ARCHAEOLOGICAL SERVICES WYAS

Rothwell Haigh, Rothwell
Leeds
West Yorkshire

Excavation Report

January 2011

Report No. 2170

CLIENT

West Yorkshire Archaeology Advisory Service

Rothwell Haigh, Rothwell Leeds

Excavation report

Summary

During the summer of 1977, the County Archaeology Unit for West Yorkshire carried out a rescue excavation of a square, ditched enclosure with an east-facing entrance at Rothwell Haigh Colliery. Relatively few discrete features were identified, but a 12.3m well situated within the enclosure was fully excavated. Pottery from the well, which was waterlogged from c. 7m, indicates rapid infilling from the late 3rd century at the earliest, through to the early to mid-4th century. Waterlogged wooden objects include a bucket, spade and bowls, while the disposal of complete pots, a quern disk roughout, articulated animal parts and a human skull highlight the potential for symbolic deposition.

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Report Information

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Contents

List of Figures

List of Plates

List of Tables

3 Relative quantities of vessels by depth using estimated vessel equivalents
4 Quantification of CBM by type and depth
5 Wood catalogue
6 The preservation of the assemblage expressed as a percentage
7 NISP counts for all species in order of abundance
8 NISP by depth
9 MNI counts
10 MNI count for the sheep/goat assemblage
11 MNE data for the sheep/goat assemblage
12 NISP count for the sheep/goat assemblage by depth
13 MNE counts for the dog assemblage
14 Dog epipyseal fusion data based on ages defined by Silver (1969
15 Shoulder heights in cm and mid-shaft diameter index by element
16 Summary of dog skeletal dimensions (S.D = Standard Deviation, C.V = Coefficient of Variation)
17 Cattle MNE counts
18 Pig MNE counts
19 Cat element distribution
20 NISP and MNE counts of the medium-sized galliform assemblage
21 Chicken metric data (in mm)
22 Bird MNE counts
23 Plant remains from five samples of sediment from the well, together with comments on the sediment and other inclusions
24 Complete list of invertebrate remains recorded from samples from the well
25 Main statistics for assemblages of adult beetles and bugs (excluding aphids and scale insects) from the quantified assemblage from the well

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English Heritage and the Department of Archaeology, University of York kindly supported the environmental and faunal analyses. Allan Hall and Harry Kenward from the department assessed a range of very old and poorly-stored bulk samples. Andy Hammon assessed the animal bone assemblage, prior to full analysis by Gemma Ayton, under the guidance of Polydora Baker and Fay Worley, all of English Heritage.

1 Introduction

The County Archaeology Unit for West Yorkshire carried out a rescue excavation at Rothwell Haigh Colliery in the summer of 1977. The site was located to the north of Rothwell and immediately to the south of the M62 motorway (Fig. 1). During a series of flights to identify new sites in West Yorkshire by crop mark evidence, a ditched rectangular enclosure was noted at Rothwell Colliery due to topsoil removal. Afforded access, the Archaeology Unit excavated the exposed features over a five-day period in August to reveal the plan of a square, ditched enclosure with an east-facing entrance, in addition to three external post-holes and a number of internal features. Subsequent investigations allowed the full excavation of a 12.3m-deep well situated within the enclosure. This was excavated between September and October of the same year.

This report represents full and final analysis of the surviving archive, finds and samples, following an earlier assessment (Richardson 2004). It is intended that this document will form the basis of a paper to be submitted shortly to *Britannia* for publication. In light of this, the figures presented here have created with reference to Britannia's requirements for contributors, rather than Archaeological Services WYAS's usual standard format.

West Yorkshire Archaeology Advisory Service (WYAAS) appointed, and funded, ASWYAS to undertake the analysis, reporting and publication.

Site location and topography

The site lies to the north-east of Rothwell and to the south of the river Aire in what is now Rothwell Country Park. Unfortunately the exact location of the ditched enclosure can no longer be identified, but was situated somewhere in the vicinity of SE 352 295 (Fig. 1). The area currently lies at about 57m aOD but the topography of the site pre-coal extraction is unknown.

Soils, geology and land-use

The site is situated on Middle Coal Measures in an area of glacial gravel and sand (British Geological Survey 1978). The overlying soils are Rivington 1 Association, being well drained coarse loamy soils over sandstone (Soil Survey of England and Wales 1983). The site was part of Rothwell Colliery at the time of the excavations, with the area of investigation set aside for tipping colliery waste.

2 Archaeological and Historical Background

Archaeological remains were first identified during aerial reconnaissance in July 1977. Following stripping by the National Coal Board prior to tipping, archaeologists were afforded an opportunity to examine the features exposed, although it was noted that the removal of bedrock as well as topsoil over much of the site may well have resulted in the loss of other

features. This may also account for the survival of the enclosure ditch to a few centimetres in places, although at the entrance terminals of the ditch, depths of 1.5m were recorded (Keighley 1981, 125; Plate 1). It is perhaps telling that most of the discrete features were also found in the vicinity of the entrance. A well was located within the enclosure and this was fully excavated. If an association with the enclosure is accepted, then the later Roman pottery recovered from the well may provide a date for the abandonment of the wider site (Faull 1981, 152).

The primary archive consists of a site diary that describes the excavation of the well. No mention of the enclosure ditch, pit and gullies is made in either the site diary or the finds' register, although contemporary plans with contours do exist. The photographic record consists of nine general shots of the site, eleven of the excavated enclosure ditch and sub-rectangular pit, and sixteen of the well.

Initial post-excavation work in 1977 involved the conservation of the waterlogged wood and the leather, most of which survives. Otherwise, the secondary archive consists largely of correspondence with specialists regarding the waterlogged material from the well, but little in the way of written assessments. Of the artefacts, ecofacts and soil samples retrieved, the beetle remains, plant macrofossils and pollen from one soil sample, a puff ball, and the human skull were reported at this stage. The reports on the puff ball and skull are reproduced here, while those on the environmental remains have been superseded by subsequent analyses.

A photographic record was made of some of the wooden artefacts, the human skull (now lost), a leather shoe with nob nails and puff balls. Inked illustrations of some of the querns, wooden artefacts, pottery and leather items were also created. Only the illustrations of the querns have been re-used here: the other objects have been redrawn to meet current standards.

3 Aims and Objectives

The aim is to study comprehensively the material recovered from Well 17, in addition to a single find from Pit 25, and consider the significance of the deposits in a broader context.

By analysing, and in the case of the soil samples assessing, the various categories of material, the date of the well in use should be established. Disuse deposits should be identified and their purpose, whether waste disposal, random backfill or 'closure' deposit, assessed. The depositional patterns and practices observed in the well at Rothwell will be compared on a regional and national level to deposits from other Roman wells. It is anticipated that the results of this study will be published in an appropriate journal, in this case *Britannia*.

4 Methodology

Given that the excavations occurred 33 years ago, little of the on-site methodology is known. Certainly no records, except a site plan, survive for the August excavations of the enclosure and its associated features. Records were better kept during the excavation of the well later in the summer, including a fairly detailed finds register (SF number, material and depth) and a site diary. All excavations, however, were carried out under 'rescue' conditions typical of the 1970s. As such, the cooperation of the National Coal Board and the colliery staff in allowing archaeologists to access and excavate features is acknowledged.

The archive is currently held in ASWYAS stores but will be deposited with Leeds Museums and Galleries in due course (Accession number LEEDM.D.2011.2).

5 Results

A *c*. 52m by 52m ditched enclosure with an east-facing entrance was investigated. The ditch terminals flanking the entrance were excavated and a further ten sections were placed across the ditch (Fig. 2). While the ditch typically survived as a shallow feature due to the recent stripping of topsoil, subsoil and bedrock, the terminals survived to depths of *c*.1.5m and widths of *c*. 3m (Plate 1). There is no record of any finds being recovered from the enclosure ditch. The ditch terminals were joined a narrow gully, which in association with three possible post-holes externally and a centrally-placed pit or post-hole just inside the entrance, may have formed part of a gateway structure. Within the enclosure, a sub-rectangular pit (25) and two further gullies were observed. Again artefacts were scarce from the discrete features and gullies, but from Pit 25 a complete beehive base was recovered (Heslop below, Cat. no. 2). Mention of two possible Iron Age pottery sherds in the preliminary post-excavation records is interesting, although these do not survive with the archive.

Well 17 represents the most significant feature exposed during the investigations and fortunately is by far the best recorded. Measuring 12.3m in depth (although in the schematic section it would appear to be have been slightly deeper at 12.6m) and approximately 2m in width, the well was emptied in its entirety in conditions that would be deemed too high risk today (Plates 2 and 3, Fig. 3). The well was cut through bedrock, as was the case at Dalton Parlours only 10 miles to the north-east (Wrathmell 1990, 195), with no evidence for timber of wattle lining. The conditions were recorded as damp to *c*. 5.5m, wet from 5.5m to just over 7m and thereafter, waterlogged. Discrete layers were recorded in section, although the necessary records to describe all of these with confidence are not available. What is not known is the level of the contemporary ground surface and hence how much of the well may have been destroyed prior to excavation. No evidence for a superstructure or well-house was encountered.

Throughout the well rubble was recorded (usually as sandstone) and with the presence of a few structural stones (Gaunt and Prudhoe below, Cat. nos. 1 and 2), stone and ceramic tiles, building debris is indicated. Pottery was also ubiquitous with sherds from the lowest silts suggesting that the well may have been use as early as the late 2nd to early 3rd century. Pottery associated with subsequent infilling indicates a date in the late 3rd century at the earliest, with rapid infilling in the early to mid-4th century. Although likely water-bearing containers are represented, they are not the predominant type and instead the pottery assemblage derives mainly from vessels associated with food preparation and consumption.

The complete or near-complete nature of some of the pottery vessels (a bowl at 9.7m and a group of vessels at 4-5m) may indicate structured deposits. Ritual/symbolic deposition may also be indicated by a prevalence of articulated animal skeletons including dogs, a complete if broken quern disk roughout, a high proportion of wooden artefacts (from 10.2-12.3m) including a bucket, spade, pegs and bowls, and a human skull that may represent a decapitated man. In contrast, the leather objects (predominantly shoes), the sparse metalwork, evidence for butchery waste, wooden offcuts and chippings suggest a more prosaic explanation for some of the well's backfill.

Interestingly, the plant macrofossils and invertebrate remains indicate only traces of domestic activity with some cereals and a fragment of coriander seed. Heather and bracken are most likely to be indicative of stable litter, while the plants typically suggest scrub or developing woodland. The insects support the hypothesis of stable litter as the proportion of individuals suggesting very foul matter was particularly high, most likely associated with herbivore dung.

The finds register records a relatively small quantity of finds that are now missing. This includes 'wickerwork' or 'woven raffia' found between 10m and 11m, part of a jet bracelet from 10.4m, large wood pieces from 7-7.2m onwards (sketches in the site diary suggest these were at least 2m in length and nothing of this order survives in the archive) and plaster between 3 and 4m. Little can be made of these items now, although the large wooden pieces may represent the structural pieces identified as missing from Rothwell Haigh by Allen when compared to Dalton Parlours (p.44).

6 Artefact Record

Romano-British pottery by R.S. Leary

The pottery was examined in context groups and catalogued according to the Guidelines of the Study Group for Romano-British Pottery for basic archiving (Darling 2004). The fabrics were recorded and sources suggested where appropriate. Reference was made to the National Fabric Collection where appropriate (Tomber and Dore 1998). Details of fabric variations were recorded where appropriate. Forms were described.

The assemblage was recovered from a well on the site and the sherds, for the most part, had the depth at which they were found indicated on the bag or sherd. In total, 254 sherds were found weighing 11480g. The stratified sherds indicate the well began to fill up in the late 3rd century at the earliest and was infilled rapidly in the early to mid-4th century. Earlier sherds in the lowest silts suggest the well was in use as early as the late 2nd to early 3rd century.

Fabrics

Amphora

Dr20 Dressel 20 amphora. Amphorae from southern Spain containing olive oil. Tomber and Dore 1998 BAT AM.

Black burnished ware types

BB1 Black burnished ware category one, Dorset. Shale present. BB1 DOR (Williams 1977, Tomber and Dore 1998).

Calcareous tempered wares

CTA2 dark brown with orange brown margins. Soft and smooth with laminar fracture. Moderate, ill-sorted, medium to fine platey and irregular vesicles. Tomber and Dore 1998 DAL SH.

CTA3 buff-brown. Hard with very irregular fracture. Abundant, ill-sorted, fine to coarse irregular, rounded and rhomboidal vesicles and occasional calcite inclusion surviving. East Yorkshire calcite-gritted ware, Tomber and Dore 1998 HUNT CG.

Grey wares

GRB1 medium to dark grey with lighter core. Hard to very hard with hackly fracture and sandy or pimply feel. Abundant, medium, well-sorted, subrounded and subangular quartz, 2-5mm. South Yorkshire grey ware.

GRB2 medium to dark grey with lighter core. Hard to medium hard with irregular fracture and sandy or pimply feel. Moderate, medium, well-sorted subrounded and subangular quartz, 2-3mm. Rather fewer subrounded quartz than GRB1. This may include some finer South Yorkshire grey wares but seems to be a local ware or Norton type (Hayes and Whitley 1950).

GRB3 grey with pale margins and grey core. Soft, powdery and slightly irregular fracture. Sparse, well-sorted fine angular, quartz. Perhaps a variant of Tomber and Dore 1998 HSM RE from the Holme-on-Spalding Moor industry.

HOSM	Grey or dark grey surfaces with lighter core. Hard, smooth with fairly smooth fracture studded with fine quartz. Moderate, fine quartz. Holme-on-Spalding Moor type. Tomber and Dore 1998 HSM RE
CRA RE	As Tomber and Dore 1998 CRA RE. CRA RE B as CRA RE but with brown core.
GRC	dark grey/brown, gritty ware with hackly fracture. Moderate, ill-sorted angular and subangular inclusions including quartz and ? granitic inclusions. West Yorkshire ware, Sumpter 1990, 135

Oxidised wares

OAB1	orange. Soft and powdery with irregular fracture. Moderate, medium, subangular quartz and sparse, medium rounded orange/brown inclusions.
OAB2	pale orange/buff with grey core. Hard, smooth with irregular fracture. Moderate, medium, angular and subangular quartz and sparse coarse rounded grey clay pellets
CRA OX	Orange with greyish orange interior. Hard, smooth with finely irregular fracture Abundant very fine quartz as CRA RE. Crambeck red ware.

Colour-coated wares

SWCC	Swanpool colour coated ware. Pale orange/buff with chocolate brown colour coat and white painted decoration. Hard, smooth with irregular fracture. Sparse, medium, subangular quartz, moderate fine subangular quartz and sparse, medium, rounded orange inclusions. Tomber and Dore 1998 SWN CC.

Mortaria

MH	Mancetter-Hartshill mortaria. Fine-textured, cream fabric, varying from softish to very hard, sometimes with pink core; self-coloured or with a self-coloured slip. Inclusions usually moderate, smallish, transparent and translucent white and pinkish quartz with sparse opaque orange-brown and rarely blackish fragments; rarely white clay pellets (or re-fired pottery). The trituration grit here consisted of hard red-brown and/or hard blackish material (probably re-fired pottery fragments), with only very rare quartz fragments, dating after AD 130-140. Tomber and Dore 1998 MAH WH.
CRA WH	Crambeck white ware. Tomber and Dore 1998 CRA WH.
MWH	Very hard dirty cream fabric with hackly fracture and slag trituration grits 2-10mm. Abundant, well-sorted medium subangular, sparse coarse, rounded brown inclusions and two very coarse, rounded, pink sandstone inclusions.

This vessel is likely to be a local fabric and is not dissimilar in texture to GRB2 above apart from the large sandstone inclusions.

Chronology

Crambeck grey wares came from the lowest recorded fills (Tables 1-2), including developed flanged bowls. These give a date in the late 3rd, after *c*. AD 280, to the 4th century at the earliest. Only fourteen sherds were recovered from the lower level below 10m but this group included a Mancetter-Hartshill, multi-reeded hammerhead mortarium with four reeds and a smooth Mancetter-Hartshill, hammerhead mortarium with oblique linear painted decoration (Cat. no. 13), both of 3rd-century type, a small sherd of Crambeck grey ware, dating after *c*. AD 280, two deep bowls with flat rims in GRB1 and GRB2 (as Cat. no. 1 and Cat. no. 2), a GRB2 wide-mouthed jar with everted rim and a reeded hammerhead mortarium with thumb spout in a very gritty dirty cream ware with slag trituration grits (Cat. no. 8). The form and inclusions in this last vessel suggest a local origin and it dates to the late 3rd to 4th century. These vessels suggest the well was in use in the 3rd century but began to fill up by the late 3rd or early 4th century. Sherds from similar wide-mouthed jars and deep bowls were present at 9-10m as well as a Crambeck white ware mortarium flange (Corder 1937 type 6, late 3rd to mid-4th century). The complete, large GRB1 deep bowl (Cat. no. 1) was found at a depth of *c*. 9.7m. At 8-10m large sherds from a Dressel 20 amphora and sherds from a Crambeck grey ware, developed flanged bowl, a Holme-on-Spalding Moor grey ware jar, a late 2nd to early 3rd-century Mancetter-Hartshill mortarium and a Nene Valley colour-coated vessel are of similar date. Joining sherds and sherds from the same vessels were identified from levels 7.3m and 8.8m but most other cross joins were within a shorter distance of each other. From 5-8m sherds from Crambeck and Holme-on-Spalding Moor lugged jars (Cat. no. 6) were found with a fragment of a GRB1 cheesepress (Cat. no. 11), samian sherds, the base and lower body of a CTA3 jar and a multi-reeded hammerhead mortarium of mid-3rd to mid-4th century date. Between 4-5m several near or partially complete vessel were found including a small Crambeck grey ware beaker (Cat. no. 5) and flanged bowl (Cat. no. 3), half a Holme-on-Spalding lugged jar (Cat. no. 4) and the bottom half of a CTA3 jar. The records note a burnt layer which included a colour-coated sherd and grey ware sherd at 4.9m. The colour-coated sherd came from a long necked beaker in Nene Valley colour-coated ware and the grey ware was a GRB1 bodysherd. Nene Valley beakers of this type (as Cat. no. 15) were most common in the late 3rd to the first half of the 4th century declining thereafter (Perrin 1999, 96).

The sequence and type of vessels present indicate the well went out of use in the late 3rd century at the earliest and was infilled, perhaps quite quickly, in the late 3rd to mid-4th century. The 3rd and late 2nd to early 3rd-century mortaria and the samian ware near the bottom (Tables 1-3) may derive from activity contemporary with the use of the well. The South Yorkshire and local grey wares were more prolific in the lower levels with Holme-on-Spalding and Crambeck wares increasing at a depth of *c*. 8-9m (Tables 1-2). The apparent

rise of Crambeck wares at 2-3m is a distortion due to sherds from a single vessel and, although CTA3 sherds do not appear until 5-6m, this may be the result of a general absence of cooking jars in the well (Tables 1-3). In general fluctuations in the relative quantities of different wares do not seem to be the result of a chronological progression. Other than the difference between the lowest fills and the other levels, there is little chronological change through the sequence.

Table 1. Relative quantities of wares by depth using sherd count with total sherd count by depth given

Ware	All	U/S	0-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-12
BB1	0.8		4.5			1.3						
CRA	18.6		9.1	69.2	14.3	3.8	55.0		23.1	25.0	3.7	7.1
CT	3.2						20.0					
CTA2	0.4		4.5									
CTA3	22.9	25.0		7.7	7.1	62.8	10.0					
DR20	4.3										40.7	
GRB1	9.9		9.1	23.1		6.4	7.5				40.7	7.1
GRB2	8.3	8.3	40.9		7.1				11.5	25.0	7.4	28.6
GRB3	0.4				7.1							
GRB4	0.4										3.7	
HOSM	9.1				57.1	2.6	2.5	66.7	34.6	25.0		
M	0.4											7.1
MH	6.3	50.0				1.3			19.2	25.0		21.4
NV	6.7					20.5			3.8			
OAB	3.6		31.8				2.5	33.3				
SWCC	0.4				7.1							
TS	4.3	16.7				1.3	2.5		7.7		3.7	28.6
No of sherds	253	12	22	13	14	78	40	3	26	4	27	14

Table 2. Relative quantities of wares by depth using sherd weight with total sherd weight by depth given

Ware	All	U/S	0-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-12
BB1	0.1		0.7			0.5						
CRA	14.0		5.9	80.0	5.5	3.9	48.6		34.5	21.8	0.9	0.2
CT	1.4						10.8					
CTA2	0.0		0.8									
CTA3	9.1	21.0		8.2	0.8	69.3	15.6					
DR20	33.2										87.4	
GRB1	6.8		7.2	11.8		16.2	19.5				4.1	8.8
GRB2	13.0	16.1	76.5		5.3				27.5	11.1	5.9	33.7
GRB3	0.1				1.3							
GRB4	0.3										0.7	
HOSM	7.2				61.5	5.6	3.3	85.3	8.8	6.6		
M	2.0											24.2
MH	8.6	56.3				0.1			26.6	60.5		28.4
NV1	0.5					3.7			0.9			
OAB	0.8		9.0				2.1	14.7				
SWCC	1.6				25.7							
TS	1.2	6.6				0.6	0.1		1.7		0.9	4.6
Total weight	11448g	311g	476g	138g	708g	1044g	1529g	148g	1604g	187g	4350g	954g

No types present need date later than the mid-4th century. Late Crambeck wares were absent and no Huntcliff jar forms were identified, although body and basal sherds in East Yorkshire calcite-gritted ware were present. Some of these latter sherds were rather thin-walled for a Huntcliff form and may belong to pre-Huntcliff jars of the late 3rd to mid-4th century. The long necked beaker type from the Nene Valley kilns is known to have been in decline by the mid-4th century. It is difficult to pinpoint the dating within a late 3rd to mid-4th-century range or determine, from the pottery, whether infilling was rapid or gradual although the lack of typological progression favours a rapid infill. At Castleford there was a pronounced change in the predominant coarse wares with late 3rd century BB1 wares being replaced by Dales ware in the early 4th century (Rush *et al*. 2000, 158). A well group such as this one would not necessarily include cooking wares and the low numbers of both BB1 and Dales ware may relate to functional rather than chronological considerations. At Castleford it was also noted that East Yorkshire grey wares such as those from the Holme-on-Spalding Moor kiln group rose in the early 4th-century groups (Rush *et al*. 2000, 158). The same trend was

noted by Evans (1985, 297) with Holme-on-Spalding Moor types being restricted to East Yorkshire until the early 4th century (Evans 1988, 328 and 331) when numbers outside East Yorkshire rose although still only present at relatively low levels of 2-5%. The relative quantity of Holme-on Spalding Moor type vessels from the well is *c*. 7% by weight but 19% by estimated vessel equivalents. This certainly reflects the popularity of the narrow-mouthed lugged jars as water carriers and compares well with the overall total from the well at Dalton Parlours where this ware accounted for *c*. 11% overall but some 60% of the pottery assemblage from the lowest fill, which Sumpter dates to the second half of the 3rd century, and 20% in the later infill where it is found in association with Crambeck ware. Taking into account the evidence from Castleford, the amount of Holme-on-Spalding Moor grey wares present points to a date in the earlier 4th century, when a rise in Holme-on-Spalding wares was apparent. The very large number of Holme-on-Spalding jars in the lowest fill of the well at Dalton Parlours is undoubtedly the result of its use as a water carrier. Thus the ceramic assemblage points to infilling from *c*. AD280, at the earliest, and finishing by the mid-4th century at the latest with an optimum date range in the first third of the 4th century based on the peak in Holme-on-Spalding Moor types at Castleford and the absence of late Crambeck and East Yorkshire calcite gritted forms of the mid to late 4th century.

Table 3. Relative quantities of vessels by depth using estimated vessel equivalents

Vessel type	All	U/S	0-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-12
Bowl	17.0	69.2			8.8		46.6			64.1		
Bowl/dish	1.4	30.8										4.8
Dish	1.2				2.7	16.7						
Dish?	0.5											2.9
Beaker	13.6					83.3	43.9					
Lid	2.3							100.0				
Mortarium	14.2								34.6	35.9	5.3	52.4
Narrow-n jar	20.2				88.5				65.4			
Wide-m deep bowl	25.6		70.6				9.5				83.2	33.3
Wide-m jar	4.1		29.4								11.5	6.7

Function and status

The function of the feature need not, of course, be assessed. The assemblage includes vessels types often found in wells and considered water-bearing containers, such as the narrow-necked lugged jar types from kilns at Holme-on-Spalding Moor and Crambeck. The presence

of these in some quantity and with substantial portions of the vessels surviving supports the evidence from wells such as that at Dalton Parlour where an example was found with a fragment of cord through one of the lugs. Sumpter took this as evidence that they were used to draw water (1990, 244), a role also suggested by girth abrasion patterns and chipped rims. A similar pattern was noted on narrow-necked vessels from a well at Lound, Nottinghamshire (Leary 1995, 34).

Unlike at Lound and Dalton Parlours, the narrow-necked vessels were not the predominant type. The distribution of vessel types in the well indicate a strong domestic character throughout its infill with vessels associated with food preparation, such as mortaria and olive oil amphora, coming from the lowest fills together with sherds of samian tableware. Although water-bearing vessels were very common around 7-8m and 3-4m, they were otherwise rare and, apart from the complete and near complete vessels, little can be made of the sequence of vessel types other than it being the result of ceramic rubbish disposal. Fine ware beakers were present at a depth of *c*. 4-5m and a large section from a fine painted colour-coated flanged dish was present at a depth of *c*. 3m.

Wide mouthed jars and deep bowls were the most numerous class at *c*. 30% overall. This class was also present in the Lound well where it was the second most common type (Leary 1995, 34-6). At Lound the wear and abrasion patterns on the wide-mouthed vessels contrasted with that on the narrow-necked vessels. The former vessels had more abrasion around the lower bodies and one had a very worn base, perhaps due to being used in some way around the well environs, standing on the ground. The very large deep bowl at Rothwell Haigh had a similar worn base and was also bore a very distinct wear pattern inside the base and lower body. This covered the base and extended a third of the way up the inside of the vessel wall, reminiscent of the wear common on mortaria and likely to result from regular abrasion of some sort such as crushing or stirring. The rim of this vessel was also slightly worn. A second grey ware base from 7.2m has a similar internal basal wear pattern but lacked the external wear. The large deep bowl was too bulky to be suitable from water drawing and, when filled with water, too heavy to use with ease as a water carrier. The open mouths of even smaller vessels were similarly unsuited to carrying liquids any distance and it is more likely that some other activity is represented here, perhaps relating to food preparation. The absence of this vessel class in the Dalton Parlours well and the predominance of sooted Huntcliff ware jars there was associated with its particular association with the bath house and the need for hot water (Sumpter 1990, 244). At Rothwell Haigh the assemblage is of a domestic character derived from both the preparation and consumption of food and drink with fineware beakers and bowls, a cheesepress, coarse ware bowls and dishes and well worn mortaria. At the waterhole at Shiptonthorpe a similar preponderance of complete vessels was noted as well as a concentration of beaker and tableware compared to the rest of the site assemblage (Evans 2006, 137). Other aspects of the waterhole assemblage - deposition of animal skulls and complete animal burials as well as a writing tablet - suggested evidence of

ritual activity, perhaps intermixed with deposition of a more domestic nature (Millett 2006, 314-5). It is very likely that the same admixture is present in the Rothwell Haigh assemblage.

A small Crambeck beaker was near complete apart from the rim (Cat. no. 5). The rim had broken off completely but the neck appears to have been smoothed to facilitate continued use of this vessel. One of the samian bases had had similar treatment. Broken around the footring base external edges, the broken edges had been smoother and in one case wear was detectable inside the basal kick as if the base had been turned into a vessel used upside down. This has been used elsewhere and sometimes part of the body of the original vessel was retained and shaped into a handle (Ward 2008, no. 1). A GRB1 cheesepress base (Cat. no. 11) had broken just outside the innermost concentric ridge and had the appearance of deliberate chipping off at that point, perhaps for re-use after a breakage. These vessels re-shaped for further use may be the result of ceramic shortages at this time. Sherds from a Dressel 20 amphora were present and the handle had been roughly knocked off perhaps to re-use this commodious vessel (Van der Werff 2003). Indeed the amphora may have arrived at the site already empty of its original contents of olive oil (Evans 2002, 27).

Some scorching was noted on the colour-coated painted bowl, a Crambeck white ware mortarium flange, a cheesepress base and two Crambeck grey ware jars, both probably of the lugged type. Sooting was found outside a CT jar and a perforation, *c*. 8mm in diameter, was present on the base of a CTA3 jar.

The proportions of vessels, particularly small bowls and dishes and fine wares such as beakers, indicate a relatively high status despite the possible bias in favour of jars due to the function of the feature. It is suggested that the well was used as handy dumping ground for domestic debris as well as for vessels broken at the well head or while drawing water. The large complete bowl (Cat. no. 1) found at 9.7m and the group of near complete vessels at 4-5m, however, may relate to 'special' deposits or structured deposition practices as is known from other Romano-British wells (Fulford 2001, 214-5, Wrathmell 1990, 271-2, Millett 2006, 314-5) rather than straightforward rubbish disposal. Such a large vessel might be awkward to throw down the well and would certainly be done quite deliberately and together with the other near complete vessels, this may represent a deliberate deposit with ritual significance.

Trade and exchange

By weight *c*. 41% of the group comprised grey ware and a further 10% were calcite-gritted coarse ware. Amongst the grey wares, Crambeck grey wares were rather more numerous than Holme-on-Spalding Moor, South Yorkshire grey wares or grey wares of unknown source, probably local. It was difficult to determine the source of some of the grey wares. South Yorkshire grey wares tend to have well rounded quartz inclusions but subangular quartz can also occur. The quartz tends to be common to abundant. A division in the medium-quartz tempered grey wares was made between those with the typically abundant, subrounded quartz of the South Yorkshire kiln products and those with less common and more angular

quartz. It was noticeable that the forms in the latter group included a wide-mouthed jar or bowl with a slight neck unlike the forms of deep bowl made at the South Yorkshire kilns and more like those made at the Norton kilns near Malton (Hayes and Whitley 1950, type 6). This difference in form and fabric may indicate a non-South Yorkshire source, perhaps locally in West Yorkshire, but further fabric analyses would be required to determine this. One basal sherd in the very coarse gritted fabric already identified as a West Yorkshire fabric was identified (Sumpter 1990, 146). East Yorkshire calcite-gritted wares were present in significant quantities. The kilns at Mancetter Hartshill supplied most of the mortaria and South Yorkshire products do not seem to be represented. A Crambeck white mortarium was identified and one dirty cream mortarium is probably of local origin. One oxidised sherd compared well with samples of Crambeck red ware but no source was identified for the remaining oxidised wares. Samian wares and a Dressel 20 olive oil amphora from Central and East Gaul and Spain were supplemented by colour-coated wares from the Nene Valley and the Swanpool kilns. The assemblage appears to be representative of a transitional period when production at Doncaster was waning but before the Crambeck and East Yorkshire kilns flooded the markets. At this time the Holme-on-Spalding Moor potters reached their widest distribution range and the Mancetter-Hartshill kilns dominated the mortaria markets.

The wares present compare well with the pottery from the well at Dalton Parlours (Sumpter 1990), early 4th-century material from Castleford (Rush *et al*. 2000, 158) and at early to mid-4th-century rural sites such as site C4SA on the Darrington to Dishforth road scheme (Leary 2007, 249-52).

Catalogue of illustrated pottery (Figs 4 and 5)

1 GRB1 complete, flat-rim, truncated subconical bowl of South Yorkshire type (Buckland *et al*. 1980 type Hd). Decorated just below the rim with a grooved wavy line. One sherd is missing in the centre of the base but the freshness of the break suggests this is a relatively recent rather than an ancient loss. The vessel is very large indeed and has very marked wear inside the base, overall the surface, and inside the lower body as if it was used for mixing coarse matter or pounding something. The edge of the outside of the base is also worn and there has been patchy loss to the external body surfaces, perhaps due to burial conditions. The rim is slightly worn on top. *Well 17, SF 298, depth 9.7m*

2 GRB2 wide-mouthed bowl with flat rim. As Cat. no. 1. *Well 17, SF 363, depth 10.7m*

3 CRA RE developed flanged bowl. Corder 1937 type 1. AD 270-400. 69% of the rim is present and all of the base. Well 17, SF 093, 105, 107, 113, 114, 117, depths 5.45m, 5.5m, 5.7m, 5.9m

4 HOSM Holme-on-Spalding Moor type grey ware adjoining sherds from the rim and upper body of a lugged jar with surface sited lugs and vertical burnish lines around the girth. 100% of rim present. Corder 1930 figs 14. *Well 17, SF 038, 041, 046, 083, 088, depths 3.25m, 3.4m, 3.65m, 4.75, 4.9m*

5 CRA RE small beaker decorated with burnished acute lattice decoration on the girth. Complete except from rim which is broken off. The break at the neck has been rounded to form a make-shift rim as if the vessel was then re-used. Corder 1928 nos 89-90 and Corder 1937 no. 11. AD 270-400. *Well 17, SF 106, 110, 111 depth 5.5m*

6 HOSM Holme-on-Spalding Moor type grey ware bodysherds from lugged jar type vessel with raised cordon bordering a zone of grouped oblique lines forming chevrons. Corder 1930 fig. 14. *Well 17, SF 132, depth 7.2m*

7 Mancetter-Hartshill multi-ribbed hammerhead mortarium with six ribs. Mid-3rd to mid-4th century. Hartley 2002 M105. *Well 17, SF 197, depth 7.2m*

8 MWH convex, multi-reeded hammerhead mortarium with thumb spout and slag trituration grits. Well worn. Probably a local fabric. Late 3rd to 4th century. *Well 17, SF 455, depth 11.65m*

9 Mancetter-Hartshill flanged mortarium and spout. The bead rim continues across the spout and the flanged curves downwards. Evans and Mills 2008 type M35, late 2nd to early 3rd century. *Well 17, SF 270, depth 8.8m*

10 GRB1/2 deep bowl with slightly everted rim, single groove around upper body. As Cat. no. 1. *Well 17, SF 097, depth 5.1m*

11 GRB1 abraded fragment from base of cheesepress, burnt on one edge. The sherd is broken along the innermost ridge of the press, possibly deliberately re-worked. Buckland *et al*. 1980 type J. *Well 17, SF 110, depth 5.6m*

12 SWCC samian form 36 bowl with white painted scroll on the flange and traces of white painted decoration inside the body. Webster and Booth 1947 nos D24-28, 4th century. *Well 17, SF 036, depth 3.15m*

13 Mancetter-Hartshill smooth hammerhead mortarium with two oblique brown painted lines on the flange. 3rd century. *Well 17, SF 480, depth 11.1-12m*

14 GRB2 small bowl with everted rim and shoulder groove as Corder 1930, fig. 12. *Well 17, SF 258, depth 8.3m*

15 NV2 bead rim, long necked beaker with traces of white painted decoration. Perrin 1999, 96 late 3rd to mid-4th century. *Well 17, SF 073, depth 4.35m*

The samian ware by G. Monteil

A total of eleven samian sherds were submitted for assessment, nine of which were stratified within the well. The fabric of each sherd was examined, after breaking, under a x 20 binocular microscope. Each archive catalogue entry consists of a site code and other information if available alongside fabric, form and decoration identification, sherd count, rim or base EVE when appropriate. The group is small and only represent 0.195 rim EVE.

