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Bogs, Bodies and Burnt Mounds: Visits to the Soar Wetlands in the Neolithic and Bronze Age

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with contributions by

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The recording and analysis of a burnt mound and adjacent palaeochannel deposits on the floodplain of the River Soar in Leicestershire revealed that the burnt mound was in use, possibly for a number of different purposes, at the transition from the Neolithic to the Bronze Age. An extensive radiocarbon dating programme indicated that the site was revisited. Human remains from the palaeochannel comprised the remains of three individuals, two of whom pre-dated the burnt mound by several centuries while the partial remains of a third, dating from the Late Bronze Age, provided evidence that this individual had met a violent death. These finds, along with animal bones dating to the Iron Age, and the remains of a bridge from the early medieval period, suggest that people were drawn to this location over a long period of time.

Watermead Country Park to the north of Leicester is a stretch of flooded gravel pits located along a reach of the River Soar, a major tributary of the Trent, flowing from south to north (Fig. 1). The site lies 3 km upstream of the confluence with the River Wreake, within a narrow valley constricted by the East Leicestershire Uplands to the east and the Charnwood Uplands to the west. The site lies interleaved between Holocene alluvia which overlie Pleistocene sands and gravels and was preserved beneath *c.* 1.5 m of alluvium at around the 45 m contour, with the hills rising to *c.* 100 m O.D.

In the spring of 1996 the University of Leicester Archaeological Services (ULAS) was invited to inspect gravel quarrying works when remains from at least three human skeletons were recovered from machine spoil from the excavation of a palaeochannel. No *in situ* human remains were found but subsequent evaluation identified numerous animal bones from the palaeochannel deposits, a burnt mound on the western bank, and a timber footbridge crossing the channel. A programme for excavation was subsequently agreed between ULAS, the quarry operator, Leicestershire County Council and English Heritage.

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ARCHAEOLOGICAL BACKGROUND

The archaeological landscape

Increasing evidence of Neolithic and Bronze Age occupation on the glacial tills of the uplands in this part of the Soar valley has been recorded in recent years. Within a 5 km radius of the site over 50 flint scatters and/or find-spots are noted on the Historic Environment Record (HER), as well as four putative enclosures and a dozen ring-ditches, mostly around the Soar/Wreake confluence (Thomas 2008). Nationally significant Late Neolithic structures and

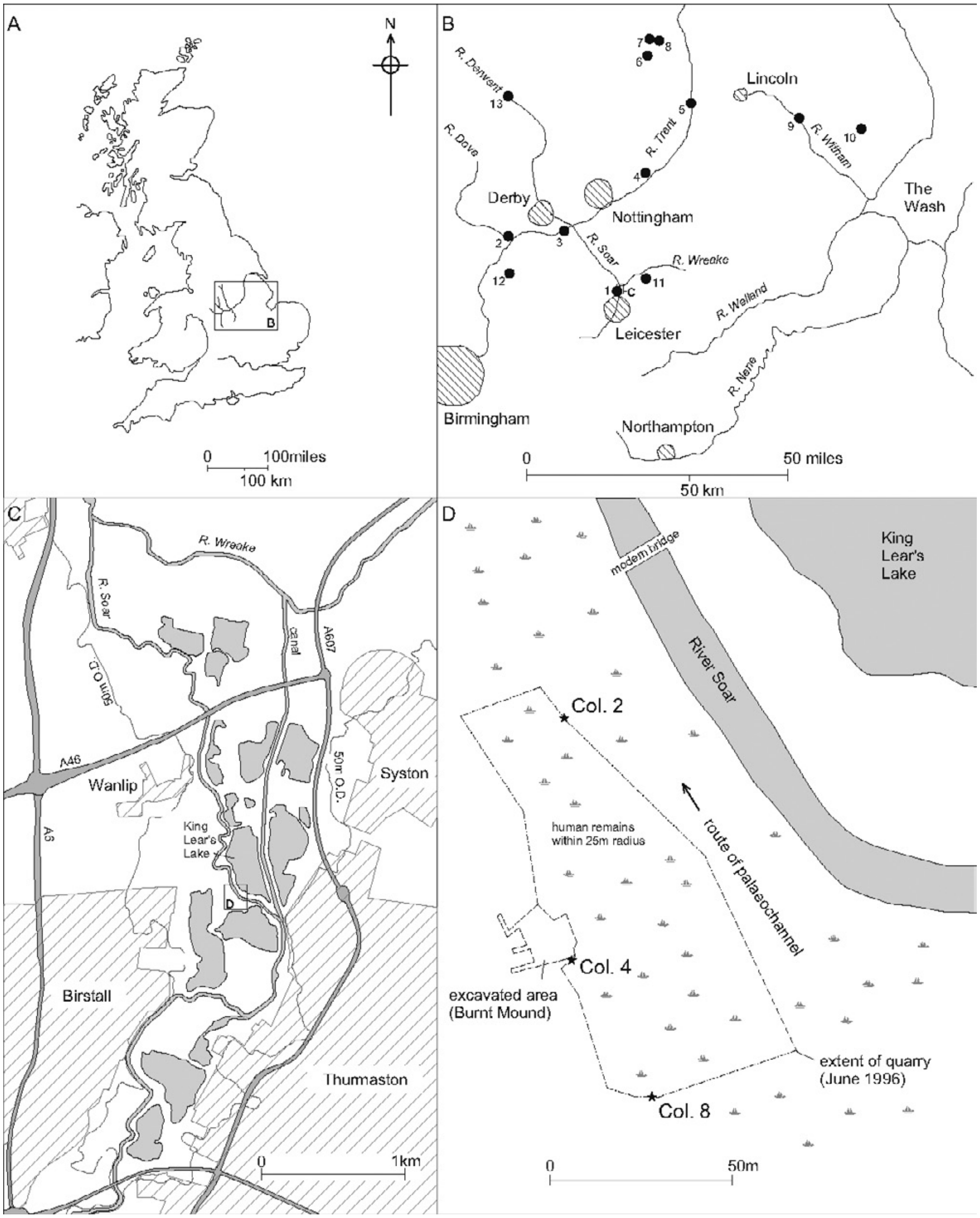

Fig. 1.
Site location map. A. United Kingdom; B. Excavated burnt mounds in the East Midlands: 1. Watermead Country Park, Birstall, Leics (SK 605 101), 2. Willington, Derbys (SK 279 272), 3. Willow Farm, Castle Donington, Leics (SK 445 288), 4. Holme Dyke, Gonalston, Notts (SK 692 469), 5. Waycar Pasture, Girton, Notts (SK825 670), 6. Pigs Pen, Tiln, Notts (SK 700 841), 7. Mattersey, Notts (SK 704 893), 8. Mattersey, Notts (SK 710 882), 9. Stixwold, East Lindsey, Lincs (TF 168 637). 10. Hagnaby Lock, Stickford, Lincs (TF 342 601). 11. Brooksby Quarry, Leics (SK 671 149). 12. Neatherseal, Derbys (SK 2627 1339). 13. Baslow, Derbys (SK 2823 7078). C. Man-made lakes at Watermead Country Park and location of current quarry. D. Area observed during excavation and watching brief with location of sediment monoliths

pit complexes with associated assemblages of Grooved Ware have been excavated at two sites in nearby Rothley (Cooper & Hunt 2005; Speed 2011), with an engraved stone face plaque a notable find. Further pits containing Neolithic pottery have been identified nearby at Rearsby (Beamish & Clarke 2008), Syston (Meek 1998), Ratcliffe-on-the-Wreake (Cater 2006), and Wanlip (Ripper 1999).

Up to three burnt mound sites have been identified during an evaluation prior to quarrying in a tributary of the River Wreake 3 km upstream of the Wreake/Soar confluence (Parker & Jarvis 2007), 9 km as the crow flies. A Middle Bronze Age rapier associated with an undated human skull was recovered near the River Soar, 2 km downstream (A102-3.1874). Iron Age and Romano-British settlements are located 1 km to the north-west at Wanlip (Beamish 1998), 1.5 km north-east at Syston (Clark 1995), and 1.5 km to the south-west in Birstall (Speed 2010).

Excavation history

Despite this surrounding rich archaeological landscape there was no known archaeology in the immediate locality of the Country Park. As a pre-*PPG*16 Planning Application for quarrying there was no facility for archaeological investigation of the workings, and it is to the credit of the operator, Ennemix Construction Materials Ltd, that inspection and subsequent excavation was allowed to take place.

The objectives of the excavations were to attempt to interpret the deposition of the human remains in a peat bog, particularly in contrast to the ceremonial burials of the surrounding landscape and to thoroughly interrogate the well-preserved burnt mound in an attempt to better understand these enigmatic monuments.

Well-preserved faunal and plant remains would establish the character of the local environment and help to determine the purpose of burnt mound activities. Samples suitable for radiocarbon dating were collected with a view to creating a chronological framework for both the disparate elements of the excavations and to contribute to wider research, such as the introduction, character, and development of agricultural practices for the Neolithic and Bronze Age of the East Midlands (Clay 2006) and to date the alleviation of the Soar and Trent basins (Monckton 2006, 269).

Full analytical drawings of the timbers would enhance the technical understanding of woodworking practises while species identification and tree ring growth patterns would contribute information concerning the exploitation of the available wood source.

In the text that follows, radiocarbon dates cited in regular type are conventional radiocarbon ages (Stuiver & Polach 1977), quoted according to the Trondheim convention (Stuiver & Kra 1986). The calibrated date ranges are quoted at 95% confidence and were calculated by the maximum intercept method (Stuiver & Reimer 1986), using the program OxCal v3.10 (Bronk Ramsey 1995; 1998; 2000; 2001) and the INTCAL98 dataset (Stuiver *et al.*1998).

EXCAVATION RESULTS

The burnt mound

The burnt mound was constructed on a raised area of alluvial clays on the western bank of a peat filled palaeochannel. It consisted of a central timber lined trough [124] surrounded by two principal spreads of fire-cracked stones and charcoal [205 & 236], two hearths [318 & 329] and a boundary ditch [303] along the northern perimeter (Fig. 2). The mound was truncated by an Iron Age gully [228], which lay below *c.* 1 m of later alluvial deposits.

The trough

The trough was assembled in a slight depression, approximately 1 m back from the break of slope into the silted palaeochannel. Constructed as a sub-circular cut [124], it measured *c.* 1 x 0.8 m and survived to a depth of 0.35 m. It could have contained *c.* 220 litres of water (*c.* 18 gallons) and would probably have filled by ground water seepage.

The base of the cut was lined with eight irregular alder planks which had been placed over a dense layer of charcoal (Fig. 3, [147] and Fig. 4). Around the perimeter of the cut, neatly avoiding the planks, slender withy rods were driven into the clay at roughly 0.2 m intervals to form a circuit of uprights. These rods were both single or in groups of 2–3 and were driven in some 0.2 m below the base of the cut (Fig. 3). Pairs of horizontal withies were then woven

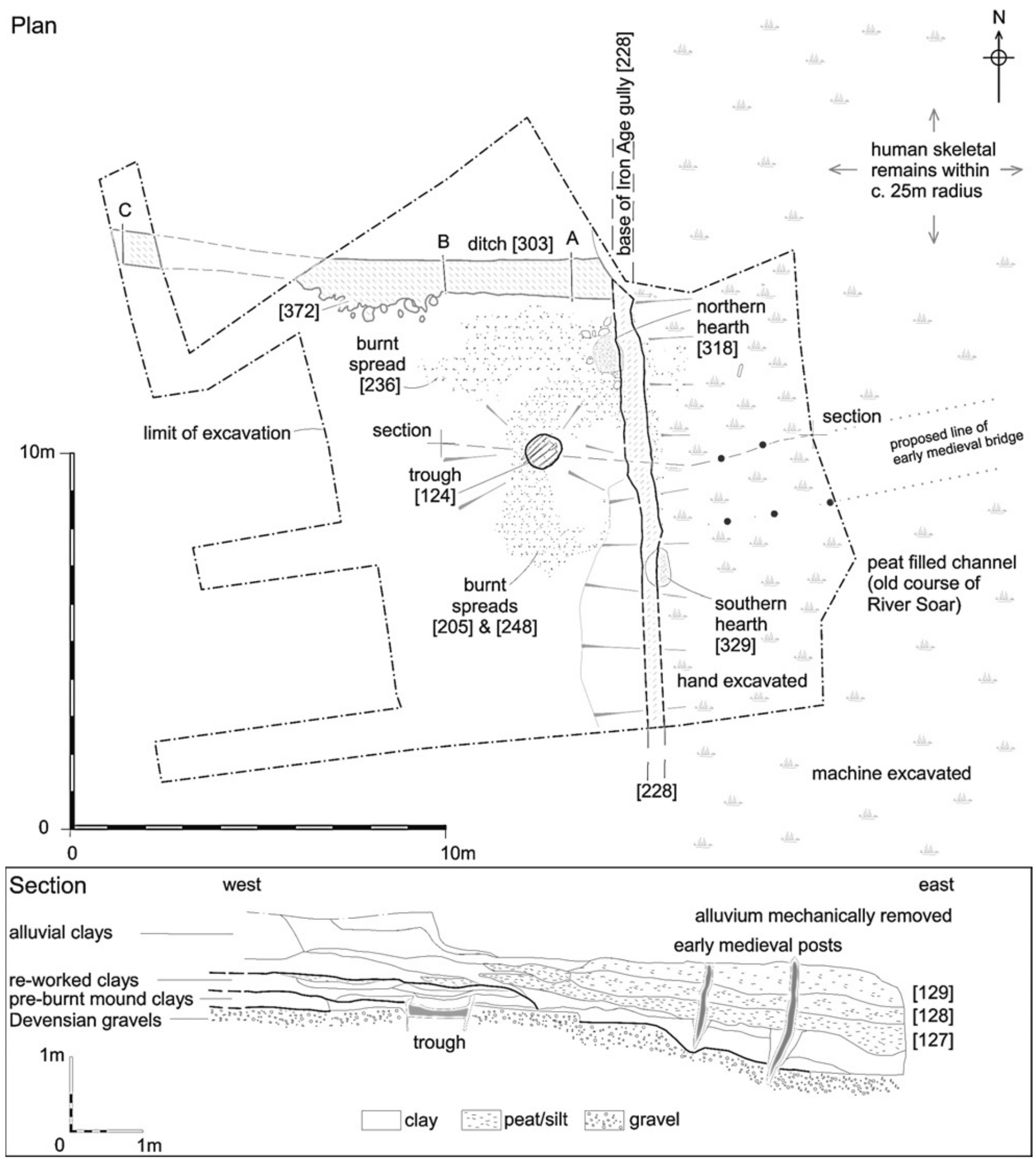

Fig. 2.
Plan of all excavated features from the burnt mound and reconstructed cross-section across burnt mound and palaeochannel.

around the uprights forming a wicker lining to the wall. The horizontal withies only survived to a height of *c.* 0.10 m (ie, three pairs were seen *in situ*), though it is likely that they originally covered the full depth of the cut. Withy rods had also been used as fillers between the base planks. There was no clear indication that the feature had been repaired during its life.

