L = 34.0mm; W = 28.7mm; Th = 20.2mm; We = 19.7g
- Cortical flint blade of pale grey unpatinated flint. The dorsal surface has a ridge of cortex running its length and cortex is present at both ends.
- Yellowish grey colour cortical chert blade.
- Distal end of a blade of black unpatinated flint with cortex on one edge.
- Distal end of a cortical black flint blade.
- Three pale grey, one yellowish grey and one black flint flake all unpatinated.
- Yellowish grey chert flake fragment.
- Irregular lump of general flint knapping debitage of pale grey unpatinated flint. The pebble has traces of cortex on one edge.
- Piece of green industrial manufacturing waste.

RWTD09 Trench 3 3002 (BS)

- Dark grey unpatinated blade with an orange gravel stained water-rolled pebble cortex.
- Black unpatinated bladelet with a white cortex surviving on one edge of the blade.

RWTD09 Trench 3 3002 W

- Flint flake of pale grey unpatinated flint. The flake is struck from a plain striking platform and has a ring of cortex around its edge.
- Flint flake of pale grey flint developing a white patination. The flake has been hard hammer struck and has had some internal fracturing as can be seen by a central bulb of percussion on the dorsal surface.
- Primary cortical flint flake of pale grey unpatinated flint.
- Small irregular flint flake of grey unpatinated flint.
- Natural piece of heavily weathered limestone.
- Green vitreous material – industrial waste.

RWTD09 Trench 3 3002 (west)

- One pale grey, two dark grey and one yellowish-brown flint flakes all with cortex traces on their surfaces.
- Brown unpatinated flint flake fragment.

RWTD09 Trench 3 3002 (BS)

- Black unpatinated flint blade-core rejuvenation blade.
- Pale grey unpatinated flint core rejuvenation blade. The piece has traces of cortex at its proximal end.

RWTD09 Trench 3 3002 S.V.

- Pale grey thin flint flake fragment. The distal end is snapped off.

RWTD09 Trench 3 3002 E½

- Large grey unpatinated flint flake. Struck with a hard hammer from a core with a plain striking platform. The flake has a central ridge from which blows have been struck – it is possible that this was a core. L = 58.5mm; W = 47.0mm; Th = 21.0mm; We = 44.8g
- Burnt primary cortical flint flake.
- One natural piece of stone and a thermally fractured piece of natural stone.

RWTD09 Trench 3 3002 Below cleaning west end.

- Later Mesolithic or early Neolithic flint blade-core. Made of black flint developing a white speckled patination. The core is struck all around its one striking platform. Traces of a white cortex survive at the base.
- L = 30.1mm; W = 20.3mm; Th = 17.1mm; We = 13.5g
- Cortical flint flake fragment. Made of pinkish grey unpatinated flint it has been broken along its length.

RWTD09 Trench 4 4001 Cleaning (E)

- Later Mesolithic or early Neolithic flint cylindrical bladelet core. Made on a water-rolled pebble of pale grey unpatinated flint. The core has been struck from two platforms, one of which has been removed with a mis-directed blow. The remaining platform has been extensively used.
- L = 20.7mm; W = 18.5mm; Th = 12.7mm; We = 5.3g
- Later Mesolithic or early Neolithic flint blade of black unpatinated flint. Struck with a hard hammer. No cortex on this blade.
- Honey colour unpatinated flint blade with traces of cortex on its dorsal surface.
- Light grey unpatinated flint blade on an irregular cortical flint. This may be sideways struck core rejuvenation blade.
- Proximal end of an unpatinated dark grey, mottled flint blade with a line of cortex running along one length of the blade.
- Grey flint flake developing a mottled white patination. The flake is struck from a plain striking platform and there are traces of a water-rolled pebble cortex surviving on both sides of the flake.
- A thick grey flint flake with a mottled patination. The flake has been struck from an internally fractured flint as it has not broken cleanly and there are traces of previous partial removals from this face. The pebble is cortical and water-rolled.
- A mesial fragment of a heavily burnt broad flint blade.
- A general piece of flint knapping debitage made on a pebble of black unpatinated flint.

RWTD09 Trench 4 4002 (A)

- Possible flake fragment from the edge of a core made of pale grey unpatinated flint.
- Primary cortical flint blade made on a pale grey unpatinated flint with a water-rolled pebble surface.
- Two pale grey, one dark grey and one yellowish brown cortical unpatinated flint blades.
- A heavily white patinated flint blade
- Distal end of a pale grey unpatinated flint blade with a cortical surface. The break is recent.
- Distal end of an irregularly shaped pale grey unpatinated flint blade with a cortical edge to it.
- Distal end of a black blade with a developing mottled white patination and some minor traces of cortex on its end.
- Pale grey unpatinated flint flake with a cortical edge to it.
- A small irregular black unpatinated flint flake.
- A pale grey unpatinated flint piece of irregular knapping debitage.

RWTD09 Trench 4 4002 (A) (North) SV

- Black unpatinated primary cortical flint blade.
- Grey chert blade with no evidence for cortex.
- Three pale grey and one dark grey unpatinated flint flakes all with traces of cortex on their edges.
- Two burned flint flakes, one with a pink tinge from light burning and the other is more heavily crazed across its surface.
- Two burnt pieces of general flint knapping debitage.

RWTD09 Trench 4 4002 (AN)

- One black and one dark grey unpatinated flint flakes both with `heavy cortical dorsal surfaces.
- Creamy white patinated flake with no traces of cortex surviving.
- One pale grey unpatinated flint flake fragment struck so hard it is almost a half cone of percussion with a highly exaggerated curve to its back.
- A pale grey flake fragment with a small area of cortex on its dorsal surface.
- Pale grey unpatinated flint blade with small traces of cortex on its proximal end.
- A small heavily burnt irregularly shaped flint blade.
- Distal end of a pale grey unpatinated flint bladelet.

RWTD09 Trench 4 4002 (B)

- A grey unpatinated flint blade with a cortical pebble surface
- surviving over much of the dorsal surface.

RWTD09 Trench 4 4002 (BS)

- A black unpatinated flint flake with a white chalk cortex surviving on one edge.
- A pale grey unpatinated flint flake with a cortical covering over ¾ of the dorsal surface.

- A heavily patinated white flint flake with a water-rolled pebble surface evident over much of the dorsal surface.