With the exception of a DR18/31 usually dated AD 120-160, the rest of the material is late and mostly dates to the second half of the 2nd century AD and 3rd century AD. East Gaulish fabrics are well represented and form slightly less than half of the group with the rest of the group taken up by Central Gaulish vessels.

One of the dishes bases (SF 203, 7.3m) looks re-worked: the edge of the base is smoothed down and the underside of the base shows some concentric patterned wear.

The range of forms is poor and dominated by dishes with mostly Dr31 and Dr31R. A single bowl is present at a depth of 9.9m, it is represented by a base from a bowl form Dr37, no decoration survives. The paucity of samian forms might be related to the date at which the well started to get filled in the late 3rd or early 4th century. By that time, samian ware is no longer imported in Britain and samian ware would have been residual. There is indeed no immediately clear relationship between the chronology of the samian ware fragments and the depth at which they were found. The earliest vessel, the Central Gaulish Dr18/31 was recovered relatively high in the well at a depth of 4.65m and probably ended up in the well as part of old rubbish deposited in the well when it was out of use. The samian from depth of and below 10m could possibly be contemporary to the use of the well since two out of the three sherds are East Gaulish, possibly from Trier and could have been in use on site in the first part of the 3rd century AD.

The metalwork by H.E.M. Cool

Only a small amount of metalwork was found in the well, most if it consisting of iron nails. These were generally fragmentary. The two complete examples (nos 4 and 6) are the typical lengths of joinery nails and one of them (Cat. no. 6) had obviously been used previously given its bent head.

The other item (Cat. no. 7) is more puzzling. At present it does not resemble any of the normal metals in use during the Roman period, and indeed was initially identified in the field as bone. This is presumably the result of its burial conditions as it came from waterlogged part of the well. These conditions may also account for the very eroded state of its surfaces with holes worn through the thickness in many places (Plate 4). It is certainly not made of iron as it is not magnetic. Its colour would be appropriate for a lead alloy but it is too light for such an identification. There are no indications of any green corrosion products normally to be expected with copper alloys, but given the burial conditions that is possibly to be expected. The grey colour might indicate it was silver, again with unusual corrosion products. Currently it is also difficult to identify what sort of item the fragment came from due to its eroded state. Given the date of the fill, the general features would be appropriate for a finger ring with triangular shoulders and a separately soldered on bezel. These generally have an elbowed profile and are quite substantial but there is a group which takes a more circular outline and is lighter in construction (Henig 1978, 38-9, ring type VIII; Cool 1983, 253-9, Groups XIV-XV). These types were mainly of 3rd or early 4th-century date, though some of the flimsiest examples occur in very late 4th or 5th-century contexts. Given the state of Cat. no. 7, however, such an identification can only be made with considerable caution.

In the light of the structured deposition that appears to being made amongst other classes of finds, it is appropriate to note here that nothing in this little group of metalwork suggests that these items were part of such rites. It can further be noted though, that iron nails do sometimes appear to take on a symbolic meaning (Dungworth 1998), and so deciding whether they were more than ordinary rubbish can only be evaluated within the context of the deposition patterns of all the finds.

Catalogue

1 Nail; head and shank fragment. Present length 30mm, head diameter 19mm. *Well 17, SF 029, depth 2.8m*

2 Nail; shank fragment. Iron. *Well 17, SF 034, depth 3m*

3 Nail; fragmented shank. Iron. *Well 17, SF 058, depth 4.1m*

4 Nail; complete. Iron. Length c. 53mm, head diameter 14mm. *Well 17, SF 085, depth 4.85m*

5 Nail; head and shank fragment. Iron. Present length c. 33mm, head diameter 17mm. *Well 17, SF 085, depth 4.85m*

6 Nail; complete with head bent to one side. Length c. 68mm, head diameter 13mm. *Well 17, SF 465, depth 11.4.m*

7 Ring. Unidentified metal. Rectangular-sectioned strip expanding to approximately circular 'bezel' with vertical rib. Approximately one-third missing. The metal appears grey and is now very thin with many irregular holes giving the item a lace-like appearance. Diameter c. 21mm, maximum width of 'bezel' 19mm, thickness 1.5mm. *Well 17, SF 329, depth 8.9-9.6m*

Ceramic building material by S. Tibbles

The assemblage of Romano-British ceramic building material (CBM) was visibly examined using a 15x-magnification lens and quantified (count and weight). Information regarding the dimensions, shape, fabric and type was recorded. The non-diagnostic material was classified adopting a best-fit policy based on surviving dimensions, fabrics and general characteristics.

It should be noted that the diversity of size and colour within bricks and tiles, caused during the manufacturing process, must be taken into consideration when comparing examples within collected assemblages and local typologies. The varying sizes and colours can be attributed to the variation in the clays used, shrinkage during drying, firing within the kiln or clamp and the location of the brick/tile within the kiln.

The 32 fragments of CBM recovered from the excavation of the well were recorded according to form and depth of recovery (Table 4). The assemblage has a combined weight of 4253g and a fabric colour range between Weak Red (10R5/4) to Reddish Yellow (7.5YR/6/6).

Table 4. Quantification of CBM by type and depth

Depth of Recovery	Form	No. of fragments
0.4m	*Tegula*	1
0.9m	*Tegula*	1
1m	Box-Flue Tile	1
5.5m	*Imbrex*	1
7.2m	Ridge?	1
7.3m	*Tegula*	1
7.9m	*Tegula*	1
8.1m	Box-Flue Tile?	1
8.5m	Ridge?	1
9.1m	*Tegula*	1
10.0m	*Tegula*	1
10.3m	*Imbrex*	1
10.4m	*Tegula*	2
10.6m	*Tegula*	1
10.8m	*Tegula*	2
11.0-11.5m	*Tegula*	1
11.0m	*Tegula*	1
11.1m	*Tegula*	2
11.1m	*Imbrex*	1
11.2m	*Tegula*	1
11.2m	*Imbrex*/Ridge?	1
11.3m	*Imbrex*/Ridge?	2
11.3m	*Tegula*	3
11.5m	*Tegula*	3
Total		32

Of the assemblage, two forms were identified; roof tile (*tegulae* and *imbrices*/ridge) and box-flue tile. No brick types were noted.

Tegulae

Twenty-two fragments of *tegulae* represent 69% of the total assemblage. Although no complete tiles are evident, based on manufacturing characteristics and fabric, it is *tentatively* estimated that eight individual tiles are present (though it is likely that some of the non-diagnostic material may represent fragments of the same tiles). Some *tegulae* display knife-trimming in part or along the edges and underside of the tile, resulting in a very smooth finish of similar ilk to the finish on the cut-aways, see below. The thickness of the *tegulae* ranges between 14mm to 20mm.

Nine diagnostic fragments display means of suspension in the form of finger-smoothed flanges (eight fragments), nail/peg holes (two fragments) and/or cut-aways (three fragments).

One fragment displays the residual element of a flange in the form of a finger groove. One flange type was identified, Type 2 (Fig. 6, Cat. nos. 1 and 2). This form of flange can be classified within the provisional regional typology for East Yorkshire (Tibbles 2000).

The upper (Fig. 6, Cat. no. 2) and lower (Fig. 6, Cat. no. 3) cut-aways, formed by the removal of a small portion of the upper and lower section of the flange, at the corners of the tile, were knife-trimmed, with a smooth 'polished' finish and blade scars. The lower cut-away was identified as a Type 5, as categorised by Brodribb (1987, 16, fig.7).

The dimensions of the flanges and cut-aways are as follows:

Flange width: 15mm to 24mm

Height including Flange: 35mm to 41mm

Upper Cut-Aways (length): >6mm and >21mm

Lower Cut-Away (length): >40mm

Nail/peg holes are evident on two *tegulae* fragments (Fig. 6, Cat. nos. 4 and 5), with diameters of 9mm and 10mm. *Tegulae* secured in this manner were likely to have been used for the lower tile courses, above the eaves of the roof (Betts 1990, 166; Brodribb 1987, 11). The tiles also display paw print impressions from a small dog (*Canis* cf.domestic). Both are of comparable size and were probably made by the same dog. The impressions would have occurred during manufacture, probably when the tiles were laid out to dry prior to firing. Animal tracks impressed on bricks and tiles are not unusual and Cram suggests that 'dogs were the commonest animal in tile yards' (1998, 236).

Imbrex

The six fragments of *imbrices*, with a thickness of 16mm to 25mm tapering to15mm at the apex of the tile, represent 19% of the assemblage. It is estimated that three individual tiles are present.

Identification of three fragments; including two joining pieces (Fig. 6, Cat. no.6), cannot be conclusively ascertained. They have similar characteristics to the ridge? tiles, including comparable thickness dimensions of 19mm and 21mm. They were catalogued as *imbrex*/ridge?

Ridge? Tile

Two fragments, probably the same tile, have a significantly larger thickness in comparison to the *imbrices* within this assemblage, 21mm and 25mm tapering to 19mm at the apex. This suggests an identification of ridge tiles. Examples with similar dimensions were noted at Frocester (Price 2000, 142).

Box-Flue Tile

Two fragments of box-flue tile were identified, representing 6% of the total assemblage. The characteristic feature of combing for the adhesion of plaster is evident on one fragment, a single comb stroke of five broad tines. The remaining fragment is plain faced with one original top/bottom edge. No diagnostic features such as vents or returning edges were recorded.

Discussion

The small size and lack of other forms does limit the archaeological potential of the assemblage. The majority of the assemblage (66%), however, was recovered from depths between 10m to 12m, associated with pottery dating from the 3rd century. It is possible that the deposition of the majority of the material occurred during a single episode, probably early in the chronological sequence.

It is also worthy to note that there is a lack of evidence of water-borne movement i.e. water-rolled and abraded surfaces. The crisp breaks also strongly infer that the tiles were near complete or at least larger, at the time of deposition. Although fresh breaks are also evident, only four fragments (two *tegulae* and two *imbrex*/ridge?) join.

Sparse fragments of CBM were recorded in later levels which suggests that dumping during the later phases was of a domestic nature, as evident within the pottery assemblage.

The assemblage is in a good state of preservation, in a stable condition and requires no special treatment for long-term storage. Heat discolouration and/or burning, including post-breakage, is evident on the majority of the fragments (25%).

Catalogue of illustrated pieces (Fig. 6)

1 Tegula. Finger-smoothed Flange Type 2. Knife-trimmed flange edge. Knife-trimmed patches on underside. Reduced core. Crisp breaks. Tile thickness: 19mm, height including flange: 37mm, flange width: 16mm. *Well 17, depth 11.5m*

2. Tegula. Finger-smoothed Flange Type 2. Knife-trimmed flange edge. Knife-trimmed upper cut-away. Blade scars cut into flange. Knife-trimmed patches on underside. Heat discolouration on all original surfaces. Crisp breaks. Tile thickness: 20mm, height including flange: 36mm, flange width: 18mm, cut-away length: >6mm, cut-away width: 19mm. *Well 17, depth 11.3m*

3. Tegula. Remnants of knife-trimmed lower cut-away Type 5. Blade scars. Flange broken, finger-groove only. One original edge of tile - top/bottom - knife-trimmed. Striations on upper surface from manufacture. Crisp breaks. Tile thickness: 19mm, cut-away length: >40mm, cut-away width: 28mm. *Well 17, depth 11.1m*

4. Tegula. Incomplete nail/peg hole. One complete paw print of a small dog. One original edge - top/bottom - knife-trimmed. Crisp breaks. Tile thickness: 17mm, hole diameter: 10mm. *Well 17, depth 10.4m*

5. Tegula. Incomplete nail/peg hole. four paw prints of a small dog. Two partial, to complete. One original edge of tile - top/bottom - knife-trimmed. Heat discolouration on upper surface, patches over breaks. Crisp breaks. Tile thickness: 16mm, hole diameter: 9mm *Well 17, depth 10.4m*
6. Imbrex/Ridge? Two joining fragments. Reduced core. Two original tile edges - end and length, heavily sanded. Crisp breaks. Tile thickness: 19mm tapering to 15mm at apex. *Well 17, depth 11.3m*
7. Ridge? Patches of grey mortar? over breaks. Reduced near throughout. One original tile edge - end- heavily sanded. Tile thickness: 25mm tapering to 19mm at apex. *Well 17, depth 7.2m*

The stone roof files by S. Tibbles

The assemblage contains nine examples of Micaceous Sandstone (thickness range 14mm-28mm), of which one complete and two near complete tiles are present.

Three different shapes of tile were provisionally identified: diamond, sub-rectangular and pentagonal, the latter examples displaying curved sides leading to a flat base. Six examples display complete, or evidence of, pecked suspension holes ranging between 8mm-12mm in diameter. Most examples bare evidence of battering on one or more edges.

Polygon-shaped tiles

Five examples were recorded with dimensions of between 300-400mm in length by 300-360mm wide by 18-28mm thick displaying slight convex upper sides leading to a flat base. Bevelling is evident on all tiles of this shape on one or more edges. Four examples display a pointed apex below which an off-set suspension hole between 8-10mm in diameter had been formed.

Sub-rectangular tiles

A single sub-rectangular tile was identified displaying dimensions of 335mm long by 25mm thick. The upper sides are slightly convex leading to a relatively flat upper edge below which a single centrally placed suspension hole 10mm in diameter had been formed. Battering is evident on all edges.

Diamond-shaped tiles (from spoil heap)

A single part diamond shaped tile displaying dimensions of 240mm in length by 14-20mm thick was recorded. A single off-set suspension hole 10mm in diameter is present. One surface displays pre-breakage burning. Two of the original edges display battering.

Non-identifiable forms

Two fragments of tile displaying surviving widths of 125mm and 225mm by 20mm thick were noted. No bevelling was identified.

All the tiles were recovered from Well 17 at various depths suggesting dumping of demolition material after the abandonment of the well, with the exception of a tile fragment from the spoil heap. From the examples examined it is not possible to determine the shape or usage of the structure from which the tiles originated. At Frocester it was suggested that the size of the tile was dictated by its position on the roof (Price 2000). Well-heads may also be roofed as suggested by Clarke and as stone tiles were a reusable commodity, they were often incorporated into secondary structures such as oven bases (Clarke 1990).

The assemblage may be compared with material from the stone tile assemblage recorded at Dalton Parlours (Clarke 1990), although the latter tile assemblage appears to be all diamond shaped. Also the assemblage is comparable to tiles from the assemblage from Frocester (Price 2000) dated to the latter part of the 3rd century onwards.

The querns and other stone artefacts by D.H. Heslop

An interesting group of querns of Iron Age and Romano-British type were recovered from the sub-rectangular enclosure at Rothwell. Most came from two features, Well 17 and a large pit, (25). Most are of flat form and at least two are probably millstones rather than hand querns. Cup-marked boulder was also recovered from the well.

The quern assemblage is in most respects typical of the quern groups from Late Iron Age and Romano-British sites in West Yorkshire. The two beehive querns are usually dated to the two centuries either side of the turn of the millennium, for example in the early fort horizons from Castleford (Buckley and Major 1998, 243) but later dates are known from both civilian and military contexts, as from the *vicus* at Catterick (Wilson 2002, fig. 352, 2 and 3). The beehives from Rothwell are well made and of a local rock source, most probably Coal Measures sandstone, which present numerous exposures in the vicinity.

The flat querns are a mixture of local lithological types and Millstone Grits. Four of the six disc forms could well come from millstones rather than hand-turned querns, a high percentage for rural sites, but it is impossible to be certain of the original form of stones represented by such fragmentary survivals. Present research is suggesting that rotary querns over 500mm are likely to be millstones (John Cruse, pers comm.). The two examples that measure around or over 650mm in diameter, nos 5 and 8, are most clearly from driven mills, but these lack features that allow the type of gearing to be ascertained.

The most interesting quern is the disk roughout from the well, a find normally only recorded at production sites. The object is complete but fractured. A likely explanation would be that

the object was placed or thrown into the well complete, but then was broken *in situ*, possibly from nothing more than the weight of overlying material on the fissile lithology.

While beehive rough-outs are known in significant numbers across Yorkshire (Heslop 2008 79), roughout querns are usually only seen as discard from production sites like the Jurassic quern quarries at Goathland and Spaunton Moor, North Yorkshire (Hayes *et al*. 1980, 299). Within 50km for the site, the records of the Yorkshire Quern Survey up to 2010 have 235 hand disc querns and 63 millstones, only one of which is a rough-out: a Millstone Grit quern from Haggs Road Farm, Spofforth, North Yorkshire. This roughout is directly comparable in size to the Rothwell example, being 350mm in diameter and 110mm thick, but was at a further stage of production, having the beginnings of a hopper, 70mm wide, but no handle slot. The presence of the roughout in the well hints at some form of structured deposition, a continuation of Iron Age practice which used rough-out querns as objects suitable for votive deposition, in the same way that iron 'currency bars' were selected for this purpose in southern and central England, 'an objects in a transitional state between the raw material and the finished product, in a state ready for donation and receipt' (Heslop 2008, 76).

The cup-marked boulder (Plate 5) is probably a type of object known as a 'portable cup-stone' which are thought to represent Neolithic cult objects but which can be found incorporated into the body of stone cairns and barrows of later date. A photographic assessment of the object by Keith Boughey, however, has cast doubt on this interpretation, due in part to the lack of rings associated with the 'cups' (Boughey pers. comm., see also (Boughey and Vickerman 2003).

Catalogue (illustrated items marked with an asterisk, see Fig. 7)

1* Beehive upper. Approximately 65% of a very finely worked collared beehive upper stone. A single fracture has avoided the feed-pipe, instead removing all but the very end of one of the two, opposed handle sockets. Diam. 310mm; ht 190mm; the collar is 30mm tall, formed by an indentation in the upper profile of the exterior. The concave hopper is 120mm wide and 80mm deep; the diameter of the feed-pipe is 23mm, and has been widened at the base. The surviving handle socket is conical and tapered. The outer profile has a very regularly pecked surface, which is less apparent in the hopper. The grinding face is finely dressed, the close-spaced tooling having been worn through at the centre and on the extreme outer edge. Light brown-grey fine grained sandstone, with well-sorted and well rounded grains, no larger inclusions or fossil pits. Probably a Coal Measures Sandstone. *Well 17, SF 006, depth?*

2* Beehive base. Complete base with wide spindle hole, 30mm wide and 43mm deep, very smoothly worn with rounded base and conical, polished sides. Diam. 290mm, ht 115mm. Coarse working on outer surface to make the circular plan, but parts of original boulder surface patina extant in places. Smooth grinding face but with hammered depression around the central spindle hole. The grinding face is inclined to provide a sloping surface. Discontinuous patch of ferruginous concretion (80mm long x 20mm wide) on outer edge of the grinding face but not on any other part of the body.

Underside has three parallel incised lines - possibly sharpening lines but may be deliberate inscription. Fine grained, well-sorted and moderately rounded sandstone, light grey brown, with several slight flaws in the bedding. Finer and less regular than one, but also probably a Coal Measures Sandstone. *Pit 25*

3* Disk rough-out. Complete but fractured (three pieces) rough-out of disk quern, 360mm in diameter and 110mm in height. Coarsely hammered tooling with no trace of any secondary working. Broken probably in antiquity but held together in matrix of deposit - the oxidation of the sandstone on the fracture face only extends half way through the thickness of the break. Dark red- brown fine grained, well sorted and rounded sandstone, with band of med-coarse graining on face of the stone, containing frequent angular quartz inclusions up to 2mm across in a ferruginous band within the bedding plane structure of the rock. Probably a Coal Measures Sandstone. *Well 17, SF 023, depth 1.65m*

4 Disc quern, upper. Upper flat quern, just under 40% extant, with fracture at oblique angle through feedpipe, so that eye is not measurable. Diam. 370mm; ht 85mm. Sloping sides and wide, conical hopper, the interior of which has slightly sharper tooling than the exterior. There is a concave depression on the outer wall, midway up, 22m diameter and 8mm deep. Light grey medium-grained sandstone, well-sorted and moderately rounded. Occasional larger inclusions of angular quartz, up to 2mm across. Possibly Coal Measures Sandstone. *Unmarked but may be Well 17, SF 333, depth 9.6m*

5 Millstone, lower. 40% of base of probable millstone of diameter 650mm + 100mm. Worn very thin, with maximum depth, 55mm at eye and less than 20mm at extant outer edge. Central hole is narrower at grinding face (64mm) widening to 90mm at outer edge. The surviving fragment is 460mm x 290mm. The grinding face is slightly concave, without dressing which is probably unnecessary as the rock has very open structure giving intrinsic excellent milling properties. The outer surface is coarsely tooled, without secondary working. The grinding face has heavy ferruginous staining spread across about half of the surface, none on fractures or underface. Red-grey coarse grained, poorly sorted and rounded Millstone Grit, with occasionally larger angular quartz inclusions. *Well 17, SF 348, depth 10.2m*

6 Disk quern or millstone, lower. Probable base stone - no evidence of handles or fixing points in the 40% surviving. Broken through the central hole, with all trace of outer edge carefully removed. Diam. > 450mm, max thickness, at eye, 65mm, min 45mm. The central hole (diameter unknown) widens at outer edge, as Cat. no. 5 and has very fine tooling, worn smooth. Very coarse but regular tooling on outer surface, hammering using tool with 20mm round head. Grinding face has dressing surviving towards raised centre but wears out towards the edge, where the smooth but not polished surface has faint circular striations. Fragment size; 290mm x 210mm. Light grey-brown sandstone, well sorted and rounded, no larger inclusions or fossil pits. Probably Coal Measures Sandstone. *Welln17, SF 294, depth 9.7m*

7 ?Quern/millstone fragment. 170mm x 150mm fragment, 51mm thick, worn smooth on one face, coarsely hammered on other face, the other four surfaces all fractures. No diagnostic features extant. Slight sooting on grinding face. Probable quern/millstone of unknown form. Light grey fine grained sandstone, well sorted and rounded, no trace of fossil pits or larger inclusions in extant fragment. *Unmarked*

8 ?Millstone fragment, probable upper. Probable millstone, diameter in region of 650mm, max thickness 75mm, min thickness 30mm. Outer edge survives with straight sides, 30mm high, curving to horizontal, giving a slightly rounded upper profile. The plan of the non-grinding face has some trace of form, possibly a raised lip around eye, joining raised radial band, but too little surviving to be definite about this. Fragment 140mm x 130mm i.e. less than 10% extant. Grey Millstone Grit. Poorly sorted coarse grains, poorly rounded, with sparse angular quartz inclusions up to 8mm across. Good milling properties. *Well 17, SF 332, depth 9.4m*

9 Cup-marked boulder. Small boulder, of roughly rectangular plan but with rounded corners, un worked except for three depressions on centre of one face. The holes form a regular triangle, but are of different shapes, the largest is the most regular circle, of 55mm diameter, and 15mm depth, the others two being oval, one 34mm x 30mm, 14mm deep the other 2 mm x 5 mm and 15mm deep. The two oval holes have straight sides and flatter bases than the smoothly dished circular hole. Sandstone, pale grey, medium to slightly coarse grained, moderately sorted, moderately compacted. Millstone Grit. Erratic. *Well 17, SF 380, depth 10m*

The structural stonework, plus geological specimens by G. Gaunt and J. Prudhoe

Most of the retained stones appear to be unworked pieces. In some cases, however, heat-reddening suggests their use by the inhabitants, while the striking appearance of the two slickensided examples (Cat. nos. 4 and 5) indicates that they may have been collected as curios. One stone clearly had a structural function (Cat. no. 1), while a second was also worked (Cat. no. 2). A third may also have been modified (Cat. no. 4).

All sandstones have subangular to subrounded grains unless otherwise stated.

Catalogue

1 Stone with square mortice which would have housed a timber. Mortice 93mm by 97mm and 99.5mm deep. Sandstone, pale grey, coarse grained, poorly sorted, poorly compacted, with appreciable feldspar. Millstone Grit. *Well 17, SF 264, depth 8.6m*

2 Worked, wedge-shaped stone. Sandstone, pale grey, medium to (slightly) coarse grained, moderately sorted, moderately compacted. Millstone Grit. *Well 17, SF 149, depth 7m*

3 Stone with one flat surface. Sandstone, pale grey, fine to mainly medium grained, fairly well sorted, moderately compacted, with sparse muscovite. Coal Measures. Fire blackened in places. *Well 17, SF 420, depth 9.7m*

4 Sandstone, pale grey, fine to medium grained, fairly well sorted, moderately compacted. Coal Measures. Appreciably slickensided (a polished and smoothly striated surface that results from friction along a fault plane). *Well 17, SF 054, depth 4m*

5 Sandstone, pale grey, fine grained, well sorted, fairly well compacted. Coal Measures. One slickensided surface. *Well 17, SF 042, depth 3.4m*

6 Sandstone, pale grey, fine to (slightly) medium grained, well sorted, fairly well compacted. Coal Measures. *Well 17, SF 056, depth 4.1m*

7 Clay ironstone concretation (part of), 'outer shell', mainly siderite with goethite ('limonite') adhering on inside. Coal Measures. On outer surface, traces of pale grey, fine - grained sandstone. *Well 17, SF 434, depth 10.8m*

8 Sandstone, pale grey, coarse grained, poorly sorted, poorly compacted, with sparse feldspar and sparse quartz pebbles up to 5mm across. Millstone Grit. Slightly heat reddened. *Well 17, SF 386, depth 10.9m*

9 Sandstone, greyish white, fine to slightly medium grained, fairly well sorted, well compacted, with sparse muscovite. Coal Measures. Erratic. Heat reddened. *Well 17, SF 033, depth 3m*

10 Siltstone, pale to medium grey, hard, probably due to very fine- grained quartz, or to siliceous matrix. Upper Carboniferous or Lower Palaeozoic. Probably erratic. Three pieces, all fitting. *Well 17, SF 099, depth 5m*

The wooden artefacts by S.J. Allen

A prior assessment of the wooden artefacts by the author was made and is that described as Conservation Laboratory Report no. 2010/24.

Methodology

Each artefact was removed from its packaging, examined, compared with any existing drawn record and catalogued. A continuous run of catalogue numbers were assigned to identify individual artefacts. Some minimal repacking was done to keep parts of broken or fragile artefacts together. With the exception of the bucket, all objects have been returned to their original boxes. On the basis of these records, an assessment of the condition of the surviving artefacts and an assessment of the quality of the illustrations was written by this author. Following this work, analysis of the assemblage was undertaken.

Catalogue

All objects have been assigned a catalogue number owing to the inconsistent grouping of individual artefacts under single finds numbers. These follow, where possible, the original SFs numbering order. Description and conversion follow normal conventions. Where wood species has been positively identified, its *botanical name* has been given, following Schweingruber (1982). Where a wood species is *not identifiable* owing to its condition, this is stated as such. Where a wood species has previously been identified but could not be checked by this author, the common *English* name is used. Where neither an object nor its documentary information is available, the wood species is *not known*. All dimensions are in millimetres. Finally, the sources of the information are designated, whether that is a surviving artefact (A) or an illustration (D). Newly illustrated artefacts are noted here by a figure number.

Table 5. Wood catalogue

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
01	131	7-7.2m	Offcut. Abraded surfaces.	Hard and brittle. One detached but refitting fragment.	radially faced	*Quercus spp.*	124 l, 45 w, 16 th.	A, D5
02	131	7-7.2m	Offcut.	Object lost- information from drawing.	not known	*not known*	103 l, 48 w, 38 th.	D6
03	131	7-7.2m	Roundwood offcut, partial bark present. One end hewn, other end broken away and missing.	Object lost- information from drawing.	?boxed heart with waney edge.	*not known*	84 l, 34 w, 23 th.	D45
04	131	7-7.2m	Section of cut roundwood, no bark present. Some hewing marks on one face. Both ends broken away and missing.	Object lost- information from drawing.	roundwood	*not known*	104 l, 24 dia.	D46
05	131	7-7.2m	Roundwood chipping, partial bark present. Some hewing marks on outer face. Both ends broken away and missing.	Object lost- information from drawing.	halved	*not known*	126 l, 41 w, 29 th.	D47
06	212	7.8m	Long peg. Even taper along length towards irregular cross section tip. Much old surface damage.	Hard and brittle.	radially faced	*Quercus spp.*	377 l, 18 w, 15 th.	A, no match to D9 or 10. Fig. 8
07	212	7.8m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	124 l, 43 w, 25 th.	D9
08	212	7.8m	Offcut or chipping. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	96 l, 41 w, 26 th.	D10
09	213	7.8m	Offcut from board or stave. Two through holes in face on mid-line, knot in one edge. Both ends broken away and missing.	Hard. Some post conservation surface collapse.	tangentially faced	*Quercus spp.*	169 l, 63 w, 25 th. holes 10 dia, 75 apart	A, D1

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
10	213	7.8m	Chipping. One end hewn, one edge broken away and missing.	Object lost- information from drawing.	not known	*not known*	87 l, 54 w, 30 th.	D11
11	213	7.8m	Chipping.	Object lost- information from drawing.	not known	*not known*	81 l, 35 w, 22 th.	D12
12	219	7.9m	Chipping. ?both ends hewn.	Object lost- information from drawing.	not known	*not known*	118 l, 45 w, 17 th.	D17
13	219	7.9m	Chipping. One end hewn, other broken away and missing.	Object lost- information from drawing.	not known	*not known*	165 l, 80 w, 32 th.	D18
14	222	7.7-7.9m	Offcut from board or stave. Single through hole in face on mid-line truncated by broken end. Other end also broken away and missing.	Object lost- information from drawing.	not known	*not known*	166 l, 75 w, 26 th. hole 08 th.	D13
15	222	7.7-7.9m	Offcut or chipping. Slightly wedge shaped.	Object lost- information from drawing.	not known	*not known*	146 l, 68 w, 25 th.	D14
16	222	7.7-7.9m	Chipping. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	105 l, 41 w, 16 th.	D15
17	222	7.7-7.9m	Offcut. One end hewn at angle to axis of grain, other end broken away and missing.	Object lost- information from drawing.	not known	*not known*	226 l, 75 w, 36 th.	D16
18	227	7.7-7.9m	Section of roundwood, partial bark present. Upper end forks into three branches of which two have hewn ends. Longer branch and lower end of main stem broken away and missing.	Hard and brittle. Single long post conservation radial shrinkage crack along length.	roundwood	*not identifiable*	312 l, 44 dia.	A
19	241	7.6-8.0m	Spindle turned artefact, possibly a handle or peg. Cylindrical, slightly tapering head with irregular, slightly skewed circumferential groove c.12-	Hard and brittle, several post conservation radial shrinkage cracks.	roundwood	*Fraxinus excelsior L.*	OA 83 l, head35 l, 46 dia, shaft 48 l, 25 dia.	A. Fig. 8

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
			15 below end. Sharp shouldered transition to narrower axial shaft. End of shaft broken away and missing.					
20	241	7.6-8.0m	Offcut from board or stave. Single through hole in face on mid-line, truncated by broken end. Other end cut square to axis of grain.	Hard and brittle, snapped into two refitting sections. Large post conservation radial shrinkage cracks.	tangentially faced	*Quercus spp.*	218 l, 69 w, 22 th.	A, D3
21	241	7.6-8.0m	Offcut from board or stave. One end hewn at slight angle to axis of grain, other end broken away and missing.	Hard and brittle.	tangentially faced	*Quercus spp.*	162 l, 33 w, 21 th.	A, D68
22	241	7.6-8.0m	Offcut. One end worked, other end broken away and missing.	Object lost- information from drawing.	not known	*not known*	177 l, 75 w, 61 th.	D4
23	244	8-8.5m	Offcut from board or stave. Single through hole in face on mid-line truncated by broken end. Other end also broken away and missing.	Hard. In two refitting sections separated by post-conservation radial cracking.	tangentially faced	*Quercus spp.*	92 l, 74 w, 26 th.	A, D7
24	244	8-8.5m	Offcut from board or stave. Both ends broken away and missing.	Hard and brittle.	radially faced	*Quercus spp.*	231 l, 43 w, 16 th.	A, no match with SF244 drawings
25	244	8-8.5m	Offcut from board or stave. One end abraded, other broken away and missing.	Moderately hard, partially split along post-conservation crack.	tangentially faced	*Quercus spp.*	200 l, 39 w, 10 th.	A, no match with SF244 drawings
26	244	8-8.5m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	189 l, 45 w, 29 th.	D8
27	244	8-8.5m	Offcut. One end hewn away, other end broken away and missing. Some surface damage.	Object lost- information from drawing.	not known	*not known*	342 l, 53 w, 24 th.	D81