The fills above the timbers consisted of a sequence of very fine alternating layers of charcoal and sand, presumably resulting from the settling of debris from heating water in the trough using hot stones [145,

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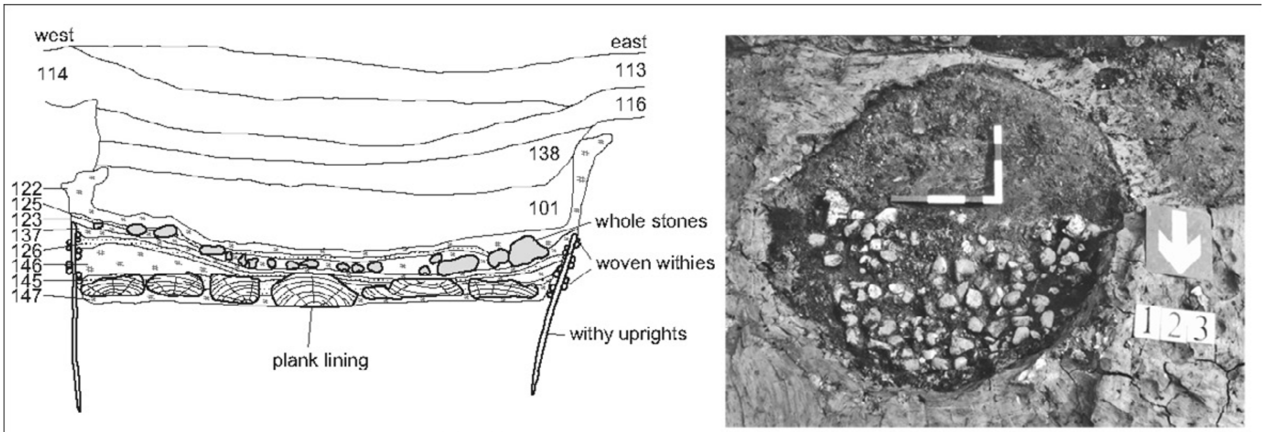
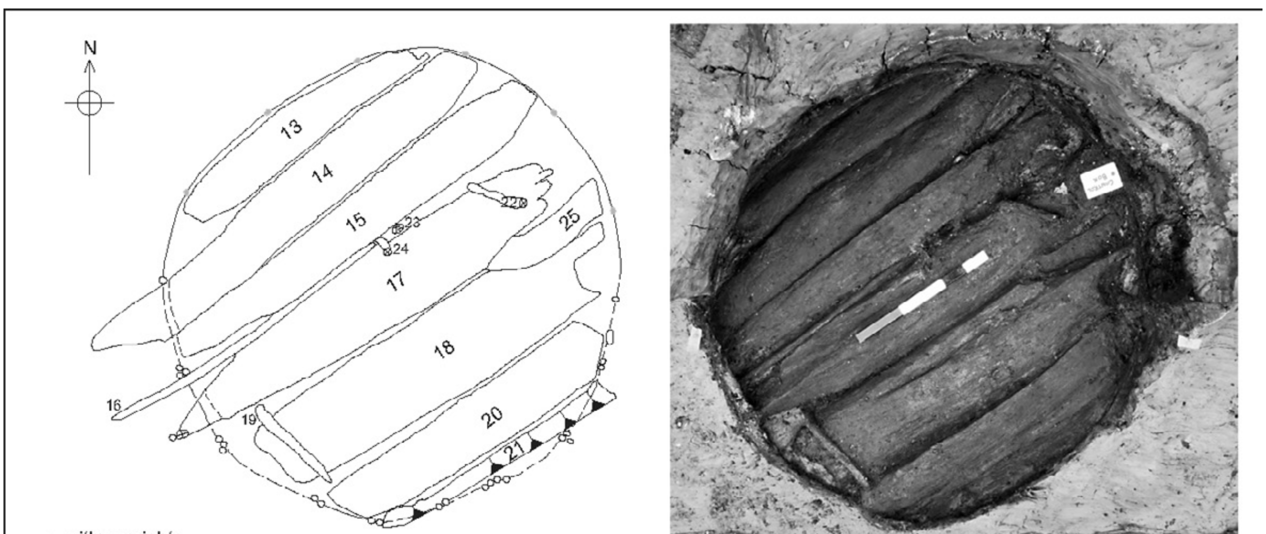


Half excavated 'whole stone' layer [123] with charcoal [137] beneath

Fig. 3.
Section through burnt mound trough and photograph of the final heating episode showing the half-excavated layer of largely whole or stones shattered *in situ* [123], above a bed of charcoal [137]



Planks lining the base of a circular cut. The lowest course of the woven withy walls is just visible along the northern edge.

Fig. 4.
The alder planks lining the base of the trough

146, 126, & 137] (Fig. 3). Above these were a layer of largely intact, whole or shattered *in situ* stones [123] interpreted as the final usage of the feature with a layer of sand and charcoal above [125, 122]. The upper portion was filled by a sequence of post-disuse flooding episodes [101, 138, & 116], which included peaty fills, fragments of charcoal and shattered stones but also re-worked earlier organic deposits.

The mounds

The mound covered an area totalling *c.* 9.6 m^2 (Fig. 5). Six patchy layers of shattered stones and charcoal

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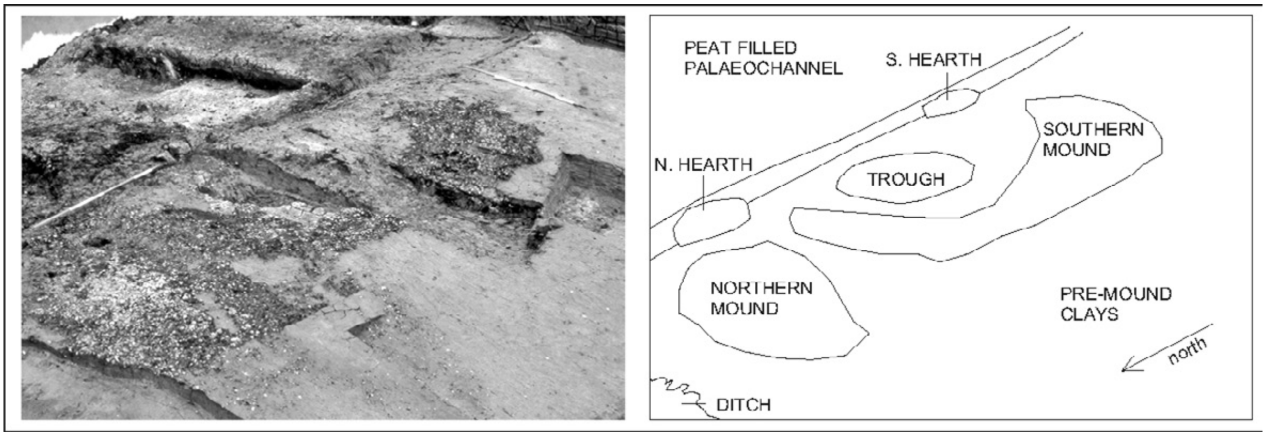

Fig. 5.
The mound (facing south-east). The patchiness of the mound is evident and the northern mound was notably stonier than the southern

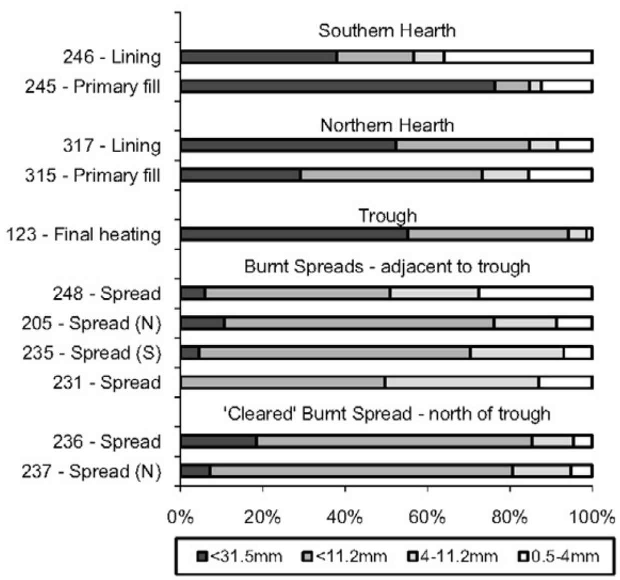

Fig. 6.
Proportion (by weight) of different sized stones from the mound material

were identified in two broad spreads, to the north [236, 237, & 251] and to the south [231, 205, & 248], the latter crescentic and centred on the trough (Fig. 2). Thin layers of alluvial clay separated these layers, and indicated that the northern spread was deposited after the southern, although the stratigraphic relationships between them were difficult to determine. The layers were not visually distinct, and were of variable thickness: in general the depth of the combined spreads although fairly well-compacted only amounted to *c.* 0.1 m.

The physical gap between trough and the northern spread suggests that either this mound material came from another source (perhaps the northern hearth) or that the spent fuel was deliberately placed away from the trough. The northern spread was more densely compacted than the southern and may have been deliberately tamped. There was some indication that the later stones had been shattered to a smaller average stone size than the earlier layers (Fig. 6), although this could simply reflect a difference in a single heating episode. The relative uniformity of the spread again suggests deliberate deposition.

Radiocarbon determinations indicate that the northern spread (Fig. 2) contained material that was contemporary with the charcoal deposit below the trough's planks and the southern spread material that was contemporary with the plank construction. This chronology suggests that either the relationship between the spreads (which indicated that the northern was deposited after the southern) was mis-recorded and the northern spread represented an earlier event, or that the northern spread and the trough contained quantities of residual material when laid out.

Shattered stones and charcoal, found both in the ditch demarcating the northern extent of the site and in the late silting of the trough (which also included re-worked pre-site clays), suggests the mound was eroded. The extent of any such erosion is difficult to measure and an accurate estimate of the original mound volume was therefore not possible.

Stones within the mound material were mostly rounded gravel pebbles, including quartzite (ie, the river gravels) and angular shattered stones. The charcoal came predominantly from alder/hazel, with fewer samples identified as blackthorn, hawthorn and oak (Morgan 2010); all species that pollen analysis suggests were growing in the vicinity of the site (Greig 2010).

Other features

Two hearths were recorded ('northern' and 'southern', Fig. 2), both within a few metres of the trough and on the very edge of the silted palaeochannel. There was no clear stratigraphic relationship between the hearths and the trough. Both hearths were truncated by the Iron Age gully [228].

The northern hearth [318] was sub-circular, 1 m diameter by 0.3 m deep with almost vertical sides (Fig. 7). Set into the clays at the base of the cut were the remnants of a lining of largely whole, rounded cobbles, reddened *in situ*. Between the stones were well-compacted lenses of sand and charcoal, possibly deliberately tamped. Loosely clustered around the hearth was a group of seven shallow, eroded but distinct post-holes, one of which [337] included a central 'post-pipe' cut.

The southern hearth [329] was oval, 1 x 0.7 m by 0.1 m deep. The primary fill was a mixed layer of clay, charcoal, and peat from which four plain body sherds of an undiagnostic pottery vessel were recovered. Above this was a dense layer of charcoal and stones. Many of the stones were burnt, whole (up to 150 mm in diameter) and reddened clay surrounding the stones suggests they were heated *in situ*.

The ditch [303] demarcating the northern extent of the burnt mound was traced over 14 m and was sectioned at roughly 2 m intervals. It consisted of a narrow ditch recut on at least two occasions on slightly differing alignments (Fig. 8). Each recut followed the complete silting up of the earlier ditch phase and the uppermost fills of the second recut contained shattered stones and charcoal. The base of

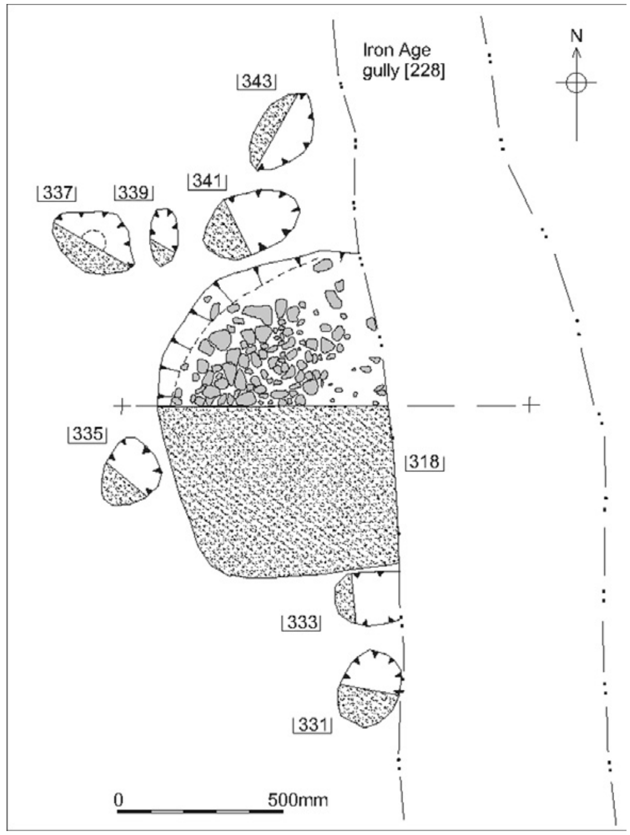

Fig. 7.
Plan of the partially excavated northern hearth and surrounding post-holes showing the density of *in situ* whole cobbles

the ditch was generally lower towards the east, suggesting it may have been draining into the palaeochannel. The ditch was not independently dated.

Solely along the southern edge of the ditch, adjacent to the main focus of burnt mound activity, the ditch sides and bank were eroded by small depressions (Fig. 2, [372]). These features were likely to be trample impressions from watering animals and suggest the ditch was approached from the south but not the north.

Twenty-nine fragments of *Bos primigenius* (aurochsen) were recovered from spoil adjacent to the site. With the exception of fragments of skull [129] and vertebra [127], (both Iron Age/Romano-British contexts, but which included reworked earlier

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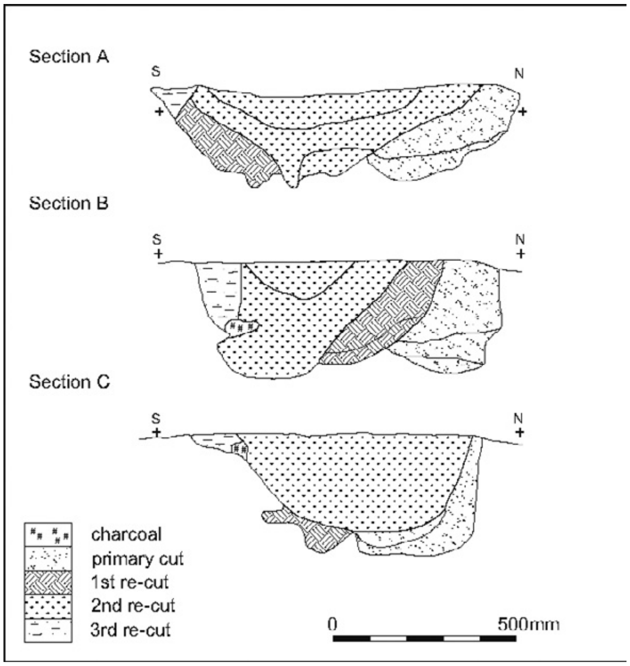

Fig. 8.
Profiles of recut ditch [303] bounding the northern edge of the burnt mound (section locations on Fig. 2)

deposits) all aurochsen bones were unstratified but recovered from the machine excavation of the palaeochannel peat.