RWTD09 Trench 4 4002 (E)

- Later Mesolithic or early Neolithic exhausted flint blade-core made on a water-rolled pebble of black unpatinated flint. The core has been worked as thin as it could be all removals struck from a single striking platform. L = 29.6mm; W = 29.7mm; Th = 9.8mm; We = 10.2g
- Utilised flint blade of possible later Mesolithic or Neolithic date. The blade is made on a piece of pinkish grey flint that has some speckles of a white patination on its ventral surface. The blade has a natural back of cortex along one length and the other has the very marginal and irregular chipping typical of use. The blade is struck with a hard hammer from a plain striking platform. L = 43.6mm; W = 20.5mm; Th = 4.6mm; We = 5.8g
- Tapering thin blade of grey unpatinated flint with no remnants of cortex on it.
- Primary cortical flake of black unpatinated flint.
- Proximal end of a black unpatinated flint blade. The blade has traces of cortex along both the edges of its lengths.

RWTD09 Trench 4 4002 (c)

- Later Mesolithic or early Neolithic flint blade-core struck from a single striking platform prepared from a flake detached from the top of the core. The core is made on a water-rolled cortical pebble of pale grey unpatinated flint. L = 31.8mm; W = 22.8mm; Th = 21.7mm; We = 18.3g

RWTD09 Trench 4 4002 (DN)

- Later Mesolithic or early Neolithic core made on a small cortical water-rolled flint pebble of grey flint. The core has been struck from two directions at right angles to one another. L = 17.0mm; W = 21.1mm; Th = 20.5mm; We = 6.2g
- Grey flint blade with a few speckles of a white patination on the ventral surface. The piece has had all traces of cortex removed. It is struck from a plain striking platform.
- Light grey unpatinated flint blade the distal tip is missing. The piece has had all traces of cortex removed.
- Pale grey unpatinated cortical flint flake.
- Piece of black unpatinated general flint knapping debitage.
- Natural stone.

RWTD09 Trench 4 4002 (DS)

- Core rejuvenation flake struck from a blade-core of grey unpatinated flint. The flake has been struck from an angle to clear the top striking platform of the core. There are traces of a water-rolled pebble cortex on the flake.
- Two fine thin blades of pale grey unpatinated flint. These blades have been carefully prepared and have no traces of cortex remaining on them.
- Tranchet flake possibly struck as a sharpening flake for a Mesolithic flint adze/axe? The flake is cortical on one edge, but the flint from which it has been struck has been carefully flaked, suggesting that this might have been an adze or axe. The flake has been detached from the side and has the twisted tranchet appearance typical of such flakes. It is made on pale grey unpatinated flint and has a water-rolled pebble cortex on one edge. L = 49.5mm; W = 21.8mm; Th = 20.2mm; We = 21.4g
- A large irregular flint flake made on a cortical pebble of pale grey unpatinated flint.
- Natural orange-stained water-rolled flint pebble.

RWTD09 Trench 4 4004

- Pale grey unpatinated flint flake.

RWTD09 Trench 4 4006

- Fine flint blade fragment missing its proximal end. The blade is made of grey flint developing a white patination. There are traces of cortex at the distal end.

RWTD09 Trench 4 4008

- Three primary cortical flint blades each made on a water-rolled flint pebble. Two are of pale grey unpatinated flint and the other has a creamy white patination.
- Burnt cortical flint blade with a pink surface.
- Cortical grey flint blade fragment. The blade is split along its length about half of its dorsal surface has a cortex covering. The flint is unpatinated.
- Black flint blade fragment. There are traces of cortex on the dorsal surface and the flint is unpatinated. The end an part of one side of the blade are missing.
- Blade of yellowish-grey unpatinated flint. The blade has a cortical edge to it.
- Pale grey unpatinated flint flake

- Black flint flake fragment with a few speckles of a white patina on it s surfaces. There are traces of a water-rolled pebble cortex on the dorsal surface. The surface has a crazed, fractured appearance, yet it has not broken along any of these fracture lines.
- Flint flake fragment of grey unpatinated flint.
- Spall of pale grey unpatinated flint.
- Piece of pale grey unpatinated flint general knapping debitage.
- Three pieces of burnt, crazed and heat-fractured general knapping debitage.

RWTD09 Trench 4 Unstratified

- One dark grey, two grey and two pale grey unpatinated flint blades.
- One white patinated small flint blade
- One pale grey unpatinated flint blade fragment.

APPENDIX FOUR

EVALUATION OF ARCHAEOMETALLURGICAL RESIDUES FROM ROBESTON WATHEN, PEMBROKESHIRE

Dr T.P. Young

ABSTRACT

This small collection of material was dominated by specimens of tapped bloomery iron smelting slag. The pieces were mainly indicative of small flows, although a few pieces were from thicker accumulations of flowed material, with charcoal moulds and chaotic textures, suggestive of deposition within the furnace or its tapping arch. A substantial proportion of the iron slag was not identifiable, but much of this may too have been tapped smelting slag, but examples lacking the characteristic surface features. One piece of tapslag contained a substantial piece of unreacted ore, but this was not identifiable in a hand specimen.

The collection included a small piece of fuel ash slag of uncertain origin (not necessarily metallurgical), some pale vitrified ceramic and two pieces of coal (possibly from steam-powered agricultural machinery, associated with later plough activity). Dense tapped slags are unlikely, in this area, to be earlier than Roman and might be as young as medieval, but are not in themselves indicative of a more precise age.

METHODS

All investigated materials were examined visually, using a low-powered binocular microscope where necessary. For microscopic residues a general statement of the nature of each assemblage was recorded (Table 1). As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

RESULTS

Iron-smelting slags

The most abundant components of the assemblage were pieces of tapped iron-smelting slags from a bloomery furnace. These were mainly fairly small fragments from thin flows, but there were a few more substantial pieces.

One 326g block showed a dimpled base overlain by slags in small amalgamated prills which penetrated between moderately large (25mm) fragments of charcoal (now represented by striated-faced moulds). This part of the block gave the appearance of a rather chaotic texture and it is possible that the prilly accumulation had flowed slightly and become disrupted. The block was topped by a series of dense flows of tapslag-like material. It is likely that this block formed either in the base of the furnace or within its tapping arch in order to have acquired both furnace slag-like and tapslag-like features.