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
28	244	8-8.5m	Offcut. One end possibly hewn away, other end broken away and missing.	Object lost- information from drawing.	not known	*not known*	294 l, 31 w, 22 th.	D82
29	244	8-8.5m	Offcut. One end hewn away, other end badly eroded.	Object lost- information from drawing.	not known	*not known*	290 l, 37 w, 35 th.	D83
30	244	8-8.5m	Offcut from board or stave. Knot running across full width towards one end. ?both ends hewn, one edge broken away and missing.	Object lost- information from drawing.	not known	*not known*	380 l, 104 w, 11 th.	D84
31	244	8-8.5m	Offcut from board or stave. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	337 l, 59 , 14 th.	D85
32	244	8-8.5m	Offcut from board or stave. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	394 l, 45 w, 21 th.	D86
33	244	8-8.5m	Offcut from board or plank. Very eroded and abraded surfaces. Both ends broken away and missing, some crush damage from objects in contact during burial.	Object lost- information from drawing.	not known	*not known*	206 l, 122 w, 23 th.	D87
34	244	8-8.5m	Offcut from board or plank. One end possibly worked, other end broken away and missing.	Object lost- information from drawing.	not known	*not known*	544 l, 84 w, 38 th.	D88
35	249	8-8.5m	Stake, no bark present. Four hewn facets cut to create sub rectangular cross section tip. End of tip and upper end broken away and missing.	Hard. Some post-conservation radial splitting. Possibly mislabelled.	roundwood	*Fraxinus excelsior L.*	122 l, 48 w, 40 th.	A, D48 (labelled as SF475)
36	249	8-8.5m	Stake, no bark present. Four hewn facets cut to create sub rectangular cross section tip. End of tip and upper end broken away and missing.	Hard, minor post-conservation radial splitting. Possibly mislabelled.	roundwood	*Quercus spp.*	162 l, 43 w, 41 th.	A, D36 (labelled as SF449)

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
37	249	8.5m	Offcut from board or stave. Two through holes in face on mid-line. Both ends broken away and missing.	Hard. Some post conservation surface collapse.	tangentially faced	*Quercus spp.*	holes 12 dia, 57 apart.	A, D2
38	249	8.5m	Offcut from board or stave. One end hewn, other end broken away and missing.	Hard, rosin deposits on surface.	tangentially faced	*Quercus spp.*	103 l, 48 w, 27 th.	A, D40
39	249	8.5m	Offcut from board or stave. Both ends broken away and missing.	Hard and brittle.	radially faced	*Quercus spp.*	68 l, 39 w, 16 th.	A
40	249	8.5m	Offcut from board or stave. Both ends broken away and missing.	Hard and brittle.	tangentially faced	*Quercus spp.*	181 l, 48 w, 32 th.	A
41	249	8.5m	Fragment of board or stave. Both ends broken away and missing, some damage to widest edge.	Hard and brittle.	radially faced	*Quercus spp.*	67 l, 35 w, 21 th.	A
42	249	8.5m	Fragment of board or stave. Both ends broken away and missing.	Hard and brittle.	radially faced	*Quercus spp.*	63 l, 28 w, 24 th.	A
43	249	8.5m	Offcut. Both ends, most of one face and one edge broken away and missing.	Hard and brittle. In two main refitting sections where glued joint has failed. Several small detached flakes.	radially faced	*Quercus spp.*	160 l, 45 w, 37 th.	A
44	252	8.85m	*c*. 30% of a spindle turned wooden beaker or cup. Flat pedestal base rising to carination and near vertical wall, finishing in an everted rim. Two incised circumferential grooves around exterior, 09 and 12 below rim. Deep axial indentation at centre of base inside vessel.	Hard and brittle. Base detached from wall and barely refits.	roundwood	*Fraxinus excelsior L.*	c.120 dia, 67 high, wall 04-07 th, base 16 th.	A, D19. Fig. 8

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
45	259	8.7m	Offcut from halved timber. One waney edge with sapwood present but no bark. Both ends hewn to length. Truncated mortice in non-waney edge/face.	Hard and brittle with three detached and refitting fragments.	box quartered	*Quercus spp.*	379 l, 121 w, 63 th. Mortice 153 l, 57 w, 48 th.	A, D20
46	261	8.4-8.8m	Offcut. Both ends broken away and missing.	Hard and brittle.	radially faced	*Quercus spp.*	148 l, 26 w, 15 th.	A
47	263	8.8m	Offcut from board or stave. One edge and one end hewn, other edge and end broken away and missing.	Hard and brittle. Much of surface flaking.	radially faced	*Quercus spp.*	225 l, 68 w, 37 th.	A
48	267	8.4-8.9m	Offcut from board or stave. Both ends eroded.	Hard, snapped into two refitting sections.	radially faced	*Quercus spp.*	198 l, 35 w, 20 th.	A, no match with SF 267 drawings
49	267	8.4-8.9m	Section of halved roundwood, no bark present. Both ends broken away and missing.	Very hard, some post-conservation collapse.	halved	*?Fraxinus excelsior L.*	202 l, 105 w, 57 th.	A, no match with D63
50	267	8.4-8.9m	Section of timber. Outer face abraded to form crude accidental tip, with small cross-grain axe notches and cracks. Other end cut square to axis of grain.	Hard, surface flaking.	radially faced	*Quercus spp.*	228 l, 39 w, 35 th.	A, D65
51	267	8.4-8.9m	Offcut from board or stave. Both ends hewn, remaining surfaces cleft.	Moderately hard.	tangentially faced	*Quercus spp.*	131 l, 53 w, 24 th.	A, D63
52	267	8.4-8.9m	Offcut from board or stave. Some old woodworm damage. Partial through nail hole in face truncated by split edge. Both ends broken away and missing.	Moderately hard.	radially faced	*Quercus spp.*	148 l, 42 w, 26 th.	A, no match with D62
53	267	8.4-8.9m	Offcut from board or stave. Both	Moderately hard.	tangentially	*Quercus spp.*	192 l, 56 w, 20 th.	A, no match

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
			ends broken away and missing.		faced			with D33
54	267	8.4-8.9m	Offcut. Both ends broken away and missing.	Hard and brittle.	tangentially faced	*Quercus spp.*	291 l, 41 w, 22 th.	A
55	267	8.4-8.9m	Section of halved roundwood, no bark present. Single hewn facet on one face. Both ends broken away and missing.	Hard and brittle.	halved	*not identifiable*	117 l, 35 w, 24 th.	A
56	267	8.4-8.9m	Offcut from board or stave. Some reworking along one edge. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	199 l, 40 w, 26 th.	D62
57	267	8.4-8.9m	Offcut from stave or board. Possible working marks on one face. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	204 l, 61 w, 21 th.	D64
58	267	8.4-8.9m	Offcut or crude stake. One end tapered towards sub rectangular cross section tip. Other end and one edge broken away and missing.	Object lost- information from drawing.	not known	*not known*	218 l, 32 w, 22 th.	D66
59	267	8.4-8.9m	Offcut. Eroded surfaces. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	156 l, 23 w, 22 th.	D72
60	267	8.4-8.9m	Chipping. ?both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	59 l, 38 w, 09 th.	D73
61	267	8.4-8.9m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	210 l, 30 w, 24 th.	D74
62	267	8.4-8.9m	Offcut from board or stave. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	167 l 40 w, 15 th.	D75
63	267	8.4-8.9m	Offcut from board or stave. Some surface damage. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	142 l, 29 w, 17 th	D76

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
64	267	8.4-8.9m	Offcut from board or stave. Mid-section possibly charred, some surface damage.	Object lost- information from drawing.	not known	*not known*	180 l, 27 w, 21 th.	D77
65	267	8.4-8.9m	Offcut. Some surface damage, both ends possibly hewn away.	Object lost- information from drawing.	not known	*not known*	182 l, 37 w, 31 th.	D78
66	267	8.4-8.9m	Offcut. ?both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	362 l, 49 w, 30 th.	D79
67	267	8.4-8.9m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	215 l, 73 w, 58 th.	D80
68	267	8.4-8.9m	Wood or timber. One end hewn, other end broken away and missing. No cross section, so of uncertain form. Drawing could be of a roundwood stake or section of squared timber.	Object lost- information from drawing.	not known	*not known*	536 l, 58 w, 57 th.	unnumbered outline drawing
69	267	8.4-8.9m	Section of roundwood. No obvious recorded working.	Object lost- information from drawing.	roundwood	*not known*	780 l, 116 dia.	unnumbered outline drawing and note
70	287	9.1-9.7m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	possibly halved	*not known*	247 l, 46 w, 29 th.	D37
71	295	9.1-9.7m	Offcut from board or stave, possibly refitting to SF303. Both ends broken away and missing. Some surface damage.	Object lost- information from drawing.	not known	*not known*	77 l, 57 w, 25 th.	D70
72	297	9.1-9.7m	Part of a perforated disc, possibly a bung or lid. Cut in transverse plane from parent log. Single central hole truncated by broken edge.	Hard and brittle.	tangentially faced	*Quercus spp.*	c. 80 dia, 30 th. hole c18 dia.	A, D41. Fig. 8

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
73	303	9.5-10m	Offcut from board or stave, possibly refitting to SF295. Eroded surfaces. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	166 l, 59 w, 25 th.	D71
74	304	9.7m	Offcut or ?perforated disc. Single eroded through hole in edge truncated by broken away edge. Ends possibly intentionally rounded or product of erosion.	Object lost- information from drawing.	not known	*not known*	76 l, 46 w, 32 th.	D24. Fig. 8
75	342	8.9-9.6m	Small peg. Cylindrical cross section, possibly worked to a sub rectangular cross section tip. Upper end broken away and missing.	Object lost- information from drawing.	not known	*not known*	83 l, 17 w, 19 th.	D42
76	351	9.9m	Offcut from board. One straight edge. Both ends cut to form converging angle meeting at the other edge, part of which broken away and missing. Single tapering through hole in face at mid-point.	Hard, minor recent damage at shortest edge.	radially faced	*Quercus spp.*	153 l, 61 w, 14 th. hole 20-15 dia	A
77	392	11.2m	Composite wooden spade with Fe fittings. Blade cut from a flat parallel sided board tapering in thickness towards the lower (cutting) end. Two shoulders cut into upper corners to create tapering axial tang. Roundwood handle pared down to fit over tang. Upper end of handle broken away and missing. Single Fe hoop around handle and tang. Single Fe staple over handle with points driven through blade to opposite face, where points are hammered together. Fe shoe fitted around lower end and	Wood hard and brittle. Blade has one upper corner detached but refitting. Handle originally in six refitting sections. Two of these are glued with epoxy resin to the tang and blade. Two of the remaining pieces are still adhered but detached from the rest of the handle. The remaining two are detached but	Blade tangentially faced, handle roundwood	*Blade Fraxinus excelsior L.* *Handle not identifiable*	OA 865 l, 176 w, 50 th. Wooden blade 340 l, 176 w, 25 th. incl. tang 132 l. Handle 524 l, 36 dia. Fe shoe 156 l, 156 w. Fe hoop and staple c. 10 w.	A. Fig. 8

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
			lower edges of blade.	refitting. Much damage to lower face of handle. Fe hoop survives partly as artefact, partly as impression in the wood. Cutting edge of shoe has an epoxy repair but two of the three fragments of the reattached piece of Fe have broken away. No active corrosion observed.				
78	393	11m	Stave built open vessel or bucket. Constructed from a two-part base and thirteen staves bound by an Fe hoop at each end. Pair of perforated iron straps nailed to opposing staves, S7 and S11, which form attachment points projecting above the rim for the hooked ends of a sub rectangular cross section fe handle. Narrow croze, 25 above lower end, cut into each stave to engage with the continuous bevel cut around the lower face of the base.	All wood components hard and brittle. Most of staves have deposits of adhesive on mating surfaces of failed joins - and on surfaces where a plastic strip mount for ironwork has been glued. S1 in 2 refitting frags, w 2 more refitting flakes. S2 part of lower corner lost. S3 lower end missing below croze. S4 no damage. S5 lower corner damaged during burial.	staves, 1, 11 and 13 tangentially faced, all other components radially faced	*all Taxus baccata L.*	staves 259-287 l, 59-84 w, 12-14 th. Base 226 l, 232 w, 16 th. Hoops c. 25 w, set 18 above lower end and 11 below rim. OA dimensions: 285 high, 310 dia at rim, 255 dia at lower end.	A. Fig. 8

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
				S6 part of lower hoop glued in place. Glued to S7. S7 parts of both hoops glued in place. Glued to S6. S8 lower end broken but refitting at croze. Damage at same point. Glued to S9. S9 part of lower hoop glued in place. Glued to S8. S10 lower end missing below croze. Refitting flake. S11 in two refitting parts, some intervening wood missing. S12 no damage. S13 in two refitting parts. Lower corner broken away and missing. B1. 75% of base, upper face discoloured. B2. c.25% of base, all surfaces discoloured.				

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
				Fe hoops. No active corrosion observed. Bag 1- 10 fragments Bag 2- 8 fragments incl. end of handle and suspension loop from S7 Box 1- 13 fragments incl second suspension loop with attached handle end Bag 3- 14 loose fragments from bottom of crate containing bucket- fallen from mounted positions after adhesive failure.				
79	393	11m	Sixteen fragments of board said to be associated with bucket. No refitting joins. All very eroded, ends broken away and missing. Also one roundwood chipping with hewn away side branch. Also lots of tiny flaked fragments derived from the above pieces which have fallen off in storage.	Very dry and extremely brittle.	1-16 radially faced, 17 halved	*1-16 Quercus spp., 17 Fraxinus excelsior L.*	1. 131 l, 60 w, 20 th 2. 83 l, 53 w, 18 th 3. 94 l, 49 w, 16 th 4. 107 l, 39 w, 12 th 5. 88 l, 37 w, 14 th 6. 87 l, 42 w, 08 th 7. 70 l, 32 w, 06 th 8. 88 l, 15 w, 12 th 9. 49 l, 33 w, 04 th	A

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
							10. 41 l, 44 w, 04 th 11. 71 l, 31 w, 06 th 12. 62 l, 29 w, 14 th 13. 49 l, 24 w, 08 th 14. 45 l, 19 w, 03 th 15. 37 l, 28 w, 03 th 16. 67 l, 23 w, 14 th 17.107 l, 31w, 19 th	
80	409	10.2m	?Stake or pile. Two opposing facets hewn to create blunt bifaced tip. Upper end broken away and missing.	Object lost- information from drawing.	roundwood	*not known*	742 l, 108 dia.	unnumbered drawing
81	440	11m	Small roundwood stake point, no bark present. Single hewn facet cut to create chisel tip. Some surface damage. Upper end broken away and missing.	Object lost- information from drawing.	roundwood	*not known*	100 l, 26 dia.	D67
82	446	11.69m	*c*. 25% of a spindle turned wooden beaker or cup. Flat pedestal base rising to abrupt carination and near vertical wall. Four incised circumferential grooves around exterior, 02, 12, 22 and 35 below rim. Not the same vessel as 101.	Hard, brittle and discoloured. Three detached but refitting frags in same bag, drawn separately.	roundwood	*Fraxinus excelsior L.*	c.90 dia, 68 high, wall 03-10 th, base 17 th.	A, D21, D22. Fig. 9
83	448	12-12.1m	Offcut. Tapers slightly along length, wider end broken away and missing. Narrower end hewn square to axis of grain. Faint hewing marks >38w, on	Hard and brittle. Much of surface flaking.	box quartered	*Quercus spp.*	321 l, 81 w, 60 th.	A, D69

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
			one face and one edge, remaining face and edge cleft.					
84	448	12-12.1m	Peg. Four hewn facets cut to create sub rectangular cross section at one end, other end trimmed to create cylindrical cross section. Sub-rectangular end cut square to axis of grain, other end broken away and missing. Some old surface damage.	Hard and brittle.	box quartered	*Quercus spp.*	161 l, 46 w, 42 th.	A, D53. Fig. 9
85	448	12-12.1m	Offcut. Much surface damage or very crude working. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	150 l, 38 w, 32 th.	D54
86	448	12-12.1m	Offcut. Badly damaged, both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	157 l, 67 w, 48 th.	D58
87	449	11.5-12m	Peg. Sub rectangular with chamfered corners creating octagonal cross section. Both ends broken away and missing.	Hard and brittle.	radially faced	*Quercus spp.*	136 l, 36 w, 25 th.	A, D35. Fig. 9
88	449	11.5-12m	Offcut. Possible through mortice in edge truncated by broken end. Axe cut >36 w on one face. Other end broken away and missing. All surfaces badly eroded and fractured.	Hard and brittle.	radially faced	*Quercus spp.*	214 l, 73 w, 47 th. 'mortice' 51 l, 25 w.	A, D33
89	449	11.5-12m	Offcut. Reworked at one end to create sub rectangular cross section tip.	Hard and brittle.	box quartered	*Quercus spp.*	145 l, 36 w, 21 th.	A, D60
90	449	11.5-12m	Peg. Multiple facets cut at one end to create blunt rounded tip. Other end broken away and missing. Some old surface damage.	Moderately hard, shrunk and warped in radial and tangential planes post conservation.	roundwood	*not identifiable*	201 l, 41 w, 36 th.	A, D57. Fig. 9

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
91	449	11.5-12m	Offcut from board or stave. Both ends broken away and missing.	Hard, brittle and flaking. One side of 'mortice' snapped off but refitting.	radially faced	*Quercus spp.*	82 l, 56 w, 26 th.	A
92	449	11.5-12m	Offcut. One face cleft, other face and edges hewn to give sub-pentagonal cross section.	Hard and brittle.	boxed heart.	*Quercus spp.*	102 l, 27 w, 22 th.	A, D56
93	449	11.5-12m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	78 l, 35 w, 26 th.	D34
94	449	11.5-12m	Offcut from board or stave. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	92 l, 47 w, 18 th.	D39
95	449	11.5-12m	Offcut or stake point. Possible sub rectangular cross section tip. Upper end broken away and missing.	Object lost- information from drawing.	not known	*not known*	127 l 54 w, 33 th.	D59
96	449	11.5-12m	Offcut, possibly from branch wood. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	118 l, 52 w, 38 th.	D61
97	451	11.6m	Peg. Partial bark present. Several adjacent long facets and extra trimming at tip to produce irregular cross section blunt tip. Head end broken away and missing.	Hard and brittle. Two detached but refitting flakes present.	roundwood	*?Salix spp. or similar*	116 l, 39 w, 34 th.	A, D26. Fig. 9
98	452	11.6m	Peg. Two opposing facets cut at one end to create blunt bifaced tip. Two opposing facets cut at other end to create second blunt bifaced with truncated axial tenon. Plane of this latter tip is at 90° to that at the other end, with an axial tenon.	Moderately hard.	roundwood	*Quercus spp.*	171 l, 42 w, 38 th.	A, D27. Fig. 9
99	453	11.85m	Fragment of bracket. One end cut at angle to axis of grain and bevelled.	Moderately hard.	radially faced	*Quercus spp.*	113 l, 92 w, 62 th. Nail hole 08 dia.	A, D25. Fig. 9

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
			Single through nail hole in face with crude countersinking in one face. Other end carved to from 'spring' of curved bracket, rising away from the nailed face, terminating in a broken end.					
100	457	11.69m	*c*. 25% of a spindle turned wooden beaker or cup. Flat pedestal base with gently curved profile rising to a slightly everted rim. Two circumferential grooves around exterior 10-15 below rim. Not the same vessel as 83.	Hard and brittle. three detached but refitting fragments. Some post conservation radial shrinkage cracks.	roundwood	*not identifiable*	c.100 dia, 70 high, wall 03-07 th, base 15 th.	A. Fig. 9
101	464	11.8m	Turned peg or finial. Cylindrical cross section head with one end reduced in diameter, then cut to form a small axial tenon by having two opposing faces hewn to create sub rectangular cross section. Head tapers evenly towards other end, where four hewn facets have been cut to create sub rectangular cross section wedge end, whose plane is at 90° to the tenon at the other end.	Moderately hard.	radially faced	*Quercus spp.*	189 l, 57 w, 54 th. head 34 l, 45 dia with wedge end 32 w, 20 th. Axial tenon 45 dia, cut to 21 w, 20 th.	A, D29. Fig. 10
102	468	11.4m	Peg. Multiple facets cut over whole length paring object to a continuous taper towards irregular cross section tip. Both ends damaged.	Hard and brittle.	roundwood	*Fraxinus excelsior L.*	78 l, 24 w, 19 th.	A, D55. Fig. 10
103	475	12-12.3m	Offcut. Both ends broken away and missing.	Hard and brittle. Snapped into two refitting sections.	radially faced	*Quercus spp.*	126 l, 36 w, 15 th.	A, D52

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
104	475	12-12.3m	Offcut or wedge. One face hewn to taper towards end, creating a wedge tip. Other end broken away and missing.	Hard and brittle.	box quartered	*Quercus spp.*	101 l, 36 w, 26 th.	A, D49
105	475	12-12.3m	Chipping from board or stave. One edge chamfered.	Moderately hard.	tangentially faced	*Quercus spp.*	81 l, 45 w, 15 th.	A, D43
106	475	12-12.3m	Offcut from board or stave. Possible truncated through hole in face at broken edge. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	147 l, 36 w, 22 th.	D38
107	475	12-12.3m	Offcut from board or stave. One end partially hewn away, other end and one edge broken away and missing.	Object lost- information from drawing.	not known	*not known*	115 l, 44 w, 19 th.	D44
108	475	12-12.3m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	67 l, 23 w, 15 th.	D50
109	475	12-12.3m	Offcut. Both ends broken away and missing.	Object lost- information from drawing.	not known	*not known*	55 l, 22 w, 18 th.	D51
110	476	12.2m	Crude peg. One end hewn roughly square to axis of grain, other end terminates in a full width tenon. Tapers towards hewn end. Part of tenon broken away and missing.	Moderately hard.	radially faced	*Quercus spp.*	203 l, 41 w, 40 th. tenon 39 l, 37 w, 19 th.	A, D28. Fig. 10
111	477	11.6m	Offcut from plank or board. Ends possibly cut away, part of one face broken away and missing.	Object lost- information from drawing.	possibly tangentially faced	*not known*	134 l, 128 w, 37 th.	D30
112	477	11.6m	Offcut from board or stave. One end cut away, other end broken away and missing.	Object lost- information from drawing.	not known	*not known*	86 l, 39 w, 13 th.	D31

Cat no.	SF no.	Depth at which found	Description	Condition	Conversion	Species identification	Dimensions	Source
113	478	11.1-12.1m	Stave. Single through hole in face 21 from original end. Possible second hole of same size truncated by broken edge. Both edges and one end broken away and missing.	Hard and brittle.	tangentially faced	*Quercus spp.*	65 l, 72 w, 17 th.	A
114	492	12.0m	Turned peg or finial. Cylindrical cross section head with one end worked to form a small sub rectangular cross section axial tenon with four hewn facets. Head tapers evenly towards other end, which is broken away and missing.	Moderately hard.	radially faced	*Quercus spp.*	130 l, 49 w, 47 th. Tenon 20 l, 26 w, 24 th.	A, D32. Fig. 10
115	497	10.4-10.5m	Offcut. Both ends broken away and missing.	Moderately hard.	radially faced	*Quercus spp.*	265 l, 34 w, 29 th.	A

Description

All of the artefacts were recovered from the fills of well 17, associated with late Roman (4th-century AD) pottery. The schematic section through the well (Fig. 3), indicates damp conditions began around 3m below the top of the well, becoming wet at around 6m and waterlogged below 7.5m. There is no indication of a lining, whether of wood or stone.

The artefact labelling is inconsistent, sometimes giving the depth at which the object was found, sometimes not. Small finds numbers were assigned, but these numbers refer to groups of several objects from the same general area rather than unique artefacts. The labels may also include the drawing number and on occasions, the artefact drawings include depth or small finds numbers not included on the object label.

Discussion

Wood was present in the well where waterlogged deposits were present. Any wood deposited in non-waterlogged layers, or above the local water table this horizon represents, would not have survived even had it been present to start with.

All of the identifiable wood species are native trees and could have been obtained locally. The bucket is a product of a specialist craft and is likely to have been produced elsewhere. This artefact and the iron-fitted spade, indicate links with other communities with access to specialist skills and equipment.

The offcuts and chippings are typical of the type of material recovered from waterlogged contexts and are a result of the breaking up of larger pieces of wood or light timber structures. The staves with nail holes clearly indicate they once formed part of a structure or larger artefact but what that structure was cannot now be defined. The chippings are probably also derived from the dismantling of a structure and are different to the trimming or dressing chips associated with constructional woodwork and carpentry. The assemblage is somewhat different from that of the well at Dalton Parlours in that there are no curved substantial timbers of the type associated there with the winding mechanism (although see p.4).

Of the identifiable artefacts, many are fairly simple wooden pegs, usually prepared from timber, roughly trimmed to shape and length. Most of these may be associated with the assembly (and subsequent dismantling) of framed wooden structures, but none are sufficiently diagnostic to indicate the type or nature of the structure concerned. Some of the pegs are more complex, being shaped at both ends to engage with other timbers or fittings. The nature of these pegs is not currently known and until some are found in an articulated position, it is unlikely that we can be certain of their precise function. On current comparative evidence they could be reworked ends from wheel spokes similar to those recovered from wells or pits at Bar Hill (Robertson *et al*. 1975, 48, no. 1) and Newstead, (Curle 1911, 122 and plate LXIX) or reworked furniture fragments similar to one from Scole (Liversedge 1977, 204, no. 4).

The bracket (Cat. no. 99) is another fitting whose precise function cannot be defined at present. What we have is a truncated fragment from what would originally have been a half loop, securing a rounded timber or metal bar against another timber whilst still allowing that first timber or bar to be moved, either rotated or drawn through. It could have been part of a drawbar mechanism for securing a large door or gate or perhaps a part any lifting mechanism used to draw water from the well during use. There is sadly, no positive evidence for the existence of a well head mechanism, though with a well this deep it would be surprising if one were not present.

The turned vessels (Cat. nos 44, 82 and 100) represent the types of vessels which could have been very common but which do not often survive outside of waterlogged burial contexts. It has been remarkably difficult to actually find close parallels for these three vessels in wood. The wood identifiable in two of the objects is ash, a wood often used as the raw material for turned wooden artefacts in later periods. All three are spindle-turned, fashioned from a piece of wood mounted axially on the lathe, as opposed to the face-turned method used to produce wider vessels in later periods. The vessels are reminiscent of drinking vessels, rather than containers or receptacles for food and have none of the dark staining deriving from food residues commonly observed in wooden vessels. Though carefully finished the decoration is fairly simple.

It is worth noting that none of the three are complete. Given their obvious appearance as artefacts, the waterlogged conditions in which the fragments were found and the fact that quite small fragments from one vessel were identified and lifted, it would appear that they had been broken before deposition in the well. Part of the vessel was disposed of in some other location. If this were simple recycling, for example as raw material for another artefact or as fuel, or if deliberately broken for placement in the well, it is not clear why only part of each vessel was present. Either the objects are part of more general material dumped in the well as part of the filling, or each vessel is a token deliberately thrown into the well.

The blade of an oak spade is known from Exeter (Earwood 1991, 275 no. 1). Its conversion is not recorded and it has been assumed that the (missing) handle passed through the blade and was pinned or nailed in place. Whilst this is quite possible, pulling the handle off a spade blade with the iron fastenings known from the Rothwell spade could equally have caused similar damage to the blade. The Exeter spade has no fittings or holes for an iron shoe, but the Rothwell example shows that such shoes need not have nails to keep them in place.

The fragmentary state of the bucket handle and associated iron fittings make it difficult at present to be certain how much is present and whether any loop was present at the apex of the handle, a feature noted on several Roman buckets, but absent at Dalton Parlours (Scott, 1990, 197). Again it is not clear whether a grip was present. We can be sure that much of the handle was sub-rectangular in cross section, tapering towards each end. The terminals are hooked though perforated handle mounts nailed to the bucket staves. This feature has a direct parallel in the type 2 mounts identified at Dalton Parlours (Scott, 1990, 200). At Rothwell, the upper

hoop clearly overlies the mount and the pointed lower end is not embedded in the wood of the stave.

Consisting of a two-part base and thirteen staves, the wood of the bucket is unusual in being cut from yew. Only one other possible yew bucket fragment is known in a Romano-British context, an isolated 3rd-century stave from Prestatyn (Newstead 1938, 186 no. 7). The species identification, however, is disputed, Earwood (1993, 78) claims this as yew, while the original publication claims oak. One fragmentary stave built vessel from Welshpool does use yew (Boon 1961, 26) and the wood is frequently found used in vessels from post-Roman burials.

Most of the components are radially faced with just three of the staves being tangential facings. The method of conversion used to produce this is no longer clear. Each stave has planed edges to allow a close fit with its neighbours but there is no noticeable bevel at either end. The narrow, 2-3mm wide 'V' section croze groove, into which the bevelled edges of the base fit, is 25mm above the lower end. It has no associated howel. The two cant staves forming the base are butted together, no pegs being present.

At 285mm high, 310mm diameter at the rim and 255mm diameter at the base, the vessel is very similar to a complete bucket from Dalton Parlours (Morris 1990, 206, no. 1), itself of thirteen staves, with a very similar handle and attachment points. Dalton Parlours 1 differs only in having a one piece base, oak rather than yew wood components, narrower iron hoops and hooked ends to the handle mounts turned under the upper hoop.

Summary

No wooden artefacts were apparently recovered above a depth of 7m within the well. According to the schematic section, this was towards the lower end of the 'wet' zone of deposits (Fig. 3). This depth would seem to indicate the upper limit of a locally fluctuating water table above which wooden artefacts simply did not survive. The fact that wood survived in layers below this depth indicates that any wood entering the well before it was filled to this level would have survived. Unless there were serious problems recovering wood in particular zones during the excavation, what has survived is what entered the well up to this point.

Spatially, the wood appears to have been found in two zones. The upper, between 7m and 9.9m depth consists for the most part of offcuts and pieces of timber, often from staves, with seven pieces of roundwood and only four artefacts- one turned vessel, three pegs and a perforated disc. The lower zone, between 10.2m and 12.3m depth still contains numerous offcuts but is far more artefactual in nature- a bucket, spade, nine pegs, fragments of two bowls, and part of a curved bracket. This distribution may be significant- the lower zone representing material deliberately placed or accidentally lost during or towards the end of the working life of the well, and the upper zone representing material caught up and deliberately placed in the well, albeit as part of a backfilling and decommissioning process.

The assemblage is somewhat different from that of the similar well at Dalton Parlours in that there are no curved substantial timbers of the type associated there with the winding mechanism, only a single bucket, a spade, several pegs of unusual form and more turned vessels. This might indicate a different, perhaps less long-lived, working life to the well or that very different activities were taking place above ground.

Leather and footwear by C. van Driel-Murray

The waterlogged levels of the well yielded a number of artefacts made of leather. These were conserved in at Doncaster Museum Conservation Laboratory immediately following excavation, and now, 30 years later, are still in a good state. Though care is required in handling, the leather has not disintegrated further, there is little additional surface flaking, nor has any extra shrinkage been noted. Records show that the objects were washed, immersed in a 1.5% solution of EDTA di-sodium salts, washed, immersed in a 3% solution of hydrochloric acid, washed, dehydrated with acetone, soaked in white spirit, before soaking in 20% Bavon ASAK ABP in white spirit. The items were then removed and reshaped before the Bavon was dry. The finds were sent to the author in the 1980s, but no further information was available, nor was any interest shown in their reporting in the subsequent years.

Leather was only preserved in the waterlogged deposits of the well, with the uppermost finds appearing at 8.8m, that is, some way below the clay packing and structural debris. Any leather at higher levels would not survive, and the present assemblage must be regarded as a fortuitous selection of what might originally have been present in the well. The find consists mainly of footwear, with some off cuts, a strip with pricked decoration, and a curious oval object. In many respects it is similar in nature to the leather from the contemporary well at Dalton Parlours, to which reference will be made throughout.

Nailed soles

The nailed bottom unit (Cat. no. 1) is the best preserved item of footwear in the well. The upper itself is lacking, but in view of the flakes visible between the sole layers, and the perfect survival of the strips of goatskin used to reinforce the lasting margins, this is probably due to the use of thinner, non-vegetable tanned leather for the upper, since skin treated with fats or mineral earths will not survive waterlogging. Deliberate removal of the upper is unlikely to have left the reinforcement in place without damaging the stitch holes. The heel stiffener, however, does appear to have been cut down, a modification of the back which would have served the same purpose as the gap left in the heel stiffener of sole Cat. no. 4. Here the hide edge seems to have been deliberately incorporated into the stiffener so as to leave an opening to alleviate pressure on the bottom edge of the foot. Wear at the seat is entirely concentrated on the lateral corner, as though the wearer was trying to avoid putting weight fully on the heel, as is normal. Shoe Cat. no. 1 was simply modified, but shoe Cat. no. 4 appears to have been specially made to cope with some sort of temporary affliction. The

two soles are of much the same size, and might have belonged to the same person. Such modifications are well known in post-medieval footwear but they are infrequent on Roman shoes. The sole Cat. no. 1 is in good condition with most of the nails present, except at the seat, where the actual grain surface of the outer sole is also missing. Just visible between the sole layers at the seat are the thongs attaching the heel stiffener, tunnelled through the thickness of the insole. The passage of the thong has caused the entire flesh side of the leather to separate completely, giving the misleading impression that an additional middle sole is present. In the 1st and 2nd century complete middle soles do appear regularly, and seem to be a specific feature of British shoe manufacture, but thereafter, shoes are made with two sole layers and a variety of smaller laminae and packing pieces in between (as is the case here, Cat. nos. 4 and 5). Descriptions of soles frequently overlook the splitting of the leather into two separate layers, something which occurs with increasing frequency in the later Roman period and is also noticeable in 4th-century assemblages on the Continent. The loosening of the leather surfaces may be due to attempts to shorten the production process, leading to less thorough tanning of thick sole leather. The hobnails are closely set around the periphery with a medial line and scattered groups of 3s and 4s, all worn down to low domes. The setting of four nails at the seat invites an association with Cat. no. 3, possibly a remnant of its pair, although this arrangement is very common. Blunt, thick waisted soles are characteristic of the 3rd and 4th centuries, and triple nail settings appear to be particularly favoured at the end of the 3rd/early 4th century. The pattern occurs regularly, though always in small numbers, at both military and civilian sites in Britain and the Continent, for example, Krefeld-Gellep (Pirling 1989, Taf. 86) and unpublished sites such as Vindolanda, London and Cuijk, as well as the Saxon Shore forts of Aardenburg and Oudenburg cf. van Driel-Murray 2001, 351-2), and there is also one example at Dalton Parlours (Mould 1990, shoe 11). On most of these, however, the trefoils are loosely scattered over the sole surface, while at Rothwell they are incorporated into a denser pattern (pattern1a), together with diamond settings at the seat and toe. What the significance of such distinct patterns was to the makers and wearers is unknown, but it must be remembered that shoe nails leave obvious prints on unsurfaced roads, instantly recognisable to passers-by. The specific message communicated by the trefoils was evidently well-understood and remained relevant across a wide range of society throughout the western Empire for a period of about 70 years (van Driel-Murray 1999). The inhabitants of Rothwell, therefore, were not entirely untouched by such wider emblematic trends.