Iron Age/Romano-British deposits
Running parallel to and along the western bank of the former river course was a north–south gully (Fig. 2, [228]). It was exposed for 13 m and was 0.70 m wide by 0.30 m deep. A single radiocarbon determination has dated the feature to the Late Iron Age (Table 1).

An area 4 x 4 m by 1.5 m deep of palaeochannel, east of the burnt mound, was hand excavated for the retrieval of artefacts. Three units of peat/silt deposits were identified (Fig. 2, section [127–9]). Forty-seven animal bones were recovered from these stratified layers (with *c*. 200 more recovered from the spoil of machine excavation of the same deposit), many with evidence of butchery. Radiocarbon dating of cattle and horse skulls suggests they were Middle–Late Iron Age in date and were contemporary with both the Iron Age gully and later palaeochannel deposits (Table 1). Insect analysis has indicated that the palaeochannel contained slow flowing or standing water: conditions indicating that the animal bones were deliberate depositions as opposed to an accumulation from river wash.

Human bones
Eleven human bones, with peat adhering to them, were recovered during excavation of the peat-filled palaeochannel, prior to quarrying. The machine driver felt that all the bones had been extracted in a single bucket scoop, suggesting they were deposited in near proximity to each other.

RADIOCARBON DATING

(A. BAYLISS, P.D.MARSHALL, J. MEADOWS, C. BRONK RAMSEY, G. COOK & H. van der PLICHT)

Sample selection and radiocarbon dating
A total of 48 radiocarbon determinations was obtained. Four samples were dated in 1996 during fieldwork to help assess its significance. Forty-four samples were dated in 2003 to determine when the burnt mound was in use, how long it remained in use, and whether some notable finds recovered from the spoil of machine excavations of the adjacent palaeochannel were similar in age to the burnt mound. This sampling programme also aimed to provide a chronological framework for the palaeoenvironmental records obtained from columns 2, 4, and 8.

Samples from the peat and fluvial sediments adjacent to the burnt mound were bones and timbers directly associated with the butchery activity, burials, and bridge construction, which could have been contemporary with the use of the burnt mound. Samples from the burnt mound sequence itself were selected using a series of Bayesian simulation models (Bayliss 2009; Meadows *et al.* 2010), which integrated stratigraphic information with the potential radiocarbon dates that could be obtained from the available datable material. All samples were of short-life material and were functionally associated with the archaeological event of interest (eg GU-5987, charcoal interpreted as fuel deriving from the use of the burnt mound). Samples from sediment columns 4 and 8 (dated in 2003) consisted of short-lived terrestrial plant macrofossils which, unless reworked, should accurately date peat formation at each sample's depth. The bulk peat samples from column 2 (dated in 1996) probably consisted mainly of the remains of plants that grew *in situ*, and so should also accurately date the deposition of the sediment at the relevant depth.

Samples processed at the Oxford Radiocarbon Accelerator Unit (OxA-) were measured by Accelerator Mass Spectrometry (AMS) (Hedges *et al.* 1989; Bronk Ramsey *et al.* 2000). Samples dated at the Scottish Universities Research and Reactor Centre (GU-) were measured by Liquid Scintillation Counting (LSC), (Stenhouse & Baxter 1983; Noakes *et al.* 1965). Samples processed at the Rijksuniversiteit Groningen (GrA-) were also dated by AMS (Aerts-Bijma *et al.* 1997; 2001; van der Plicht *et al.* 2000). Each laboratory maintains internal quality control procedures and takes part in laboratory intercomparison studies (eg, Boaretto *et al.* 2002), which demonstrate the accuracy of the measurements and the validity of the precision quoted.

The results are conventional radiocarbon ages (Stuiver & Polach 1977) and are listed in Table 1. Further details of the samples dated in 2003 are provided in Bayliss *et al.* (2007a, 32–42). They have been calibrated using the calibration curve of Stuiver *et al.* (1998) and the computer program OxCal (v3.10) (Bronk Ramsey 1995; 1998; 2001). Date ranges quoted are simple calibrated radiocarbon dates and have been calculated by the maximum intercept method (Stuiver & Reimer 1986). Figs 9 and 11–13 show the calibration of the results by the probability method (Stuiver & Reimer 1993).

Archaeological Interpretation

METHODOLOGICAL APPROACH

A Bayesian approach has been adopted to the interpretation of this site's chronology (Buck *et al.* 1996; Bayliss *et al.* 2007b). Although simple calibrated dates accurately estimate the ages of individual samples, this is not usually what is of interest. It is rather the dates of the archaeological events represented by the samples that are significant. At Watermead, it is the chronology of the construction and use of the burnt mound and associated activity that is under consideration, not the dates of individual fragments of wood or charcoal. The dates of this activity can be estimated by combining archaeological stratigraphy and phasing with the calibrated radiocarbon dates in formal, statistical models. The *posterior density estimates* produced by this modelling are thus not absolute: they are interpretative estimates of the chronology of a site that can and will change if further data becomes available.

All the modelling has been undertaken using the program OxCal v3.10 (Bronk Ramsey 1995; 1998; 2001; http://c14.arch.ox.ac.uk/). The algorithms used in the models described below can be derived from the structure and the OxCal keywords shown in Figures 9–14.

THE BURNT MOUND

Our preferred interpretation is shown in the model defined in Figure 9. Plant macrofossils from the grey clay provide *termini post quos* for the later activity defined by the northern and southern spreads, north and south hearths, and trough. Charcoal found beneath the planks of the wooden trough provides a *terminus post quem* for the timbers and withies used to build it. Timbers T17 and T18 are clearly re-used (see Beamish below) and therefore only provide *termini post quos* for construction of the trough.

Four samples have been excluded from the model: OxA-12998, a withy sample from the trough, which was anomalously early; OxA-12548, macrofossils from a gully [228] cutting the burnt mound, which appear to be reworked; OxA-12484, charcoal from [248], which appears to contain intrusive material of medieval date; and OxA-12586, macrofossils from the top fill of the trough [124], which again appear to be reworked.

The model has good agreement between the radiocarbon dates and stratigraphy (A=96.5%) and provides an estimate for the construction of the trough of *2200–2000 cal* BC (*95% probability*; *Last trough_construction*; Fig. 9) and probably *2145–2050 cal* BC (*68% probability*). Activity is estimated to have ended in *2180–1950 cal* BC (*95% probability*; *Boundary end*; Fig. 9) or *2130–2020 cal* BC (*68% probability*). The difference between the end of activity and construction of the trough; *1–100 years* (*95% probability*; Fig. 10) and probably *1–40 years* (*68% probability*) could be used to infer the length of burnt mound activity on the site.

SAMPLES FROM THE PALAEOCHANNEL ADJACENT TO THE BURNT MOUND

Of the bone and timber samples from the palaeochannel adjacent to the burnt mound, only the two aurochsen (GrA-23585, 3925±45 BP, 2570–2230 cal BC and GrA-23589, 3840±50 BP, 2470–2130 cal BC) may be contemporary with the burnt mound activity (Table 1). The human bones date to the beginning of the 3rd millennium cal BC (Middle Neolithic) and the early 1st millennium (Late Bronze Age), while the cattle and horse bones date to the Middle–Late Iron Age.

The three timber posts appear to have been components of a wooden bridge, whose construction must post-date all three timbers, and may be regarded as the final event in a phase of activity. In OxCal, the function 'Last' is used to estimate the date of the final event in a phase. The best estimate of the date of construction is therefore provided by the distribution '*bridge construction*' (Fig. 11), which has a range of *cal* AD *480–650 (95% probability)*.

TABLE 1: RADIOCARBON DATES (SEE BAYLISS et al. 2007A FOR FURTHER CONTEXTUAL DETAIL)

Laboratory Code	*Sample*	*Sample*	*δ¹³C (‰)*	*Radiocarbon Age (BP)*	*Calibrated date (95% confidence)*
Burnt Mound sequence					
GrA-23698	[236] 86A	charcoal, *Corylus avellana*, from a layer of shattered stone and charcoal	-26.3	3850±40	2470–2140 cal BC
OxA-12573	[236] 86B	charcoal, *Prunus spinosa*, context as GrA-23698	-25.6	3877±34	2470–2200 cal BC
GrA-24519	[236] 86C	charcoal, Pomoideae, context as GrA-23698	-27.2	3890±50	2490–2200 cal BC
GrA-24516	[236] 86D	charcoal, *Prunus spinosa*, context as GrA-23698	-25.3	3850±50	2470–2140 cal BC
OxA-12959	[236] 86E	charcoal, *Alnus glutinosa*, context as GrA-23698	-24.5	3913±36	2490–2290 cal BC
GrA-23700	[248] 92A	charcoal, *Corylus avellana*, from layer of shattered stone & charcoal	-26.1	3835±40	2470–2140 cal BC
OxA-12484	[248] 92B	charcoal, *Alnus glutinosa*, context as GrA-23700	-25.4	932±28	cal AD 1020–1210
GrA-24520	[248] 92C	charcoal, *Alnus glutinosa*, context as GrA-23700	-27.8	3700±50	2280–1940 cal BC
OxA-12958	[248] 92D	charcoal, *Alnus glutinosa*, context as GrA-23700	-28.3	3765±34	2290–2030 cal BC
OxA-12957	[248] 92E	charcoal, *Alnus glutinosa*, context as GrA-23700	-26.6	3725±34	2280–1980 cal BC
GU-5986	[246] 111	charcoal, *Alnus* sp. & bark, from hearth 329	-25.5	3940±100	2860–2140 cal BC
GU-5985	[317] 108	charcoal, *Corylus avellana* & *Alnus glutinosa*, from hearth 318	-25.9	3890±50	2490–2200 cal BC
GU-5987	[147] 67A	charcoal, *Corylus/Alnus* sp., from base of wooden trough	-26.9	3870±50	2470–2140 cal BC
GU-5988	[147] 67B	charcoal, *Corylus avellana*, *Alnus glutinosa*, & *Corylus/Alnus* sp., from base of wooden trough beneath alder planks	-27.5	3770±50	2400–2030 cal BC
GU-5994	timber 15	wood, *Alnus glutinosa* wide roundwood, plank forming base of trough	-29.6	3640±50	2150–1830 cal BC
GU-5983	timber 17	wood, *Alnus*?, as GU-5988	-23.9	3890±50	2490–2200 cal BC
GU-5984	timber 18	wood, *Alnus*?, as GU-5988	-29.4	3800±50	2460–2040 cal BC
GU-5995	timber 20	wood, *Alnus glutinosa* wide roundwood, as GU-5988	-29.7	3730±50	2290–1970 cal BC
OxA-12998	withy 30	wood, *Alnus glutinosa* roundwood, inc. bark, from wattle wall of trough	-28.8	4039±31	2830–2610 cal BC
OxA-12644	withies 31/32	wood, *Corylus/Alnus* roundwood, 3 rings, as OxA-12998	-27.6	3741±38	2290–1980 cal BC
OxA-12586	[101] 56	waterlogged stem/leaf, monocotyledon, from uppermost fill of trough	-28.8	4172±34	2890–2600 cal BC
OxA-12548	[229] 89	waterlogged seeds of *Carex* sp., *Ranunculus* subgen *Ranunculus*, *Cirsium* sp., from fill of gully 228	-25.2	2042±25	120 cal BC–cal AD 30
OxA-12585	pollen tin 107A	waterlogged bark frags, from blue-grey clay 173	-28.1	3971±34	2580–2350 cal BC
GrA-23745	pollen tin 107B	waterlogged bark fragments, context as OxA-12585	-28.4	4100±40	2870–2490 cal BC
From the Palaeochannel adjacent to the Burnt Mound					
GU-5980	timber 01	wood, *Quercus* sp. roundwood, 14 rings, from bridge	-27.5	1580±50	cal AD 380–610
GU-5981	timber 03	wood, *Quercus* sp. roundwood, 9 rings, from bridge	-27.5	1530±50	cal AD 420–650
GU-5982	timber 04	wood, *Quercus* sp. roundwood, 17 rings, from bridge	-25.9	1510±50	cal AD 420–650
GrA-23584	bone 111	bone, cattle skull, context 129	-22.3	2105±45	350 cal BC–cal AD 1
GrA-23572	bone 114	bone, horse skull, as GrA-23584	-22.6	2165±45	380 cal BC–50 cal BC
GrA-23585	bone 03	bone, male aurochs femur with butchery marks, as GrA-23584	-23.1	3925±45	2570–2230 cal BC

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TABLE 1: RADIOCARBON DATES (SEE BAYLISS et al. 2007A FOR FURTHER CONTEXTUAL DETAIL) CONTINUED

GrA-23589	bone 190	bone, female aurochs femur, as GrA-23584	-23.4	3840±50	2470–2130 cal BC
GrA-23586	small find 47	bone, human skull, male, $\delta^{15}N$ = 11.8‰	-21.2	4280±45	3010–2760 cal BC
GrA-23588	small find 55	bone, human femur, possibly female, $\delta^{15}N$ = 10.9‰	-21.2	4290±45	3020–2790 cal BC
Column 2					
GU-5671	AS57 1996 31.1	bulk peat, humic acid fraction	-28.3	7790±80	6990–6450 cal BC
GU-5672	AS57 1996 31.3	bulk peat, humic acid fraction	-29.0	9330±80	8790–8290 cal BC
GU-5673	AS57 1996 31.5	bulk peat, humic acid fraction	-30.0	9780±70	9310–9140 cal BC
Column 4					
OxA-12549	WPB/4/20cm	waterlogged seeds, *Schoenoplectus* sp.	-24.2	1237±25	cal AD 680–890
OxA-12999	WPB/4/33–35cm	waterlogged seeds, *Schoenoplectus*, *Prunella?*, *Ranunculus sceleratus*, *Lychnis flos-cuculi*, *Oenanthe* sp., *Potentilla* sp., *Carex* subgen *Carex*, *Eleocharis* sp.	-25.0	1207±27	cal AD 720–900
GrA-24528	WPB/4/44–46cm	*Prunus/Crataegus* twigs	-26.9	1620±45	cal AD 260–550
OxA-12826	WPB/4/54cm	waterlogged seeds, *Apium* cf. *nodiflorum*, *Lychnis flos-cuculi.*, *Rorippa* sp., *Persicaria lapathifolia*, *Urtica dioica*, *Carex* subgen *Carex*, *Eleocharis* sp., *Ranunculus* subgen *Ranunculus*, *Mentha* sp.	-26.4	1625±50	cal AD 260–550
OxA-12973	WPB/4/68–70cm	waterlogged seeds, *Ranunculus flammula*, *R. sceleratus*, *Ranunculus* sp., *Lychnis flos-cuculi*, *Polygonum lapathifolium*, *Isolepis setacea*, *Apium nodiflorum*, *Mentha* sp., *Carex* sp., *Chenopodium* cf. *album*, *Rumex acetosella*, *Rumex* sp., *Stellaria media*, *Potentilla reptans*, *Cerastium fontanum*	-26.8	1682±33	cal AD 250–430
OxA-12482	WPB/4/81cm	waterlogged seeds, *Ranunculus* subgen *Ranunculus*, *Galium* sp., *Carex* subgen *Carex*, *Apium* cf. *nodiflorum*, *Persicaria lapathifolia*, *Mentha* sp.	-23.9	4490±33	3360–3020 cal BC
OxA-12823	WPB/4/100–102cm	*Corylus avellana* nutshell, seeds of *Urtica dioica*, *Sambucus nigra*, *Ranunculus* subgen *Ranunculus*, *Viola* sp.	-27.4	2110±90	390 cal BC–cal AD 80
Column 8					
OxA-12634	col8 [113]	waterlogged stem/leaf, monocotyledon	-29.5	1048±28	cal AD 900–1030
OxA-12550	col8 [114]A top	waterlogged stem/leaf, monocotyledon	-27.9	1044±24	cal AD 900–1030
OxA-12635	col8 [114]B mid	waterlogged stem/leaf, monocotyledon	-29.3	1698±30	cal AD 250–430
OxA-12773	col8 [114]C bottom	waterlogged stem/leaf, monocotyledon	-27.7	2256±28	400–200 cal BC
Cut-marked bone					
OxA-6831	AS57 1996 32	human bone, atlas vertebra C1, with cut marks, from vicinity of column 2	-20.4	2760±55	1020–800 cal BC

Column 2

This column was located *c.* 60 m north of the burnt mound, near the spot where the cut-marked human vertebra (OxA-6831) was recovered. The three results are in stratigraphic sequence, and date the peat deposit to the early Holocene, long before the vertebra was deposited (Fig. 12). The peat was sealed by alluvium before any of the dated archaeological activity took place.