One block of tapslag showed a substantial (c.20mm) clast of unreacted (although roasted and cracked) ore. The fragmentation of the ore by cracking (probably during the dehydration of goethite to haematite) has rendered the original texture unrecognisable in hand specimen.

Another larger tapslag fragment contained numerous angular clasts of pale reduced-fired clay. These showed no sign of reaction with the enclosing slag, so are probably fragments of furnace, floor, or tap-arch blocking picked up by the tapslag flow as it exited the furnace.

Indeterminate iron slags

A significant proportion of the iron slags were unidentifiable. Many of these may have been tapped bloomery slags, but lacked the characteristic surface features. Others were slags with a well developed basal crust that were possibly furnace slags. There were no pieces that were certainly from smithing rather than smelting.

Miscellaneous residues

A single fragment of low density fuel ash slag was of uncertain origin. Fuel ash slags may be generated during metallurgical process, but many are not (for instance the fuel ash slags from the corn driers at South Hook; Young 2010b). Very similar slags (clinkers) can also be produced during the burning of coal (for instance in steam engines), but the present example doesn't show the usual characteristics of coal clinker.

A tiny fragment of oxidised fired and vitrified ceramic is very likely to be a piece of furnace material associated with the iron slags. A fragment of vitrified pale ceramic may also be furnace material, but might alternatively be associated with the fuel ash slag.

INTERPRETATION

The iron slags are indicative of iron-smelting in a slag tapping furnace. The ore being smelted remains unknown and various sources seem to have been exploited in Pembrokeshire (Young 2010a, c).

Slag tapping furnaces were introduced into the Bristol Channel Orefield probably late in the pre-Roman Iron Age. They were used in various forms until the early post-medieval period. The present material most closely resembles slag from a fairly small furnace and the most likely date range is Roman to earlier medieval.

EVALUATION OF POTENTIAL

The presence of bloomery iron smelting in this part of SW Wales was not previously known and therefore this occurrence has significant potential and is worthy of further investigation, even if the assemblage is dominantly residual.

The slags appear well-preserved (thus permitting further meaningful analysis) and with one of the specimens bearing an ore clast there is scope for detailed analysis of both the slag and ore. This would clarify the source of the ore being smelted.

Chemical analytical and microstructural investigations on two tapslag specimens and the ore fragment are therefore recommended.

REFERENCES

Young, T.P. 2010a. Archaeometallurgical residues from the South Hook LNG Terminal. *GeoArch Report 2010/03*, pp.

Young, T.P. 2010b. Fuel ash slags from corn-drying kilns, South Hook LNG Terminal. *GeoArch Report 2010/04*, 24 pp.

Young, T.P. 2010c. Analysis of archaeometallurgical residues from Brownslade, Pembrokeshire [NPRN 94225]. *GeoArch Report 2010/07*, 23 pp.

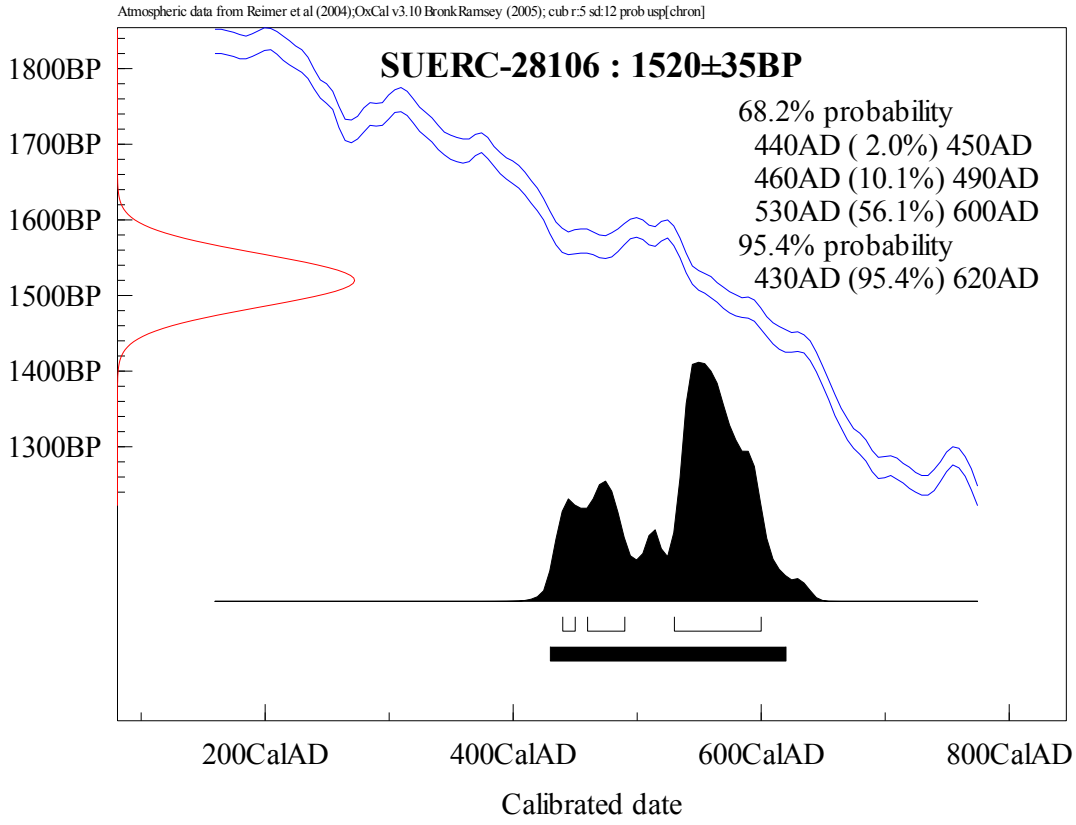
			weight (g)	no.	notes
TR1	TP1		340	24	tap slag fragments in small pieces
			3.3	1	weathered boxstone-like concretion fragment - doesn't appear particularly iron rich
			4.9	1	fuel ash slag fragment. Has smooth maroon upper surface, highly vesicular, variably white crystalline and black glassy
			5.9	1	pale ceramic with occasional large quartz grains, surface irregular and vitrified with black glass
			8.8	1	natural stone
			188	11	fragments of dense iron slag, variably vesicular. None shows characteristic textures of tap slag- they all could be, but lack appropriate preserved surfaces
TR1	(B)		13.5	1	naturally fractured flint
			416	21	tap slag fragments, mostly small, one larger fragment shows a clast of roasted ore of c20mm diameter
			190	3	larger slag blocks, all with a basal crust, with rather granular slag adhering - could be furnace slags but strictly indeterminate
			90	8	indeterminate vesicular iron slag fragments
			80	1	block with lobate base but rather irregular chaotic upper parts - rather similar to block from (018) but without definite dense tapslag top. Contains lots of small angular fragments of pale reduced fired clay
			8	1	dense dimpled slag surround part of a 25mm diameter cavity - possibly slag coating from a tool.
			2.7	1	coal
TR1	(C)		10.8	1	small tap slag fragment, dense
			13.3	1	flow lobed slag, probably tapped, porous, possibly etched but originally very vesicular, fayalitic and cindery
TR1	(D)		30	1	tap slag - small piece from flow c20mm thick
TR3	3001	e. end	26.1	2	rottenstone
			1.3	1	coal
			0.6	1	oxidised fired clay with vitrified surface
			2.8	1	natural rock
TR3	3002	w. end	22.3	1	piece of grey vesicular slag with dimpled base, probably lobate, top lost but shows large rounded vesicle suggestive of tap slag
	18	8	326	1	large block of slag with flow lobed dense upper part, lower part more chaotic with small lobes and moulds of c25mm charcoal, base dimpled, suggests tapped slag flow of c55mm thick