The remaining soles are fragmentary: all come from nailed footwear, with evidence for laminae, in the case of Cat. no. 4 still thonged to the insole. Curiously, none of the leather found together at 8.8m (SF 280) seems to be functionally associated in any way, and there is no room for the upper fragment Cat. no. 2 between the sole layers of Cat. no. 1. It is possible that it is associated with sole Cat. no. 4, since the spacing of the nail holes on the two corresponds. Scraps and flakes from Cat. nos. 1, 3 and 4 occur throughout the well fill, while the completely disintegrated left sole Cat. no. 5 can be partially reassembled from fragments

at different levels. The scattered distribution suggests that most of the footwear had already disintegrated before being dumped in the well together with other rubbish.

Carbatinae (single-piece shoes)

The four carbatina fragments all belong to the same style, and although none of the pieces actually fit, three of them may derive from the same pair of shoes. Cat. no. 6 is the most complete, the front fragment Cat. no 7 is possibly from its pair, but Cat. no. 8 is of thicker, denser cowhide, and must come from a different, though similar shoe. The basic pattern is a simple U-shaped piece of leather, with a series of oblique cuts forming the distinctive forward facing loops, usually four on each side. The loops are opened up by means of cuts descending from punched roundels at the tip, and the front is cut into short tabs, each separated by a roundel. Although the tabs of Cat. no. 7 are damaged, other surviving examples of the style show that each tip would be pierced to take the lace. This ingenious cutting pattern leaves hardly any waste, while the elasticity of the leather allows the loops to be pulled across the foot with the toe tabs fitting snugly around the toes. No fewer than four almost identical shoes with forward facing loops occur in the Dalton Parlours well, with plainer specimens known from Vindolanda and late 3rd-century contexts in London (Dowgate excavations MOL archive; Queens Street Well 19, Wilmott 1982; also unpublished examples from Oudenburg, cf. Vanhoutte 2009).

A remarkable parallel is formed by the shoes worn by a bog-body found at Amcotts, Lincolnshire. These were still laced up, and a drawing made at the time of discovery in 1747 shows the neat fit and decorative mesh of the crossing loops, giving an impression of how the shoes actually looked (Turner and Rhodes 1992, fig. 2). The shoes from Rothwell and Dalton Parlours are much more decorative than any of these parallels, with cusping, openwork and surface impressions, Rothwell even more so than Dalton Parlours. For footwear on rural sites, both are quite flimsy, and despite the subsequent severe wear all were originally quality products. The sole of Cat. no. 6 had worn through and a repair was attached with leather thong, some of which is still in place, indicating a total sole thickness of *c*. 6-9mm. The sole layer was attached with care, and had been trimmed to shape, leaving light scars on the surface of the shoe, and was presumably made of rawhide as no trace of it remains. Rawhide provides a hard, hornlike surface, but is unsuitable for wet conditions and it would have decayed in the waterlogged conditions of the well.

Toe tabs are widely attested in Northern Europe, forming a logical development in improving the fit of single-piece footwear during the later Iron Age, and continuing into the Roman period, with several particularly fine examples relatively well dated to the 3rd century (van Driel-Murray 1987, fig. 4). Whether these tabbed shoes also featured in Iron Age Britain is unknown, due to the lack of native footwear finds, though the fact that tabs only begin to appear in later contexts might suggest a Continental origin, perhaps through Germanic auxiliaries (as at Birdoswald, for instance, cf. Mould 1997, fig. 241). Equally, however, the feature could represent a native substrate which has simply failed to survive.

The scrap (Cat. no. 13) with its all-round narrow thong stitching perhaps comes from a reinforced seam of a side-closing upper, like the thonged seams present in Dalton Parlours (Mould 1990, fig. 142.1; 12), but it also bears some resemblance to the shaped back seam of certain Continental carbatinae. The small loop fragment (Cat. no. 10) does not appear to belong to any of the footwear in the well, but yet again, it attests to the presence of decorative footwear, with impressed swags and punched roundels on an apparently polished surface.

Non-footwear

The function of the two fragments that do not belong to footwear is unclear, but they are evidence for the varied use of leather goods on the site, some of it decorated. Although there are no cut or stitched edges to provide a clue as to its purpose, the decorated strip (Cat. no. 12) had been subject to severe usage, and the leather is worn and split. Equally enigmatic is the 'label' (Cat. no. 11). This roughly shaped piece of scrap leather had been cut away from some kind of backing. Some impressions on the back resemble wickerwork, but whether this is associated with the purpose of the piece is unclear, particularly as wickerwork was recorded in the well, and the impressions might have been caused by pressure after deposition. Another possibility is that the object is one side of a home-made bulla or amulet pouch, cut open to remove the contents.

The inhabitants

What do the leather finds tell us about the inhabitants and their activities? The off cuts are too few to suggest the presence of a professional leatherworker, but some form of leatherworking was being carried out on site, if only the repair and cobbling of existing items. Old leather was being reused (Cat. no. 14) and new hides were also available (Cat. nos. 15-17) while rawhide was employed for repairs. Rawhide could have been made locally, but hides tanned to this quality would have to be purchased elsewhere. The carbatinae are made of cowhide or calfskin, occasionally smoothed to give a slightly shiny surface (Cat. no. 9), while goatskin was employed for the uppers of Cat. no. 1. The use of thin leather thong rather than twine for stitching is typical for the later Roman periods.

Shoe sizes can give an indication of the resident population, but here the uniformity of sizes is distinctly strange. The nailed sole is made for a foot about 21cm in length (= continental size 32, British child 13/adult 1), and a reconstruction of the carbatina suggests that this was made for a person with a similar size. Carbatinae close more snugly around the foot than the ridged nailed shoes, and the seam edges are usually also somewhat elevated from the ground, so that sizes are only approximations, but the fragmentary Cat. no. 8 also appears to posses comparable dimensions. Even allowing for shrinkage during conservation, all these shoes fall well within the adult female size-range for the Roman period (i.e. size 30-35). In addition the two nailed soles Cat. nos. 1 and 4 may have been made for the same person, apparently a woman with some affliction or discomfort on the lower heel edge of her left foot.

Taken together, the shoes seem to reflect only a few persons, apparently all female. The restricted size-range within this complex is unusual: Dalton Parlours, for instance, contains both adult's and children's shoes. Particularly interesting is the fact that the carbatina here suggested as a woman's shoe on the basis of size alone, was the type actually worn by the female Amcotts bog-body at the time of her discovery. On the whole, most Roman shoe styles were used equally by men and women, and given the paucity of complete examples of shoes with forward facing loops, it is perhaps too early to conclude that this was a style especially favoured by women.

Despite the rural location, the footwear is professionally made, following current fashions, with numerous decorative touches in the treatment of the uppers and the arrangement of the hobnails. The complex as a whole is little different in nature to urban or military complexes elsewhere, and reinforces the widespread acceptance of international footwear styles throughout the Roman Empire.

Dating and context of deposition

The composition of the leather finds is closely comparable to the Dalton Parlours well: both contain thick waisted soles with triple nails and one-piece shoes of the same distinctive style. Triple nails occur sporadically throughout the 3rd century, gaining in popularity towards the end, and with examples on the Continent continuing till the mid 4th century (Krefeld mid 4th century; Cuijk *c*. 330 AD). Plain carbatinae with forward facing loops already appear at Oudenburg in a well dated to *c*. 270 AD: there are no soles with triple nails in this assemblage, and the shoes from both Rothwell and Dalton Parlours are of a far more developed and intricate form, suggesting that both groups should be dated towards the end of the 3rd century or early in the 4th. This accords with the date in the first third of the 4th century, suggested by Leary on the basis of the pottery.

In contrast to the situation at Dalton Parlours, and despite the presence of a human skull at 9.6m, there is no indication of any special deposit of footwear in this well. It is unlikely that the uppermost shoes – the sole and carbatina in SF280 – form a closing deposit, as the pieces are all incomplete and not functionally associated. It is, furthermore, by no means certain that these were actually the last items to be thrown in, since leather above this level would have decayed. Most of the shoes are very fragmentary, and must already have disintegrated before entering the well. Flakes and fragments associated with the larger items occur throughout the deposit and the presence of a possible pair at 10.3m and 8.8m respectively, suggest this part of the shaft was filled at one go with re-deposited refuse from elsewhere on the site. All the identifiable fragments are consistent as to date, however, and there is no evidence here for footwear from earlier periods which might form an initial offering, as is the case at Dalton Parlours, nor for a lengthy period of infilling.

Catalogue (illustrated items marked with an asterisk, see Fig. 11)

Footwear: Nailed soles

1.* Complete left bottom unit, consisting of insole and outersole, with signs of packing between, all firmly nailed together. The shoe is worn and especially compacted at the front where the nail shafts have left prominent bumps on the insole, while the outside sole surface is extensively flaked, lacking the entire grain flake at the seat, where the surrounding nails are also missing. A goatskin lasting margin reinforcement made in two sections, meeting at the toe, is in place and was originally whipped to the shoe upper (only flakes of which remain visible between the sole layers) and thonged to the insole. The small stitch holes suggest the use of twine, and a narrow strip of thong at the edge of the reinforcement is probably to be associated with the construction of the upper. A heel stiffener, which appears to have been deliberately cut down, is attached to the insole by leather thongs (2-5 mm wide) passing through the thickness of the leather, causing the sole to split and giving the false impression that an additional middle sole is present. The sole has a thick waisted, blunt shape, with nails grouped in threes and fours at the tread and seat. Some flakes as well as a nail belonging to this sole were retrieved from lower down in the well (SF 399). Outer sole, 23/8.5/6.5/6cm; insole, 22/8.2/5.3/6cm, foot size: 21cm = continental size 32, British child 13/adult 1. *Well 17, SF 280.3, depth 8.8m*

2. Thin, delaminated and split fragment of a nailed shoe upper, the edges punctured and deformed by the nailing. Probably calfskin. Only a narrow strip of the grain split with rather more of the flesh remaining, along with other scraps elsewhere in the well and four small fragments (largest: 5 x 4.5cm) of similar leather quality in the same find number. (13) x (6)cm. *Well 17, SF 280.4, depth 8.8m*

3. Seat reinforcement wedge, delaminated flesh flake, lacking all the nails, but with flakes of the grain side present in SF311, including the grain flake matching the setting of four nails and a scrap of a lasting margin. Other flakes may be present in SF299 and 300. (9.5) x 6cm. *Well 17, SF 312, depth 9.8m*

4.* Fragmentary insole with a long lamina still attached by several short pieces of thong. Pattern of nail punctures and the curve of the lamina suggest a left shoe. Impressions of twine bracing cross the lamina. Nail punctures show a complex, plaited design. The sole is severely worn, in a curious pattern which spares part of the heel area. Probably associated with this sole is a fragmentary heel stiffener (SF 388.2) secured by nails and thonging, and cut down at the top. The cowhide is poorly fleshed, 4mm thick, and incorporates the hide edge, seemingly intentionally so as to leave a gap. Sole: (16.5)/-/6/6cm. Stiffener: (13) x 4.5cm. *Well 17, SF 388.1+2, depth 11.0m*

5. Numerous thin flakes, separated into flesh and grain surfaces belonging to a disintegrated nailed insole with a small lamina, distributed through several layers. The matching flesh and grain flakes in SF 300 indicate a left sole. *Well 17, SF 299+300, depth 9.6m*

Carbatinae/one piece shoes

6.* Two sides of a single piece shoe, in poor condition, the leather entirely delaminated and split into two surfaces. The back seam is still held together with narrow thong stitching (butted edge/flesh seam). There were at least 4 narrow loops on either side of the foot, mostly snapped off, though a few can be refitted. The actual sole area is decayed and

holes still containing the remnants of thongs indicate the attachment of a repair sole. This had been trimmed to shape, leaving light knife scores on the shoe sides. The quarter loops have decorative frilling formed by close-set C-shaped stamps, and there are traces of impressed swags on the scuffed outer surface. The split surfaces have shrunk at different rates, making it difficult to fit fragments accurately. (37) x (6)cm. *Well 17, SF 280.1, depth 8.8m*

7. Delaminated front section of a shoe similar to Cat. no. 6, though given the number of loop stubs on the main piece, it cannot belong, except to its pair. A single loop remains with the stumps of eight small tongues in front, each separated by a roundel formed by a semi-circular stamp. At the bottom, some thong holes of a repair sole are present. (9) x (3.5)cm. *Well 17, SF 280.2, depth 8.8m*

8. Entirely delaminated side of a one-piece shoe of the same type as Cat. no. 6, but of thicker, denser cowhide and unlikely to form its pair. All the loops are snapped off and only a single fragment remains. The two surfaces have shrunk differently. (17) x (7)cm. *Well 17, SF 381, depth 10.7m*

9. Two fragments from the side of a one-piece shoe, similar to Cat. no. 6, also with decorative frilling of the ankle fastenings. Dark, brittle, smoothed calfskin, varying in quality. One side is delaminated and split, the other still firm and complete. This could match Cat. no. 7. (17) x (6)cm. *Well 17, SF 350.1, depth 10.3m*

10. Upper fragment from another shoe entirely, maybe not even a carbatina. A single loop remains, with traces of roundels and impressed swags and outlines marked on the dark, smoothed leather. Thin brittle calf, delaminated and split. (4) x (6.5)cm. *Well 17, SF 404, depth 11.0m*

Non-footwear and off cuts

11.* Roughly shaped oval cut from a hide remnant (fine calf, not smoothed), stitched around the edges with narrow, rolled thongs which have been cut through.. Some parallel impressions on the flesh side, looking like narrow rods (wicker?) might be functional, but are more likely to be caused by crushing in the well following discard. 6 x 5.5cm. *Well 17, SF 282, depth 9.3m*

12. Thin grain split, probably calfskin but very tattered and scuffed, apparently ripped along a fold. A line of at least seven pricked triangles cross the surface: there are no thread impressions so this simply surface decoration. There are no signs of cut or stitched edges and the function is uncertain. (17) x (8)cm. *Well 17, SF 280.5, depth 8.8m*

13. Thonged scraps. Fragile and torn triangle of leather stitched all round with thin leather /gut thong (overstitch), which attaches a similar flake. Another scrap with thong/gut stitching associated in some way. Possibly caprid skin. Might form the back/sole seam of a single-piece shoe of the Deurne type. (4) x (3)cm. *Well 17, SF 299, depth 9.6m*

14. Reuse off cut or torn strip of a shoe upper of still supple firm goatskin with a few fixing holes. 16 x 3.5cm. *Well 17, SF 388.3, depth 11.0m*

15. Long narrow cowhide trimming, 4mm thick. 19 x 0.7cm. *Well 17, SF 466, depth 11.4m*

16. Thin, wrinkled secondary off cut, probably calf from belly/leg area. 23 x 7cm. *Well 17, SF 337, depth 9.6m*
17. Delaminated primary off cut, goatskin? 13 x 5cm. *Well 17, SF 391, depth 11.0m*

Cotton fabric by J.P. Wild

Textile from the well was examined by Peter Wild, Department of Archaeology, University of Manchester in July 1979. It is clear from correspondence that Wild was sceptical that the cotton was Roman in date, although without knowing the depth from which the cotton was recovered, this scepticism is difficult to assess. This brief report is included here.

The textile is an open plain weave:

System (1), weft ?, Z-spun, *c*. 17 threads per cm, wide set fine yard, max. L. 1.5cm.

System (2), warp ?, strong Z-spun, *c*. 10 threads per cm, wide set, max. L. 3.5cm.

Yard (2) is thicker than (1).

Cotton is very rare in the western Roman provinces, but S-spun cotton yarn was found in a 4th-century Roman well at Chew Stoke, Somerset (Wild 1970, 18).

7 Environmental Record

Human bone by K. Manchester

A human skull (with the mandible absent) was recovered from a depth of 9.6m, just over two metres from the bottom of the well. This was examined by Keith Manchester in 1978 and photographs were taken (Plate 6). His report, dated 29.09.1978, is given in full below.

The specimen from the well at Rothwell consists of a deeply brown stained human cranium of an adult, probably male. The age at death, assessed by dental attrition was about 25 years, but the complete union of the cranial sutures suggests that the individual may have been somewhat older. The cranium is dolicocephalic, orthocranic, mesoconchic and leptorrhine. The mandible and the remainder of the skeleton are absent. No disease processes are evident.

The following parts of the cranium have been removed, however: left mastoid process, left occipital condyle, left and right styloid processes, minimal loss of the posterior margin of the foramen magnum paracentrally, anterior margin of the foramen magnum paracentrally (right more than left), anterior half of the right occipital condyle, right mastoid process, central part of the left zygomatic arch including zygomaticotemporal suture, right zygoma, zygomatic process of the right temporal bone, lateral wall of the right maxillary antrum. Those parts of the skull base are all lost in roughly the same plane which is horizontal. Post-mortem disarticulation of the head, as for instance in disturbance of a grave, would be unlikely to

cause these injuries unless the head was hacked off prior to putrefaction. Simple disturbance of such a relatively new grave is unlikely.

These injuries could possibly result from decapitation with the neck slightly flexed. A direct blow in an antero-posterior direction, however, would result in gross injury to the mandible and maxilla. The mandible is absent but no such maxillary damage is found. Possibly decapitation by a laterally directed blow could cause the injuries found but the arc of the instrument must have been posterior to the maxilla. Such accuracy on a kneeling victim is perhaps not credible. A review by Wood Jones (1908), however, of 100 executions in Nubia in Roman times cites a single decapitation. In this case there was a clean cut track of the weapon which removed the left mastoid process and the left occipital condyle. In the Nubian specimen the maxilla does not appear to be damaged. The absence of the mandible in the Rothwell specimen may suggest that the cranium was placed in the well after putrefraction of the soft tissues. It is not considered possible to be more precise about the nature of the injuries and the circumstances of deposition of the cranium.

Animal bone by G. Ayton

Methodology

All analytical data was recorded onto the English Heritage Zooarchaeology Access database. The bone was recorded according to the zoning system outlined by Serjeantson (1996) and the percentage of the element remaining has also been noted. Notes have been made regarding the specimens that could not be identified or were too fragmented to be recorded onto the main database.

The surface preservation was recorded as either ‘poor’, ‘moderate’ or ‘good’. Evidence of burning and gnawing has been noted also. The state of fusion was recorded where visible. Bones were recorded as fused when the fusion line around the epiphyses was no longer visible. If the fusion line was still visible or the epiphyses was attached but loose then the bones were recorded as ‘fusing’. All the specimens recorded as ‘fusing’ are combined with the unfused specimens for the calculations of the mortality profiles. All mammal bone measurements have been taken in accordance with Von Den Driesch (1976). Additional measurements for canid long bones and skulls were taken in accordance with Harcourt (1974). The measurements of the bird bones were taken in accordance with Cohen and Serjeantson (1996). The mandibular tooth wear of cattle and pig was recorded using Grant (1982). The mandibular tooth wear of sheep was recorded with reference to Payne (1973).

Butchery marks were recorded with reference to the type of mark which has been defined as chopping, cutting, sawing, shaving mark and axial splitting. The zones on which the butchery marks have been observed have also been recorded.

In order to distinguish between the bones and teeth of sheep and goats a number of criteria were used including those outlined by Boessneck (1969), Boessneck *et al*. (1964), Halstead *et al*. (2002), Hillson (1995), Kratochvil (1969), Payne (1985, 1969), Prummel and Frisch (1986) and Schmid (1972).

The taxonomic separation of chicken, pheasant and guinea fowl has been undertaken with reference to the criteria outlined by Tomek and Bochenski (2009) and MacDonald (1992). The corvids have been separated with reference to Tomek and Bochenski (2000).

Assemblage Overview

A total of 4,677 fragments of animal bone were recovered from the well of which 2,510 were recorded onto the Access database. The assemblage was hand collected during excavation and the soil from the bottom of the well was also sieved. A number of specimens were retrieved through the processing of soil samples. These specimens were later added to the hand-collected assemblage and no record exists as to what percentage of the assemblage was retrieved through sampling or of the species and elements they represent.

The well was excavated in spits of varying dimensions. The spit numbers relate to groups of artefacts rather than to depth of excavation. Small find numbers were allocated to each spit and the depth of each small find was recorded. The depth of each spit is not unique and several spits may derive from one or overlapping depths. It was noted during the recording that conjoining fragments, and specimens which had obviously been articulated, had been assigned different small find numbers.

In total, 74 of the excavated spits contained animal bone with each spit ranging in depth between 0.1-0.8m. Animal bone was retrieved from the well at depths of 3.7-11.9m. A total of 58 spits contained recordable specimens with the remaining sixteen spits containing small, poorly preserved and unidentifiable fragments.

The ‘non-recordable’ assemblage is formed of fragments of bone cortex, small cranial fragments and ribs where zones 1 and 2 are missing.

Preservation

The majority of the fragments are in a good or moderate state of preservation. Table 6 displays the percentage of fragments in each preservation category for the whole assemblage. The assemblage was also divided into two size categories, large mammals and, secondly, medium to small mammals, birds and amphibians. Table 6 highlights the percentage of differential preservation between the two groups. A greater proportion of the large mammal bones were assigned to the poorly preserved category. The surface of the poorly preserved fragments displayed cracked and flaking bone cortex associated with the drying out of wet and waterlogged bones.

Table 6. The preservation of the assemblage expressed as a percentage

Taxa	Good	Moderate	Poor
Whole assemblage	49	35	16
Large mammals	27	39	34
Medium/Small mammals/Birds/Amphibians	54	34	12

Gnawing has been noted on less than 1% of the entire assemblage and can be attributed to canids. Such a low frequency of gnawed bones suggests that the carcasses were not accessible and had been deposited in the well soon after the death of the animal.

Species Representation

The assemblage contains both domestic and wild taxa including cattle (*Bos taurus*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus scrofa*), equid (*Equus* sp), dog (*Canis familiaris*), cat (*Felis catus*), rat (*Rattus* sp), water vole (*Arvicola terrestris*), mouse (*Mus* sp), frog/toad, chicken (*Gallus gallus*), rook (*Corvus frugilegus*), crow (*Corvus corone*) and possible buzzard (*Buteo buteo*). The NISP counts (Number of Identified Specimens) are shown in Table 7.

Table 7. NISP counts for all species in order of abundance

Species	Total	%
Sheep/Goat	489	27
Dog	450	25
Cattle	343	19
Pig	328	18
Cat	44	2
Chicken/Guinea	43	2
Equid	20	1
Cattle/Red deer	12	<1
Rat	11	<1
Crow	11	<1
Amphibian	11	<1
Raptor (Buzzard?)	8	<1
Rat/Water vole	7	<1
Murid	5	<1
Roe deer	2	<1
Water vole	1	<1
Small rodent	1	<1
Rook/Carrion crow	1	<1
Rook	1	<1
Totals	**1788**	

A further 722 rib and vertebral fragments were recovered. A total of 623 specimens have been identified as 'medium mammal' and 99 specimens were identified as 'large mammal'.

The identifiable assemblage is dominated by sheep/goat followed by dogs, cattle, pig, cat, horse and chicken respectively. The remaining taxa, including the small mammals, wild birds and amphibian, contribute 6% of the overall assemblage which may not be a true representation of their relative importance as no record has was made of the sampling and sieving strategy employed during excavation.

The total number of recordable fragments from each depth is shown in the first column of Table 8. Individual counts for the four predominant taxonomic groups are shown in the next four columns.

Table 8. NISP by depth

Depth (m)	NISP	Dog	Sheep/Goat	Cattle	Pig
Surface find	76	9	6	9	17
4.35	1			1	
7.2	3			2	
7.6-8.0	5			2	2
8-8.5	1				
8.4-8.8	350	47	31	79	63
8.9-9.7	663	130	79	84	90
9.6-10.5	1037	224	235	143	131
10.5-10.9	120	13	44	2	3
10.9-11.3	29	1	3	15	3
11.8-11.9	11				
Spoil heap	214	26	91	6	19
Total	**2510**	**450**	**489**	**343**	**328**

The calculations show that the majority of the animal bones have been recovered from a depth of 8.4-10.5m with the highest concentration of remains for all four taxa recovered from a depth of 9.6-10.5m. This suggests that there was a period of intense dumping or that the assemblage was subject to post-depositional slumping possibly as a result of carcass decomposition.

The predominance of the four taxa changes slightly between depths. Sheep/goats are the most commonly recovered taxa in the lower depths (9.6-10.9m) but are only slightly more frequent than dogs. Dogs were the predominant taxa between 8.9-9.7m and cattle the predominant species between 8.4-8.8m.

The MNI (Minimum Number of Individuals) counts are shown in Table 9.

Table 9. MNI counts

Taxa	MNI
Sheep/Goat	34
Dog	19
Pig	15
Cattle	12
Cat	4
Equid	1

The relative percentage of the four main species varies slightly when comparing MNI and NISP counts. The MNI counts show that pig were more abundant than cattle and that sheep/goat are underrepresented in the NISP count.

Sheep/Goat

The sheep/goat remains form 27% of the overall assemblage and represent at least 34 individuals. The sheep/goat assemblage is dominated by skulls and mandibles facilitating the separation of the two taxa. Each tooth and the mandibular bones have been assessed independently. If the majority of the criteria suggested that the mandible derived from a specific taxon then the bone was assigned to that taxon accordingly. If the criteria were equally divided between sheep and goat then the mandibles were placed in the 'sheep/goat' category. Occasionally a mandible would display a number of characteristics typical of either sheep or goat and an equal number of undeterminable characteristics. In such cases the mandibles were assigned to a 'probable' taxa. The NISP and MNI counts for the sheep and goat remains are shown in Table 10.

Table 10. MNI count for the sheep/goat assemblage

Taxa	NISP	MNI
Sheep/Goat	380	12
Sheep	71	12
Goat	38	10
Total	**489**	**34**

The MNI counts are more likely to represent a true reflection of the relative percentages of the two taxa as only a limited number of elements can be separated. The MNI counts show that although only 38 fragments of bone have been identified as goat, at least ten individuals are represented. A total of ten complete and near-complete goat skulls and twelve sheep skulls were recovered. The MNE (Minimum Number of Elements) for the combined sheep/goat assemblage is shown in Table 11.

Table 11. MNE data for the sheep/goat assemblage

Element	Total
Skull	20
Mandible	41
Scapula	23
Humerus	15
Radius	14
Ulna	10
Metacarpal	14
Pelvis	18
Femur	22
Tibia	13
Navicular	1
Metatarsal	17
Metapodial	28
Calcaneum	7
1st phalanx	6
2nd phalanx	2

The MNE counts suggest that all elements of the carcass, including meat-bearing bones and skeletal extremities, were deposited in the well though the assemblage is dominated by mandibles and metapodials. This suggests that the well contained a number of complete specimens alongside deposits of primary butchery waste.

Table 12. NISP count for the sheep/goat assemblage by depth

Element	8.4-8.8m	8.9-9.7m	9.6-10.5m	10.5-10.9m	10.9-11.3m
Skull	6	11	43	4	2
Maxilla	3	3	13	10	
Mandible	4	2	34	8	
Scapula	7	1	18		
Humerus	1	5	8		
Radius		8	8		
Ulna		4	5		
Metacarpal		2	8	1	
Pelvis	1	6	12		
Femur	1	9	22		1
Tibia	4	1	13		
Navicular		1			
Metatarsal		1	12	5	
Metapodial		7	16	5	
Calcaneum	1	1	3		
1st phalanx		1	1	1	
2nd phalanx				1	

The analyses of elements by depth (Table 12) suggest that the assemblage recovered from the lowest depths (10.5-11.3m) is dominated by metapodials, mandibles and fragments of the maxilla. Both sheep and goat have been identified at this depth. The analysis reveals that the well may have initially been utilised as a dumping ground for primary butchery waste before whole carcasses were deposited.

Evidence of butchery has been recorded on thirteen sheep/goat and four goat specimens. The goat specimens include three skulls which display cut marks across the occipital condyles indicative of decapitation. Further chop and cut marks have been recorded on a number of elements including scapula, femur, humerus and pelvic fragments.

Fig. 12 displays the mortality curve for the sheep/goat assemblage based on the stage of fusion of 234 bones. The assemblage is dominated by unfused bones and specimens on which the fusion line is still visible, with 58 fragments representing three neonatal individuals. The data suggests that *c*. 55% of the sheep/goat population died in their first year with only *c*. 15% surviving beyond 3-4 years (Silver 1969).

Fig. 13 represents the mortality curve for the sheep/goat assemblage based on the tooth wear of 36 mandibles. The graph shows a peak of slaughter between 1 and 2 years of age with both younger and older animals represented. This indicates that the animals were slightly older at the time of death than the epipyseal fusion data suggests. The mortality curve reflects a kill-off pattern that is geared towards meat production (Payne 1973).

Of the 36 mandibles recorded, eight were identified as sheep (two definite and six probable) and eight were identified as goat (five definite and three probable). The remaining twenty mandibles were recorded as 'sheep/goat' as they could not be confidently identified to either taxa.

Fig. 14 represents the age-at-death based on mandibular tooth wear for each of the three groups. The figure suggests that goats may have been slightly older than sheep at the time of death. The absence of identifiable sheep and goat mandibles in the younger age categories corresponds with the limited number of criteria to differentiate between the two taxa using the deciduous teeth. A number of the criteria outlined by Payne (1985) for distinguishing between the mandibular teeth of young sheep and goat are hidden by adjacent teeth and the mandible itself.

A recent study undertaken by Zeder and Pilaar (2010) has assessed the reliability of a number of the criteria applied when distinguishing between the mandibles and teeth of sheep and goat. The authors worked with a large assemblage of domestic, wild and feral sheep and goats from a wide age range that had previously been securely identified to genus level. This study suggests that identification based on the loose teeth, particularly M1s and M2s of young goats (0-1.5 years) is relatively unreliable. The identification of complete mandibles in this age category is more reliable than loose teeth but is also quite tricky and often results in a greater number of mandibles being placed in the 'sheep/goat?' category. These findings are

reflected in the absence of positively identified sheep or goats from the 0-12 month age-groups in the well assemblage. Zeder and Pilaar (2010) also show that sheep and goat mandibles from animals aged between 1.5 and 6 years were identified with the highest percentage of accuracy when compared to the younger and older specimens. For all age categories the number of goat mandibles classified as 'sheep/goat' was higher than the number of sheep mandibles placed in this category (Zedar and Pilar 2010).

If the results from this study are reflected in the well assemblage it suggests that the number of goat mandibles in the 'sheep/goat?' category will be higher than the number of sheep. If this factor is taken into consideration then the mortality profile of both goats and sheep reflects a peak of slaughter between 1 and 2 years of age.

Due to the low numbers of fused long bones and loose teeth, only a small quantity of biometrical data is available. One sheep metacarpal has a greatest length of 11.1cm which, by applying the multiplication factor outlined by Teichert (1975) gives an estimated shoulder height of 53.cmm A single femur provided a greatest length measurement of 15.1cm. The bone may derive from either a sheep or a goat and so both Teichert's (1975) factor for sheep and Schramm's (1967) factor for goats have been applied. The shoulder heights have been calculated as 53cm and 52cm for sheep and goat respectively. These animals are a comparable height to the smaller Roman sheep recovered from the well at Dalton Parlours (Berg 1990).

Dog

A total of 452 fragments of dog bones have been identified in the well assemblage. The MNI count for dog is nineteen which suggest that dogs are the second most abundant taxa.

The MNE counts are shown in Table 13. A number of fragments have been labelled as 'associated' during excavation though no complete articulated skeletons were recorded. This is most likely caused by the excavation method which has resulted in articulated and associated elements being split into several 'spits'. The size, shape and distribution of elements suggest that whole carcasses were deposited in the well.

Table 13. MNE counts for the dog assemblage

Element	Total
Skull	12
Mandible	31
Scapula	22
Humerus	28
Radius	21
Ulna	24
Metacarpal	1
2nd metacarpal	8
3rd metacarpal	14
4th metacarpal	23
5th metacarpal	11
Pelvis	20
Femur	32
Patella	1
Tibia	30
Fibula	15
Calcaneum	3
2nd metatarsal	6
3rd metatarsal	9
4th metatarsal	4
5th metatarsal	9
1st phalanx	2

Several authors (Bruni and Zimmerl 1951, Sumner-Smith 1966, Silver 1969, Habermehl 1975) have published epipyseal fusion ages for dogs. Although discrepancies occur between the sequence and age of fusion, there is a general consensus that full maturity is reached by the time the animal is 18 months old. In order to facilitate inter-site comparisons, the age sequence provided by Silver (1969) has been used to estimate the age at death of the dogs from Rothwell Haigh. The results are shown in Table 14 and indicate that the assemblage includes dogs from a range of ages with the majority reaching skeletal maturity. The remains of at least four neonates were also recovered.

Table 14. Dog epipyseal fusion data based on ages defined by Silver (1969)

Element	Unfused	Fusing	Fused	Percentage
0-12mths				
Proximal scapula	5		11	
Distal humerus	4		21	
Proximal radius	4		16	
Distal radius	6		16	
Proximal ulna	5		19	
Distal Ulna	4		13	
Proximal metacarpal			56	
Distal metacarpal	6	1	36	
Pelvis	1	2	16	
Proximal first			2	
TOTAL	**35**	**3**	**206**	**84%**
MNI	**3**	**1**	**12**	
12-18mths				
Proximal metatarsal			28	
Distal metatarsal	3		25	
Proximal tibia	8	1	22	
Distal tibia	7	1	19	
Distal fibula	6			
Proximal fibula	2		11	
Proximal calcaneum	2		2	
Proximal humerus	6	1	21	
Proximal femur	13	2	16	
Distal femur	12	1	18	
TOTAL	**59**	**6**	**162**	**71%**
MNI	**8**	**1**	**12**	

A total of thirteen of the eighteen mandibles recorded had at least one molar erupted indicating that the animals were older than four months at the time of death (Silver, 1969). Three of the mandibles were from neonatal animals. Although no teeth were recovered the mandibles are very small, light and porous and occasionally associated with neonatal long bones. Of the remaining two mandibles, the first contained an unerupted deciduous fourth pre-molar and the second an unerupted first molar ageing these two animals to less than eight weeks and between two and five months respectively.

The canid assemblage has provided a large metrical data set. The biometric data can be utilised to study the range in the size and build of the dog skeletons recovered from the well. Previous investigations (Harcourt 1974) have drawn attention to the increased variability in the size and build of dogs during the Roman period when compared to the skeletons recovered from prehistoric sites. The shoulder heights of the majority of dogs recovered from

Romano-British sites ranges from 42-56cm. A number of taller dogs, with shoulder heights around 60cm, have been recovered from various sites including Thisleton, the Roman small town in Rutland (Baxter 2010a). Similarly, much smaller dogs, including the dwarf and midget varieties, with shoulder heights of less than 40cm have been recovered from a number of sites including York Road, Leicester (Baxter 2010b), although both shorter and taller dogs are much less frequently recorded.