Column 4

One sample, OxA-12482, clearly contained reworked material and has been excluded from the model. The other six dates from this column, however, are in good agreement with a model that assumes sample age increases with depth below the surface (Fig. 13). They suggest that Column 4 dates from the end of the Iron Age or the start of the Romano-British period to late in the Anglo-Saxon period. A sand horizon

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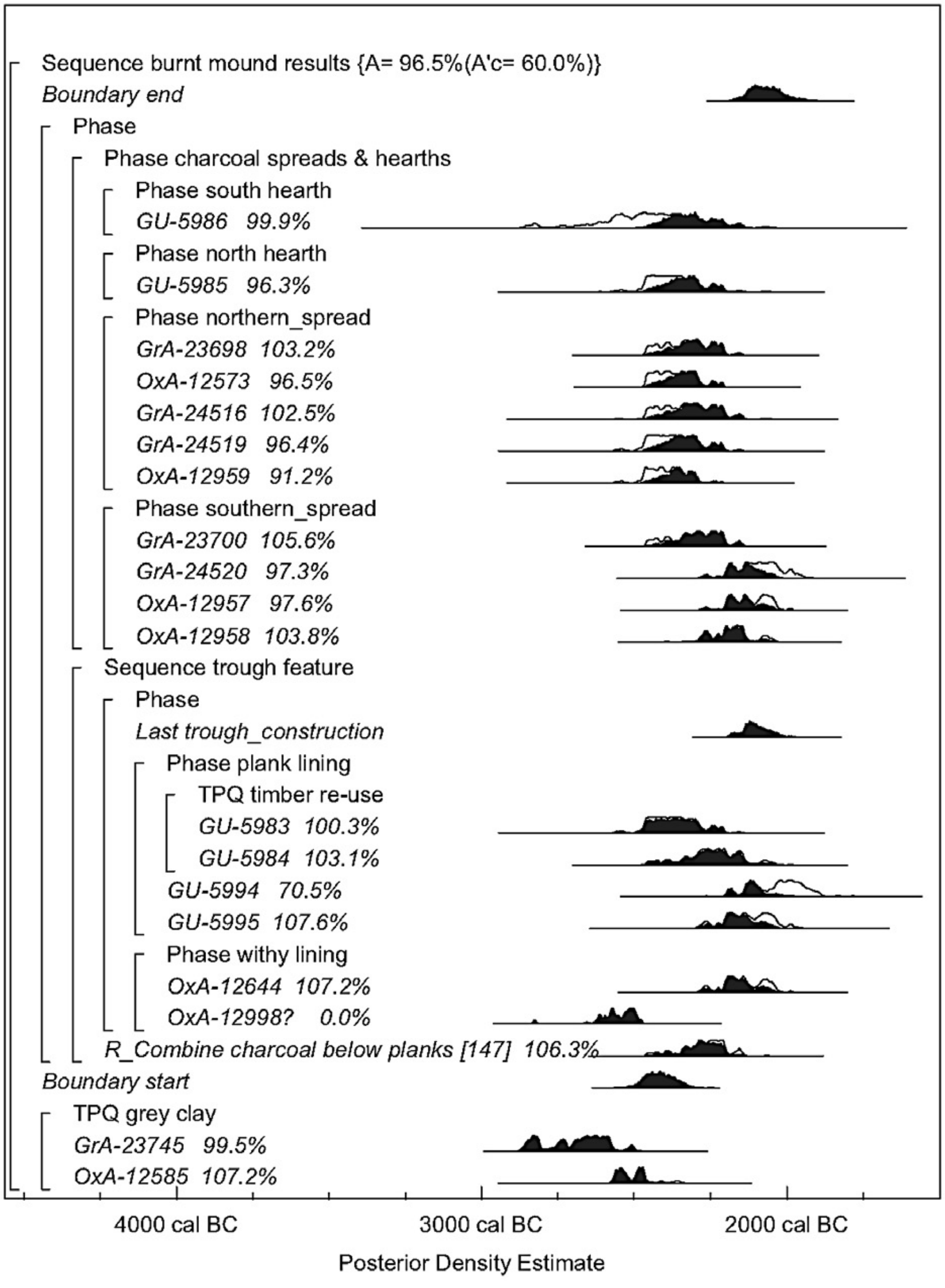

Fig. 9.

Probability distributions of dates from the burnt mound. Each distribution represents the relative probability that an event occurs at a particular time. For each of the dates two distributions have been plotted: one in outline, which is the result of simple radiocarbon calibration (Stuiver & Reimer 1993). Distributions other than those relating to particular samples correspond to aspects of the model. For example, the distribution 'Boundary end' is the estimated date for the end of burnt mound activity. The large square brackets down the left-hand side along with the OxCal keywords define the overall model exactly

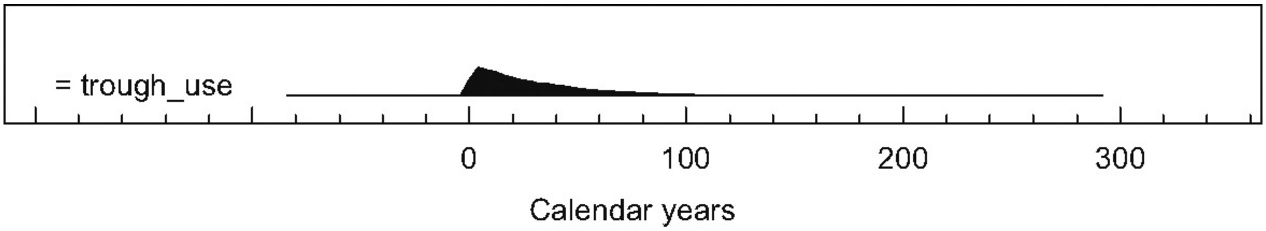

Fig. 10.
Duration of burnt mound activity (the difference between the construction of the trough and the end of burnt mound activity) derived from the model shown in Figure 9

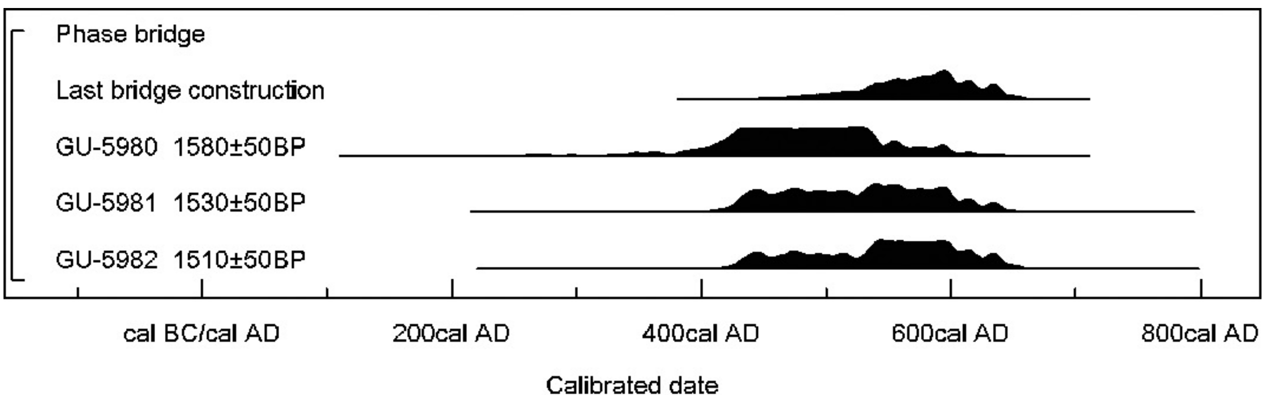

Fig. 11.
Probability distributions of radiocarbon dates from the bridge (Stuiver & Reimer 1993)

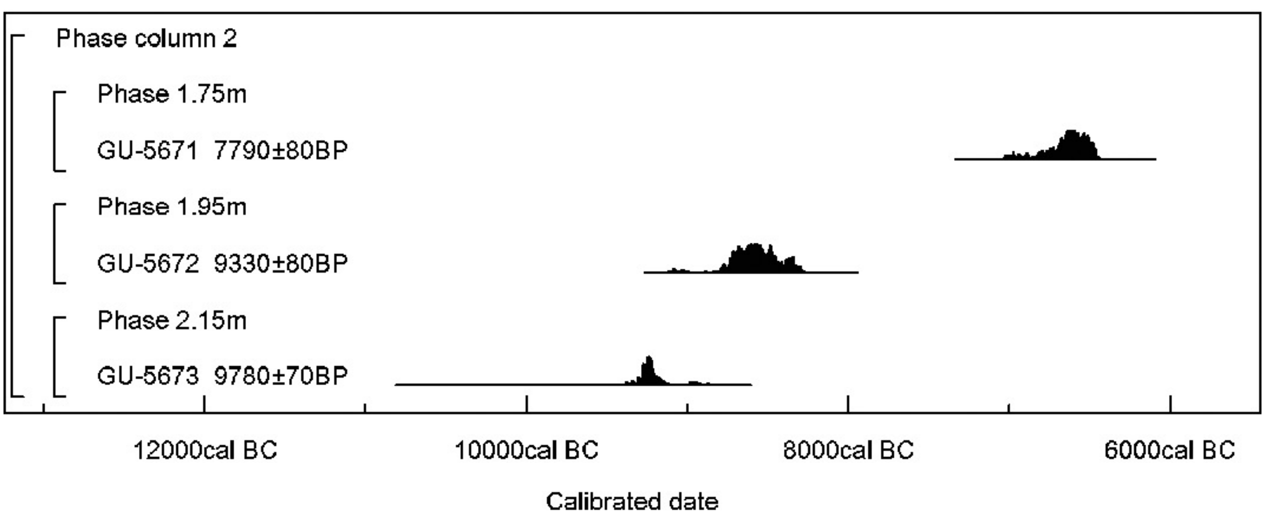

Fig. 12.
Probability distributions of radiocarbon dates from column 2 (Stuiver & Reimer 1993)

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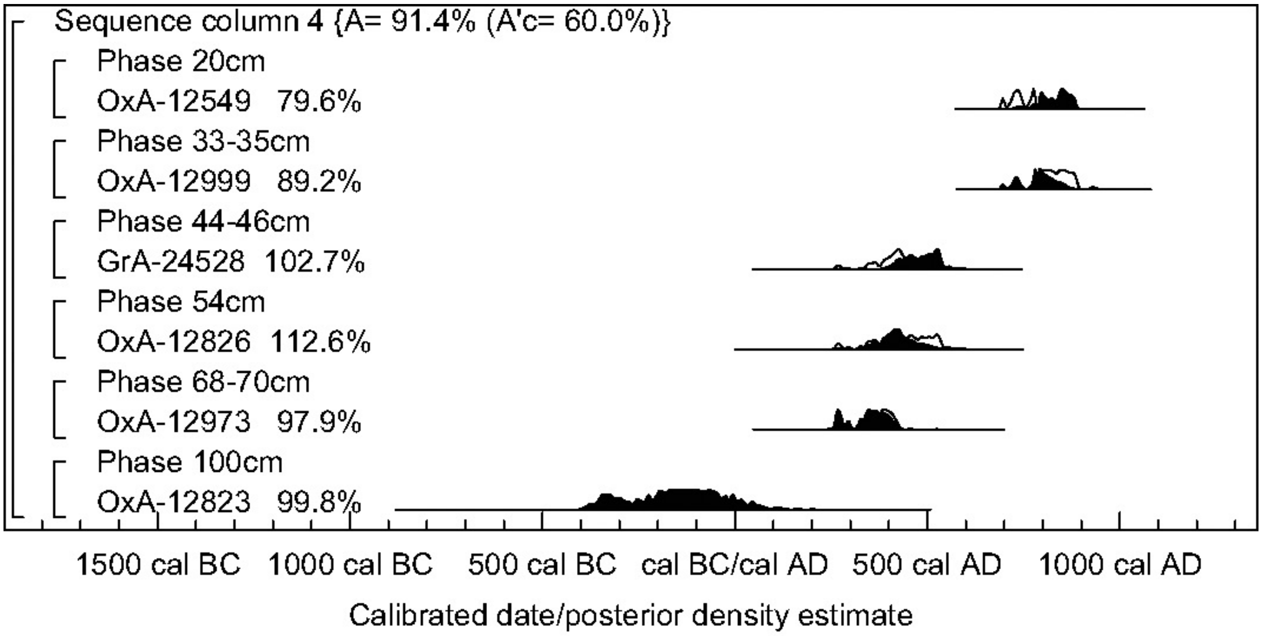

Fig. 13.
Probability distributions of dates from column 4. The format is identical to that of Figure 12. The large square brackets down the left-hand side along with the OxCal keywords define the overall model exactly

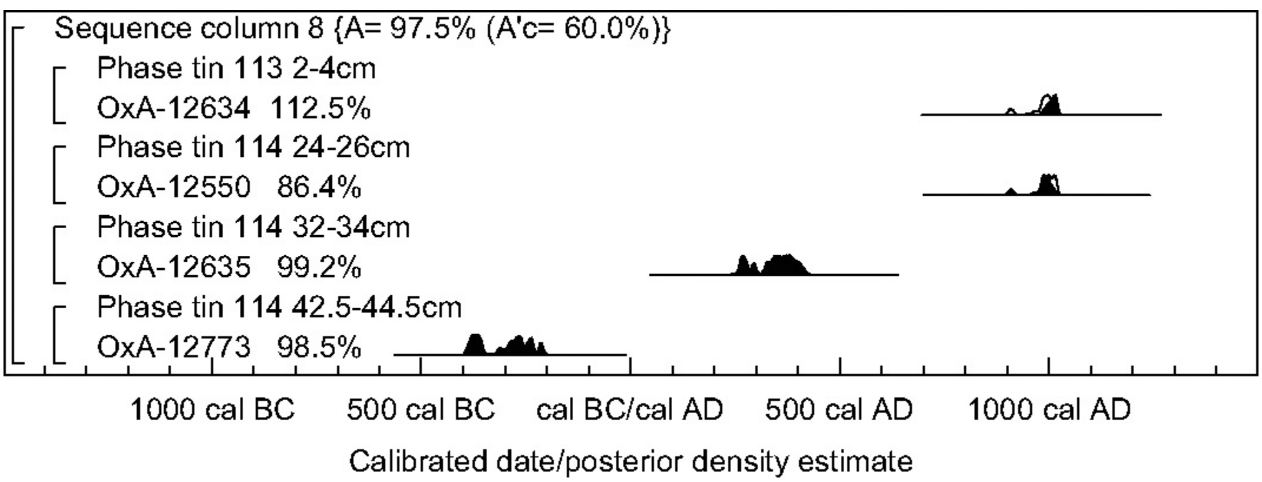

Fig. 14.
Probability distributions of dates from column 8. The format is identical to that of Figure 12. The large square brackets down the left-hand side along with the OxCal keywords define the overall model exactly

noted just below 81 cm probably represents an alluviation event, during which older plant material from nearby peat deposits (eg, that sampled by Column 2) may have been introduced. Such reworked material could account for the anomalously old result, OxA-12482, at 81 cm. The remaining samples appear to date *in situ* peat formation. Column 4 is from a section *c.* 10 m south-east of the burnt mound and *c.* 5 m south of the line of timber posts. The pollen sequence clearly post-dates the burnt mound activity, but apparently includes the period during which the bridge was built.