APPENDIX FIVE

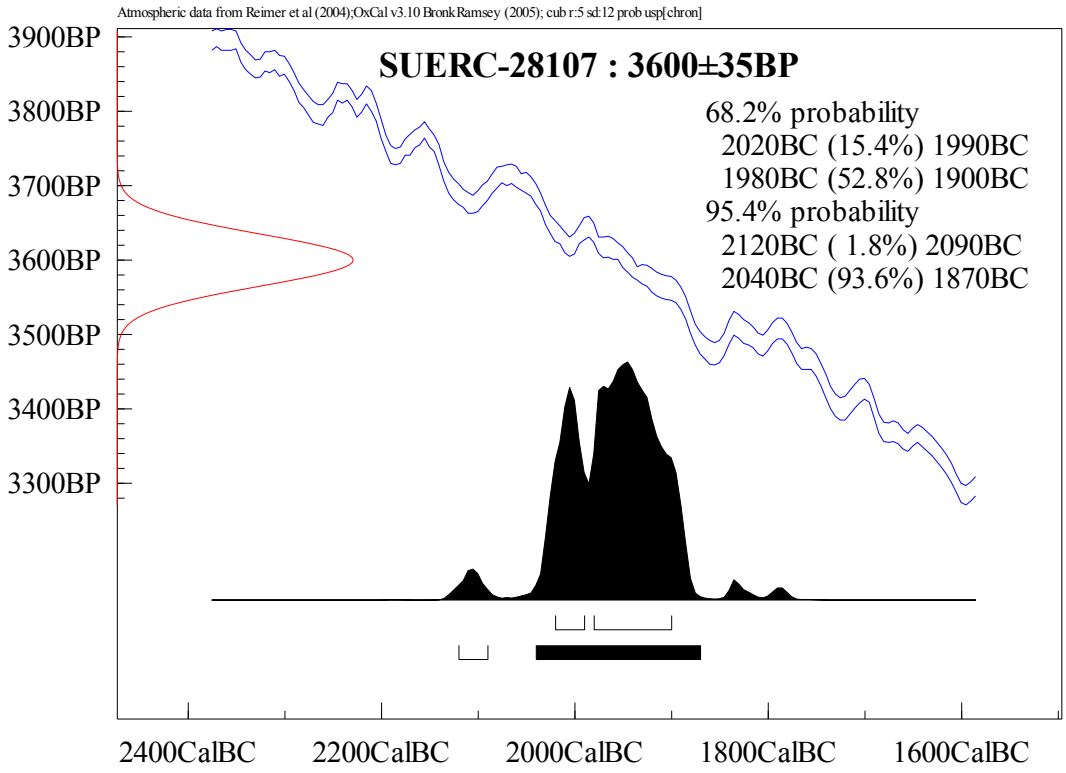
CARBON DATING SAMPLE CALIBRATION PLOTS

Samples were measured at the Scottish Universities Environmental Research Centre AMS Facility (SUERC). The ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

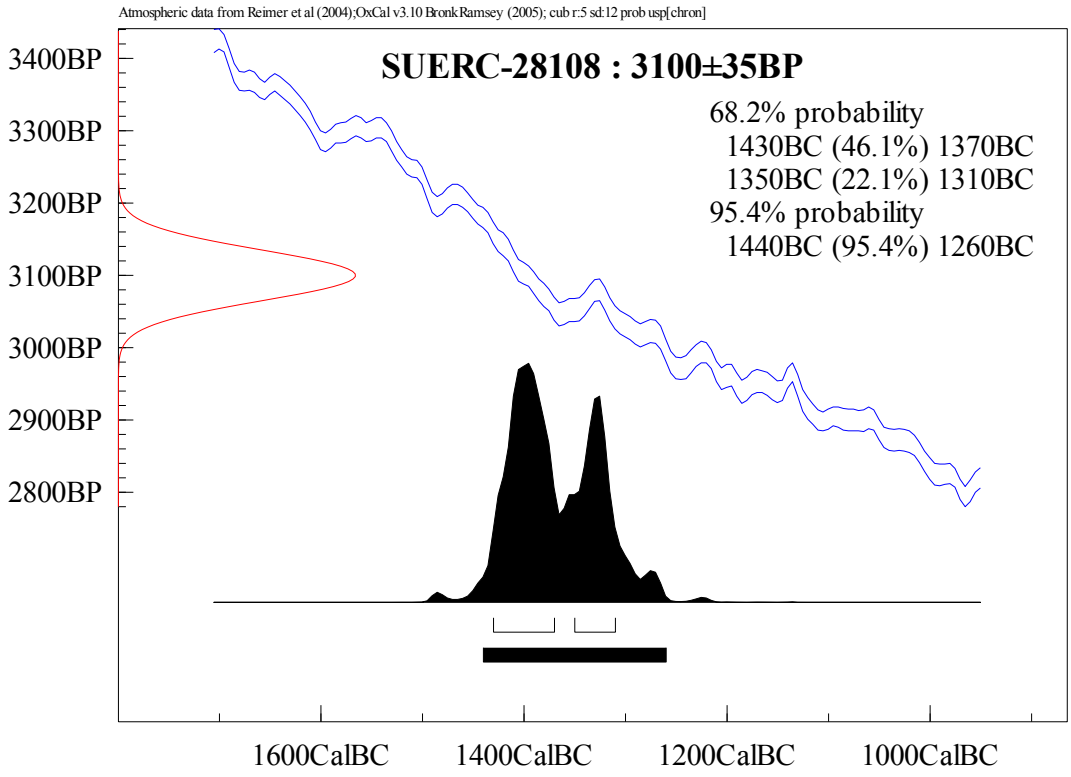
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3). Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.