The shoulder heights of the dogs from Rothwell Haigh have been calculated using the factors defined by Harcourt (1974). The canids recovered from the well ranged in height from 27.4-57.4cm with a mean of 48.4cm (Table 15) which indicates that the dogs from the well include some of the smaller Roman breeds.

Table 15. Shoulder heights in cm and mid-shaft diameter index by element

Element	Shoulder	Number	MSD %	Number
Humerus	32.7 - 56.4	11	6.3 - 8.6	7
Ulna	31.6 - 50.1	9	4 - 7.4	3
Radius	30.3 - 51.2	8	7 - 10	5
Tibia	27.4 - 56.3	10	4.8 - 6.4	8
Femur	28.9 - 57.4	16	5.3 - 8.8	12

In order to analyse the build of the dogs the mid-shaft diameter index (MSD) has been calculated for all elements (Table 15). The MSD index of 35 long bones ranges from 4-10 with a mean of 6.9. This range presented by Harcourt (1974) is 5.8-12.7 with a mean of 10.1 which is based on the measurements of 1156 specimens. The well assemblage includes five specimens which have a MSD index of less than 5.8 which includes two left ulnae from dogs with shoulder heights of 48.3 and 50.3cm respectively. This suggests that the well assemblage contains dogs that were of a more slender build than the specimens examined by Harcourt (1974).

A particularly robust tibia with a bowed shaft and an estimated MSD index of 13.5 has been recovered from the well. The total length of this bone is not known as the fusion line at both the proximal and distal ends is still visible and a fragment of the proximal epiphyses is missing. It has therefore not been included with the data presented in Tables 14 and 15. The total length has been estimated at 10cm and the shoulder height has been calculated as *c.* 30cm. This particular bone displays all of the characteristics outlined by Baxter (2010b) for the dwarf type which includes short and thickened limbs.

Table 16 provides a summary of the canid long-bone skeletal dimensions from the well. The greatest length of each of the elements is within the Roman range outlined by Harcourt (1974). There are no particularly tall dogs within the well assemblage nor, with the exception of the dwarf type discussed above, are there any particularly robust individuals.

Table 16. Summary of dog skeletal dimensions (S.D = Standard Deviation, C.V = Coefficient of Variation)

Element	GL Range (mm)	Number of Specimens	Mean (mm)	S.D	C.V
Humerus	103.0 -172.3	12	150.6	17.8	11.8
Ulna	111.6 - 177.9	9	155	28.9	18.6
Radius	89.1 - 154.7	8	128.3	30.5	23.8
Tibia	90.7 - 189.6	14	143.6	32.8	22.8
Femur	96.2 - 186.9	16	144.8	29.6	20.4

If shoulder heights are plotted against the MSD index (Fig. 15) two distinct groups are noted. The estimated measurements of the dwarf tibia have also been plotted for comparison. The first group, on the left of the graph, ranges in height from 27.4-36.9cm with an MSD index of 5.3-10. The second group on the right hand side of the graph ranges in height from 46.3-57.4cm with a MSD index of 4-8.6. Whether these groups are representative of the living population or dogs specifically chosen for burial in the well is unclear.

A number of contemporary sites have also produced large quantities of dog remains from wells and shafts. Excavations at Tripontium (Harcourt 1973) revealed two wells containing canid assemblages which represent a minimum of six animals. Shoulder heights range from *c*. 22-48cm and the MSD index ranges from 6.6-12.6. Metrical analysis of the dog bones recovered from Tripontium suggests that the dogs were of a similar size range to those at Rothwell Haigh. Harcourt (1973) suggests that the dogs from Tripontium represent three distinct types. If we compare the stature of the dogs from Tripontium with those from Rothwell (Fig. 16) we can see that similar types of dogs were found at both sites though a number of dogs, possibly representing a third distinct type with a smaller shoulder height were also recovered from Tripontium.

Excavations at the Greyhound Yard and Methodist Chapel in Dorchester (Maltby 1990) recovered 4572 dog bones of which 4050 belonged to associated groups of at least three or more bones. Dog burials were found mainly in the lower fills of cess pits and in disused wells dating from AD100-400. A minimum of 93 dogs are represented with neonates, juvenile and adult animals present. The shoulder heights ranged from 21-53cm, which is comparable to the heights of the dogs from Tripontium but includes smaller dogs than those recovered from Rothwell.

A total of 31 dogs were recovered from Dalton Parlour the majority of which derive from the top two meters of the well (Berg 1990). MNE counts suggest that some compete carcasses were deposited though the elements recovered from the lower levels was restricted to skulls, mandibles and loose teeth. The majority of the dogs reached skeletal maturity though the assemblage also contained the remains of seven younger animals. The height of these dogs ranged from 36-64cm, suggesting that the well at Dalton Parlours included slightly larger dogs than evidenced at Rothwell Haigh.

The measurements of eight dog skulls have been taken in accordance with Von Den Driesch (1976) and Harcourt (1974). All of the skulls recovered from the well possess a sagittal crest. In order to examine the shape and size of the skulls, the cephalic, snout and snout width indices were calculated and compared with the data published by Harcourt (1974). The results are presented in Fig. 17.

The width to length ratio of the four measurable skulls is comparable with the results from a number of Roman sites including Findon and Camulodunum (Harcourt 1974). The data show that the dogs from Rothwell have relatively narrow skulls compared to the length.

The snout index has been calculated for six of the skulls from Rothwell. Just one of these skulls gives a snout index that falls outside of the range published by Harcourt and the metrical data suggest that the skull is particularly narrow when compared to the total length of the skull. The snout width index, which is based on the measurements of four skulls, ranges from 33.7-45.2. The lower end of the range is beyond that published by Harcourt as one skull has a narrow muzzle in relation to its length, as mentioned above.

The length of nineteen dog skulls from Dorchester ranged from 12.4-18.8cm which is slightly smaller than the range of 16.3-20.9cm of the seven measurable skulls from Rothwell (Harcourt 1973).

Four bacula have been recovered and the Table Test, outlined by Ruscillo (2002), was performed on six humeri which were complete, mature and without pathology. The humerus is held at the proximal end and placed on its anteroventral plane on a level surface. Three of the humeri (two left and one right) fell onto their medial side indicating that they derived from male individuals. The remaining specimens (all from the right side) fell onto the anteroventral surface suggesting that they probably derived from female animals. Ruscillo (2002) notes, however, that 28% of the male dog specimens also rest on their anteroventral plane.

Cattle

A total of 343 fragments of cattle bones were identified which indicates that cattle are the third most abundant taxa. MNI counts show that a minimum of twelve animals are represented which suggests that cattle are overrepresented by NISP counts. The larger cattle bones were generally in a much poorer state of preservation than the bones of the medium and small taxa. The relatively large surface area of the cattle bones has resulted in a greater degree of water damage This may result in cattle being underrepresented in both NISP and MNI counts.

Table 17 presents the MNE (Minimum Number of Elements) count for cattle. All elements of the carcass are represented with mandibles being the most commonly occurring element. The metapodials, which are particularly robust bones, are underrepresented when compared to the meat-bearing elements which suggest that they may have been removed prior to burial. The

metapodials are sometimes left attached to the hide to facilitate transportation to the tannery or utilised in bone working. The element representation suggests that the well may have contained at least three complete skeletons alongside kitchen waste or articulated meat joints.

Table 17. Cattle MNE counts

Element	Total
Skull	9
Mandible	24
Scapula	7
Humerus	10
Radius	13
Ulna	9
Metacarpal	5
Pelvis	11
Femur	10
Tibia	13
Navicular	1
Metatarsal	5
Calcaneum	3
Astragalus	4
1st phalanx	4
2nd phalanx	3
3rd phalanx	1
Horncore	4
Sternum	2

The analysis of element representation by depth does not reflect any particular patterns of deposition. All elements of meat-bearing and non-meat bearing groups appear to be scattered throughout the well.

Just fourteen cattle mandibles with two or more teeth intact were recovered from the well. The mandibular wear stage of each mandible was recorded with reference to Grant (1982). Tooth eruption and wear indicate that cattle were killed at a range of ages as both very young and senile animals are represented. In ten of the fourteen mandibles recovered the third molar had erupted and was in wear suggesting that the majority of the mandibles derive from older animals.

Epipyseal fusion data indicates that the well contained cattle skeletons from a variety of age groups. Fig. 18 suggests that *c.* 40% of cattle survived beyond four years of age, though many were killed at a younger age and both younger and senile animals are represented by the mandibular tooth wear data.

A total of 25 neonatal cattle bones were also recovered and include pelvic fragments as well as fragments of the skull and long bones. The neonatal specimens were found at depths of 8.9-9.6 and 9.6-9.9m and epipyseal fusion and MNE data suggests that the remains may derive from a single animal.

The cattle assemblage includes nine skulls three of which display small, solitary holes with rounded margins in the occipital region. Perforated skulls have been recovered from contemporary sites at Lincoln (Dobney *et al*. 1996), Exeter (Maltby 1979), York (Carrott *et al*. 1995), Humberside (Carrott *et al*. 1994) and Sheepen (Luff 1982). The causes of these perforations have been the focus of recent studies (Fabis and Thomas 2009, Baxter 2002, Brothwell *et al*. 1996). Brothwell *et al*. (1996) present a number of possibilities as to the cause of these perforations including the suggestion that they are formed as a result of the trauma inflicted through yoking. The identification of these perforations in European bison (*Bison bonasus*) and aurochs (*Bos primigenius*) has now resulted in a rejection of the yoking hypotheses and the current understanding is that the perforations are congenital in origin (Fabis and Thomas 2009).

Due to the poor preservation of the cattle remains only a limited quantity of metrical data is available. The greatest lengths of a number of long bones including two tibiae (25.9-29.4cm), one metacarpal (18.2cm), one metatarsal (21.3cm) and five radii (23.2-25.9cm) are similar in range to bones recovered from Romano-British contexts at Dalton Parlours (Berg 1990), Tripontium (Noddle 1973) and Exeter (Maltby 1979). One metacarpal and one metatarsal, of unknown sex, provided greatest length measurements and withers heights have been calculated using the intermediate factors outlined by Fock (1966). The withers heights have been calculated as 111.8cm and 116.1cm for the metacarpal and the metatarsal respectively. These cattle are comparable in height to the larger specimens recovered from features dating to the late Romano-British period (AD 350-400) at Greyhound Yard, Dorchester (Maltby 1990). Excavations in Dorchester also revealed contemporary well shafts with similar species composition to the Rothwell Haigh assemblage.

Just twelve of the 343 fragments of cattle bone recovered from the well displayed signs of butchery. Evidence of primary butchery has been recorded in the form of cut and chop marks on an astragalus and a calcaneum. Evidence of jointing has been recorded in the form of cut and chop marks on the proximal and distal ends of femurs and tibias. Additionally, a large, rounded hole has been recorded on the parietal and frontal region of a semi-complete cattle skull and has been interpreted as evidence of pole-axing.

Pig

A total of 328 bone and teeth fragments have been identified as pig, making them the fourth most abundant taxa in the well. MNI counts suggest that pigs are slightly underrepresented by NISP counts. Bones from at least fifteen individual pigs were deposited in the well making them the third most abundant taxa preceded by dog and sheep/goat respectively.

The MNE count (Table 18) suggests that all elements of the carcass are represented though the assemblage is dominated by mandibles and meat-bearing elements. This suggests that complete skeletons may have been deposited alongside meat-joints or that some of the smaller non-meat bearing elements were lost during excavation.

Table 18. Pig MNE counts

Element	Total
Skull	8
Mandible	26
Scapula	5
Humerus	19
Radius	10
Ulna	11
3rd metacarpal	7
4th metacarpal	9
5th metacarpal	1
Pelvis	13
Femur	21
Tibia	17
Fibula	11
Astragalus	2
Calcaneum	1
3rd metatarsal	5
4th metatarsal	4
5th metatarsal	3
1st phalanx	4
2nd phalanx	4

The stage of fusion of 200 elements was recorded. The mortality curve based on MNI and epipyseal fusion data is presented in Fig. 19.

The data presented in Fig. 19 suggest that *c.* 70% of the pig assemblage derives from animals that died within their first year (Silver 1969). Less than 5% of the pig remains derived from older animals that survived beyond 3.5 years (Silver 1969).

Tooth wear was recorded for mandibles and identifiable loose teeth according to Grant (1982) and converted to age ranges using Hambleton (1999). Loose teeth were placed in age categories using the eruption sequence outlined by Hambleton (1999) and Silver (1969). A total of 22 mandibles and loose teeth provided age-at-death data and the mortality curve is displayed in Fig. 20.

A total of eight mandibles were recovered from animals that died between 2 and 14 months, which represents 36% of the population. This suggests that 64% of the population were older

than 14 months at the time of death. The mandibular tooth wear data reflects a peak of slaughter between 14-21months with a total of eleven mandibles and loose teeth deriving from this age group. No mandibles or loose teeth from old adults or senile animals were recovered.

The tooth wear data reflect a slightly older population than the epipyseal fusion data and suggests that the majority of the animals died between 14 and 21 months. Epipyseal fusion data suggests that 77% of the population died between 0 and 12 months. If these pigs were wild then fusion of the bones may occur slightly later (Bull and Payne 1982). Various measurements of the bones and teeth can be used to distinguish between domestic and wild pigs (Payne and Bull 1988). As the assemblage is dominated by bones and teeth from juvenile animals, however, very few measurements could be taken.

Just two fragments of canine teeth were recovered from the well representing one male and one female pig.

Cats

A total of 44 cat bones were recovered from the well from a depth of 8.4-11m and a number of bones were recovered whilst sieving through the spoil heap. The assemblage represents a minimum of five individuals. The majority of elements are represented (Table 19) and only the small extremities, which are likely to have been missed during excavation, are underrepresented.

Table 19. Cat element distribution

Element	MNE
Scapula	2
Humerus	3
Radius	4
Ulna	3
Pelvis	5
Femur	5
Tibia	8
Pelvis	1
Skull	2

The fusion ages of domestic cats presented by Smith (1969) have been referred to in order to analyse the age-at-death of the cats from the well assemblage. The majority of the cat assemblage derives from immature animals although no neonates have been identified. At least one animal was two years old or older at the time of death.

Separation of wild and domestic cats is possible using biometric data. Unfortunately, the majority of the cat specimens from Rothwell derived from immature animals and so very

little biometrical data is available. A total of seven pelves were recovered and the smallest height and smallest breadth of the ilium have been measured in accordance with Von Den Driesch (1976). The results are displayed in Fig. 21.

Although the figure is based on a small number of measurements it is clear that the cats showed great variation in size. These cats may represent both domestic and wild populations though a recent study of biometric variation from zooarchaeological samples (O'Connor 2007) shows that the size of house cats varies considerably. Deforestation and hunting of wild cats for fur would have resulted in the decline of the wild cat population and the presence of immature bones also indicates that the bones derive from domestic animals.

Equids

A total of twenty fragments of equid bones representing one individual have been recovered. The elements represented include the mandible and maxilla, a humerus and a radius and the metapodials all of which are fused. One metacarpal and one metatarsal gave greatest length measurements of 20.4cm and 23.5cm respectively. The withers heights calculated using the factors defined by May (1985) are 125cm and 123cm, which is equivalent to approximately 12-13 hands.

Johnstone's (2004) analysis of equids in the Roman world revealed that there is a small amount of overlap in the withers height of small horses and large donkeys though the slenderness of their bones are sufficiently different to separate the two. The metapodials of horses (*Equus caballus*) and donkeys (*Equus asinus*) could be separated using measurements of the shaft breadth and the greatest length (SD/GL x100). The metacarpal index has been calculated as 17.4 which is greater then the indices outlined by Johnstone (2004) for Roman donkeys (13-15) and smaller than those of Romano-British horses (22-25). The metatarsal index has been calculated as 10 which falls within the range outlined by Johnstone (2004) for Roman donkeys (10-11.5).

It is a commonly excepted view that the Roman introduced donkeys to areas outside their natural climatic range (Johnstone 2008). Donkey remains have also been recovered from Late Iron Age contexts on sites with known contacts and trade with the Roman Empire, such as Danebury (Grant 1984).

Roe Deer

Two fragments of roe deer, including an unfused proximal tibia epiphysis and a metacarpal were recovered whilst sieving the spoil heap.

Bird

The bird bone accounts for approximately 3% of the assemblage. The bird assemblage is in a good condition and the majority of the bones are complete. A large proportion of the bones, 43 fragments out of 64, has been identified as medium-sized galliforms including chicken,

pheasant and guinea fowl. Chickens dominate the assemblage though specific taxonomic identification was not possible for all of the specimens. The NISP and MNE counts for the galliform assemblage are shown in Table 20.

Table 20. NISP and MNE counts of the medium-sized galliform assemblage

Element	Chicken	Chicken/Pheasant	Chicken/Guinea Fowl/Pheasant
Skull			
Vertebrae			1
Furcula			2
Coracoid	1		
Sternum		3	2
Humerus		1	2
Radius	1		
Ulna	6		1
Carpometacarpus			
Scapula		4	
Synsacrum			
Femur	6		
Fibula			1
Tibiotarsus	4		1
Tarsometatarsus	3		
Pelvis	4		

It is very rare to find pheasant and guinea fowl in Romano-British assemblages (Serjeantson 2009) and so for the purpose of analysis these undetermined bones will be incorporated into the chicken assemblage.

The chicken assemblage represents a minimum of four individuals. All of the bones are fused and no cut marks have been noted. The MNE counts shown in Table 20 suggest that whole chickens were deposited in the well. The skull, wing and feet extremities are not represented which may be due to taphonomic reasons and recovery bias rather than selective butchery practices. The femurs were complete and so analysis was not undertaken on the presence or absence of medullary bone; but no spurs or spur scars were noted on the tarsometatarsii. The greatest lengths, taken in accordance with Von den Driesch (1976), of the specimens positively identified as chicken are shown in Table 21. The domestic fowl from Rothwell are similar in size to the smallest specimens recovered from Roman contexts at Dorchester (Maltby 1990) and Exeter (Maltby 1979).

Table 21. Chicken metric data (in mm)

Element	Site	Number	Range	Mean
Femur	Rothwell	6	68.1-78.1	71.3
	Dorchester	24	71.7-88.1	77.1
	Exeter	11	67.9-88.0	76.8
Tarsometatarsus (no spur)	Rothwell	2	66.0-66.3	66.1
	Dorchester	23	61.6-87.1	73.1
	Exeter	8	66.2-79.1	72.0
Tibiotarsus	Rothwell	4	96.0-99.2	97.5
	Dorchester	23	95.5-124.9	114.2
	Exeter	1	119.1	
Ulna	Rothwell	3	60.8-61.2	61
	Dorchester	37	60.1-82.7	72
	Exeter	8	59.9-76.7	67.2

The greatest length and the smallest breadth of the chicken femurs have been plotted in Fig. 22. One particularly long and robust specimen on the far right of the graph may represent a male individual with the smaller, less robust specimens clustering on the left hand side representing females.

The remaining assemblage contains a small number of crow, rook and possible buzzard bones alongside a well preserved skull of a passerine (perching/song bird-Table 22).

Table 22. Bird MNE counts

Element	Crow	Rook	Buzzard	Passerine
Skull				1
Vertebrae				
Furcula				
Coracoid	1			
Sternum	1	1		
Humerus	4		2	
Radius			1	
Ulna				
Carpometacarpus			1	
Scapula	1			
Synsacrum				
Femur				
Fibula				
Tibiotarsus	4		2	
Tarsometatarsus	1		2	

At least two crows and one rook are represented by partial skeletons. The birds may have been attracted to the small mammals that accumulated in the well as well as the remains of the larger animals.

A small and well preserved skull belonging to a passerine was recovered from a depth of 10.5-10.9m. The greatest length of the skull is 18mm and the specimen is 13mm at the widest point across the frontal bone. The skull possesses a narrow interorbital septum measuring 2mm at the narrowest point. The skull has been compared to the bird reference collection held at English Heritage, Fort Cumberland, Portsmouth and was found to be larger than the skulls of wrens, meadow pipit and smaller than the blackbird and the song thrush. Birds with skulls of a comparable size and morphology include the robin and the wheatear.

Small mammals

A number of small mammal and amphibian remains were recovered from the well and include mouse, rat, water vole and frog/toad. These bones probably represent casualties, animals that had fallen into the well.

Pathology

Just 1.5% (39 specimens) of the total bone assemblage displayed signs of pathology. Each pathological bone has been photographed and recorded in detail. The records and photos are stored in the archive and a brief description of the specimens is given below.

Oral pathologies

Malocclusion has been noted on a sheep/goat maxilla. The third and second molar and the posterior cusp of the first molar show signs of abnormal occlusion being twice the length of the pre-molars.

A pig mandible displays evidence of having been affected by a stage 2 abscess (Levitan 1985) between the first and second molar. The mandibular bone surrounding the molars displays signs of bone destruction around the alveoli and evidence of periostosis has been noted on both the lingual and buccal surfaces of the mandible.

One dog skull has a small periapical void behind the first and second incisors which are no longer present. The void, possibly caused by a dentiginous cyst, has destroyed the bone above the first incisor creating a small perforation through the pre-maxilla.

A second dog skull displays a similar, but larger, perforation above the second and third incisor. The bone that would have separated these two teeth has been destroyed. A small, incomplete fracture has also been noted on the left side of the frontal bone and near to the eye socket. The skull is asymmetrical with the snout curving to the right-hand side. If the cause of the fracture also affected the facial muscles and occurred before the bones of the skull were fully fused, it may have caused asymmetrical development of the skull.

Trauma

Two cattle cervical vertebrae were found fused together. The centrum of the caudal vertebra appears to be impacted into the caudal surface of the cranial vertebra. This has resulted in the asymmetrical alignment of this section of the spine. The bone around the centra has fused and is very smooth suggesting the trauma occurred much earlier on in the animal's life. There is also a possibility that the cause is congenital and not pathological.

Evidence of healed fractures was noted in eight ribs. Four of these ribs derive from large mammals, three of which show signs of pseudoarthrosis which has resulted in the development of false joints. The remaining ribs display evidence of healed fractures resulting in periostosis.

Signs of pathology have been noted on two cattle vertebrae including a thoracic vertebra, which displays an increase in bone density around the spinous process, and a lumber vertebra which displays an increased bone density on the medial of the transverse process. The increase in bone density may have resulted from a fracture.

A second cattle lumber vertebra has a patch of porous bone on the cranial end below the spinous process. The cortex bone has been destroyed; damage to the soft tissue may have resulted in the cortex bone being reabsorbed.

Exostosis

Exostosis has been observed on a number of bones including a cattle metatarsal and navicular which appear to articulate. Osseous tissue has been observed on the proximal dorsal metatarsus and on the dorsal navicular and may be indicative of spavin. The condition is not extensive as anklylosis has not yet occurred.

Exostosis has also been noted on a sheep/goat ulna and radius which articulate but are not fused. New bone has formed around the olecranon and on the medial edge of the proximal articulation of the radius where it forms a lip. The radius also displays grooving of the articular surface and eburnation indicating that the animal was suffering from osteoarthritis. A cattle femur also shows signs of eburnation around the proximal articulation. The articulation has been worn down to the cancelous bone and has a distinct polished looked often associated with osteoarthritis.

Exostosis has been observed around the lateral side of the distal articulation of a sheep/goat humerus and on an ulna particularly around the olecranon. Brothwell and Baker (1980) suggest that this may be caused by trauma inflicted whilst putting the animals through races or pens.

Infection

Possible evidence of tuberculosis has been identified on a cattle cervical vertebra. The centrum on the caudal end is extensively pitted resulting in the destruction of the articular surface suggesting that the pathology was incredibly invasive. Evidence of new, irregular bone formation has been noted around the edge of the caudal articulation suggesting that the animal had suffered from the disease for sometime before death occurred (Simon Mays pers comm.).

Periostosis has been noted on four large mammalian ribs resulting in patches of newly woven bone on both the inner and outer surfaces. This may be a non-specific indicator of a chronic pulmonary infection.

A medium-mammal rib has developed a particularly bulbous section of bone below the articulation. This amorphous tuber may also be indicative of tuberculosis.

Vertebral ostephytosis has been noted on five medium mammal vertebrae. The vertebrae have not been identified to species but may derive from dogs which are the second most abundant species in the assemblage. A study of the occurrence of vertebral oseteophytosis in dogs has been undertaken by Morgan *et al*. (1967). The study revealed that the disease was more common in older, female dogs. The disease was also more common in certain breeds including the Boxer, German shepherd, Airedale terrier and Cocker spaniel. It appeared that many dogs affected with the disease did not demonstrate any clinical symptoms relative to the spine (Morgan *et al*. 1967).

A possible case of osteomyelitus has been noted on a pig pelvis, affecting the bone around the edge of the acetabulum between the margin of the illium and the ischium. New bone has begun to form on the medial edge of the acetabulum indicating that the pathology did not kill the animal.

Conclusions

The Roman well yielded an assemblage of 4677 bones, primarily hand-collected, of which 1788 have been identified to taxon. Many of the specimens probably derive from partial or complete skeletons though these were rarely recorded or recovered together during excavation. Sheep/goat, dog, cattle and pig are the most frequently occurring taxa, while equids (including possible donkey), cat, chicken, wild birds, and microfauna are much less common. The taxonomic distribution and skeletal element representation suggest that the fill derives from a range of sources, including both economic and possible ritualistic activities, and some natural casualties.

Although some of the data are suggestive, it is difficult to isolate ritualistic deposits when we know so little about the economic regimes of the site. The data derived from the cattle, sheep, goat and pig assemblages suggest that the well contains butchery and kitchen waste alongside associated bone groups. The most commonly occurring element for cattle, pig and the

combined sheep/goat assemblage are the mandibles perhaps because they are one of the robust elements and less prone to fragmentation during butchery. Butchery marks are present on a relatively small number of elements though cut marks may have been eroded, particularly on the larger bones which were less well preserved. A range of pathologies were noted in cattle, sheep/goat pig and dog remains, including a possible case of tuberculosis in cattle.

The assemblage of dog remains (450) derives from a minimum of nineteen individuals, including neonatal and juvenile animals, although adults predominate. The biometric data suggest that at least three types of dog are represented, including a short bow-legged individual. Dogs become increasingly common throughout the Roman period though they are generally only present in small numbers and contribute to less than 1% of refuse contexts (Clark 1995). Whole or partial skeletons are often interpreted as having a symbolic or ritual significance. The association of dog skeletons and Roman wells and shafts is not altogether uncommon and articulated skeletons have been recovered from a number of sites including Dalton Parlours (Berg 1990), Tripontium (Cameron and Lucas 1973), Dorchester (Maltby 1990) and Oakridge (Maltby 1987).

The Roman well at Dalton Parlours contained a total of 8421 fragments of animal bone recovered from a depth of 0.35-16.2m. Species abundance varied with depth though, overall, sheep/goat dominated the assemblage followed by dog, cattle and pig respectively. The element distribution varied with depth and by species and presents a distinct picture of several activities including the disposal of primary butchery and kitchen waste, the secondary deposition of domestic rubbish and the primary dumping of complete or semi-complete animal carcasses (Berg 1990). The analysis of the animal bones compares well with the data from Rothwell Haigh and suggests that similar activities may have been occurring at both sites.

The wells at Tripontium also contained fragments of cattle, sheep, goats, pigs, horse and cat. The cattle element representation is similar to the Rothwell assemblage with a large number of mandibles and only two metapodials. The sheep and goat assemblages include all elements though the assemblages are dominated by skulls and foot bones. The author concludes that the assemblage represents whole animals alongside butchery waste (Noddle 1973).

Excavations at Oakridge, on the chalk downs to the North of Basingstoke, revealed a large middle Iron Age to late Romano-British settlement complex (Maltby 1993). A number of features were discovered including a well that was excavated to a depth of approximately 26 meters. Two periods of intense dumping occurred, the first in the late 1st century AD and the second around the late third/early fourth century AD and contemporary with the well at Rothwell Haigh. The well produced a total of 24,717 bones representing 38 species. The assemblage was dominated by small mammal and amphibian bones. Dogs were the third most abundant domestic species preceded by cattle and sheep/goat. A total of 4919 canid specimens were recovered representing partial and complete skeletons. Maltby (1993)

suggests that the foetal and neonatal articulated dog skeletons represent attempts to control the canid population by disposing whole litters at birth. The older population may represent dogs that died of natural causes as well as pit fall victims. Maltby (1993) concludes that the well contains a mixture of butchery and skinning waste, along with carcasses of animals that fell down the well.

It is clear that well and shaft assemblages are relatively complex. The animal bone assemblages recovered from these features contain the waste products from a number of activities which often become intermingled and difficult to isolate. Alongside these waste products we find articulated skeletons and articulated bone groups, a large number of which have been identified as dogs. Butchery marks on dog skeletons have been noted, particularly in Late Iron Age/Early Romano-British assemblages (Maltby 1987). They are, however, relatively infrequent and so we must assume that dogs were rarely eaten. The carcasses may represent the remains of animals killed for their skin or those kept as domestic pets. There appears to be a significant link with deposition of dog carcasses and wells and shafts which may be linked to a ceremonial or ritualistic event. Although we cannot be certain as to the nature of their deposition, the dog specimens have afforded us with the opportunity to study the biometrical variation in the Romano-British dog populations. Harcourt (1974) noted that during this period we see an increase in variability of both the size and shape of domestic dogs, a statement which still holds true though further studies need to be undertaken on pre-historic specimens in order to realise the true extent of this variation.

Plant and invertebrate assessment by A. Hall and H. Kenward

A selection of five samples from the well (Table 23) was made, representing a spread through the depth of the deposits. Weighed subsamples of the sediment, which was in all cases completely desiccated and rather indurated, were left to soak in water for a period of days to weeks. They were then sieved by AH (the sandy nature of the sediment meant that this was, in the end, very much easier than had been anticipated) and a 'washover' of less dense, organic material taken off. This fraction was sorted under a low-power binocular microscope and the nature of the organic material, particularly the plant remains, noted.

Insect remains were picked out for separate examination, with paraffin flotation (Kenward *et al.* 1980) used to concentrate further remains in two cases. They were passed to HK as tubes of sorted fragments and, in the case of Samples 271 and 405, jars of flot from paraffin extraction. Although it had originally been intended only to assess the insect material and make decisions as to further work, the quantity of material and its nature made it more logical simply to record all of the remains at this stage. The exception was Sample 179, for which the fossils were in such poor condition that further work could not be justified.

The pre-sorted remains and the material resulting from paraffin floatation were examined for insect and other macro-invertebrate remains using a low power binocular microscope. The

fragments were picked out and either recorded direct and returned to industrial methylated spirits, or kept on damp filter paper in square plastic 'Petri'-style dishes before being identified with reference to standard identification manuals and modern specimens. Lists of taxa from each sample were made, in the case of the beetles and bugs fully quantitatively, and for other invertebrates, semi-quantitatively (Kenward 1992; Kenward *et al.* 1986). The preservational condition of the insect remains was recorded using the scales proposed by Kenward and Large (1998). In summary, preservation is recorded as chemical erosion (E) and fragmentation (F), in each case on a scale from 0.5 (in superb condition) to 5.5 (extremely decayed or fragmented).

Results

Notes on the plant and some other material from the samples are presented in Table 23. A complete list of the invertebrate taxa recorded from the samples is given in Table 24, and selected statistics of each of the assemblages, and the combined assemblages, in Table 25. The statistics used are explained in Appendix 1, and detailed species lists by sample in Appendix 2.

Overall there was some surprisingly good preservation even of material preserved by anoxic waterlogging, despite long-term storage (possibly because the material dried rather quickly, so that decay processes were unable to effect too much damage). There were modest-sized assemblages of plant remains including some charred material from cereals (grain and chaff), heather and bracken (perhaps from litter, most likely from stable cleanings) and the merest traces of plants likely to represent domestic activities (a fragment of coriander seed in one sample). Overall the plant material was dominated by taxa likely to have originated in an area of scrub or even developing young woodland, perhaps representing clearance of such an area and the use of the well as a repository for such cleared debris (the small size of the fragments suggests they were already rather well fragmented before being thrown into the well, however, and so were not deposited 'green'). These results accord to some degree with those of the rather more detailed analyses of Bartley (nd) though the evidence for calcareous grassland recorded by him was not clear from the present work and the quantities of moss recovered from this later group of samples seem to have been much smaller. Unfortunately it is not easy to establish precisely the levels from which the samples Bartley examined were taken.

Other than from Sample 179 (the uppermost, from 6.93-7.08 m), assemblages of insects, mostly beetles, of modest size were recovered. Preservation was very varied within and between assemblages; it was extremely poor in Sample 179, and (by a small margin) best in Sample 271 (from 8.24-8.45 m), and showed the greatest variability in Sample 405 (from 9.7-9.8 m: E 3.0-5.0, F 2.5-5.0). In a substantial proportion of cases, identification was limited by either the degree of fragmentation or the extent of decay, and this reduced the total numbers of individuals identified from the samples.

The main statistics for the combined assemblages (last column in Table 25) reflect considerable ecological mixture (high 'alpha' of Fisher *et al.* 1943), a substantial influence from natural or (more probably) semi-natural vegetation (over half the individuals coming from outdoor habitats), almost no aquatic habitats (the aquatic insects almost certainly being background fauna), a lack of trees or dead wood (the only insect from such habitats being a single woodworm beetle, *Anobium punctatum*, common in buildings and fences). The outdoor fauna of Sample 271 included the weevil *Strophosomus nebulosus* (of which there were eight; it is also often referred to as *S. retusus*). It is generally said to be associated with heathers and heath (*Calluna* and *Erica,* e.g. Duff 1993; Smreczyński 1981), suggesting importation with cut plants or in heathland turf, as indicated by some of the plant remains, though the lack of remains of other clearly heathland insect taxa is peculiar, since whole suites of such insects tend to be found together in archaeological material suspected of including imported heath/moor resources (Kenward 2009). This association, however, seems not to be fully clear (it was omitted by Philp 2006, for example) and the weevil may perhaps occur under other circumstances. *Tropiphorus terricola* and many of the other plant-associates from across the samples would be found in an area of waste ground where perennial weeds had begun to be established. There was nothing to suggest scrub (cf. the botanical evidence), but early woody invaders such as elder and blackberry, the best-represented indicators of this type of vegetation within the plant remains, typically lack a distinctive fauna and thus are likely to be invisible in insect death assemblages. Following Philp (2006), the beetles indicate herbs in the pea family, Leguminosae/Fabaceae (*Sitona hispidulus*, *S. sulcifrons*, *Hypera punctata*, and probably most of the *Apion*), nettles, *Urtica* spp. (*Brachypterus* sp., *Cinorhinus quadrimaculatus* with several in Samples 271 and 405), docks or their relatives, *Rumex* and other Polygonaceae (*Chaetocnema concinna*, *Apion miniatum*, *Rhinoncus pericarpius*), plantain, *Plantago* species (*Gymnetron labile*), and crucifers, Brassicaceae/Cruciferae (*Ceutorhynchus ?contractus*). An unusual record from Sample 271 is the little weevil *Orobitis cyaneus*, associated with *Viola* species.