Column 8

Column 8, located *c.* 50 m south-east of the burnt mound, covers a similar time span. All four results are in good agreement with an assumption that sample age increases with depth (Fig. 14). Peat formation here seems to have started in the Middle Iron Age and continued until late in the Anglo-Saxon period. The entire pollen sequence is therefore later than the burnt mound.

ENVIRONMENTAL AND FINDS DATA

(A. MONCKTON with A. J. BROWN, J. GREIG, J. HATTON, D. SMITH, & E. TETLOW)

The local environment was examined through plant and invertebrate analyses of three sequences of palaeochannel deposits: Column 2, located near the presumed position of the human remains, Column 4, located adjacent to the burnt mound and Column 8, within the former palaeochannel (Fig. 1, D). The sequence provided amongst the earliest data from the Soar catchment and ranged from early Holocene to early medieval: a gradual change from an open landscape dominated by grasses, to developed woodland, to cleared woodland was demonstrated, with some evidence of cereals and finally as a hay meadow.

Early Holocene

Grasses together with a range of herbs, including meadowsweet and sedges, dominated the earliest pollen from a palaeochannel, sampled as Column 2. Trees and shrubs included pine, birch, willow, and oak (Greig 2010). This represented the time after the last glaciation before the development of woodland and was dated to 9310–8740 cal BC (Table 1: GU-5673). The lack of insects associated with woodland also suggested an open landscape. A range of water beetles associated with slow flowing or even stagnant water indicates the conditions in the channel, while insects associated with sedges and sphagnum moss suggest the surrounding vegetation. One notable species was a small rove beetle (*Eucnecosum brachipterum*) which today is often associated with wet moss and the roots of heather in bog lands, mainly at altitude in mountainous areas in the British Isles. It is no longer found in the lowland river valleys of the midlands and may be a late survival from glacial faunas. The same species has been frequently recovered from similar early Holocene deposits examined at Hemington, Leicestershire (Greenwood & Smith 2005). Other plant feeding beetles show that this channel contained a range of waterside vegetation including stands of water reeds, sedges, and bur reed (Smith & Tetlow 2010). The river valley vegetation of reed swamp and sedge beds surrounded by tundra has also been found at Croft (Hughes & Roseff 1996), at West Bridge in Leicester (Shackley & Hunt 1985), and at Hemington in the Trent Valley in this period (Greenwood & Smith 2005).

The upper part of this deposit was notably different with the pollen spectrum being that of Atlantic wildwood with oak, elm, lime, alder, and hazel, and only a trace of herb pollen. The date of 8790–8290 cal BC (Table 1: GU-5672) seems to be early for such developed woodland. A very sparse pollen count near the top of Column 2 reveals a similar spectrum, and the date 6990–6450 cal BC (Table 1: GU-5671) also seems somewhat early.

These results conform to the usual pattern of woodland development from initial open sub-arctic tundra (Greig 2010). The corresponding insect samples produced small insect faunas with few species of the surrounding environment, although the water beetles suggest that the water conditions present were essentially similar to those seen earlier. The absence of insects indicating cold conditions suggests the amelioration in climate that occurred at the start of the Holocene (Smith & Tetlow 2010).

Early Neolithic

The palaeochannel appears to have silted up to form a bog or possibly a cut-off channel surrounded by bog. The vegetation of the marshy area is likely to have been similar to the previous period represented. Pollen evidence in the previous and succeeding deposits suggests that wildwood was present on surrounding land and was therefore also likely to have been present in the Late Neolithic.

Late Neolithic/Early Bronze Age: the environment of the burnt mound

There is evidence of the wildwood with mixed lime, oak, and elm woods on drier land, and oak and alder carr in the wetter valleys. Samples from the northern hearth (Table 1) have a range of trees, alder, oak, hazel, and lime and rather few herbs, suggesting rather undisturbed woodland. The macrofossils add evidence of elder and a small flora mainly of wetland and marsh plants such as water crowfoot, ragged robin, and spike-rush. Drier grassland was represented by fairy flax and tormentil, and spores show that bracken grew locally (Greig 2010). Pine was an additional tree found in the peat from the trough, which contained earlier washed-in material (OxA-12586, Table 1). These results suggest that the burnt mound activity was in a clearing by the waterside on marshy ground, with grassy vegetation beyond, in a surrounding of wet woodland, mainly of alder. The clearing may have been man-made, or it may have been a natural clearing caused by the river and extended by the people using the site. The charcoal surviving from fuel debris shows that alder and hazel were most commonly used, probably obtained from nearby, together with oak, willow, and the shrubs hawthorn and blackthorn from the surroundings. Elm is also represented amongst the charcoal, perhaps brought from further away (Morgan 2010). The charred plant remains add little to this; they only show the use of woodland resources, possibly gathered for food, which include hazel nutshell, sloe stone fragments, elder, and hawthorn pips. These were in small numbers and, while such fruits would have been consumed, they may just have been brought to the site as fuel. No cereal remains were found in the 21 samples examined (Monckton 2010); although cereal cultivation seems unlikely nearby cereals have been found at other sites of this period in the region (Greig 2010). The aurochsen may have found grazing in such clearings as well as access to drinking water.

No insect remains were recovered from these samples. It is conceivable that adverse conditions prevented preservation, but other studies have also failed to identify insect remains in association with burnt mound sites and this may be indicative of a low intensity of use (Smith 2009, 137; Smith & Tetlow 2010).

Bronze Age

There were no samples from this period and woodland clearance was not represented. The channel was still silting up in the succeeding period, so it is likely that there was standing water at this time, possibly in a cut-off channel. The local vegetation would have been similar to the previous and succeeding periods. As with the Midle–Late Neolithic examples, the Late Bronze Age human remains are likely to have been deposited in a bog.

Iron Age–Romano-British

There is evidence of Iron Age woodland from pollen analysis of Column 4 (Greig 2010). The relevant part of the pollen bore dates from 390 cal BC–cal AD 80 to cal AD 260–550 (Table 1: OxA-12823, -24528). It indicates woodland of alder, hazel, and oak with traces of elm and lime, perhaps remnants of the formerly extensive wildwood. Macrofossils of alder, hazel, and elder suggest that woodland and scrub probably grew on the site. There are few signs of human activity, apart from some cereal type pollen and charcoal, together with a seed of the weed greater plantain. Just above this level in the pollen profile was a presumably band of Neolithic material, perhaps representing a flood event. It is possible that this may be related to destabilisation of soils by clearing woodland and cultivation. Woodland clearance in the Bronze Age and Middle Iron Age is known from headwater sites of the Soar at Croft and Kirby Muxloe (Smith *et al.* 2005; Smith 1995). At variance with these results is the pollen record from Column 8, 50 m upstream of Column 4 (Fig. 1, D). This shows survival of pine woodland with birch and hazel, which would have been expected at a much earlier date (Brown & Hatton 2010). Local conditions indicated by insect remains from Column 4 show water beetles of still or slow flowing water, with rushes, reeds, and sedges at the channel margin and water plants. Dung beetles are present suggesting the use of land as pasture.

The gully cutting the eastern perimeter of the burnt mound [228] was dated to the Late Iron Age and may relate to the control of grazing. The nearby Middle Iron Age site at Wanlip, just to the north, had evidence of a mixed economy of pastoral and arable farming and charred cereals (Beamish 1998). Cultivation in this locality in the Iron Age is supported in the Watermead column record.

Romano-British–early medieval landscape

By the Romano-British period the landscape seems to have been largely open with very little sign of remaining woodland. The middle part of Column 4 dates from cal AD 250–430 to cal AD 680–890 (Table 1: OxA-12973, -12549) and shows signs of a more open and occupied landscape, with woodland and scrub (mainly oak, hazel, and alder with some sloe or hawthorn) comprising a small proportion of the pollen sum. A consistent record of beech pollen suggests beech woods were established, with a record of heathers suggesting some heathland, although this may have been at some distance from the site (Greig 2010).

Crops are represented by a constant record of cereals, and a record of peas at cal AD 260–550 (Table 1: GrA-24528). A large range of weeds is present, further indicating cultivated land, and grassland plants and sedges are also much in evidence, as well as dung beetles indicating pasture (Smith & Tetlow 2010). Macrofossils of grey club-rush, which grows in shallow water and marshes, indicate that there was swamp, at least in the channel immediately where the deposit was forming. Other wetland plants such as water dropwort, spike-rush and sweet-grass (Greig 2010), and insect remains including water beetles of slow or still water and feeders on marsh plants were also present (Smith & Tetlow 2010).

The pottery vessel

(Nicholas J. Cooper)

Four joining sherds (SF16, [246]) weighing 25 g were retrieved from the southern hearth feature in the burnt mound (Fig. 2). The undecorated sherds belonged to the body of a possibly straight-sided or, at least, jar-like vessel *c.* 120 mm in diameter. The vessel was hand-made but not obviously coil built and 8 mm in thickness. The external surface was untreated, the internal surface was smoothed and had flaked off in places, probably due to the waterlogged burial conditions. The fabric was reduced in colour throughout to a very dark grey with slightly lighter surfaces and contained moderate amounts of very fine rounded quartz (<0.01 mm) with moderate amounts of very fine white mica, both of which are likely to be naturally occurring in the clay rather than added. The fabric has not been recognised in the county before and, lacking diagnostic decoration, it is unlikely that it would have been recognised as 3rd millennium cal BC in the absence of the radiocarbon dates.

Archaeological wood

(Matthew Beamish)

Seven alder planks lined the base of the trough (Fig. 4; Timbers 13, 14, 15, 17, 18, 20, & 25), with smaller spaces filled by roundwood twigs (T16 & 21, probably also 19 & 22). All these pieces were fragmentary and soft, and most appeared compressed. Some had been penetrated by the roots of reeds.

All the larger pieces had been tangentially split. The wood was slow grown; 50 rings were counted from the largest surviving plank cross-section (T14). The surfaces of most of the pieces were very eroded although some had surviving bark. The cross-section of Timber 17 suggests it was from near the pith of the tree. Evidence of tooling was minimal and little attempt had been made to flatten convex or concave surfaces.

Two blade facets up to 50 mm wide survived at one end of T17. As these appeared to be shaping the end of the piece rather than making it shorter, in contrast with the remaining unshaped planks, they may indicate that it had been re-used in the trough. The marks were too eroded to allow blade width estimations and no signatures were visible.

Two part blade profiles were found on a small piece amongst the trough boards (T25). The marks show that a narrow blade, probably not wider than 16–17 mm had been used along the grain, perhaps to split the wood.

Blade impressions also survived partially at one end of T20. Here narrow concave cuts up to 17 mm wide, in this instance perpendicular and across the grain, overlay a more ragged surface that was not cleanly cut. It is possible that the same tool with a 17 mm wide blade was used on both pieces.

At one end of T18 remnants of a hole, or housing survived (Fig. 15). In plan this was rectangular, 110 mm long, and probably not more than 100 m wide. The insides of the hole were tapered and irregular. Although it was probably designed to fully penetrate the piece (effectively producing a through mortise), a cut edge was only visible to a depth of 40 mm. Thereafter the edge was too ragged to be certain that the hole was intended to fully penetrate the wood. It appeared that waste material had been removed by ripping it out along the grain. The housing indicates that T18 had been re-used as part of the trough lining.

Two cut marks were recorded in one corner, the shorter of which probably represented a single blow from a blade 17 mm wide.

Charred plant remains

(Angela Monckton)

Bulk samples were taken from 22 contexts to look for plant remains that could indicate the activities that

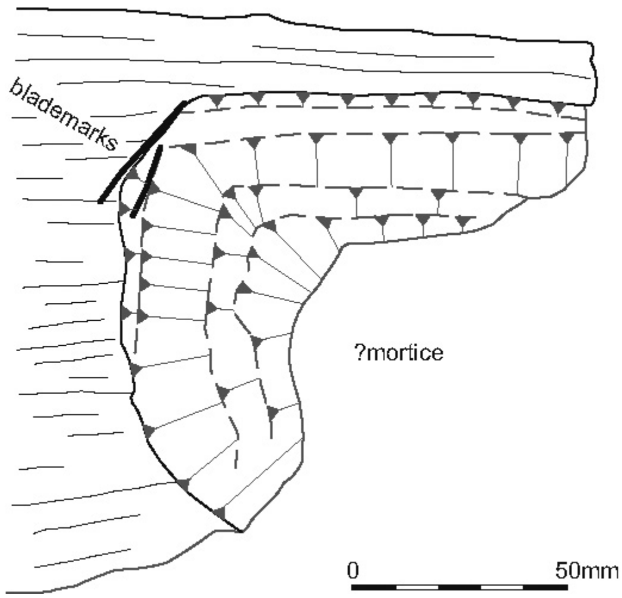

Fig. 15.
North-west end of Timber 18, with broken remnant of hole or mortice

may have taken place on the site. Only eight contexts contained plant remains, although charcoal was abundant in most of the samples.

The southern hearth (Sample 112 [245], Fig. 2), contained two alder seeds (*Alnus glutinosa*) together with a small fragment of alder cone axis. A second sample from the hearth and samples from the northern hearth contained no plant remains other than charcoal.

Three of the seven mound deposits sampled contained some items of charred plant remains. From the southern spread an alder seed and a charred seed of a reed (Cyperaceae) were found in the flot, the fine residue contained single charred fragments of hazel nutshell (*Corylus avellana*), a sloe stone fragment (*Prunus spinosa*), and a pip of hawthorn (*Crataegus* sp.). The northern spread contained a small charred bud possibly of a shrub, a seed of clover type (*Medicago* or *Trifolium)* and a couple of indeterminate seeds too fragmentary to identify.

The trough (Fig. 3) produced a charred elder pip (*Sambucus niger*), a charred alder seed, and an uncharred fragment of hazel nutshell. The upper layers of the trough were filled with redeposited earlier silt and peat.