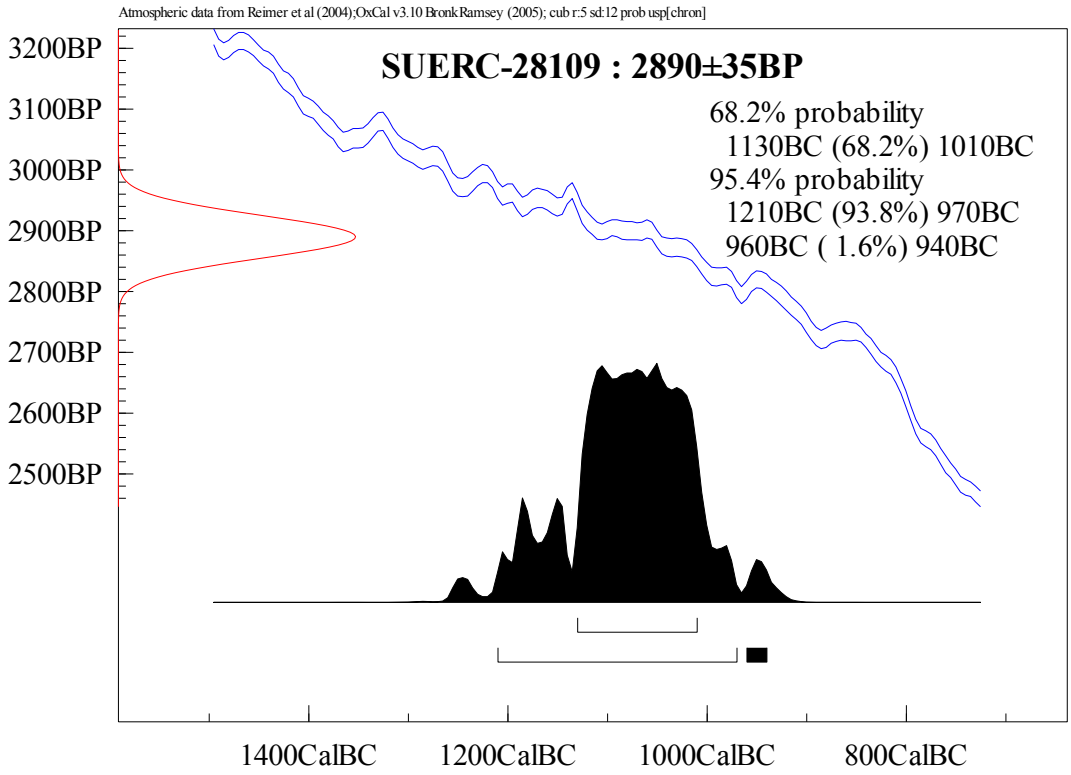
Sample codes: RWBM09-019. SUERC-28106. (GU-21007)
Charcoal : Corylus avellana (Hazel)



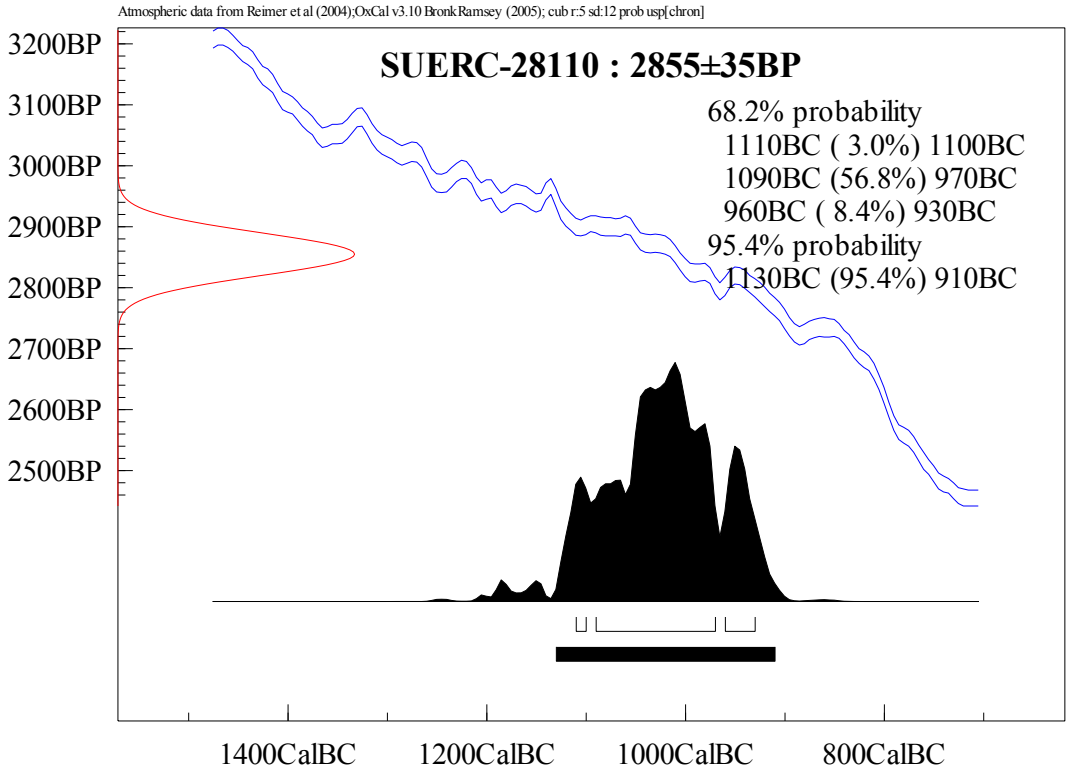
Sample codes: RWBM09-028. SUERC-28107. (GU-21008)
Charcoal source: Corylus avellana (Hazel)