There are indications of grassland, quite possibly grazing land from which the dung beetles originated, from the chafers *Phyllopertha horticola* and *Hoplia philanthus*, and the elaterids (click beetles) *Agrypnus murinus*, *Athous haemorrhoidalis*, *A. hirtus*, and *Agriotes pallidulus.* The herbivorous species mentioned above could all also have come from rough grazing land, of course. *Prosternon tessellatum* is known to breed in rotting wood, but also in organic soil. If the *Strophosomus nebulosus* were imported with heath or moor turf, *P. tessellatum* may have had the same origin, but the lack of supporting evidence from other insects must be emphasised.

By comparison with many occupation-site assemblages (e.g. Roman Tanner Row and Anglo-Scandinavian Coppergate, both in York: Hall and Kenward 1990; Kenward and Hall 1995) the proportion of decomposers (species associated with rotting matter) was low. The proportion of individuals suggesting very foul matter, however, was strikingly high (over a quarter of three of the assemblages, but much lower in Sample 271). Within this component,

scarabaeid ('true') dung beetles, mostly *Aphodius* species, were important. Thus, even the small group from Sample 192 included four *Aphodius prodromus* or *sphacelatus* (probably the former, which was identified from other samples), while *A. prodromus* and *A. fimetarius* or *pedellus* were the most numerous species in Sample 405, and *A. contaminatus* and *A. prodromus* among the most numerous in Sample 461. Fragments of the large *Geotrupes* dung beetles were found in all the samples, suggesting they were abundant in the surroundings. The most likely origin of these beetles, and many others in the assemblages when found with them in abundance, would be from herbivore dung.

Synanthropic beetles were present in all the assemblages, but in small numbers, and predominantly facultative taxa, which are at least as common in natural and semi-natural habitats as at occupation sites. There were no strong synanthropes (those essentially dependent on humans), and notably no grain pests, which are present in most Roman intensive occupation deposits. This suggests that the fills of the well were not formed at a time when there were buildings, even stables, nearby.

Trends are seen in the main statistics with increasing depth. Diversity increased steadily downwards (alpha = 23, 71, 88, 123, combined assemblages 98), though the standard errors were mostly quite large and overlapped. The percentage of outdoor individuals increased quite substantially downwards (38%, 54%, 56%, 67%, mean 55%); this was reflected in an increase in the percentage of aquatic taxa, though this was never more than small (0%, 1%, 2%, 4%, combined assemblages 3%), and the percentage of aquatic individuals was always negligible (maximum 2% in sample 461). It is not really clear what these trends might mean. The percentage of plant-associated taxa did not show the same trend, being substantially lower in the top and bottom analysed groups. Other statistics sometimes showed considerable variation, but not in a systematic way, especially when the small size of most of the assemblages is taken into account (Sample 192 was often an outlier, but the number of individuals was so low that it would be foolish to pay too much attention to statistics derived from it).

Discussion of the insect assemblages

Interpretation has been limited by the rather small numbers of fossils recovered and by the poor preservation of a good proportion of them. It is also notable that the remains of invertebrates other than beetles and the relatively tough puparia and some mites and hymenopterans were rare, quite possibly as a result of differential preservation. Nevertheless, it is possible to make some suggestions as to the ecological conditions under which the fauna probably originated.

There was a range of taxa from grassland, and indeed almost all of the plant-associated and ground living taxa, as well as the dung beetles, may have originated in such a habitat. All of these may have travelled some distance to the well fills, but it is not impossible that there were dumps of soil from grazed weedy grassland incorporated into the fill. The variable

preservation of the insect fossils would accord with an origin in a living soil, where decay would be rather rapid so that older fossils would soon show substantial changes. Trampling of such a soil, and the effect of digging it up and dumping it, might contribute to the high degree of fragmentation shown by many fossils. Unfortunately, the same changes might have resulted from the long storage of the samples, with the amount of decay varying according to exposure to oxidation, and fragmentation resulting from drying and mechanical impacts in transport.

Whether the observed trends in diversity and the representation of some of the ecological groups are significant in terms of the way insects became incorporated into the deposits in the well is uncertain. The changes in diversity and the percentage of outdoor individuals might reflect a greater background fauna component lower in the well, or a change in the local environment towards more uniform conditions, or dumps from different sources being deposited in the well. This might be resolved on the basis of sedimentary, botanical or artefactual evidence. It seems unlikely that much of the fauna entered through a 'pitfall' effect; there were only quite small numbers of large and medium-sized ground beetles and staphylinids (these are typical of species which fall accidentally into holes in the ground).

The rarity of 'typical', and lack of 'strong', synanthropes suggests strongly that by the time the deposits formed there were no occupied structures nearby. This might relate to a period of abandonment of the well with gradual infill, or to backfill by dumping.

Recommendations for further work

No further work is believed to be required on the plant or insect assemblages unless there are specific archaeological questions which it is felt might be answered by further analysis.

Table 23. Plant remains from five samples of sediment, together with comments on the sediment and other inclusions

Sample	Wt (kg)	Comments
179	1.475	Sample from 6.93-7.08m
		Mottled mid-brown (when wet) indurated (becoming loose and crumbly on wetting) silty sand. The washover comprised about 75cm^3 of organic material, mainly charcoal with some rather poorly preserved plant and insect remains—many of the remains were worn and/or fragmentary. Most abundant amongst the plant macrofossils were uncharred seeds of elder (*Sambucus nigra* L.). The charred remains included traces of chaff of spelt wheat *Triticum spelta* L.) and a few grains of wheat and oats presumably from domestic occupation. Traces of two taxa—uncharred seeds of heath grass (*Danthonia decumbens* (L.) DC. in Lam. & DC.) and tentatively identified charred heather (*Calluna vulgaris* (L.) Hull) root fragments—may point to material from an area of heathland within the fills. The residue consisted of about 300 cm^3 of sand and angular stones.
192	1.25	Sample from 7.33-7.48m
		Desiccated clay silt/sand. There was a washover of about 360cm^3 of granular organic debris, and a residue of about 150cm^3 of small stones and some sand. Much or the organic fraction

Sample	Wt (kg)	Comments
		comprised very decayed wood and bark with a lot of silt coating; there were a few clumps of compressed plant detritus, and a few twig fragments, and many of the more abundant remains were from woody taxa such as willow (*Salix*: bud-scales and twig epidermis), elder (seeds), thorns of hawthorn/blackthorn (*Crataegus*/*Prunus spinosa* L.) and prickles of rose/bramble (*Rosa/Rubus* sp.), perhaps all consistent with clearance of an area of scrub. Charred and uncharred frond fragments of bracken (*Pteridium aquilinum* (L.) Kuhn) might also have originated in this way, if they were not from, for example, litter from animal stalls. Again heath grass and charred ?heather root fragments were noted, as were charred wheat grains and chaff identified as spelt wheat, together with chaff of barley. One additional indicator of human occupation was a trace of coriander (*Coriandrum sativum* L.) 'seeds', but the rather large assemblage of fruits and seeds was otherwise a mixture of taxa from disturbed places and damp habitats, some of which might have originated in stable manure, though this was by no means as diagnostic as is often the case in deposits of this period rich in 'waterlogged' remains (cf. Hall and Kenward 1990; Kenward and Hall 1997).
271	1.03	Sample from 8.24-8.4 m depth Dry crumbly mottled clay silt with stones. This sample yielded a washover of about 330cm^3 of granular silt-coated organic debris; the residue of about 350cm^3 comprised angular stones and some sand. The coarser organic detritus was again dominated by angular twiggy fragments, all rather strongly decayed and silt-coated. The assemblage appeared to be a very much reduced version of that seen in Sample 192 with the addition of rather frequent bud-scales of poplar/aspen (*Populus*). Amongst the small amount of very decayed moss was some material of *Mnium hornum* Hedw., a species typical of woodland floors but perhaps caught up with scrub if this is the origins of the elder seeds, rose/bramble prickles and twig fragments. Together with charred ?heather root was a trace of charred shoot which was definitely from this plant.
405	1.1	Sample from 9.7-9.8m depth Crumbly, slightly indurated, grey to grey-brown (oxidizing slightly orange-brown on outside surfaces), slightly structured sandy clay silt with some organics. The washover of about 150cm^3 comprised granular organic debris including a little rather worn wood and some twig fragments, and about 450cm^3 of stones and a little sand. The debris also again included rather a lot of large *Populus* buds and detached scales, some buds perhaps being partly mineral-replaced (and some catkin-scales indicating the presence of aspen, *P. tremula* L.). Also noted were traces of charred barley rachis and spelt wheat chaff (and wheat grains), including one almost complete spelt glume, indicating it had not undergone much attrition between charring and deposition. Again, many of the taxa might have originated in scrub or light woodland and there was again some charred and uncharred material from heather and bracken, perhaps from imported litter.
461	0.85	Sample from 11.8-11.9m depth Mottled crumbly, silty sand. There was a washover of about 70cm^3 of organics debris, including wood fragments to 70mm (but only one large specimen, the rest <10mm). The residue comprised about 250cm^3 of stones and sand amongst which were rather large rodent mandibles and some other bone The more abundant remains were bud/bud-scales of *Populus* (with some deeply laciniate catkin-scales indicating the presence of aspen) and uncharred bracken frond fragments, together with seeds of birch (*Betula*) and stinging nettle (*Urtica dioica* L.). The remaining taxa included a few mosses from woodland and/or heathland habitats, heather shoots and traces of charred barley and spelt wheat chaff. There was at least one tentatively identified seed of flax, *Linum usitatissimum* L.

Table 24. Complete list of invertebrate remains recorded from samples from the well. Order and nomenclature follow Kloet and Hincks (1964-77) for insects and does not take account of more recent nomenclatural changes except where taxa have been split. Ecological codes used in calculating statistics (Table 25) are given (**ec**); they are explained in Appendix 1. * = not used in calculating assemblage statistics. The remains were of adults unless stated. The abbreviation 'sp.' indicates that the record was probably an additional taxon, 'sp. indet.' that the material may have been of a taxon listed above it; **nr** is the number of subsamples from which the taxon was recovered at Rothwell Haigh

Taxon	**ec**	**nr**
*Dermaptera sp.	u	1
Anthocoris sp.	oa-p	1
Aphrodes sp.	oa-p	1
Auchenorhyncha sp.	oa-p	1
*Diptera sp. (adult)	u	1
*Diptera sp. (puparium)	u	1
Carabus violaceus Linnaeus	oa	1
Notiophilus substriatus Waterhouse	oa	1
Clivina fossor (Linnaeus)	oa	1
Clivina sp. indet.	oa	1
Trechus ?quadristriatus (Schrank)	oa	1
Trechus obtusus or *quadristriatus*	oa	2
Trechus micros (Herbst)	u	3
Bembidion sp.	oa	2
Stomis pumicatus (Panzer)	oa	1
Pterostichus melanarius (Illiger)	ob	3
Pterostichus (*Poecilus*) sp.	oa	2
Pterostichus sp.	ob	1
Calathus fuscipes (Goeze)	oa	2
Calathus ?melanocephalus (Linnaeus)	oa	3

Amara aulica (Panzer)	oa	1
Amara sp.	oa	2
Harpalus rufipes (Degeer)	oa	1
Harpalus sp.	oa	1?1
Carabidae sp.	ob	2
Helophorus sp.	oa-w	1
Sphaeridium sp.	rf	3
Cercyon analis (Paykull)	rt-sf	3
Cercyon haemorrhoidalis (Fabricius)	rf-sf	4
Cercyon ?terminatus (Marsham)	rf-st	1
Cercyon unipunctatus (Linnaeus)	rf-st	1
Megasternum obscurum (Marsham)	rt	4
Cryptopleurum ?crenatum (Kugelann)	rf-st	1
Cryptopleurum minutum (Fabricius)	rf-st	1
Chaetarthria seminulum (Herbst)	oa-w	1
Hydrophilinae sp.	oa-w	1
Onthophilus striatus (Forster)	rt-sf	1
Histerinae sp.	rt	2
Limnebius sp.	oa-w	1
Ptenidium sp.	rt	1
Leiodes sp.	u	1
Catops sp.	u	3
Catopinae sp. indet.	u	1
Silpha sp.	u	1
Micropeplus fulvus Erichson	rt	1
Acidota crenata (Fabricius)	oa	1
Acidota cruentata (Manneheim)	oa	1
Lesteva ?longoelytrata (Goeze)	oa-d	1
Omalium spp.	rt	2
Syntomium aeneum (Muller)	oa	1
Anotylus nitidulus (Gravenhorst)	rt	1
Anotylus ?tetracarinatus (Block)	rt	1
Stenus spp.	u	3

Lathrobium sp.	u	2
?Medon sp.	u	1
Rugilus sp.	rt	1
Othius sp.	rt	2
Gyrohypnus fracticornis (Muller)	rt-st	1
Xantholinus sp.	u	4
Philonthus spp.	u	3
Staphylinus olens Muller	u	2
Staphylinus sp.	u	2
Staphylininae sp.	u	1
Tachyporus ?hypnorum (Fabricius)	u	1
Tachyporus sp.	u	1
Tachinus laticollis or *marginellus*	u	1
Tachinus ?signatus Gravenhorst	u	1
Tachinus sp.	u	1
Drusilla canaliculata (Fabricius)	u	1
Aleocharinae spp.	u	2
Pselaphidae sp.	u	1
Geotrupes sp.	oa-rf	5
Aphodius contaminatus (Herbst)	oa-rf	1
Aphodius ?depressus (Kugelann)	oa-rf	1
Aphodius fimetarius or *pedellus*	oa-rf	1
Aphodius granarius (Linnaeus)	ob-rf	2
Aphodius prodromus (Brahm)	ob-rf	3
Aphodius prodromus or *sphacelatus*	ob-rf	1
Aphodius spp. A	ob-rf	4
Oxyomus sylvestris (Scopoli)	rt-sf	1
Onthophagus sp.	oa-rf	1
Melolontha sp.	oa-p	1
Hoplia philanthus Illiger	oa-p	1
Phyllopertha horticola (Linnaeus)	oa-p	2
Agrypnus murinus (Linnaeus)	oa-p	1
Athous haemorrhoidalis (Fabricius)	oa-p	1?1

Athous hirtus (Herbst)	oa-p	1
Prosternon tessellatum (Linnaeus)	oa	1
Agriotes pallidulus (Illiger)	oa-p	2
Agriotes sp.	oa-p	2
Elateridae sp.	ob	2
Anobium punctatum (Degeer)	l-sf	1
Brachypterus sp.	oa-p	2
Cryptophagus sp.	rd-sf	1
Atomaria spp. A	rd	2
Orthoperus spp.	rt	1
Lathridius minutus group	rd-st	3
Enicmus sp.	rt-sf	2
Corticaria sp.	rt-sf	1
Corticariinae sp.	rt	1
Phaedon sp.	oa-p	1
Phyllotreta sp.	oa-p	1
Chaetocnema concinna (Marsham)	oa-p	1
Halticinae sp.	oa-p	1
Apion (*Erythrapion*) *miniatum* Germar	oa-p	1
Apion spp.	oa-p	3
Phyllobius sp.	oa-p	1
Phyllobius or *Polydrusus* sp.	oa-p	1
Strophosomus nebulosus Stephens	oa-p	1
Tropiphorus terricola (Newman)	oa	1
Sitona hispidulus (Fabricius)	oa-p	1
Sitona sulcifrons (Thunberg)	oa-p	1
Sitona sp. indet.	oa-p	1
Hypera punctata (Fabricius)	oa-p	1
Cidnorhinus quadrimaculatus (Linnaeus)	oa-p	4
Ceutorhynchus ?contractus (Marsham)	oa-p	1
Ceutorhynchus sp.	oa-p	2
Rhinoncus pericarpius (Linnaeus)	oa-p	1
Rhinoncus sp. indet.	oa-p	1

Orobitis cyaneus (Linnaeus)	oa-p	1
Gymnetron labile (Herbst)	oa-p	1
Gymnetron sp. indet.	oa-p	2
Curculionidae spp. indet.	oa	2
Coleoptera sp.	u	2
*Coleoptera sp. indet. (larva)	u	1
*Hymenoptera sp.	u	2
*Aranae sp.	u	2
*Acarina sp.	u	2

Table 25. Main statistics for assemblages of adult beetles and bugs (excluding aphids and scale insects) from the quantified assemblage from the well. For explanation of abbreviations, see Appendix 1. Zero values of index of diversity represent 'not calculated'

There were no grain pests or other strong synanthropes in the assemblages. Sample 179 gave too few remains for useful analysis.

Sample	**192**	**271**	**405**	**461**	**Whole site**
Basal depth (m)	7.48	8.45	9.8	11.9	-
S	22	68	65	49	139
N	37	114	96	60	307
ALPHA	23	71	88	123	98
SEALPHA	7	12	18	40	9
SOB	10	36	36	32	80
PSOB	45	53	55	65	58
NOB	14	61	54	40	169
PNOB	38	54	56	67	55
ALPHAOB	0	37	48	73	59
SEALPHAOB	0	9	13	28	8
SW	0	1	1	2	4
PSW	0	1	2	4	3
NW	0	1	1	2	4
PNW	0	1	1	3	1

SD	0	0	0	1	1
PSD	0	0	0	2	1
ND	0	0	0	1	1
PND	0	0	0	2	0
SP	5	20	17	8	37
PSP	23	29	26	16	27
NP	6	40	23	8	77
PNP	16	35	24	13	25
SM	0	0	0	0	0
PSM	0	0	0	0	0
NM	0	0	0	0	0
PNM	0	0	0	0	0
SL	0	0	0	1	1
PSL	0	0	0	2	1
NL	0	0	0	1	1
PNL	0	0	0	2	0
SRT	9	18	23	16	47
PSRT	41	26	35	33	34
NRT	20	28	44	24	116
PNRT	54	25	46	40	38
ALPHART	6	22	20	21	30
SEALPHART	2	8	5	9	4
SRD	1	2	4	1	8
PSRD	5	3	6	2	6
NRD	2	4	8	1	15
PNRD	5	4	8	2	5
SRF	4	6	10	10	30
PSRF	18	9	15	20	22
NRF	11	8	25	16	60
PNRF	30	7	26	27	20
SSA	5	3	8	6	14
PSSA	23	4	12	12	10
NSA	10	5	13	6	34

PNSA	27	4	14	10	11
SSF	3	3	5	3	8
PSSF	14	4	8	6	6
NSF	7	5	8	3	23
PNSF	19	4	8	5	7
SST	2	0	3	3	6
PSST	9	0	5	6	4
NST	3	0	5	3	11
PNST	8	0	5	5	4

Puff ball identified R. Watling

A puff ball identified as *Bovista nigrescens* by Dr Roy Watling of The Royal Botanic Garden, Edinburgh probably in 1980, was recovered from the well. Their presence on archaeological sites Skara Brae, Stanwick, Scole and Chesterholm was recorded, as was their use for stanching blood or for tinder (Watling and Seaward 1976). *Bovista nigrescens* occurs from July to November and might identify the time of year that the well filled up (van Driel-Murray pers. comm.). Unfortunately neither the small find number not the depth was recorded for the specimen identified. Puff balls, initially misidentified as leather, however, do survive from depths of 7.9m (SF 216), 8.4m (SF 279) and 9.6m (SFs 300, 310 and 311 and 337), but these have not been identified further.

8 Scientific Dating

It was the intention to date articulated animal bones, found at various depths throughout the lower levels of the well, by means of radiocarbon dating. Prior to the submission of samples, however, advice was sought regarding the appropriateness of this proposal, and Peter Marshall recommended that no samples be submitted. His rational is given here.

Radiocarbon dating by P. Marshall

In order to implement a Bayesian approach a rigorous procedure for extracting the necessary information to build chronological models from archaeological sites has been developed (Bayliss and Bronk 2004). This procedure will underpin the proposed radiocarbon dating programme for Rothwell.

The well was excavated in its entirety and ceramic analysis indicates it began to fill up in the late 3rd century at the earliest and was infilled rapidly in the early to mid-4th century. Earlier sherds in the lowest silts suggest the well was in use as early as the late 2nd to early 3rd century. Can radiocarbon dating improve the precision of dating provided by the ceramics?

The samples

The contextual integrity of radiocarbon samples has been of serious concern in sample selection for many years (Bowman 1990, van Strydonck *et al*. 1999), but it becomes even more critical when contextual information is used to modify chronologies. Thus the first stage in sample selection is to identify short-lived material, which is demonstrably not residual in the context from which it was recovered. The taphonomic relationship between a sample and its context is the most hazardous link in this process, since the mechanisms by which a sample came to be in its context are a matter of interpretative decision rather than certain knowledge. All samples should therefore consist of single entities (Ashmore 1999).

There are three basic criteria which a sample must meet before it can be considered suitable for radiocarbon dating. First, the carbon in the sampled organism must be in equilibrium with the carbon in the atmosphere (or some other well-characterised reservoir) at the time when the organism died. By far the most common source of error of this type is the 'old-wood effect' (Bowman 1990), where dates are obtained on wood or charcoal from long-lived plants. The carbon in a tree-ring dates from the year in which that tree-ring was laid down (that is why radiocarbon calibrations works), and so all samples should consist of twigs or the outer rings of the tree. Samples of heartwood from long-lived species, such as oak, or samples which have not been identified to age and species before dating, can only be incorporated into models as *termini post quos* (and are thus far less effective at producing precise chronologies).

The second basic criterion which a sample must meet before it is dated is that it must be securely associated with the archaeological activity that is of interest. The importance of this relationship between the *dated event* has been highlighted repeatedly since the seminal paper on the subject by Waterbolk (1971), but routinely still far too little attention is paid to the association between the sample, the context from which it was recovered and the archaeological event that our dating targets (Van Strydonck *et al*. 1999; Bayliss 2009). Bayesian modelling, because of our desire to incorporate informative prior information from stratigraphy in our models, reinforces the critical importance of the taphonomy of the dated material and the association between it and the past activity which we wish to date.

Since it is the interpretation of the taphonomy of the dated material, which so often goes wrong in archaeological sample selection, it is perhaps worth outlining in some detail the grounds we have used for making this inference in this study. The following categories of material were used to identify samples that might be suitable for dating, in roughly descending order of reliability they are:

Bones found in articulation and recorded in the ground as such. These samples would have been still connected by soft tissue when buried and hence from animals which were not long dead (Mant 1987, 71).

Articulating bones identified as such during faunal analysis. These samples may have been articulated in the ground (but not recognised as such) or have only been slightly disturbed before burial. The presence of more than one bone from the same individual provides evidence that such samples are close in age to their contexts. The security of this inference increases as the number of articulating bones increases.

Waterlogged wood that must have been buried fairly rapidly otherwise it would not have survived.

Simulation model construction and results

The radiocarbon results were simulated using the R Simulate function in OxCal v4.1 (Bronk Ramsey 2009) and the calibration curve of Reimer *et al*. (2009), with errors based on the material to be analysed and the type of measurement required (e.g. AMS from SUERC). The simulated dates used were based on the ceramic evidence.

The result of the simulation (Fig. 23) shows that no extra precision is gained as a result of obtaining radiocarbon measurements - this is due to the shape of the radiocarbon calibration curve (Fig. 24) and the small number of samples. For example a sample with an actual calendar age of AD 200 is likely, even with mathematical modelling to only produce an estimated date of *cal AD 135-340* (*95% probability*; *AD 200*; Fig. 23)

Radiocarbon recommendations

Radiocarbon dating is not going to provide any greater precision than the ceramic analysis and therefore submission of samples is not recommended.

9 Discussion

The well, encountered within a *c*. 2700m^2 square enclosure with an east-facing entrance, is presumed to be associated with the domestic occupation of this rural site during the Roman period, despite scant evidence for the settlement itself. If correct, the settlement was in use from at least the late 2nd to early 3rd century, with its abandonment in the late 3rd century at the earliest, as the well was decommissioned and its water source lost. The complete excavation of a simple rock-cut well, 2m in diameter and to a depth of 12.6m, well below the water table, resulted in the recovery of a wide range of artefacts and environmental remains typically only found in waterlogged conditions.

The wooden artefacts include a rare yew bucket (only one other example of a yew bucket is known, from Prestatyn) and an ash spade complete with its iron shoe. Although the other items, turned bowls, pegs and a bracket were made from locally available native woods, the spade indicates specialist manufacture. The leather objects, predominantly footwear, indicate some form of local leather working, if only repair and cobbling, but the quality of the hides suggests that some at least were purchased elsewhere. The shoes fall within the adult female

size-range for this period and, despite the rural location, they followed current fashion. Meanwhile the environmental remains preserved by the same anaerobic conditions provide modest evidence for food remains (cereals and a single fragment of coriander), unlike similarly dated wells from Skeldergate, York (Hall *et al*. 1980, 120) and The Bedern, York (Kenward *et al*. 1986, 262-3) that were much richer in foodstuffs. From Rothwell, clear indicators of stable litter and herbivore dung were noted, a pattern repeated at Rudston Villa (Buckland 1980, 162).

In contrast, the survival of other assemblages was not reliant on waterlogged conditions, and these included the pottery, metalwork and stone. The pottery assemblage, including some near-complete vessels, is made up of some water-bearing containers as might be anticipated in such a context, but is predominantly from vessels associated with food preparation and consumption. This is in contrast to the assemblage from Rudston Villa (Stead 1980, 30) and Dalton Parlours where lug-handled jars and Huntcliffe jars predominated (Sumpter 1990, 236). The metalwork, iron nails and a finger ring of unidentified metal, in contrast appear mundane, despite Hingley's observation that votive deposits of ironwork in deep pits and wells were a Roman phenomenon (2006, 230). The ceramic building material, stone roof tiles and a few pieces of structural stonework attest to (a) building(s) nearby, while the slickensided sandstone fragments and the cup-marked stone may indicate the curation of curios. Six querns (two beehive and four disk or millstones), plus two possible millstone fragments, attest the likelihood of arable production and certainly the capacity for milling. One, a disk roughout, is typically only found at production sites and as such represents a possible 'offering'. Finally the animal bone reveals the deposition of butchery waste, in addition to the discard/placement of complete animals.

Structured deposits, imbued with particular meaning as opposed to casual discard, are indicated by a number of the assemblages, in particular the disposal of complete pots, animal carcasses, wooden artefacts, disk roughout and the human skull. Some were clearly disposed of complete (certain animals, pots, bucket, spade and disk roughout), while others, such as the wooden bowls, were represented by token pieces. The skull may also have been used to represent the individual, although the possibility that this man was decapitated might indicate the removal of an enemy's head as a trophy (see Cunliffe 1983, 164 for Iron Age 'head hunting'). The sequence of structured deposits, however, has not been clearly defined, although the wooden artefacts tended to concentrate in the lower levels (between 10.2-12.3m), while animal bones, including carcasses, were most commonly recovered from 8.4-10.5m and disc querns were concentrated between 9.4-10.2m. The pottery was more widely distributed. Assuming that the well was redundant when animal carcasses were being introduced, their putrification would have fouled the water supply, the human head (at 9.6m) was deposited sometime after the well's decommission. Human remains in pits and wells are alos known from Newstead, Dalton Parlours and Appleford (Hingley 2006, 230), while nine cases of complete or near-complete human skulls were recovered from pits during excavations at Danebury (Cunliffe and Poole 1991, 421).

Comparative patterns of deposition for the other categories of finds are also known from Roman wells. From Barton Court Farm, Abingdon, a late Roman well contained several almost complete pots, a bucket and well-preserved ironwork in its lowest levels (Miles 1986, 15). At Silchester, one well contained a hoard of ironwork close to its base (Fox and Hope 1901, 246-7), while another a pierced pewter flagon and a damaged stone column (Fulford *et al*. 2006, 40). At Great Holts Farm, Boreham, a ritual connotation such as a foundation or termination act is implied by the pottery, which had been deliberately broken (Germany 2003, 56) and perhaps by 'inordinately large' cattle bones that might indicate imported, or specially selected, beasts (Germany 2003, 41). Complete or near-complete pottery vessels are also known from Skeldergate, York (Perrin 1981, 50), Rudston Villa (Stead 1980, 29), Dalton Parlours (Wrathmell 1990, 196), Staines (Chapman and Smith 1988, 4), Portchester (Fulford 2001, 211), Southwark (Fulford 2001, 207) and Neatham (Fulford 2001, 208), while animal carcasses, often dogs, but also cats, sheep, goats, cattle and horses, are known from Dalton Parlours (Berg 1990, 259), Welton Villa (Mackey 1999, 26), Baldock (Fulford 2001, 209), Dorchester (Maltby1990), Oakridge (Maltby 1987) and Staines (Chapman and Smith 1988, 4-5). At the latter, a prevalence towards males dogs was muted.

Merrifield (1987, 40-50) has suggested that the pots held libations and were placed into freshly dug wells as part of a ritual of 'commencement'. Once the useful life of the well was finished a further offering of 'termination' would be made prior to backfilling. This would explain the completeness of many of the vessels from wells, while closure deposits could have included animal carcasses, winding mechanisms, buckets and other water-carrying vessels, all of which would have effectively terminated the usefulness of the well. Such an explanation was used by Wrathmell to explain the discard of intact water-drawing materials down the well at Dalton Parlours (1990, 271) and ritual closure was also surmised for the backfilling of a well in the mid-2nd century at Welton Villa (Mackey 1999, 24). Fulford's (2001, 215) study of wells, pits and their contents concludes that such deposits were a multi-period phenomenon with its origins in the Iron Age (e.g. Danebury) and continuing through the 1st century AD (e.g. Newstead) to the 4th and 5th centuries AD (e.g. Barton Court Farm). Examples such as Rothwell and Silchester show that this was also both a rural and urban phenomenon.

10 Conclusions

Despite a poorly-preserved enclosure and a dearth of associated structures, the excavation of an unlined rock-cut well at Rothwell Haigh in the 1970s has provided a valuable assemblage of artefacts and environmental remains. They indicate domestic activity (cereals, querns and millstones, animal husbandry and butchery waste) and local crafts (wood working, leather working or repair), as well as contacts with a wider community (imported hides, specialist metalworkers and access to current fashions). On balance, the association of complete pottery vessels, a human skull, animal carcasses, rare wooden artefacts (in particular a yew bucket)

and a disk roughout has been used to propose ritual activity. Given their form and location within the well, a closure event appears to be most likely. Along side these 'purposeful' deposits, the pragmatic discard of butchery waste, stable litter, dung and wood chippings also occurred.