All the plant remains were of wild plants: mostly fruit stones, pips, or seeds from trees or shrubs including alder, elder, hawthorn, hazel, and sloe. They were largely edible species but found in very small numbers in charcoal rich deposits, which included the wood of these same trees and shrubs. These species are also represented as pollen and plant macrofossils (see above), suggesting they all grew in the immediate locality. There is therefore little to suggest anything other than the incidental inclusion of food waste material, its inclusion either resulting from being transported to the site with wood for fuel or perhaps as disposal from occasionally consumed fruits or nuts. These plants all produce fruits and nuts in the late summer and early autumn so suggest activity during that season, as suggested at the Willington burnt mounds (Beamish 2009).

Although cereals are lacking at Watermead, cereal cultivation is known from the region from at least the early 4th millennium cal BC, with abundant charred grain from a Neolithic building at Lismore Fields, Buxton (Jones 2000) including emmer dated to 3940–3540 cal BC (OxA-2434; 4930±70 BP), and a mixed sample of emmer and hazel charcoal dated to 3940–3530 cal BC (OxA-2348; 4920±80 BP). A deposit of numerous emmer grains from Aston Cursus (Loveday 2000) dated to 3780–3020 cal BC (BM-271; 4700±150 BP) was confirmed as Neolithic in recent work (Loveday 2012). At Willow Farm, Castle Donington (Coward & Ripper 1999) a deposit from a pit provided evidence for Late Neolithic–Early Bronze Age wheat and barley together with collected foods including crab apples and hazel nuts, suggesting a varied landscape including some cultivated land and woodland. Glume wheats in moderate numbers from Lockington, Leicestershire (Monckton 2000) show spelt already present by the later Bronze Age. Here charcoal associated with emmer in a pit was dated to 1950–1520 cal BC (Beta-83721; 3440±80 BP), and charcoal associated with spelt and emmer in a post-hole was dated to 1500–1010 cal BC (Beta-83722; 3039±80 BP). However, evidence for spelt is absent from other Bronze Age sites in the county; despite extensive sampling at Willow Farm (*ibid.*), only emmer was found from Bronze Age contexts. A small amount of evidence for spelt was found at Eye Kettleby near Melton Mowbray, Leicestershire (Finn 2011), and at Ridlington, Rutland (Beamish 2005): at the latter site hulled barley was abundant, with grains dated to 1440–1040 cal BC (Wk-10073; 3025±69 BP).

The evidence was interpreted as burnt waste from food preparation including grains of wheat and barley with a little chaff and weed seeds with hazel nutshell present as a collected food.

At other burnt mound sites a greater abundance of nutshell fragments has been noted, for example at Willington Burnt Mound I (Beamish 2009), where like Watermead only evidence for wild foods was present. The greater abundance of nutshell in earlier prehistoric periods is thought to indicate their greater importance in the diet than in later periods (Robinson 2000). It may also indicate the proximity of woodland to many sites. From the Middle–Late Bronze Age burnt mound at Willow Farm, Castle Donington, the evidence from charred plant remains includes barley grains and wheat glumes, a little chaff, and weed seeds with hazel nutshell, similar to the evidence from the other Bronze Age features nearby. In addition, elder and hawthorn were present, whose berries may have been consumed. These remains occurred with the main concentration of charcoal at the top of the mound near the hearth. The count was again too low to suggest that food preparation was the principal purpose of the activity. Evidence for processing wild foods has also been reported from burnt mounds on the Essex coast (Wilkinson & Murphy 1995). Perhaps a certain quantity of food waste could be expected if a group of people were gathered for any length of time. However, the extensively sampled burnt mound deposits from Watermead produced very few remains of wild plants as possible food waste with a complete absence of cereal grains. Such sites on floodplains are likely to be away from areas of cereal cultivation and more suitable for use as seasonal pasture and exploitation of other wetland resources. The extensive burning, suggested by the mound of fire-cracked stones and charcoal, would seem to be excessive for cooking on an ordinary domestic scale.

Insect remains

(David Smith)

Five samples associated with the burnt mound were analysed for insect remains; the reworked upper fill of trough (Fig. 3) (Sample 56 [101]), fills of the northern hearth (Samples 103 [315] and 104 [316]), and fills from the east–west bounding ditch [303] (Fig. 2) (Samples 101 [233] and 102 [234].

The samples from the trough and from the northern hearth did not contain any insect remains but did produce some pollen and seeds suggesting that the material in these features was waterlogged at the time of deposition, although insect remains may simply not have been preserved.

The samples from the ditch produced insect faunas, but these were relatively small and have limited interpretative value. The water beetles present, such as *Octhebius minimus*, *Helophorus grandis*, and H. *aquaticus* are usually associated with slow flowing and vegetated waters (Hansen 1987). There are indications amongst the various Carabidae ‘ground beetles’, along with the presence of *Platystethus nitens* and *Dryops* species, that the ground around this ditch was open and muddy and from a few individuals of dung beetles, which feed on the droppings of a range of large herbivores of nearby pasture.

To date, the number of insect faunas examined from burnt mounds in the Trent Valley and nationally is extremely limited. In the Trent basin only those from Girton, Nottinghamshire (Kitchen 2008), Castle Donington, Leicestershire (Smith 2001; Smith & Howard 2004), and Willington, Derbyshire (Smith 2009) have been examined in any detail. As with Watermead, these appear to have been associated with the banks of cut-off channels or backswamps beside or within highly vegetated channels of slow flowing water. Like the Watermead results, these other burnt mound faunas also have produced no indicators for the presence of food waste or human occupation. There are no remains of the ‘flesh flies’ or ‘corpse flies’, which one might expect to be associated with food waste and the use of these mounds as cooking/feasting sites (ie, O’Kelly 1954). There is also a complete lack of human ecto-parasites such as head or body louse (*Pediculus humanus* L.) or human fleas (*Pullex irritans* L.). Both species of parasite are fairly common in settlement sites (ie, Kenward & Hall 1995) and might be expected to be associated in some numbers with the waste of ‘sweat lodges’ (ie, Barfield & Hodder 1987). Certainly, regardless of whether these burnt mounds are being used for the cooking, or as ‘sweat lodges’, it seems unlikely that they were being used intensively or continuously for long periods of time

Faunal remains, contemporary with burnt mound

(Tony Gouldwell)

Two of the aurochs bones were radiocarbon dated to the second half of the 3rd millennium cal BC (Table 1:

GrA-23585, -23589). Numbers of anatomical elements present did not seem to fit a pattern, with ribs being noticeably abundant (Table 2). The body parts recovered were probably accounted for by the greater survival and visibility of larger pieces.

Full metrical analysis suggests there seem to be at least two individuals present, quite possibly just one of each sex (Gouldwell 2010). All observed epiphyseal sutures were fused, with indications that both the bull and the cow were adults at over 3.5 years.

Aurochs is recorded in Britain from the Ipswichian interglacial, and from the late Devensian to Bronze Age, with an isolated find of uncertain history from AD 4th century Roman *Segontium* at Caernarfon (Yalden 1999, 106–11). Local finds from a similar peat deposit at Cossington, Leicestershire, include a distal fragment of humerus, a lower jaw and ribs (Browning 2008).

TABLE 2: WILD CATTLE (*BOS PRIMIGENIUS*) BONE BY ANATOMY AND CONTEXT: NISP

Context	–	*127*	*129*	*Total*
Taxon, anatomy				
skull	1	–	–	1
" (cf. B. *primigenius*)	1	–	1	2
dentary	2	–	–	2
vertebra: cervical	1	–	–	1
vertebra: thoracic	2	1	–	3
rib	12	–	–	12
scapula	1	–	–	1
humerus	1	–	–	1
metacarpal	1	–	–	1
pelvis	2	–	–	2
femur	2	–	–	2
tibia	1	–	–	1
B. primigenius & cf. *primigenius*: totals	27	1	1	29

BUTCHERY OF AUROCHSEN

Superficial scratches were consistent with gnawing, particularly by fox incisors, rather than cuts. Butchery was expressed in breakage and grazed surfaces. The vertebrae were fairly complete. Ribs seem to have been removed from an intact spine. One smaller (female?) thoracic vertebra has been trimmed on the right side and dorsally, removing the neural spine. Grazing across one large (male?) thoracic vertebra posteriorly indicates transverse sectioning of the spinal column between vertebrae. A lack of grooving on the chopped surface suggests that the implement was of metal or polished stone. The rib cage was likely wrenched open to create slabs of brisket, breaking some ribs just distally of the proximal ends. Three out of four left proximal ends are broken just distally of the articulations; two out of five from the right.

In the humerus the shoulder joint was dismembered by a chop removing the proximal articular surface from its metaphysis. At the elbow the trochlea along with the distal part of the limb was removed from the posterior of the distal humerus. The chopped surfaces are too degraded for recognition of directional wear or striations (cf. Olsen 1998). Two femoral specimens include first a proximal fragment with major trochanter and a small tapering part of the shaft. Second is a right distal articular end. The bone was chopped just proximally of the metaphysis from an anteromedial direction. Breakage here would access the marrow cavity and/or work the bone material. Disarticulation of the joint itself is suggested by the posterolateral condylar surface which bears two parallel chop-marks, running not quite perpendicular to the shaft, but somewhat diagonally. This could have happened as a result of chopping through tendons to release the meat from the thigh, and in dismembering the knee-joint.

The dating of the bones places them in or near the earliest stages of metalworking in Britain and Ireland (Darvill 2002, 494; Parker-Pearson 1993, 78–82).

Human remains

(Jill Cook)

A probable three individuals were identified from two male skulls and a possible female femur (Table 3). Many of the remaining bones were of a consistent size to have originated from these individuals and suggest they were from articulated burials. The three individuals have been radiocarbon dated.

Most of the skeletal elements were not present but the surviving bones were in excellent condition (Fig. 16). They showed no signs of weathering, carnivore or rodent gnawing such as might result from pre-depositional exposure, nor did they show any damage that can accrue during the burial or post-depositional phase (Andrews & Cook 1985; Cook 1986).

This small sample of early 3rd millennium cal BC human bones showed no evidence for cause of death or post-mortem treatment of the cadaver or skeleton. The Individual 1 cranium lacked the middle part of the face. The maxilla, nasal bones, and lower orbits were missing due to ancient damage that appears to have occurred post-mortem. There was no evidence to suggest peri-mortem interference with the skull.

With the exception of one of the femurs (SF56), all of the post-cranial remains were undamaged and in good condition. SF56 had ancient damage at both the proximal and distal ends but fractures did not show the characteristics of deliberate human actions (White 1992). Furthermore the bone shaft lacked any sign of superficial alteration or tool marks except for some recent scuffing. This is also true of the other limb bones and clavicle.

TABLE 3: BONES PRESENT & CALIBRATED RADIOCARBON DATES FOR THE HUMAN SKELETAL REMAINS

Specimen	*Condition*	Sex	*Tool mrks*	*Natural mrks*	*MC*	*Lab. no.*	$\delta^{13}C$ (‰)	*Radio-carbon age* BP	*Calibrated range* BC *at 95% probability*
Individual 1,									
SF 47, *Cranium*	Good. Damage in mid-facial region	M		slight		GrA-23586	21.2	4280±45	*Middle Neolithic* 3030–2700
SF 52, *R radius*	Good/complete				yes				
SF 53, *R clavicle*	Good/ complete			scuffing & depressions					
SF 56, *R femur*	Good/damaged at proximal & distal ends								
Individual 2,									
SF 55, *R femur*	Good/complete	?F			yes	GrA-23588	21.2	4290±45	*Middle Neolithic* 3030 – 2710
Individual 3,									
SF 48, *Atlas vertebra*	Good/complete		yes			OxA-6831	20.4	2760±55	*Middle–Late Bronze Age* 1040–810
SF 46, *Cranium*	Good	M							
SF 49, *Axis vertebra*	Good/complete		yes						
SF 50, *R tibia*	Good/complete				yes				
SF 51, *R fibula*	Good/complete								
SF 54, *Mandible*	Good								

The Late Bronze Age Individual 3 cranium and mandible could be seen clearly to articulate with the two vertebrae with cut marks. A right tibia and fibula (SF50 & 51) appeared to belong to the same individual.

The cranium and mandible of Individual 3 exhibited minimal damage. There was some slight peeling off on the left temporals of crania, as well as some release along the squamosal suture of skull (SF46). These were probably due to environmental changes since excavation. The mandible (SF54) retained an almost full dentition bearing a complete set of M^3 (wisdom teeth), which suggest that the individual was at least *c.* 18–21 years old at the time of death. On the skull, the thin, fragile bone of the nasal aperture and the back of the palette were intact suggesting that the skull was carefully buried and undisturbed. There was an absence of any random, superficial scuffs or scratches such as would have accrued had the skull been disposed of casually and been left to roll about (Andrews & Cook 1985). Similarly, there was no evidence of peri-mortem trauma or tool marks on either the cranium or the mandible.

Both cervical vertebrae in the collection showed clear ancient striations (Fig. 17). On the atlas (C1) vertebra (SF48), there were two almost parallel, horizontal marks, 16 mm long, on the outer face of the left posterior arch. The upper edge of the top mark overhung a slightly rougher lower edge of this deeper striation, which was asymmetric in cross-section. The lower mark was symmetric in cross-section and more superficial. The axis (C2) vertebra had a fine striation, 8 mm long, on the anterior face below the right superior articular surface, just above the position of the hyoid bone. The mark was similar to the upper example on the atlas vertebra in having an overhanging upper edge and asymmetric cross-section. All of the marks resembled slicing marks made by a fine edged tool used at a slight angle. All of the marks are clearly ancient and were, in part, still filled with sediment. They were not close in appearance to cut marks made by stone tools (Cook 1986; 1991) but are commensurate with descriptions of marks made by metal implements such as a sword or knife (Molleson 1991). The cuts were inflicted peri-mortem and are probably indicative of the cause of

Fig. 16.
Two views of the cranium of the Middle–Late Bronze Age Individual 1 (left) and the Middle–Late Neolithic Individual 2 (right): both well-preserved with no evidence of casual damage

death rather than mortuary or other post-mortem practices. Indeed, the latter can probably be ruled out in the absence of deliberate fracturing or cutting, scraping, chopping, and percussion marks on any of the other bones. The location of the slicing marks on the vertebrae suggests that the individual was faced by another right-handed person, who cut the right side of the victim's throat. With the head fallen forward another two cuts were made to the back of the neck.

Stable isotope measurements for Individual 1 and 2 (Table 1, GrA-23586 and GrA-23588) show results consistent with a fully terrestrial diet.

With the exception of the cervical vertebrae, the human bones found at Watermead show no evidence for cause of death or post-mortem treatment of the cadaver or skeleton. However, the vertebrae carry relatively rare examples of slicing marks made by a metal implement (Molleson 1991). No healing had

Fig. 17.
The Bronze Age male (Individual 1) atlas or C1 vertebra (SF48), with cut marks

occurred and it is probable that the marks account for the brutal cause of death of one of the individuals present. What happened to the rest of the bones from these individuals is unknown. Although the occurrence of odd human bones discarded amongst other material is quite common in some prehistoric periods, the lack of random damage on these few pieces seems to contradict casual disposal. There is insufficient evidence to suggest any other peri-mortem practices, such as excarnation, or mortuary practices involving the deposition of whole or parts of bodies.