Sample codes: RWBM09-036. SUERC-28108. (GU-21009)
Charcoal source: Hedera helix (Ivy)



Sample Codes: RWBM09-041. SUERC-28109. (GU-21010)
Charcoal source : Corylus avellana (Hazel)



Sample codes: RWTD09-4005. SUERC-28110. (GU-21011)
Charcoal : Corylus avellana (Hazel)

APPENDIX SIX

CONTEXT SUMMARY

Robeston Wathen Burnt Mound

Number	Description
001	Field boundary ditch fill
002	Field boundary ditch cut
003	?Pit fill
004	?Pit cut
005	Field boundary bank.
006	Burnt mound material. Same as 036? Separated from 013 by a thin lense of yellow silt. Appears to be the latest deposit of burnt mound material in the sequence. Very dark grey sandy silt matrix containing frequent charcoal fragments and frequent small fragments of heat affected sandstone.
007	Grey clay. Mixed clay deposit overlying natural shale 008. Contains stone and charcoal from layer 006 above. Possible trample/ buried soil remnant. Cut by 015.
008	Natural bedrock shale/clay layer
009	Layer of burnt mound material. Dark grey sandy silt matrix containing frequent charcoal fragments and frequent small fragments of heat affected sandstone. Cut by 015.Paler (less charcoal) than other deposits of burnt mound material
010	A layer of redeposited natural. Mid orange brown (heat affected?) clay silt containing sandstone fragments rather than shale. Cut by 015.
011	Mixed layer of burnt mound material mixed with topsoil and severely bioturbated by roots from undergrowth along stream bank.
012	Primary fill of cut 015. Mid/dark grey clay with some medium sized angular stones. The stones are presumably derived from heat shattered stones, but have not been cleaned out or re-used.
013	Layer of burnt mound material. 'Heating stones' within cut 015. This deposit consists primarily of fist sized heat-affected stones (probably used at least once previously). Other deposits of burnt mound material are derived from similar material to 013 that has been discarded once the stones have become too heat fractured for re-use.
014	A thin layer of redeposited natural silty clay, cut by 015 and separated from natural 008 by a thin deposit of burnt mound material 006.
015	'Trough' cut.
016	'Roasting pit' cut. 'U' shaped profile, linear in plan. Cut into natural clay silts which are heat reddened.
017	Stone lining of cut 016. Heavily heat affected rough shale slabs lain on top of the lump charcoal fill of 016. 017 and 019 possibly separated by layer 018.
018	Possible 'sealing' layer between charcoal and stone slabs in cut 016. May however be the result of natural infilling of voids between stone slabs and charcoal.
019	Charcoal fill of cut 016. Large fragments of lumpwood charcoal - the fuel for the roasting pit.
020	Post hole cut
021	Fill of post hole

022	Layer. Present day topsoil/subsoil remnant.
023	Layer. Probably slumped natural, possibly mixed with some burnt mound material. Mid grey-brown sandy clay with 10% burnt mound material including small heat affected sandstone fragments. Little if any charcoal.
024	Layer. Probably slumped natural, possibly mixed with some burnt mound material. Mid/light grey gritty sandy silt with 10% burnt mound material including medium sized, slightly heat affected (stained?) sandstone fragments. Little if any charcoal.
025	Layer. Probably slumped natural, possibly mixed with some burnt mound material. Mid/light grey silt with some sand and grit and 20% small, slightly heat affected (stained?) sandstone fragments. Little if any charcoal.
026	Layer. Probably slumped natural mixed with some burnt mound material. Very dark grey/black sandy silt with 20% small, slightly heat affected (stained?) sandstone fragments.
027	Layer of burnt mound material. Dark grey/black gritty sandy silt with 20% heat affected sandstone fragments.
028	Layer. Natural deposit ? early in the sequence but containing some charcoal. May represent pre-burnt mound activity. Light grey clay silt with sand and grit and 40% very small, sub-rounded stones.
029	Layer. Probably recently (modern) redeposited burnt mound material.
030	Layer. Present day topsoil/subsoil remnant (same as 022/035?).
031	Layer. Probably a natural deposit. Ferrous stained layer underlying current streambed. Mid orange waterlogged clay silt slurry with frequent small to medium sized angular stones.
032	Layer. Probably a natural deposit underlying the present stream bed. Firm mid brown clay silt with occasional small subangular stones.
033	Layer. Probably a natural deposit. Fill of possible former stream channel? Firm, mid-orange (ferrous stained) clay with abundant small to medium sub angular and occasional sub-rounded stones.
034	Layer of burnt mound material, similar to 006, 009, 011, 013 etc. Very dark grey/black clay silt with sand and grit and frequent small angular fragments of heat affected sandstone and charcoal flecks and fragments.
035	Layer. Present day topsoil/subsoil remnant (same as 022/005?). Friable mid grey-brown clay silt with occasional small angular stones.
036	Layer of burnt mound material. Same as 006? Friable very dark grey/black silty clay with frequent charcoal flecks and fragments and frequent small angular fragments of heat affected sandstone.
037	Layer of burnt mound material, Same as 043? Mid/dark brown silty clay with sand and grit and frequent small angular fragments of heat affected sandstone and charcoal flecks and fragments.
038	Layer. Same as 001
039	Cut. Same as 002
040	Layer of burnt mound material. Same as 006. Friable mid orange-brown clay silt with sand and grit and frequent small angular fragments of heat affected sandstone and charcoal flecks and fragments.(paler than 041)
041	Layer of burnt mound material. Same as 006. Friable very dark grey/black silty clay with sand and grit and frequent small angular fragments of heat affected sandstone and charcoal flecks and fragments.

042	Layer of burnt mound material. A group of thin laminations of burnt mound material alternating with thin layers of redeposited light grey clay mixed with burnt mound material. Presumed to be result of excavation of, or cleaning out of a trough feature. Alternatively, could be waterlain, as a consequence of water flow management?
043	Layer of Burnt mound material. Same as 037? Friable dark orange silty clay (ferrous stained?) with sand and grit and frequent small angular fragments of heat affected sandstone and charcoal flecks and fragments.
044	Secondary fill of trough 046. Firm, dark grey brown clay silt with occasional small stones and rare charcoal. Possibly a hill wash deposit representing a period of abandonment between periods of activity on site.
045	Primary? Fill of trough 046. Same as 013 Friable mid grey brown silty clay matrix between abundant fist sized heat affected stones. Rounded edges suggest these have been re-used from previous heating events, but were not completely spent.
046	Burnt mound trough. Same as 015. Southern half excavated. Western extent truncated by cwm bank (and machine cut), but slight ridge and stones in base of cut may indicate the base of the western edge of the trough cut.
047	Probable cut feature, or a former watercourse (less likely). Apparently north-south aligned linear cut on west side of the cwm. Burnt mound material 025 has slumped into the cut from the east side, while possible slope wash 024, apparently devoid of burnt mound material, has slumped in from the western side.