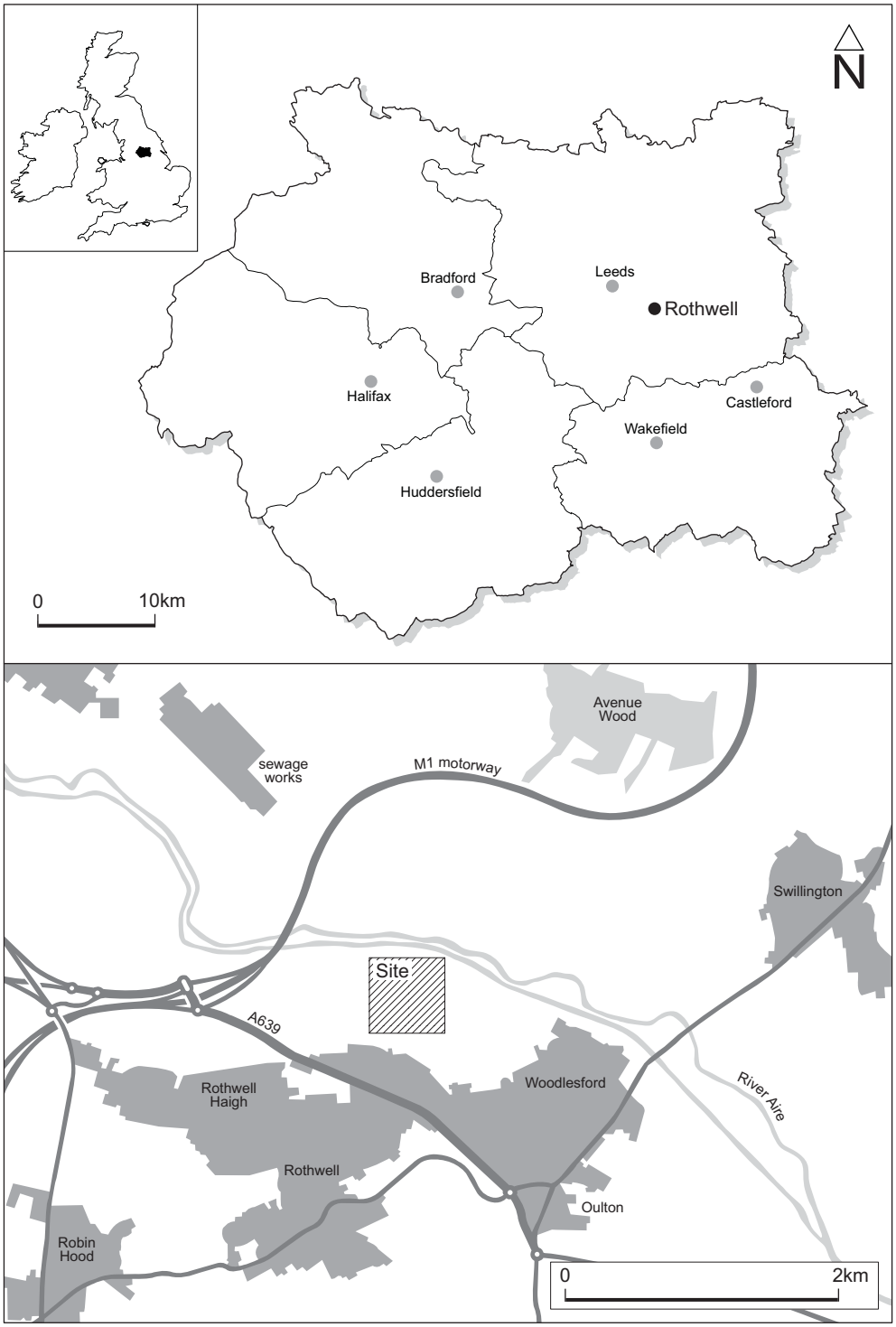

Fig. 1. Site location

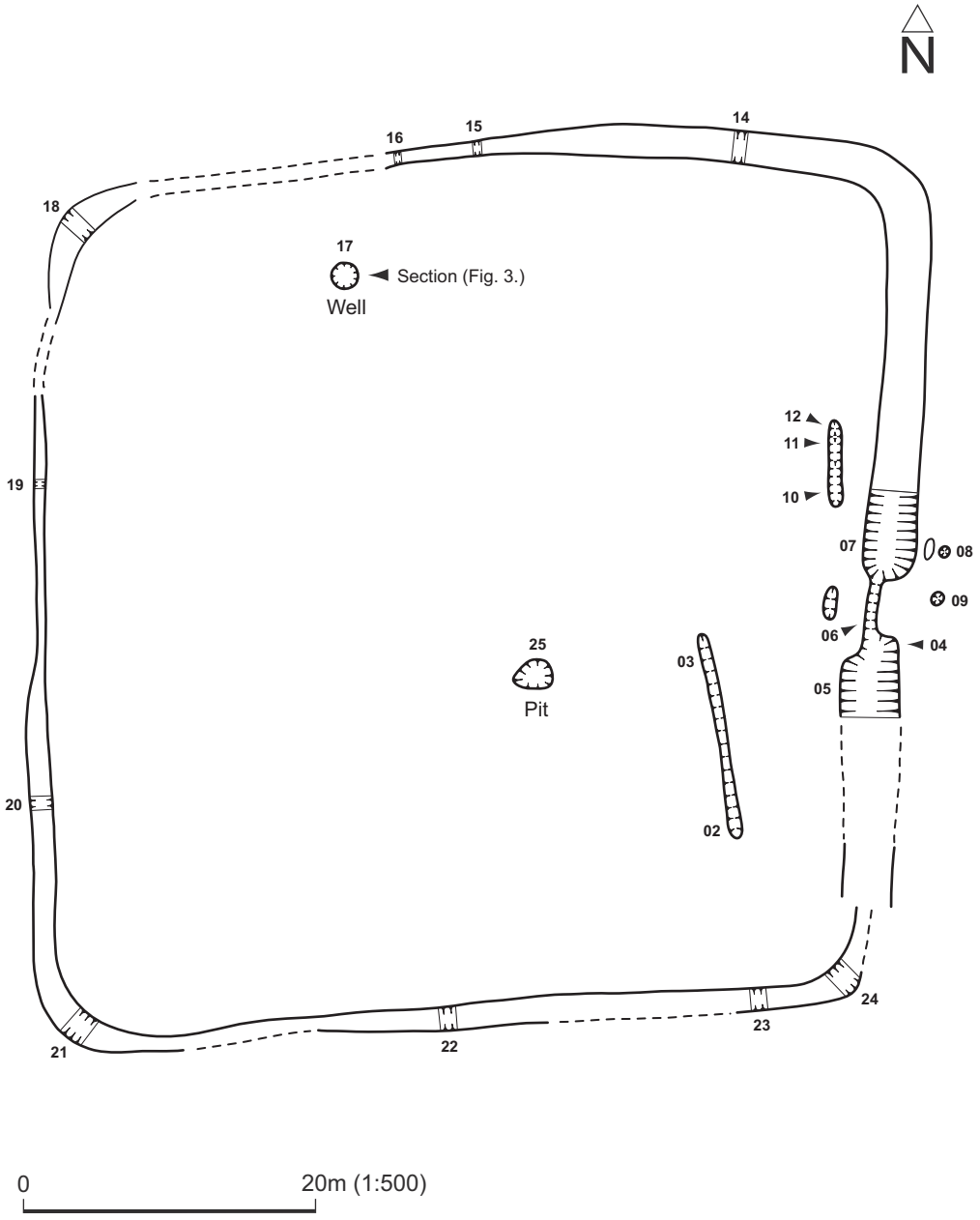

Fig. 2. Plan of the enclosure and associated features

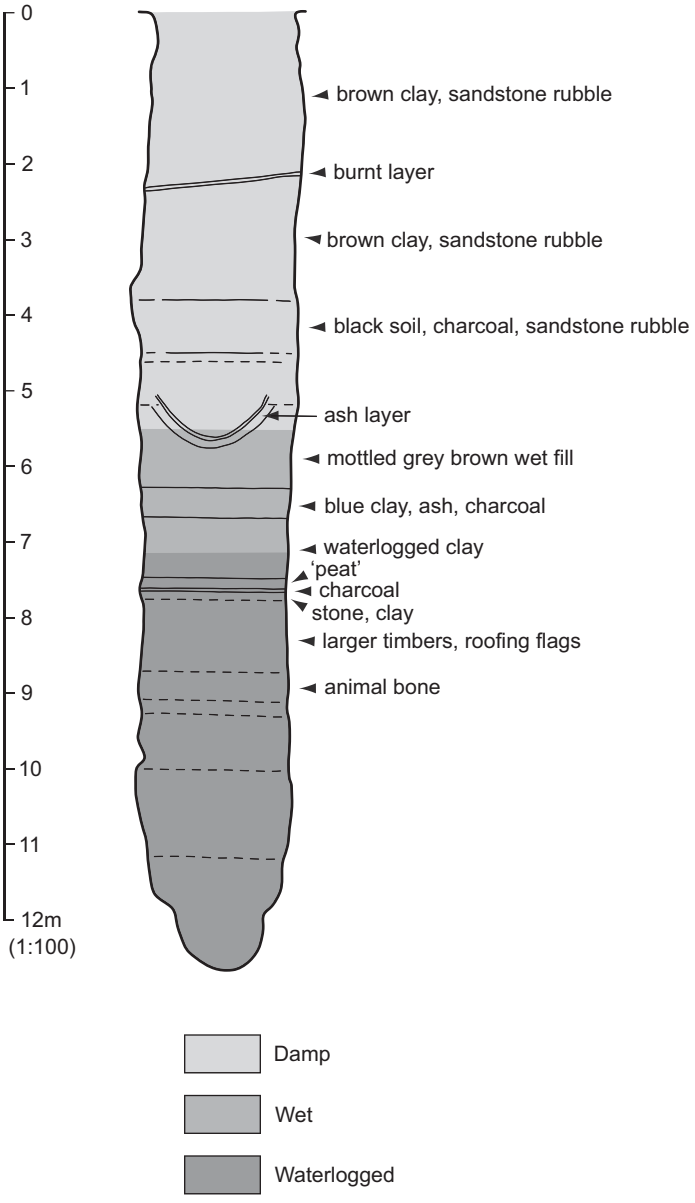

Fig. 3. Schematic section through Well 17

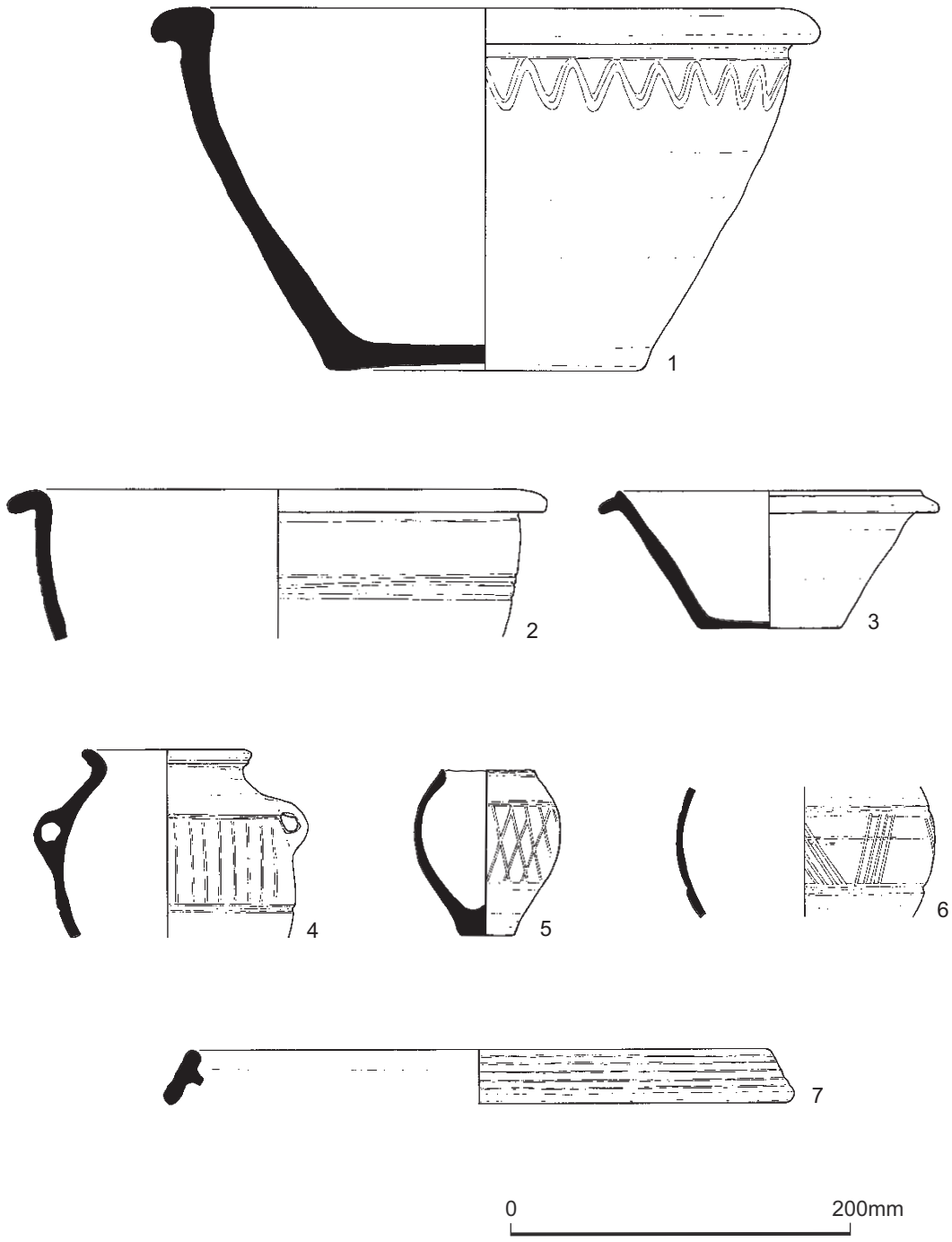

Fig. 4. Pottery Cat. nos. 1-7 (scale 1:4)

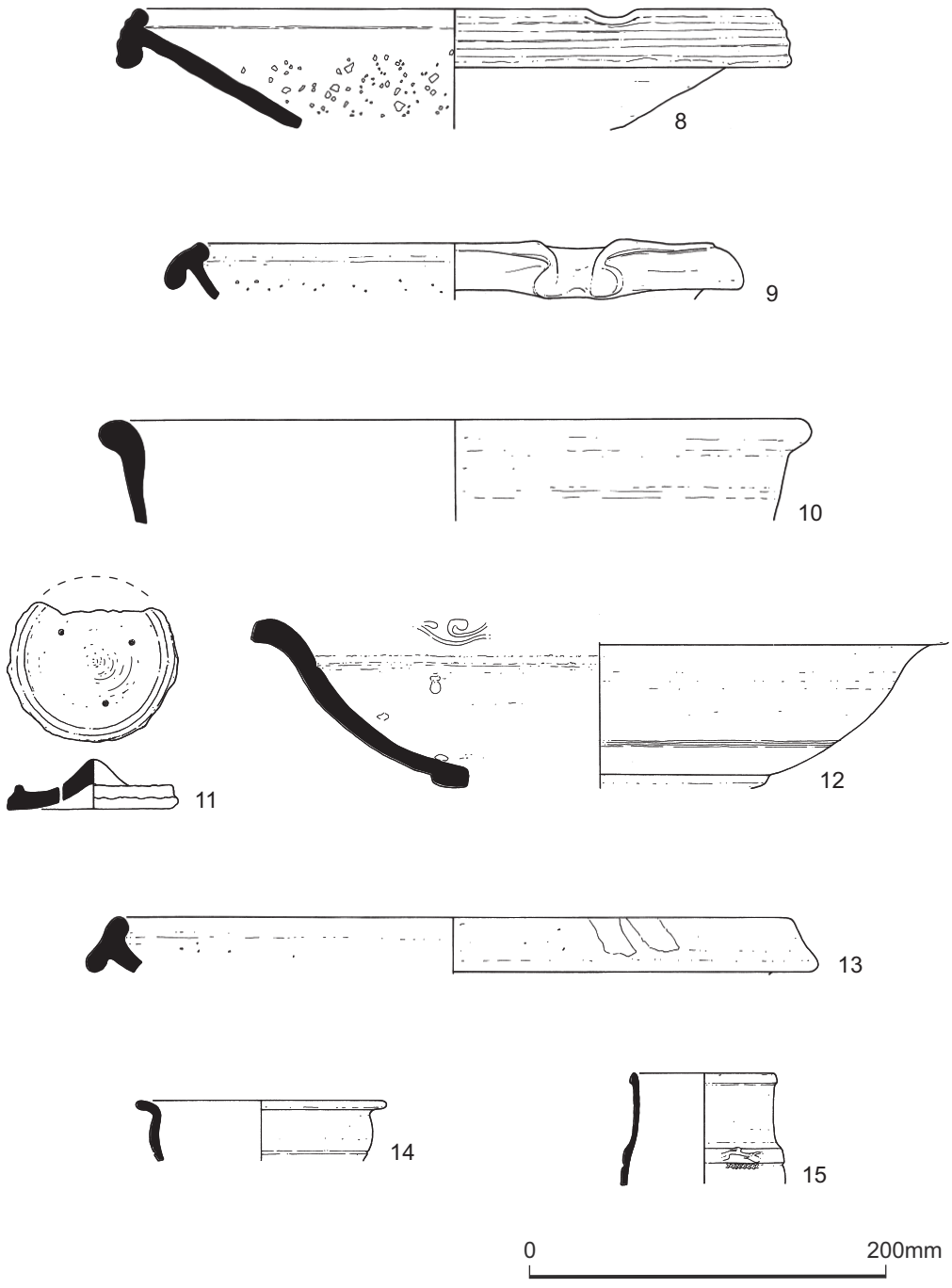

Fig. 5. Pottery Cat. nos. 8-15 (scale 1:4)

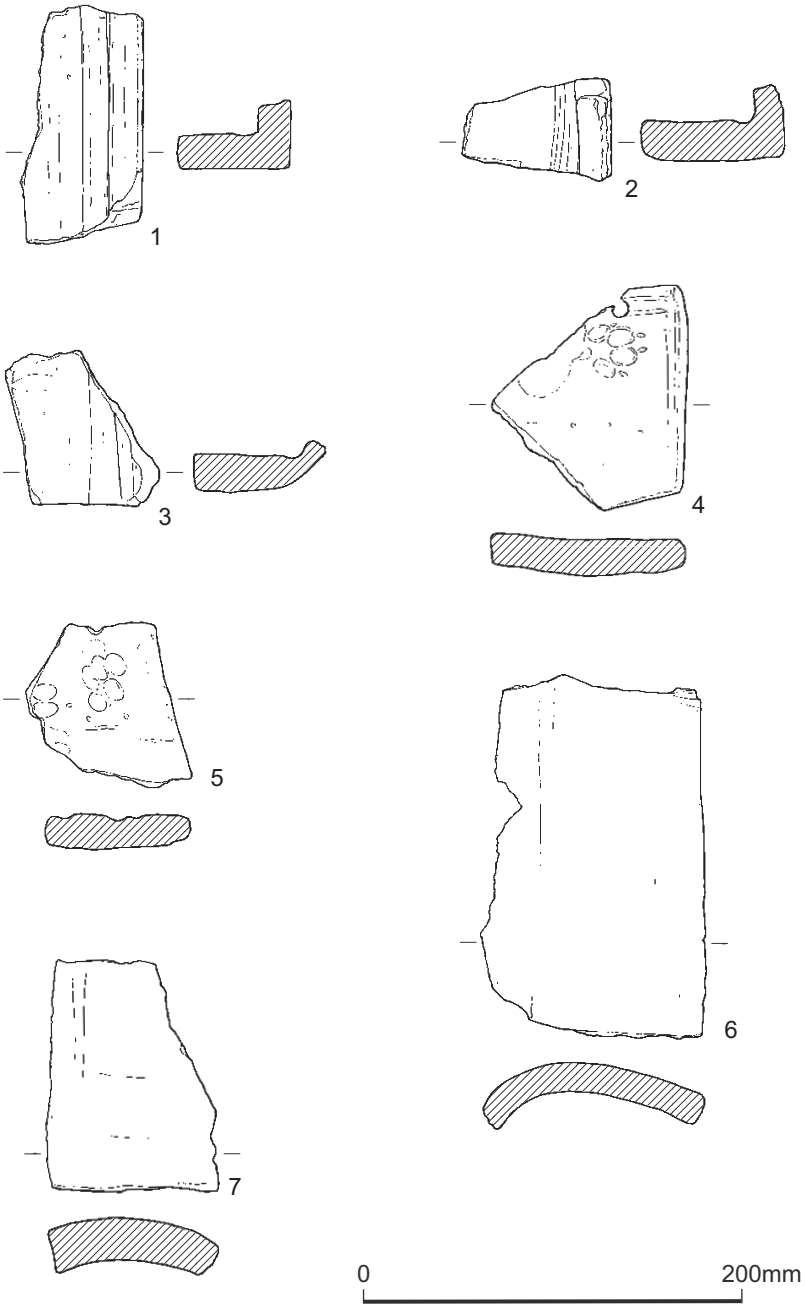

Fig. 6. Ceramic building material (scale 1:4)

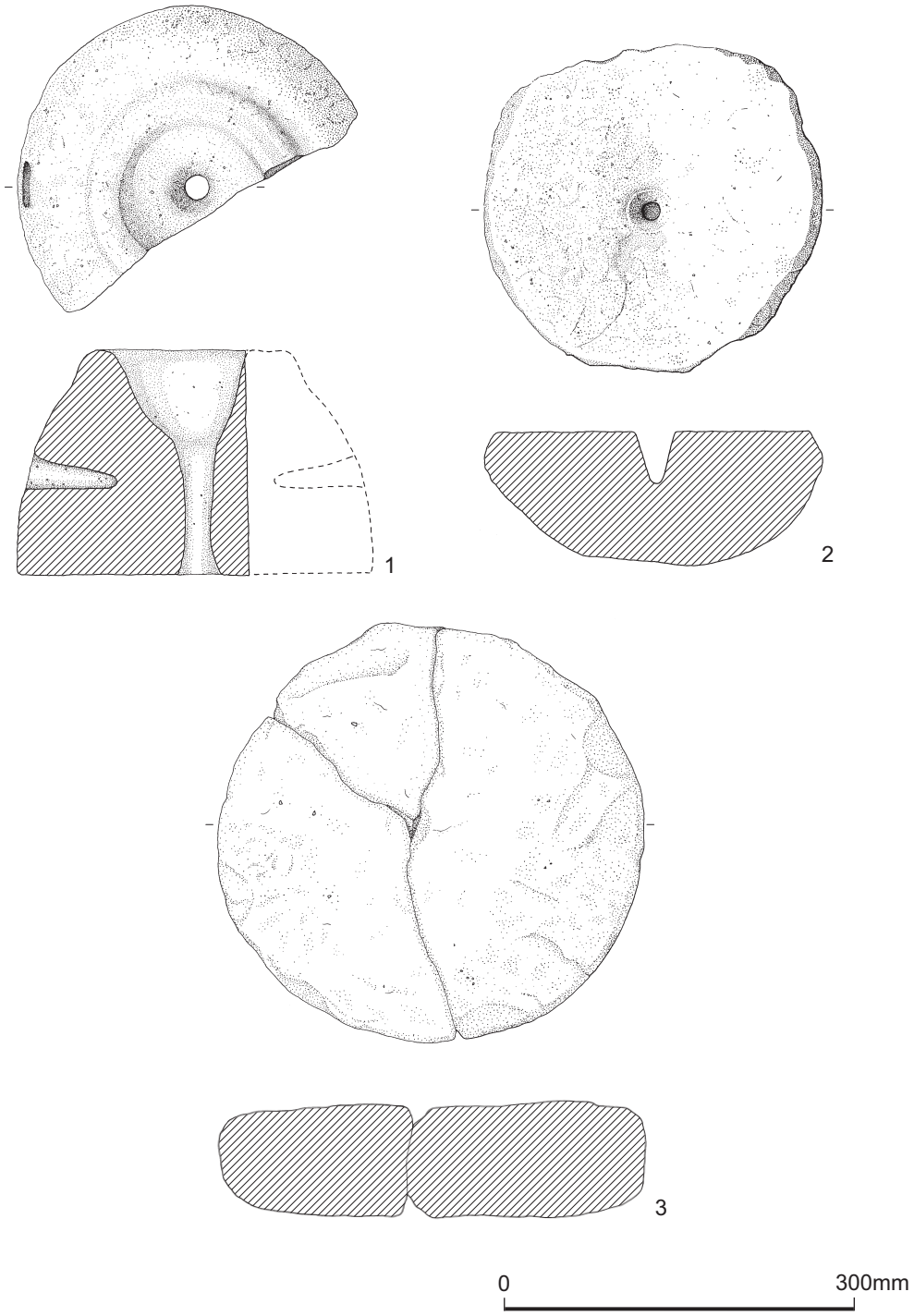

Fig. 7. Querns (scale 1:6)

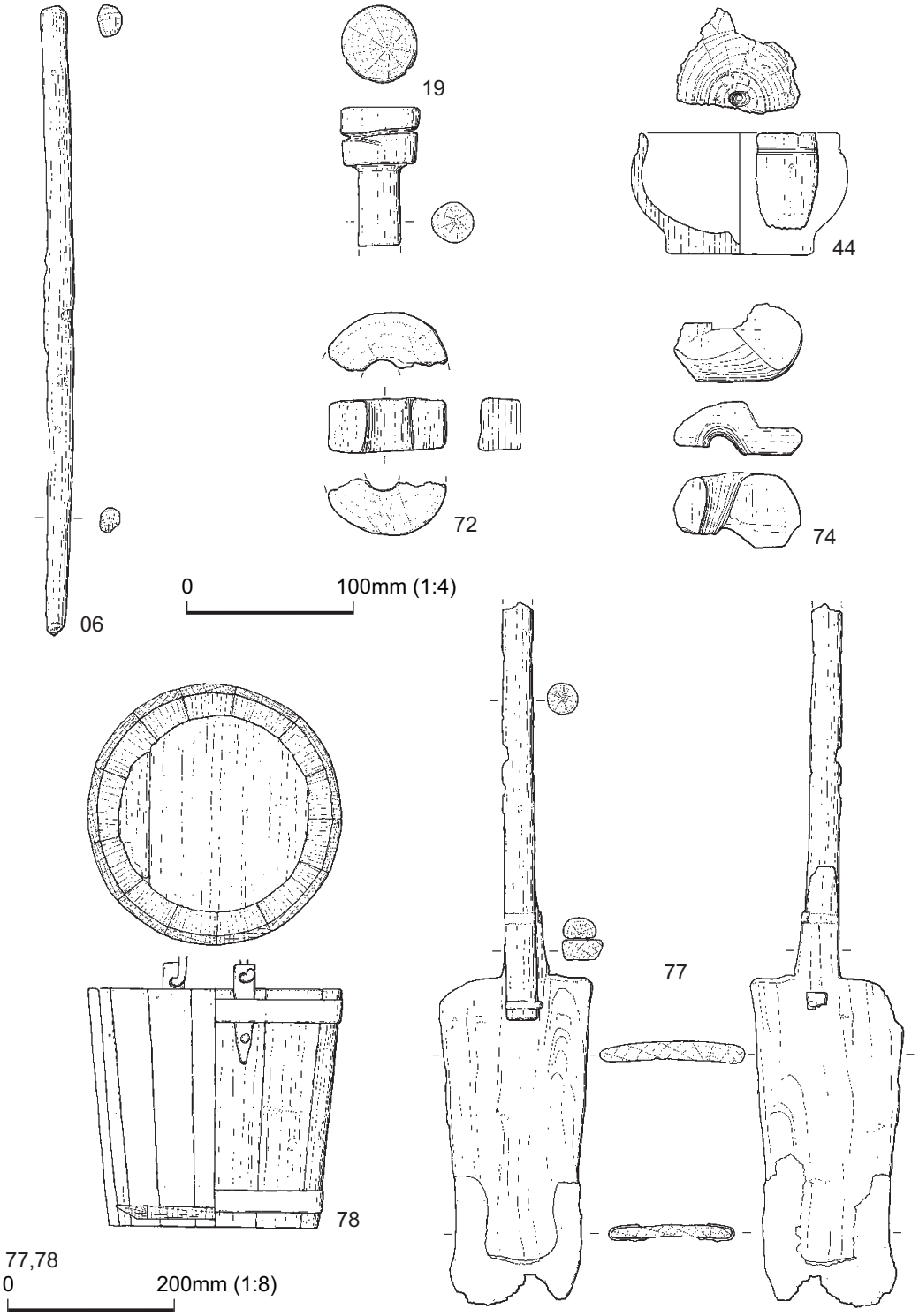

Fig. 8. Wooden objects Cat. nos. 6, 19, 44, 72, 74, 77 and 78

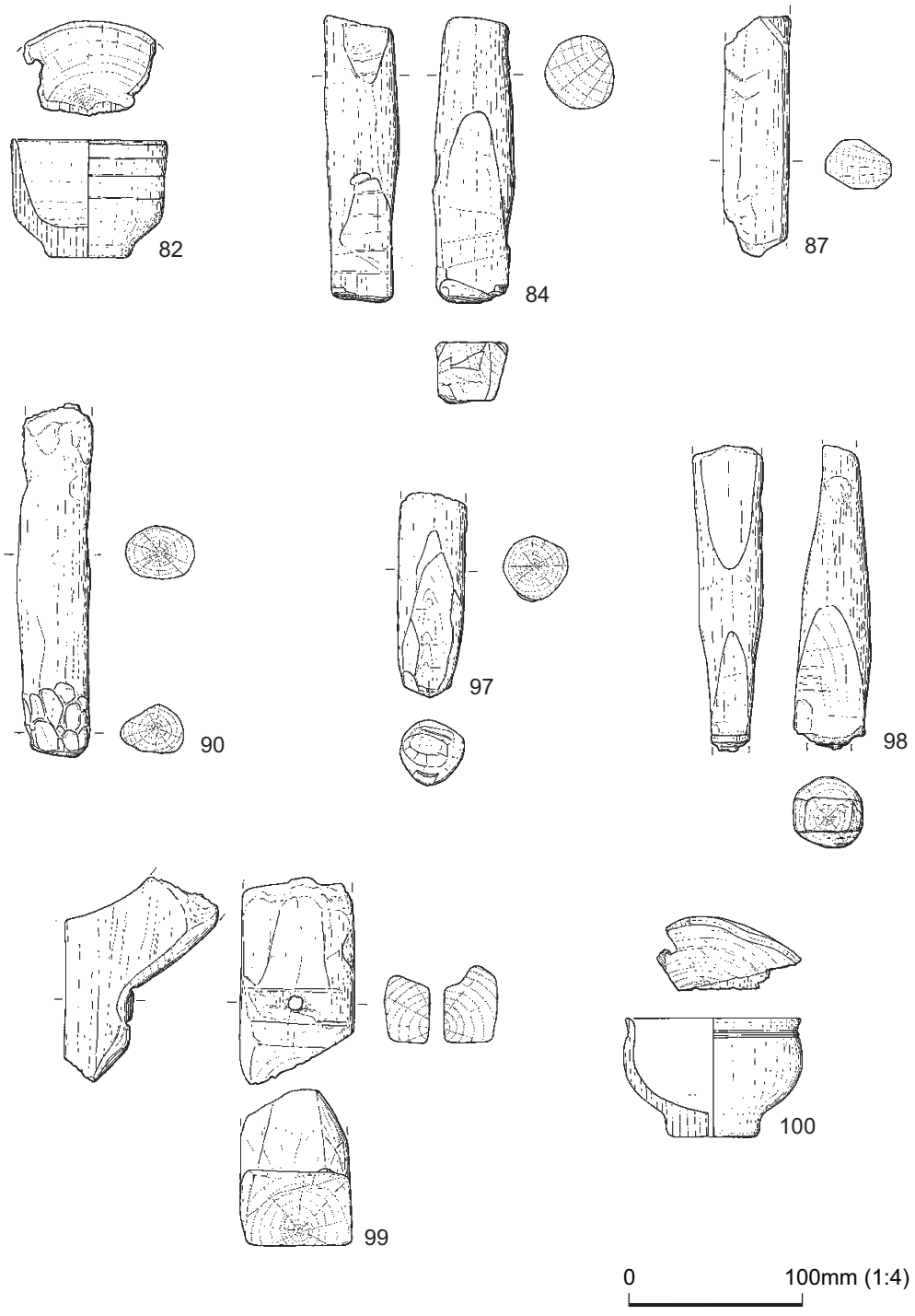

Fig. 9. Wooden objects Cat. nos. 82, 84, 87, 90 and 97-100

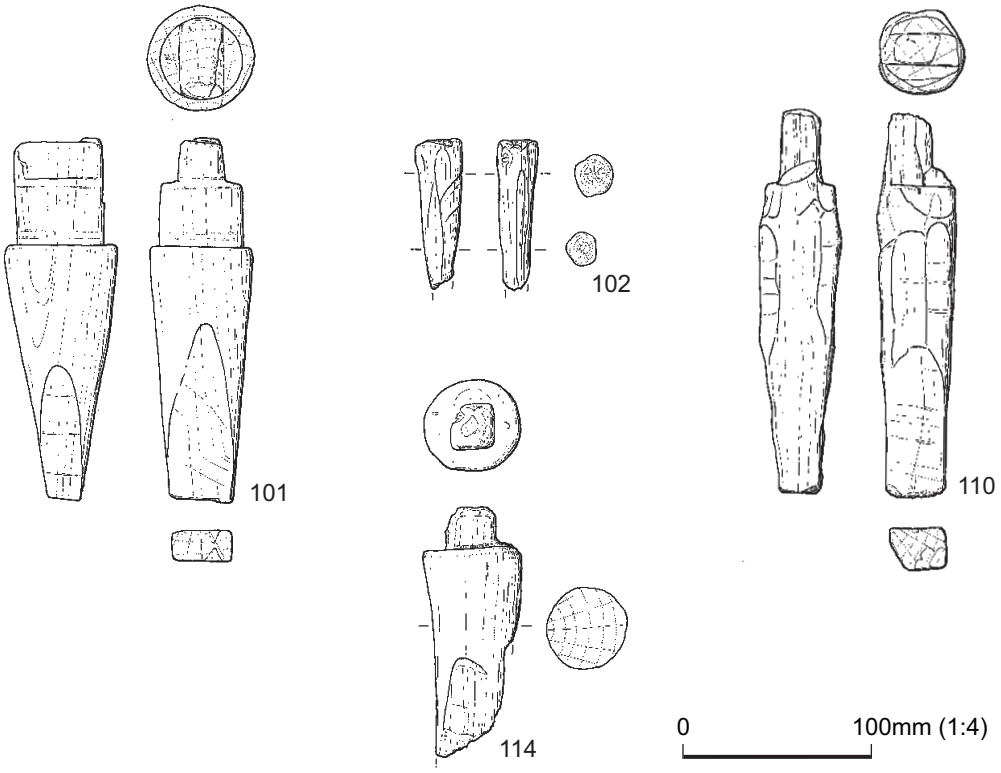

Fig. 10. Wooden objects Cat. nos. 101, 102, 110 and 114

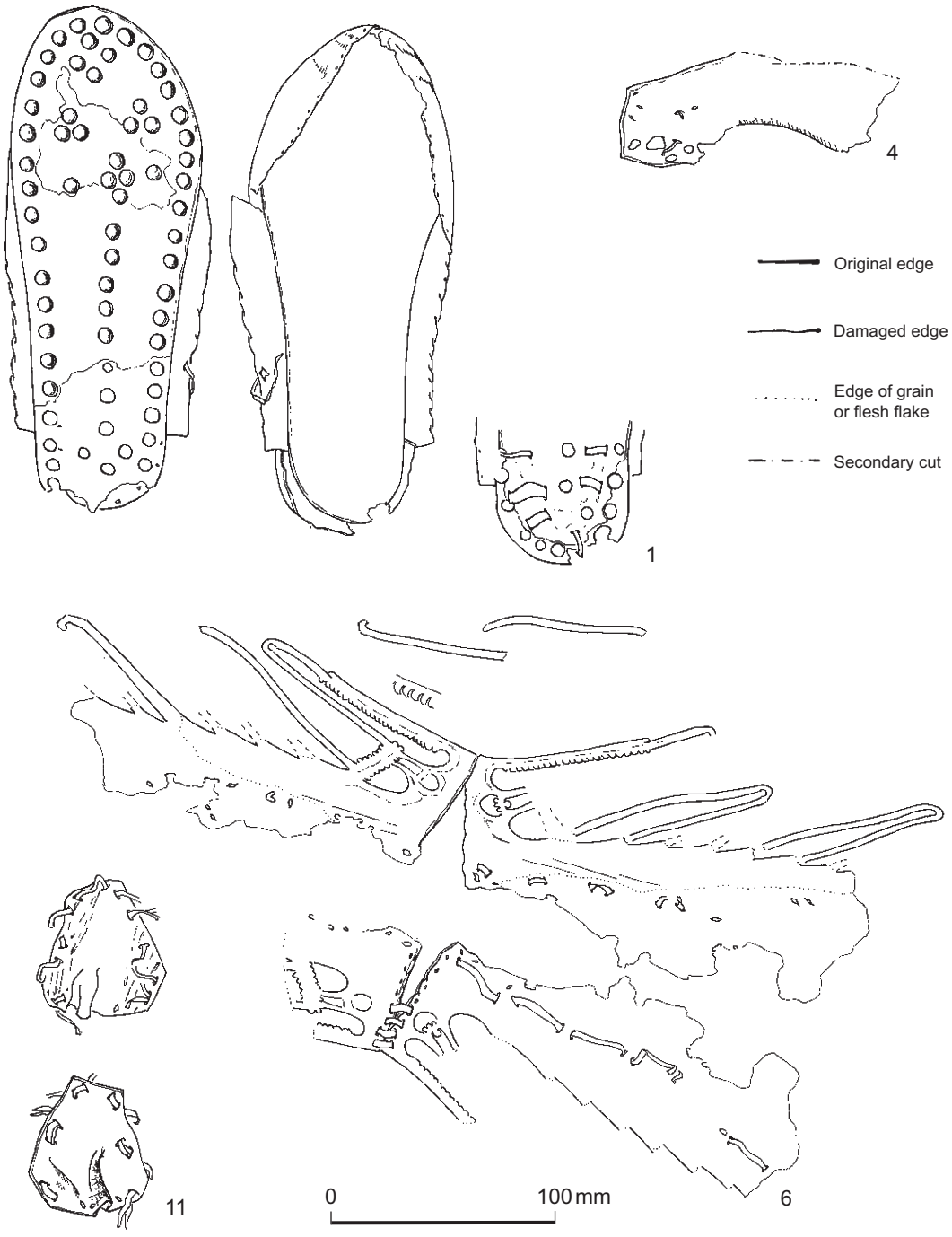

Fig. 11. Leather Cat. nos. 1, 4, 6 and 11 (Scale 1:3)