MERCURY POROSIMETRY REPORT
(MATTHEW COLLINS)

In order to assess the potential to provide evidence for inhumation *vs* defleshing, three samples of human bone were subjected to mercury porosimetry (HgIP). The technique forces mercury under pressure into small (0.5 g) samples of freeze dried, evacuated bone revealing the distribution of internal pores. Inhumated human bone has an internal pore-size distribution dominated by pores with diameters of 0.6 μm and 1.2 μm (Jans *et al.* 2004). These are attributed to putrefying collagenolytic bacteria (possibly *Clostridium* spp; Collins *et al.* 2002; Turner-Walker *et al.* 2002). Butchered bone lacks this type of alteration and is either extremely well preserved or has been attacked by fungi (which rapidly forms on defleshed bone still containing periosteal membrane). Microbial Porosity is extremely common in human bone, although is rare amongst neonatal skeletons (presumably due to a lack a well developed gut flora). Conversely microbial porosity is less common in animal bone being most commonly found in intact skeletons (eg, dog burials).

Analysis was carried out on long bones from each of the three individuals identified (Table 3): *SF52,* right radius, Individual 1; *SF55*, right femur, Individual 2; *SF50*, right tibia, Individual 3. The results (fully reported with methodology in Collins 2010) are atypical of human bone. There is no evidence of microbial attack in any of the bones and all have lost collagen.

The deposition of the human bone
(Jill Cook, Matthew Collins, & Susan Ripper)

The mercury porosimetry analysis suggests that cessation of blood supply to these individuals at the time of or very shortly after death is the probable

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cause of the lack of microbial attack. Turner-Walker *et al.* (2002) have observed that microbial attack of bone leads to pore sizes of between 600 nm and 1.5μm. This intermediate or 'm' porosity is typical of intact buried corpses and is much less common in butchered animal remains. From this observation they developed an argument, based upon earlier work by Bell *et al.* (1996), that collagenolytic gut bacteria entering the bone post-mortem via the blood supply cause this microbial attack.

The absence of any such 'm' porosity in the Watermead bones indicates that they have not suffered microbial attack. Excarnation would lead to the removal of the gut contents, and thus cessation of this type of attack. However, in previous (very limited) analysis of unusual pre-Christian burials there is some initial microbial attack evident. None is evident in this case. The pattern of attack is commonly seen in butchered animal remains.

The results indicate an atypical pattern of intrusion, which was rarely seen in human bones in a larger European study. It is concluded that the bones have not suffered putrefaction, but may have suffered excarnation or butchery. As a consequence the corpses were not simply buried intact but underwent some form of treatment, which removed the gut contents or cut the blood supply prior to burial.

Although the bones are from different periods, the similarities in their condition suggest they were subjected to similar processes, post-mortem. Excarnation is not supported by any evidence of scavenging and the observed fungal growth within the brain cavity suggests the Middle Neolithic bodies were buried swiftly after death, before the brain soft tissue decayed. However, it is the Late Bronze Age individual that contains evidence of sudden death or 'butchery', but the *c.* 2000 year gap in their radiocarbon age must prohibit any conclusions regarding continuity of tradition.

There is compelling evidence that excarnation was practised in parts of Britain in the Early Neolithic (Smith 2006) with some evidence of collective burial in various mortuary structures found nationally also found in the East Midlands (Clay 2006, 75). There is some evidence that rivers and wetlands in some areas became a focus for ritual activity in the Middle Neolithic (Thomas 1999, 113), although burials from this period are extremely rare. In a Late Neolithic/Early Bronze Age deposit at Langford Lowfields, Nottinghamshire, over a dozen skulls were found accumulated with other human and animal bones around a logjam on the River Trent (Garton *et al.* 1997). A fragment of wickerwork suggests the bones may once have rested on some sort of mortuary platform. A single human rib (from a partially articulated rib cage) was dated to 2400–2030 cal BC (3780±50 BP; Beta-87093).

Those who were not buried in the numerous barrows and flat graves recorded in the Late Neolithic/Early Bronze Age may have been deposited in the water, and skulls found in a number of rivers (eg, the Thames: Bradley & Gordon 1988) may be rare evidence of this type of deposition.[1]

DISCUSSION

(SUSAN RIPPER & MATTHEW BEAMISH)

A burnt mound is an accumulation of charcoal and fire-cracked stones which are the debris from a water heating process in which heated stones are plunged into a trough of water to produce hot water and/or steam. The stones thermally fracture by repeated heating followed by immersion in cold water, until they disintegrate to beyond a useable size. The resulting 'stone chip', along with spent hearth fuel (charcoal), appears to have then been deliberately spread around the trough area forming a platform of consolidated ground. Burnt mounds are invariably located on marginal ground unsuitable for permanent settlement, near to running water, and often adjacent to a bog or marshy ground. Despite large scale excavation and sampling, often in conditions ideal for preservation, few artefacts or organic remains (excepting charcoal) are recovered from these sites. There are currently two orthodox interpretations, which vary in emphasis: the English Heritage *National Monuments Records Thesaurus* suggests burnt mounds were places where 'heated stones were used to boil water primarily for cooking purposes' (English Heritage 1999, online), while Darvill (1988, online) proposes that 'most are best interpreted as sauna baths of some kind, although a few might have been used as cooking sites'. The paucity of food debris and/or evidence for structures to contain steam has steered archaeologists to look elsewhere for interpretation, principally; leather shield manufacture (Coles 1979, 198), softening/dyeing of basketry woods (cf. Heseltine 1982, 9–12), brewing

(O'Drisceoil 1988), and textile production (Jeffrey 1991).

Burnt mounds were seemingly a common feature of the Late Neolithic and Bronze Age landscape with examples identified across north-western Europe. In Ireland, where they are particularly prolific, over 4500 burnt mounds (*fulacht fiadh)* have been identified (O'Drisceoil 2002). The National Monuments Records of Scotland lists 1855 (Archaeological Data Service 2005), while the English Heritage National Inventory currently holds records for 913 burnt mounds (Arch Search 2012). Discussion of their distributions, however, must remain, in essence, a discussion of visibility and, for new discoveries, the application of archaeological development control. Recent quarrying for mineral extraction in floodplains has led to an increase in the recognition of burnt mounds across the British Isles and the likelihood is that, with the increasing demand for development land, many more will be discovered.

Within the Midlands, new eastern and southern examples (Fig. 1) join previously identified clusters from around the tributaries of Tame and Trent in south Staffordshire and Warwickshire (Cantrill 1913, 649; Hodder 1990). In Derbyshire, burnt mounds remain rare, with examples identified at Willington (Beamish 2009) and Netherseal, on the Seal Brook (David Budge pers. comm.), and possibly at Baslow and Bubnell (English Heritage 2007, NMR Monument 965779). In Nottinghamshire, examples include Holme Dyke, Gonalston (Elliot & Knight 1998) and Waycar Pasture, Girton (Garton 1993). In Leicestershire, two burnt mounds associated with the River Trent were excavated at Castle Donington (Coward & Ripper 1999) and at least three in close proximity have been exposed by a stream tributary of the River Wreake at Brooksby (Parker & Jarvis 2007). Mound type deposits were suggested across an area of valley bottom in a test-pit survey through alluvium adjacent to the River Wreake at Syston (Beamish 2003, 147).

Where Burnt Mounds are identified, it is not uncommon for several examples to exist within relatively close proximity. For example, two burnt mounds were identified along an 80 m reach of a palaeochannel of the River Trent at Castle Donington (eg, Coward & Ripper 1999), three within 150 m at Brooksby Quarry, (Parker & Jarvis 2007), and a similar distance between Burnt Mounds I and II at Willington (Beamish 2009). Studies on the Fen edge of burnt mounds (*pot-boiler)* sites have shown that although some are found in close proximity to lithic scatters, many others are not, and a link between areas of settlement and burnt mounds cannot be made (Silvester 1991, 87). The Castle Donington examples (Coward & Ripper 1999) lie within view of a ring-ditch and at Watermead numerous ring-ditches have been found in the locality, the nearest being approximately 1 km to the east at Roundhill, Syston (Monument ID MLE990) but, again, any link between these monuments could only have credence in the light of much further research.

Date

On the basis of the Bayesian modelling, the use of the burnt mound and trough is for between *1–110 years* (*95% probability*) and *1–45 years* (*68% probability*) (Fig. 10) with activity estimated to have ended in *2180–1950 cal* BC (*95% probability)* or *2130–2020 cal* BC (*68% probability*) (Fig. 9). This compares with evidence from Northwold, Norfolk, where Bayesian modelling suggested that a burnt mound was is in use for *35–165 years (95% probability)* with most of the probability at the shorter end of the distribution (Crowson 2004, 32, fig. 18: *use_mound*) and from Willington, Derbyshire, where a burnt mound was in use for *20–210 years (95% probability)* (Marshall *et al.* 2009, 68, fig. 35: Willington II).

Activities resulting in the creation of charcoal clearly occurred on earlier occasions on the site, but these activities are not demonstrably of burnt mound type. The use of this location for the Neolithic and Bronze Age human burials, and the dumping of animal bones in the Neolithic and the Iron Age, with the later construction of a bridge or jetty in the Anglo-Saxon period, reiterates that the attraction to the location was complex and persistent.

There was no clear indication from the ephemeral physical remains of the Watermead site that the deposits were the result of two distinct episodes, although it was not clear that the two broad spreads were contemporary. The early dates of the charcoal layer beneath the plank lining of the trough (GU-5987 and GU-5988) could be argued to represent an earlier phase of trough use rather than a later incorporation or even *curation* of residual material, but this would imply the re-using of the same pit centuries after it was first used, and this is considered implausible.

Burnt mounds, although now acknowledged as having a Neolithic currency, are still generally held to be later Bronze Age in date (Bradley 2007, 214). The dating of burnt mounds has been recently explored in detail (Beamish 2009) and can be summarised as follows. An initial assessment and recalibration of some 87 dates from 58 burnt mounds from Britain and Ireland show a broadly even distribution between the mid-3rd millennium cal BC and the second quarter of the 1st millennium cal BC. Although earlier Neolithic dates have been determined from 'fire-pits', ie, pits filled with deposits of burnt stone and charcoal but with no associated mound or spread (eg, 3650–3360 cal BC Beta-68472; 4720±60 BP) at Greenlaw, Dumfries-Galloway, Scotland (Maynard 1993, 35), dates from burnt mounds where a spread or mound is an integral part of the evidence appear to span a broadly continuous sequence which starts with a date of 2860–2400 cal BC (GU-7865; 4030±60 BP) from Kilmartin, Argyll, Scotland (Anthony *et al.* 2001, 924). There is a clear distinction between the heating of water and creation of steam as a one-off episode leaving perhaps solitary pits with no related spread of burnt stone, and the formalisation of such a site as a *monument* that is intentionally defined, used, revisited, and sometimes redefined over a period of time.

The dating of the Watermead burnt mound places it in the earlier part of this emergent chronology, where it joins other examples with usage dates in the later 3rd and early 2nd millennium cal BC, from the north Midlands, East Anglia, and Wales. Other isolated examples currently beyond this zone, are from the south coast and the Scottish Borders. All the above Burnt Mounds could be consistent with the chronology currently assigned for the prevalence of Beaker material between 2400 and 1800 cal BC (Bradley 2007, 144), although those at the earlier end of the range may have been slightly too early to have had any such associations. A number of Norfolk burnt mounds have a direct relationship with Beaker material, for instance, Hoe and Overa Heath, Quidenham (Apling 1931, 365 & 368) and Northwold (Crowson & Bayliss 1999). The Norfolk Fens have been suggested as an area of early burnt mound development (*ibid.*, 247). On the basis of the radiocarbon dates, this area can now be augmented to include a swathe of central Britain, although there appear fewer early examples from the south Midlands and southern England in general; this may well be a function of visibility and dissemination.

THE MOUND

Palynological analysis suggests a valley floor with alder and oak carr woodland on damp land, at the time of the burnt mound's use. On drier land away from the valley bottom, there were mixed woodlands with a lime, elm, oak, and hazel understorey; remnants of the wildwood. The burnt mound was clearly a formed and defined area, although in two parts; a crescentic shape surrounding the trough and a consolidated stony area just to the north. Despite its small relative size it was clearly both within a restricted area and the surface was recognisably compacted. Most recorded mounds have uniform, consistent edges, rarely feathered or irregular and the recognition that mounds were deliberate constructions has been argued elsewhere (Moore & Wilson 1999, 232). The activity appeared to be demarcated to the north by the contemporary east–west ditch.

Although the Watermead burnt mound appears to have included deliberately 'tamped' surfaces it cannot be assumed that these were primarily constructed to aid the refinding of the mound. Palynological evidence at Willington (Beamish 2009) suggests that while the background was one of pasture, fast-growing lush vegetation in the immediate surrounding marshy ground would quickly render these low-lying sites invisible. Pasmore and Palister (1967, 14) noted that in the New Forest, extant burnt mounds supported different vegetation, usually heather. While this may have made the refinding of a burnt mound, perhaps for a year or two after last use, a small expanse of stone and charcoal would be rendered indiscernible from the surroundings in the long term. The consolidation of an expanse of ground suggests the activity which burnt mounds were primarily used for may have included a requirement for a solid surface on which to spread out. It is perhaps more probable that the mound was refound by association with a topographical feature, such as a natural ford or localised variation in the geology, which cannot be seen today.

Using an index formulated from experimentation O'Kelly (1954) estimated that 0.5 m^3 of stone would be required to heat a tank containing 450 litres of water. During 'experiments using a reconstructed fulacht' Buckley (1990) estimated that coarse sandstone could be used 12 times before disintegration. As a very rough estimate, the

Watermead burnt mound (nearly 10 m^2 by 100 mm deep) comprised 1 m^3 of fire-cracked stone, to heat a trough that held *c.* 220 litres of water. This, very crudely, suggests the trough was used for 4–5 boilings, although each stone could have been used many times and the mound was likely to have been eroded.

The trough

The troughs from earlier burnt mounds tend to be small and circular (Fig. 18) and the large rectangular troughs are generally found on later burnt mounds although the overall validity of this observation has yet to be tested. At Swales Fen, Suffolk the lining of the trough 'consisted of slender rods interwoven around groups of two or three vertical rods ... the floor of the trough was lined with seven split alder logs' (Martin 1988, 358–9). Charcoal from the base of the wood-lined pit was radiocarbon dated to 2400–1970 cal BC (HAR-9271; 3760±60 BP). The trough from one of the possible burnt mounds at Brooksby Quarry, Leicestershire (as yet undated), was similarly lined with whole and split logs (Jarvis pers. comm.). Both troughs, and the Willington Burnt Mound I unlined trough, were of similar dimensions to that at Watermead and all would have held comparable amounts of water.

Analysis of tool marks at Watermead suggests the timbers were worked using a narrow bladed stone tool, but no attempt had been made to flatten surfaces. The curved portion of the split logs was uppermost in the trough, which would have resulted in an uneven surface (also seen at Brooksby, Swales Fen and the timber lined Burnt Mound II, Willington (Beamish 2009, 12b.)). A flat surface was obviously not a prerequisite for the function of the trough, although this could easily have been achieved by turning the split logs over.

When the water heating process was completed a final layer of largely complete cobbles was left in the trough. The cobbles were presumably only retrieved prior to the next firing (Fig. 19).