Robeston Wathen – The 'Teardrop'

Number	**Description**
Trench 1	
1001 (A)	Soft homogenous pale clay-silt getting coarser with depth
1002 (B)	Soft homogenous pale clay-silt getting coarser with depth
1003 (c)	Soft homogenous pale clay-silt getting coarser with depth
1004 (D)	Soft homogenous pale clay-silt getting coarser with depth
Trench 2	
2001	Cleaning layer. Moderately compacted light brown silt
2002	Residual ploughsoil. Moderately compacted mid brown clay silt containing occasional small pebbles and large cobbles. Concentration of flint primarily in mid area of trench.
2003	
2004 = 019	Fill of posthole. Firm mid brown silty clay containing moderate small sub-angular stone and larger post packing stones.
2005 = 020	Posthole cut. 0.43m diameter circular posthole cut with moderately sloping sides tapering to flat base
Trench 3	
3001	Cleaning layer Moderately compacted light brown silt.
3002	Residual ploughsoil (hand excavated) Loose mid grey brown clay silt containing fine shale gravel and moderate cobbles.

	Pottery and clay pipe stem recovered.
3003	Hearth/ furnace base fill (?) Firm heat affected clay silt containing moderate large charcoal flecks.
3004	Hearth/ furnace base 'Keyhole' shaped with possible flue to south. Large flat stone in bowl.
Trench 4	
4001	Cleaning layer. Moderately compacted light brown silt. Numerous flint flakes
4002	Residual ploughsoil. Loose mid grey brown clay silt containing fine shale gravel and moderate cobbles.
4003	Natural. Firm mid brown clay silt in centre of trench. Friable shale grit/gravel at east and west ends of trench.
4004	Posthole fill. Firm mid grey brown clay silt containing occasional charcoal flecks. Great concentration of charcoal towards centre of fill suggesting the presence of a post pipe. Some suggesting of post packing in the form of an orangey clay silt. A single stratified flint flake recovered from lower portion of fill.
4005	Posthole 0.40m x 0.30m subcircular posthole with near vertical sides tapering to flat base.
4006	Stakehole fill. Firm mid grey brown clay silt containing occasional charcoal flecks. Single flint flake recovered.
4007	Stakehole cut 0.06m diameter circular cut. Full depth uncertain.
4008	Stakehole fill Firm mid grey brown clay silt.
4009	Stakehole cut Subcircular cut 0.10m in diameter

APPENDIX SEVEN

Quern stone assessment

ROTARY QUERN FROM ROBESTON WATHEN, PEMBROKESHIRE

(RWBM 09)

By Mark Redknap and Jana Horak

In 2009, a matching pair of rotary quern-stones were recovered by developers some eight metres north of a burnt mound at Robeston Wathen, Pembrokeshire, excavated by the Dyfed Archaeological Trust (SN08321543). The stones appear to have fallen, or been thrown into boggy ground next to a stream, close to a large burnt mound of Bronze Age date. There was also a 'roasting pit' (feature 016) of early medieval date in the vicinity.

The stones were examined following the geological principles outlined under British Standard EN 12407:2000. This involved a visual investigation using a hand lens to access the following features:

- The general colour of fresh and/or weathered surfaces of the rock. Where possible a colour values was attributed using the *Munsell Rock Colour Chart.*
- Fabric (bedding, structures, grain composition, grain shape, and sorting)
- Grain size (expressed in mm and converted to grain size classification scale)
- Grain composition
- Presence of additional features such as macrofossils, igneous textures/ structures

Descriptions

1. Upper stone

1.1. Description

The upper stone is discoid, with a neatly tooled (pecked) circumference and upper surface (rounded at junction of side and top). The grinding lower face is conical, closely fitting the form of the lower stone. The central perforation is circular (diameter 5.8 x 6.0cm), with slightly more wear at one point, where it meets grinding surface. There is a rectangular socket at one point in the edge of the stone (W 5cm x depth 2.3cm+). Diameter of upper stone 31cm; thickness 10.6cm.

1.2 Stone Type

Lithic arenite (sandstone). Greenish grey [GLEY 2 5/5BG, greenish grey] lithology, weathering a duller grey-green colour. This is a grain-supported, moderately well sorted sandstone composed dominantly of two clast populations; (i) grey subrounded quartz grains (750- 2000 µm) with occasional larger pebbles up to 6 mm, (ii) cream angular fragments. The latter either represent altered feldspar crystals or lithic fragments of acid volcanic rock. The rock is massive, showing no indication of bedding, and has a compact texture and a quartz cement. It is cut by a series of fracture surfaces one of which is filled by a quartz vein.

The quartz-rich and grain-supported nature of this lithology has similarities to the 'grits' (sandstones) within the Arenig sequence (*Tetragraptus* Beds of Strahan *et al*., 1914) from which Whitland Abbey was built. However the lithology of Quern 2 differs from these grits in containing a feldspar/lithic component. Although the source of Quern 2 is considered to be from the Arenig (Ordovician) sequence an exact lithological match has not been sourced. The most likely option is the grey speckled grit mentioned by Strahan *et al*. (1914) (Blaencediw Formation of Fortey & Owens, 1987) which is exposed to the north of Whitland in the vicinity of Henllam Amgoed.

Fig. 1a, b. Top and underside of the upper rotary quernstone from Robeston Wathen, Pembrokeshire. (Copyright: National Museum of Wales)

Fig. 2a, b. Top and underside of the lower rotary quernstone from Robeston Wathen, Pembrokeshire. (Copyright: National Museum of Wales)

2. Lower stone

2.1. Description

The lower stone is circular, with about one third of its circumference missing through damage. It has a flattened conical upper grinding surface, and unmodified, natural boulder underside, for setting in the ground. There is a large central socket (diameter 6cm, depth 6.2cm) for a wooden rynd. Stone diameter 31 x 26.5cm; thickness about 17cm.