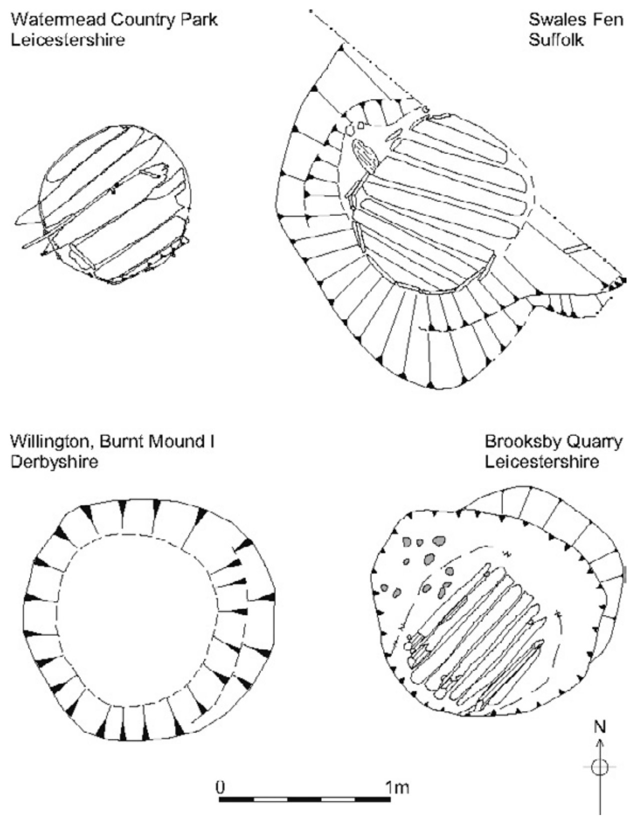

Fig. 18.
A comparison of circular troughs: Watermead Country Park and Swales Fen (redrawn from Martin 1988) were timber and wattle lined, Willington (redrawn from Beamish 2009) was unlined and Brooksby (Beamish & Jarvis unpublished) lined just with alder planks and logs

The function of burnt mounds

The heating of stones is indisputable, with the hot stones used to heat water in the trough (Fig. 20). Despite wet-sieving 220 kg of mound material, no burnt animal bone was found. None was found in the fills of the trough and analysis did not identify insects associated with rotting food. The very small collection of hazel nutshell, sloe stone fragments, and charred elder pips suggests that, while organic remains survived in these conditions, the processing of food was not the purpose of burnt mound activities. That some of the aurochs bones were possibly contemporary with the usage of the burnt mound is of interest, but no direct link can be made between the bones and the burnt mound. The plant remains, however, indicate that activity was taking place in the late summer and early autumn.

O'Driscoeil (1988) has suggested that leather manufacturing may have been the principal 'industry' of the burnt mound. Even in the most basic preparation of animal hides the removal of fats and meats can be aided by soaking the hide in warm water.

Rubbing potash or even urine into the skin is thought to loosen the hair fibres and aid de-hairing, and hides can be tanned by soaking the scraped skin in water mixed with oak bark and then dried. The drying of a skin stretched over a small fire would further soften the hide and improve flexibility. However, the absence of both animal remains and oak in the charcoal samples at Watermead, and the absence of insects that might be attracted to such activities, lend no support to this theory.

The circular trough would be rather small for an adult to bathe in and the absence of structural evidence around the trough suggests that it had not been used as a steam bath. The shallow post-holes recorded around the northern hearth might be evidence of a structure used for steam bathing (cf. Barfield & Hodder 1987) but the clear evidence from the hearth of heating *in situ* would have rendered any enclosed space very smoky, and such a use is not considered plausible. Alternatively the post-holes may have supported a frame to dry materials near to the hearth.

Jeffrey has outlined the historical evidence for fulling, the process that prevents shrinkage of woollen cloth achieved by agitating garments *in* hot water preferably with a detergent to degrease the fibres (Jeffrey 1991, 101). Although detergents are not known in the archaeological record for this time, a mix of animal tallow and wood ash can produce a sudsy substance that could be used to clean clothes. Urine is also a known surfactant and even 'lye' (sodium hydroxide, the base for soap) can be simply produced by leaching wood ash in water for a number of days.

Felting has been suggested as an activity that requires hot water to shrink wool fibres (Jeffrey 1991), but the process also requires a hard surface on which to agitate the fibres. The fractured stone and charcoal surface of the mound would have provided an expanse of consolidated ground but would hardly have been suitable for the violent agitation of felted cloth against a hard surface.

Hot water is also a necessary element to the process of dyeing material. Dyestuffs are easily obtained (most plant leaves, barks, berries and even soils will produce colour). Preparation involves crushing and fermentation in cold water. The liquid would then be added to a container of hot water and the garment steeped in the brew. The addition of a mordant (such as tannic acid) would fix the dye, but the process would still be viable without it.

Iron Age/Romano-British deposits

The valley floor woodlands seem to have lasted until the Late Iron Age or early Romano-British period when they too gave way to occupied land with fields and meadows and rather little remaining woodland. Direct evidence of activity in this period at Watermead was restricted to a single shallow gully, a collection of animal bone, and accompanying environmental data. The gully suggests a small degree of management of the landscape. The stratified animal bones were restricted to a horse skull (with evidence of butchery), a cow skull that had been skinned and other pieces, various red deer fragments, and a single fragment of sheep/goat. That the bones had been disposed of in the silted palaeochannel suggests the area was, during this period, regarded as wasteland and perhaps no longer held the appeal of former times.

Understanding prehistoric ceremonial activities and ritual deposition in watery contexts

Within the East Midlands Early Neolithic human remains with evidence of excarnation are known from funerary sites (eg, Vyner & Wall 2011) but remains of Middle Neolithic date are much rarer. Environmental evidence from the Mesolithic suggests that the area into which the Watermead remains were deposited was a peat bog, and there is little to suggest that the landscape changed significantly in the Neolithic. The presence of multiple bones from at least two individuals (a male and a female) suggests they were articulated at the time of disposal and deposited in standing water. The presence of a possible fungal replacement of the brain hemispheres of the surviving skull suggests they may have been buried swiftly after death. The absence of scavenging or weathering marks on the bones would seem to support this and rule out the likelihood of excarnation. The mercury porosimetry analysis has suggested that blood supply was swiftly cut off, which suggests the individuals may have been put to death or butchered, although there is no evidence of cut marks to support this.

In the Late Bronze Age, some 2000 years later, another individual appears to have been deposited in the same peat bog. Again, taphonomic observations suggest the surviving bones were remarkably well preserved, with a similar fungal replacement of the brain and no evidence for scavenging or weathering. The survival of cut marks on the uppermost vertebrae, however, attests to the individual having his throat cut.

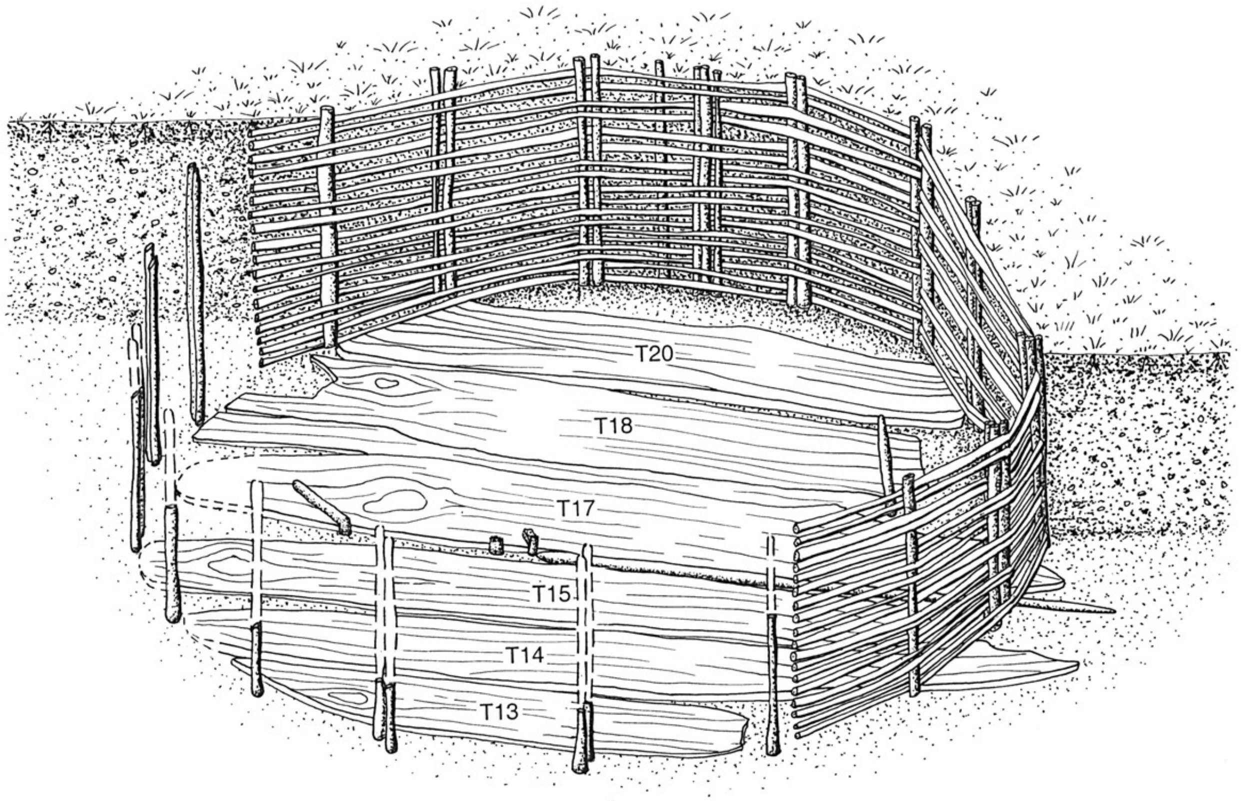

Fig. 19.
Reconstruction of the trough lining, with cut-away to show the construction of the below ground lining

Although no direct evidence of continuity of tradition can be made between the human remains deposited at Watermead it perhaps can be suggested that the reasons that made the locality attractive in the Middle Neolithic were still evident in the later Bronze Age, some two millennia later.

CONCLUSION

Watermead adds to a wealth of recorded floodplain archaeology in the region, largely resulting from aggregate quarrying. Not only has unexpected archaeology been exposed but also extremely well preserved deposits. Twelve burnt mounds have now been excavated in the East Midlands in the last two decades, providing a valuable contribution to the study of Late Neolithic/Early Bronze Age wetland research. With a further four recognised in evaluative work, we can perhaps approach future investigations of these monuments with clear targets.

There was no evidence for permanent occupation at Watermead, but rather multiple episodes of activity, each for only a short duration. The users of the burnt mound may have been transient people, perhaps using these sites seasonally, or the activity undertaken may have been one that needed to be in a particular location (near running water, or reed beds, etc.). There does not appear to be any link between the deposition of human remains in a waterlogged context and the burnt mound activity. It is highly likely that a topographical feature (say a natural promontory or a fording place) was the reason for the site being returned to from the Neolithic onwards, but that such a feature is no longer visible in the landscape.

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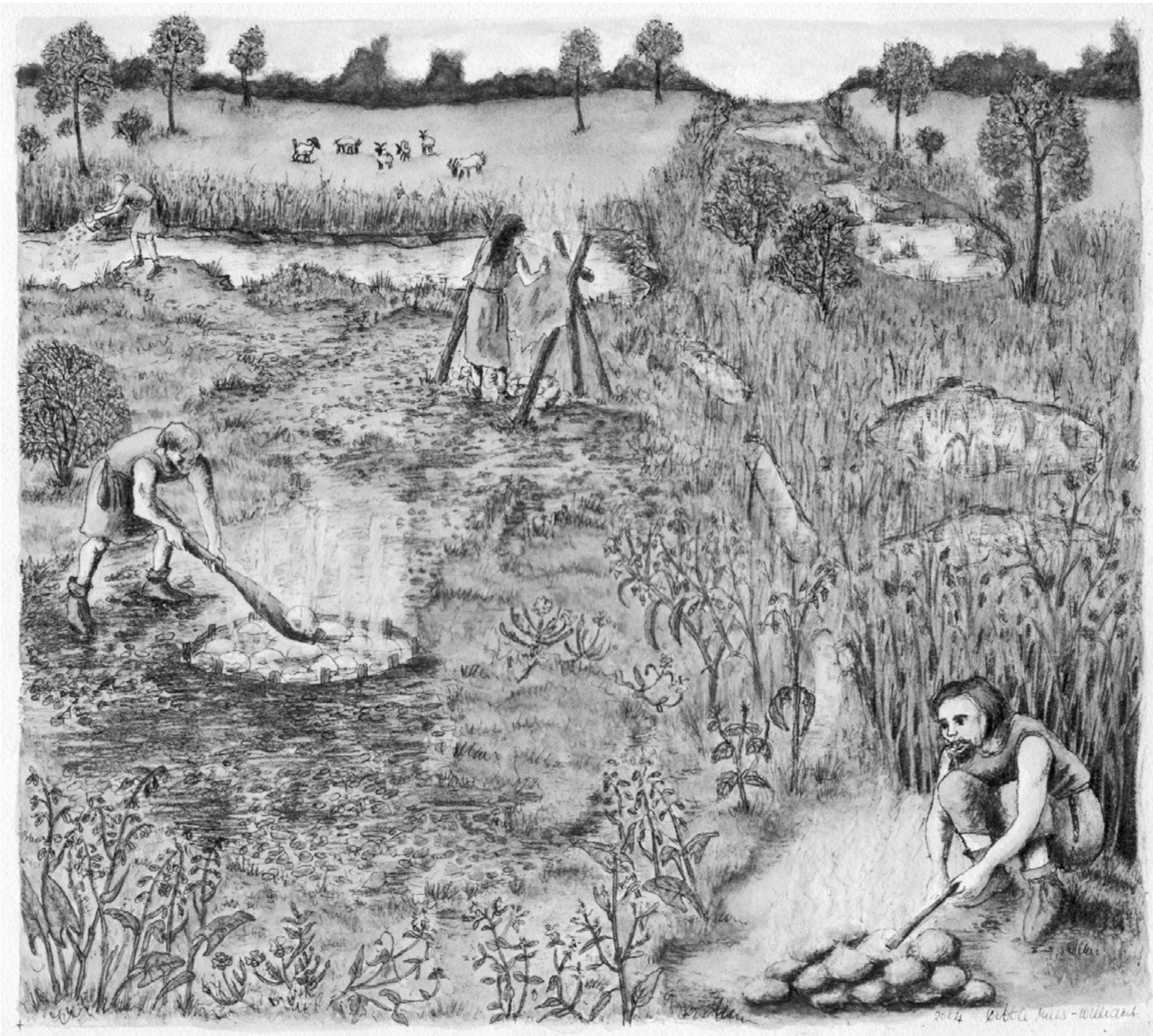

Fig. 20.
Reconstruction of the burnt mound showing heating stones (right), placing hot stones into a water-filled trough (centre) and drying skins over a second hearth. The palaeochannel is shown as a reed filled area of marshland

Endnote
[1] It should perhaps be noted that when the skulls were first retrieved, observations of the apparent survival of 'brain tissue' were made through the foramen magnum (spinal hole), in the form of a large grey/cream mass seen within each skull. Kevin West (Pathologist at the Leicester Royal Infirmary) examined samples and concluded that they did not contain the 'architecture' of soft tissue, and he speculated that they were of fungal origin. The survival of brain shaped casts suggests the cranial cavity had become filled with some material during or after decomposition forming an endocast.

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