2.2. Stone Type

Quartz coarse sandstone/conglomerate. This lithology is dominated by sub-rounded grains of white quartz (750 – 1500 µm) containing scattered, more rounded, white quartz pebbles (10-15 mm). The rock has poorly sorted; grain-supported texture showing weakly developed bedding oriented at a slight angle to the grinding surface. A minor component of red [Munsell 10R 5/2, weak red], ovoid, mudstone flakes are also present. The rock has quartz cement and a slightly porous texture, from the erosions of some clasts (probably non-quartz). The quern is cut by a fibrous quartz vein (7 mm wide). This lithology weathers pale pink-tinged cream colour; a fractured surface of the quern shows a fresher surface that is a deeper pink.

The quartz–rich nature of this lithology, combined with the presence of red mudstone casts, indicates that the lower stone has been worked from a conglomerate derived from the Old Red Sandstone (ORS) succession. The ORS sequence has an east-west trending outcrop to the south of Robeston Wathen. Within the 'Red Marls' (St Maugham's Formation, Lower ORS) a discontinuous conglomerate horizon (White Quartz Conglomerate of Strahan *et* al, 1914) occurs, this appears to be the most likely source for this lithology. This is located approximately 4 km south of Robeston Wathen.

Discussion

The form of the upper stone is bun-shaped, rather than that of the typical beehive quern of Curwen's 'Wessex' type, which are often thicker (around 17cm; *cf* the example from Penycoed, Llangynog, Carmarthenshire; Marshall 1985, Fig. 17). The best published assemblage from south-west Wales is from Carmarthen, with twenty one upper and nine lower stones (Marshall 2003). The neatly shaped profile of the Robeston Wathen upper stone is close in cross-section to a number of Carmarthen examples (notably nos 2 and 3; Marshall 2003, Fig. 8.16), and one from Bear Field, Cowbridge, which also has no trace of a rynd chase (diameter about 34cm; Parkhouse 1996, Fig. 70 no. 6). The lower stone, in essence a modified boulder designed to be anchored in the earth, is unlike the Carmarthen lower stones, many of which are discoid, and worked on all faces, but the rough underside recalls the Roman lower stones from Usk (Welfare 1995, Fig. 69 nos 66, 67). In light of these *comparanda*, an Iron Age or early Roman date seems likely for the Robeston Wathen examples. The lithologies of the two stones are locally derived, indicating that the quern-stones were not imported.

Beehive querns have been recorded from Woodside Camp and Penycoed, and flat rotary querns from Walesland Rath, Woodside & Coygan - but more usually either none or between one and three querns are recovered from excavated native sites. On the Carmarthen querns, Marshall states that '*It is unfortunately not easy to establish which stones are paralleled by similar forms from other sites in Carmarthen, or indeed Romano-British sites in south-west Wales, since few of Carmarthen or Pembrokeshire Museums' quite sizeable collections of stones are adequately provenanced*.'

As the excavator has pointed out, the Robeston Wathen find suggests an association with food production and a late Iron Age/ Romano-British presence in the vicinity, although no evidence of settlement or other activity of this period has yet been identified. The absence of associated features of this period within the Dyfed Archaeological Trust excavations may be a result of soil truncation. The location of the querns within a boggy area around a spring points to the possibility that they have been deliberately deposited with votive intent in the boggy area. Elsewhere, querns often seem to be deliberately placed, associated with metalworking activity, the presence of significant pits and artefact deposits, and linked with 'transformative' processes, such as the transformation of ore to

metal, or raw plant to cultured food. As a male (base) and a female (top) quern, they can also have loaded, engendered, meanings linked with fertility and reproduction.

Acknowledgements

We are very grateful to Adam Gwilt for valuable comments on the quern-stones, and James Wild for photography.

References

Fortey, R. A. & Owens, R. M. 1987, 'The Arenig Series in South Wales', *Bulletin of the British Museum (Natural History) (Geology)* 41, 69–307.

Marshall, C. 1985, 'Quern stones', in K. Murphy, ,Excavations at Penycoed, Llangynog, Dyfed', Carmarthenshire Antiquary 21, 75-112.

Marshall, C. 2003, 'Quernstones', in H. James, *Roman Carmarthen. Excavations 1978-1993*, Britannia Monograph 20, 353-67.

Parkhouse, J. 1996, 'Stone objects', in J. Parkhouse and E. Evans, *Excavations in Cowbridge, South Glamorgan, 1977-88*, BAR Brit. Ser. 245, 215-20.

Strahan, A., Cantrill, T.C., Dixon E. E. L. & Jones, O. T. 1914, *The Geology of the South Wales Coalfield, Part XI The Country around Haverfordwest.* Memoirs of the Geological Survey.

Welfare, A 1995, 'The milling stones', in W. H.Manning, *Report on the Excavations at Usk 1965-1976. The Roman Small Finds*, 214- 237.

ARCHIVE

The archive for this project will be stored at Dyfed Archaeological Trust Offices in Llandeilo until alternative arrangements have been made. The archive contains:

A printed and digital copy of the report

Site record sheets

Site plans

Survey data

Non publication drawings

CD of digital site photographs

CD of the digital archive

Finds

Correspondence

Miscellaneous documents

EXCAVATIONS ON THE A40 BYPASS AT ROBESTON WATHEN PEMBROKESHIRE 2009

RHIF YR ADRODDIAD / REPORT NO. 2010/4
RHIF Y PROSIECT / PROJECT RECORD NO. 98579

Mawrth 2010
March 2010

Paratowyd yr adroddiad hwn gan / This report has been prepared by

Duncan Schlee

Swydd / Position: Field Services Project Manager

Llofnod / Signature ..... Date

Mae'r adroddiad hwn wedi ei gael yn gywir a derbyn sêl bendith
This report has been checked and approved by

James Meek

ar ran Ymddiriedolaeth Archaeolegol Dyfed Cyf.
on behalf of Dyfed Archaeological Trust Ltd.

Swydd / Position: Head of Field Services

Llofnod / Signature ..... Date

Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

As part of our desire to provide a quality service we would welcome any comments you may have on the content or presentation of this report

ymddiriedolaeth archaeolegol

DYFED

archaeological trust