Fig. 12. Sheep/goat mortality profile based on epipyseal fusion data

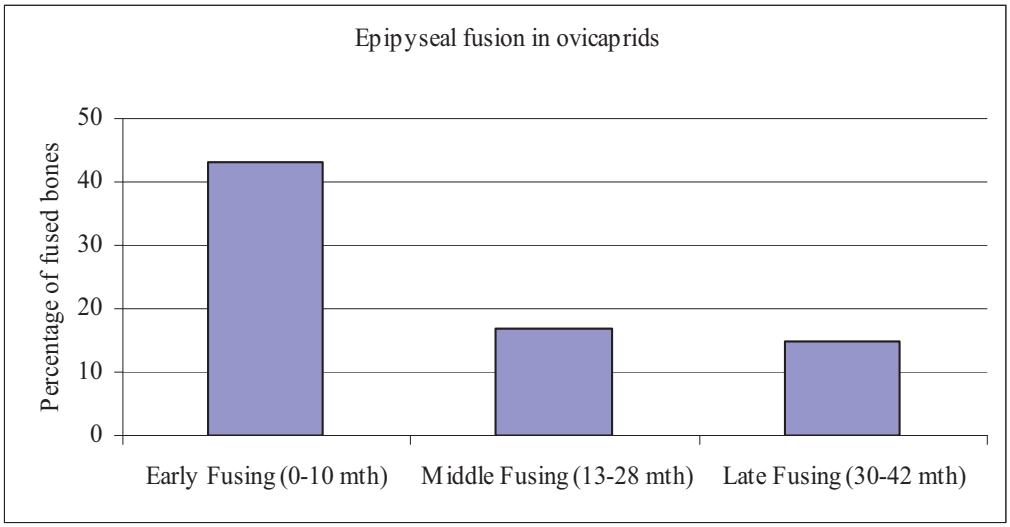

Fig. 13. Sheep/goat mortality curve based on Payne (1973)

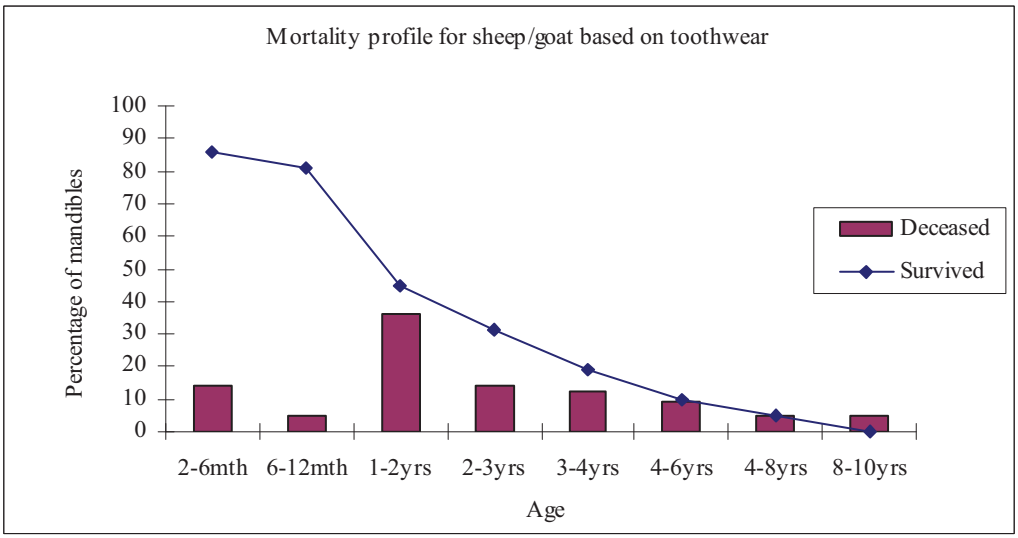

Fig. 14. A comparison of tooth wear stages for sheep/goat, sheep, and goat

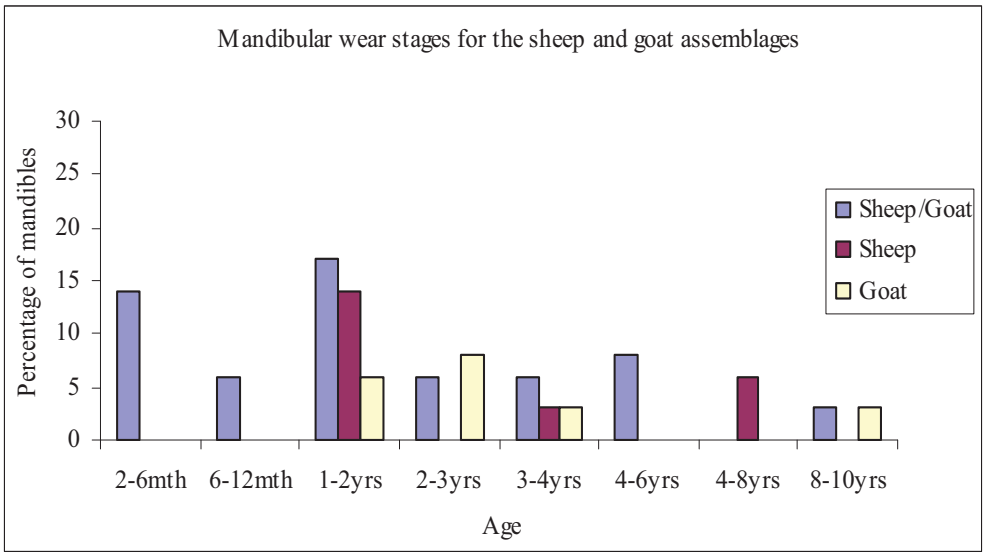

Fig. 15. MSD index against withers heights (in cm). Values for dwarf specimen are based on estimate for GL

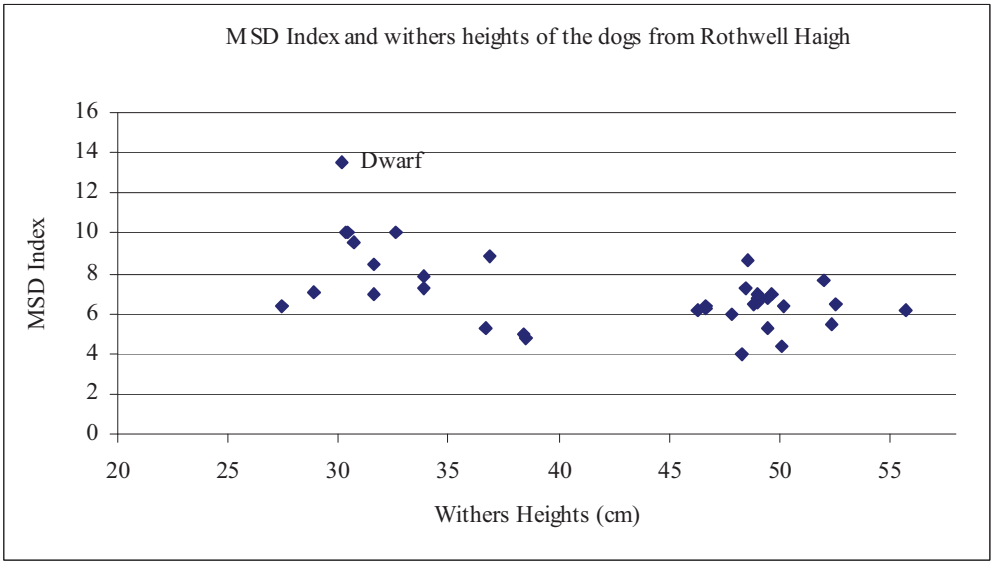

Fig. 16. A comparison of the shoulder heights and MSD indices of the dogs from Rothwell Haigh and Tripontium

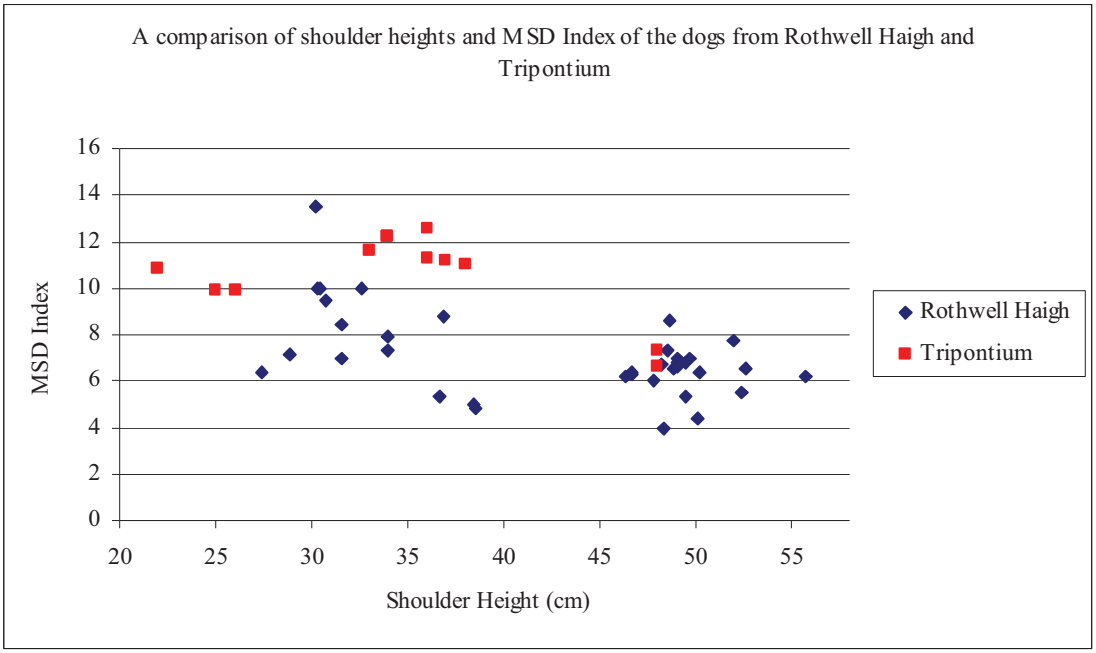

Fig. 17. Canid skull indices

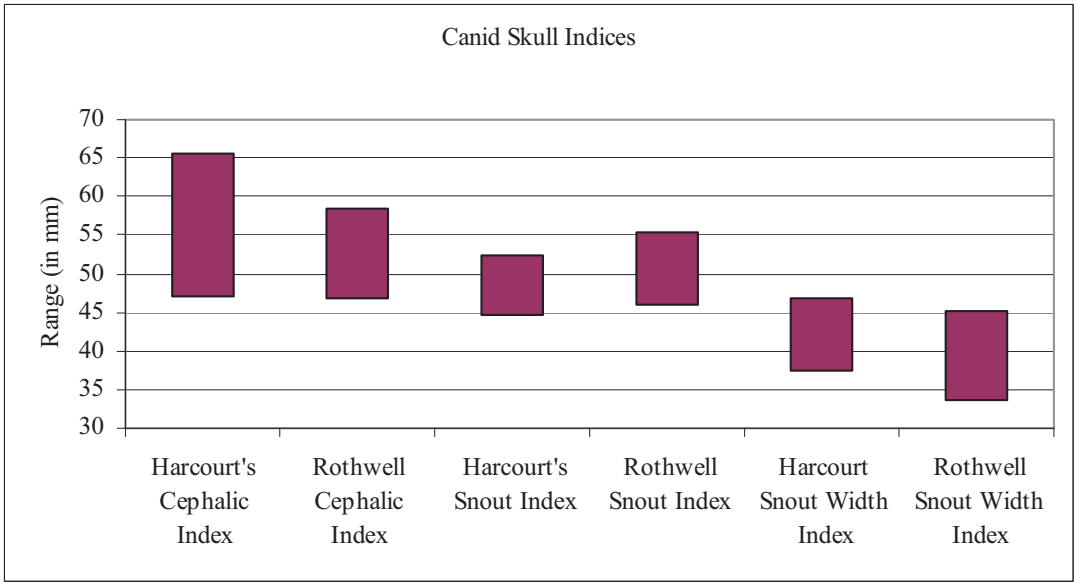

Fig. 18. Cattle mortality profile based on epipyseal fusion data

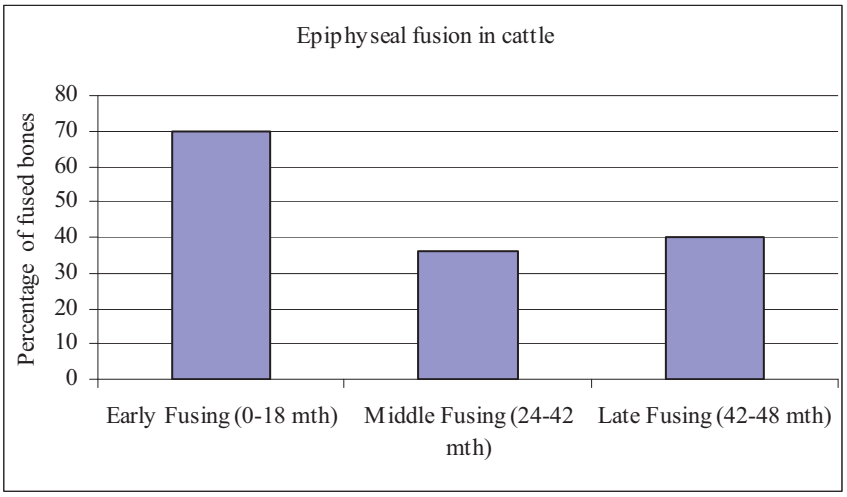

Fig. 19. Mortality curve for pigs based on epipyseal fusion data

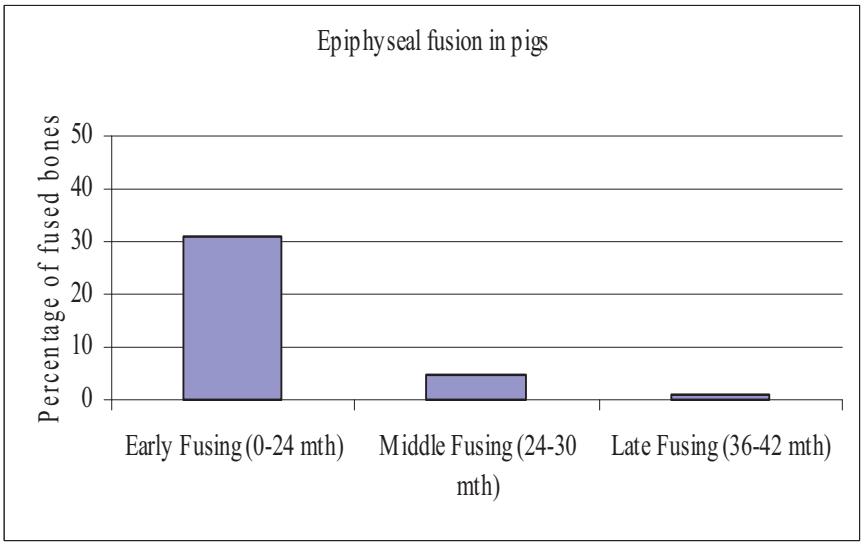

Fig. 20. Mortality curve for pigs based on tooth wear

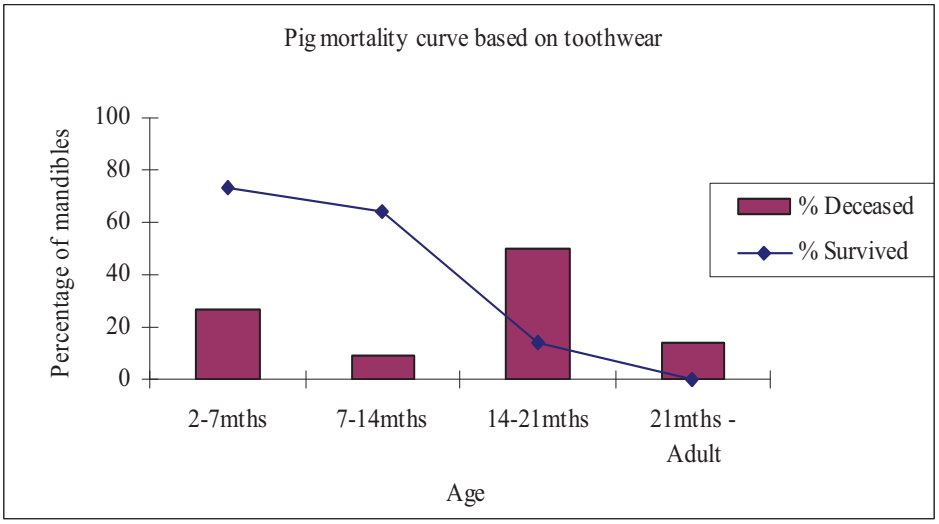

Fig. 21. Cat pelvis measurements

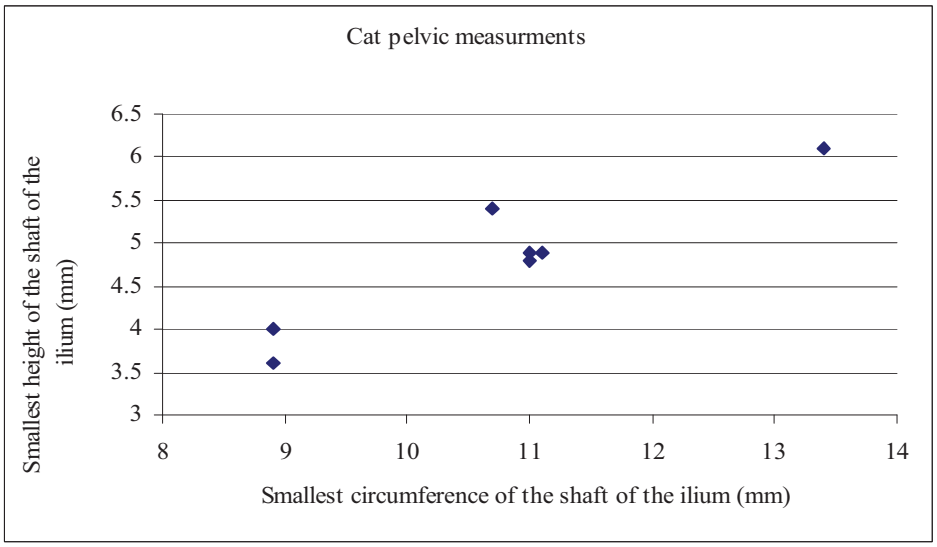

Fig. 22. Measurements of the chicken femurs

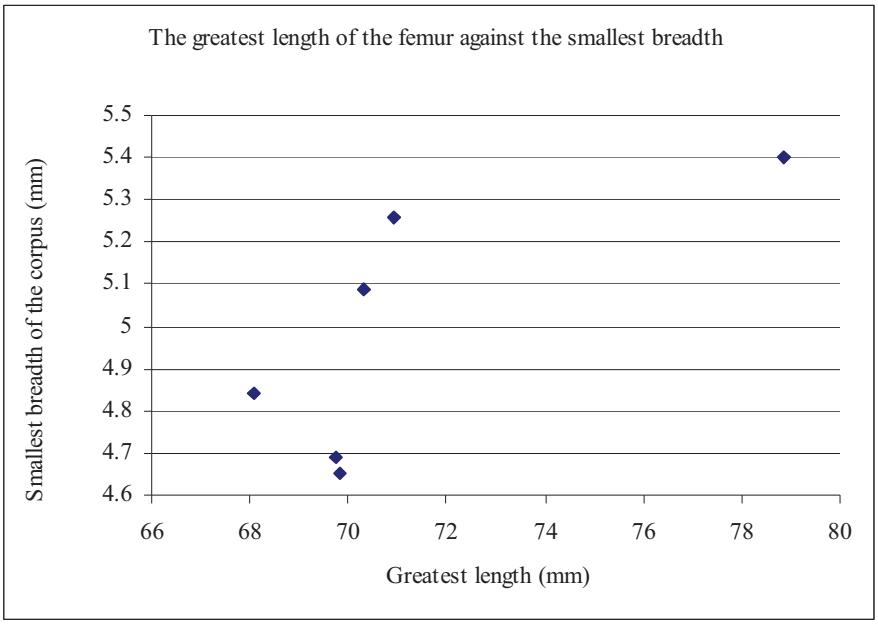

Fig. 23. Probability distributions of simulated radiocarbon results from the well (the actual dates of these samples is AD 200, 275 and 350). Each distribution represents the relative probability that an event occurred at some particular time. For each of the simulated radiocarbon measurements two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model used. The large square brackets down the left hand side along with the OxCal keywords define the overall model exactly.

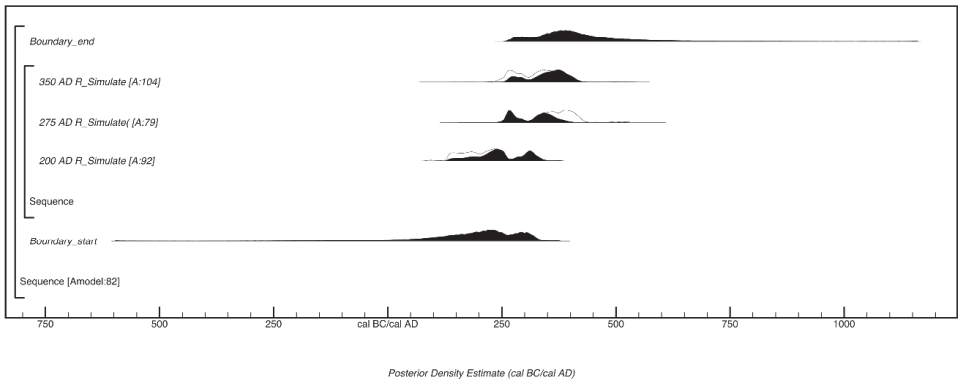

Fig. 24. Radiocarbon calibration curve 100 BC- AD 700 (Reimer *et al*. 2009) with simulated results from Fig. 23 plotted

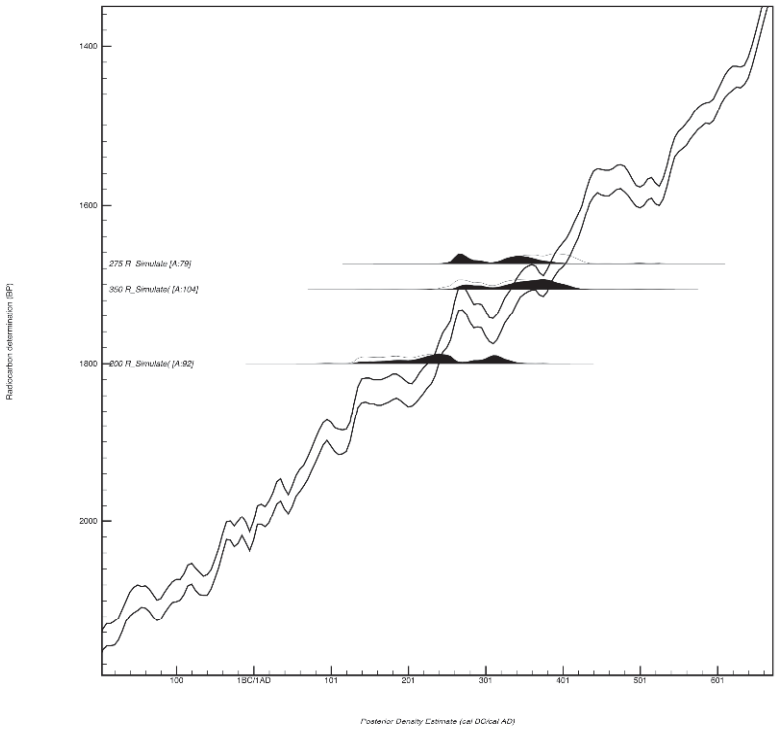

Plate 1. Section through an entrance terminal

Plate 2. Well 17 during excavation

Plate 3. Well 17 fully excavated

Plate 4. Finger ring from Well 17, 8.9-9.6m

Plate 5. Possible cup-marked boulder from Well 17, 10m

Plate 6. Human skull from Well 17, 9.6m

Appendix 1: Abbreviations for ecological codes in Appendix 2

Lower case codes in parentheses are those assigned to taxa and used to calculate the group values (the codes in capitals in Table 25; OB is based on oa+ob; RT on rt+rd+rf, SA on sf+st+ss.

'certain' outdoor taxa	oa
probable outdoor taxa	ob
aquatic taxa	w
damp ground/waterside taxa	d
strongly plant-associated taxa	p
wood-associated taxa	l
generalist decomposer taxa	rt
'dry' decomposer taxa	rd
'foul' decomposer taxa	rf
facultatively synanthropic taxa	sf
typically synanthropic taxa	st
strongly synanthropic taxa	ss

Appendix 2: Lists of invertebrate taxa recorded from the samples

For each sample assemblage the adult Hemiptera (bugs) and Coleoptera (beetles) are listed first, followed by the remaining invertebrates. The taxa are listed in descending rank order. Headers: E – mode for erosion; F – mode for fragmentation (following Kenward and Large 1998); ec – ecological codes; n – minimum number of individuals; ReM – recording method (n – non-quantitative notes only; s – scan recorded *sensu* Kenward 1992); sq? – counting method (m – 'many', translated as 15; s – 'several', translated as 6; other records are based on MNIs). For translation of ecological codes, see Appendix 1. Nomenclature follows Kloet and Hincks (1964-1967). Latin names are not italicised in this table, which is generated from a database.

Context: 999 Sample: 179 ReM: N

Weight: 0.00 E: 4.50 F: 4.00

Notes: Listed HK 12th August 2010. Tube of remains from AH. Very decayed: E 3.5-5.5, mode 4.5; F 2.5-5.0, mode 4.0. Not worth listing fully; broadly as other groups from the well, perhaps a few additional taxa from similar habitats.

Taxon	n	?sq	ec
Geotrupes sp.	1	-	oa-rf

Context: 999 Sample: 192 ReM: S

Weight: 0.00 E: 3.50 F: 3.00

Notes: Recorded HK 6th August 2010. Tube from AH. Some notably paler remains. Some ?mineral deposition on cuticle surfaces. E 2.5-4.0, mode 3.5 distinct; F 2.5-4.0, mode 3.0 weak.

Taxon	n	?sq	ec
Cercyon haemorrhoidalis	5	-	rf-sf
Megasternum obscurum	4	-	rt
Aphodius prodromus or sphacelatus	4	-	ob-rf
Catops sp.	3	-	u
Philonthus sp. A	2	-	u
Lathridius minutus group	2	-	rd-st
Cidnorhinus quadrimaculatus	2	-	oa-p
Bembidion sp.	1	-	oa

Stomis pumicatus	1	-	oa
Sphaeridium sp.	1	-	rf
Cercyon analis	1	-	rt-sf
Onthophilus striatus	1	-	rt-sf
Gyrohypnus fracticornis	1	-	rt-st
Xantholinus sp.	1	-	u
Philonthus sp. B	1	-	u
Philonthus sp. C	1	-	u
Geotrupes sp.	1	-	oa-rf
Elateridae sp.	1	-	ob
Phyllobius or Polydrusus sp.	1	-	oa-p
Sitona hispidulus	1	-	oa-p
Ceutorhynchus sp.	1	-	oa-p
Gymnetron sp.	1	-	oa-p
*Diptera sp. (puparium)	15	m	u
*Diptera sp. (adult)	1	-	u
*Coleoptera sp. (larva)	1	-	u

Context: 999 Sample: 271 ReM: S

Weight: 0.00 E: 3.00 F: 3.00

Notes: Recorded HK 6th August 2010. Flot and tube from AH. Some notably poor preservation, but variable. E 1.5-4.0, mode 3.0 weak; F 1.5-4.0, mode 3.0 weak.

Taxon	**n**	**?sq**	**ec**
Xantholinus sp.	9	-	u
Strophosomus nebulosus	8	-	oa-p
Brachypterus sp.	4	-	oa-p
Cidnorhinus quadrimaculatus	4	-	oa-p
Philonthus sp.	3	-	u
Aphodius prodromus	3	-	ob-rf
Agriotes pallidulus	3	-	oa-p

Atomaria sp. A	3	-	rd
Orthoperus sp. A	3	-	rt
Enicmus sp.	3	-	rt-sf
Rhinoncus pericarpius	3	-	oa-p
Trechus micros	2	-	u
Calathus ?melanocephalus	2	-	oa
Micropeplus fulvus	2	-	rt
Acidota cruentata	2	-	oa
Lathrobium sp.	2	-	u
Tachinus ?signatus	2	-	u
Phyllopertha horticola	2	-	oa-p
Athous haemorrhoidalis	2	-	oa-p
Orthoperus sp. B	2	-	rt
Phyllobius sp.	2	-	oa-p
Tropiphorus terricola	2	-	oa
Aphrodes sp.	1	-	oa-p
Auchenorhyncha sp.	1	-	oa-p
Carabus violaceus	1	-	oa
Trechus obtusus or quadristriatus	1	-	oa
Pterostichus melanarius	1	-	ob
Pterostichus (Poecilus) sp.	1	-	oa
Amara aulica	1	-	oa
Amara sp.	1	-	oa
Carabidae sp.	1	-	ob
Sphaeridium sp.	1	-	rf
Cercyon haemorrhoidalis	1	-	rf-sf
Megasternum obscurum	1	-	rt
Chaetarthria seminulum	1	-	oa-w
Histerinae sp.	1	-	rt
Leiodes sp.	1	-	u
Catops sp.	1	-	u

Catopinae sp.	1	-	u
Omalium sp.	1	-	rt
Stenus sp. A	1	-	u
Stenus sp. A	1	-	u
Stenus sp. B	1	-	u
Stenus sp. B	1	-	u
Rugilus sp.	1	-	rt
Othius sp.	1	-	rt
Staphylinus olens	1	-	u
Staphylinus sp.	1	-	u
Tachyporus sp.	1	-	u
Tachinus laticollis or marginellus	1	-	u
Aleocharinae sp. A	1	-	u
Aleocharinae sp. C	1	-	u
Pselaphidae sp.	1	-	u
Geotrupes sp.	1	-	oa-rf
Aphodius ?depressus	1	-	oa-rf
Aphodius granarius	1	-	ob-rf
Athous hirtus	1	-	oa-p
Agriotes sp.	1	-	oa-p
Atomaria sp. B	1	-	rd
Corticaria sp.	1	-	rt-sf
Phaedon sp.	1	-	oa-p
Apion sp. A	1	-	oa-p
Apion sp. B	1	-	oa-p
Sitona sulcifrons	1	-	oa-p
Cidnorhinus quadrimaculatus	1	-	oa-p
Ceutorhynchus sp.	1	-	oa-p
Orobitis cyaneus	1	-	oa-p
Gymnetron labile	1	-	oa-p
Curculionidae sp.	1	-	oa

Coleoptera sp.	1	-	u
*Hymenoptera sp.	15	m	u
*Acarina sp.	15	m	u

Context: 999 Sample: 405 ReM: S

Weight: 0.00 E: 3.50 F: 3.50

Notes: Recorded HK 12th August 2010. Tube and flot jar from AH. Some very decayed, fossils mostly broken, even tiny sclerites. E 3.0-5.0, mode 3.5 weak; F 2.5-5.0, mode 3.5 weak.

Taxon	**n**	**?sq**	**ec**
Aphodius prodromus	7	-	ob-rf
Aphodius fimetarius or pedellus	4	-	oa-rf
Atomaria sp. B	4	-	rd
Cercyon haemorrhoidalis	3	-	rf-sf
Geotrupes sp.	3	-	oa-rf
Cidnorhinus quadrimaculatus	3	-	oa-p
Trechus micros	2	-	u
Cercyon ?terminatus	2	-	rf-st
Megasternum obscurum	2	-	rt
Stenus sp. A	2	-	u
?Medon sp.	2	-	u
Xantholinus sp.	2	-	u
Aphodius sp. B	2	-	ob-rf
Melolontha sp.	2	-	oa-p
Phyllopertha horticola	2	-	oa-p
Lathridius minutus group	2	-	rd-st
Enicmus sp.	2	-	rt-sf
Apion sp. B	2	-	oa-p
Ceutorhynchus ?contractus	2	-	oa-p
Anthocoris sp.	1	-	oa-p

Notiophilus substriatus	1	-	oa
Clivina fossor	1	-	oa
Trechus obtusus or quadristriatus	1	-	oa
Bembidion sp.	1	-	oa
Pterostichus melanarius	1	-	ob
Pterostichus (Poecilus) sp.	1	-	oa
Calathus fuscipes	1	-	oa
Calathus ?melanocephalus	1	-	oa
?Harpalus sp.	1	-	oa
Sphaeridium sp.	1	-	rf
Cercyon analis	1	-	rt-sf
Cryptopleurum ?crenatum	1	-	rf-st
Histerinae sp.	1	-	rt
Limnebius sp.	1	-	oa-w
Ptenidium sp.	1	-	rt
Silpha sp.	1	-	u
Acidota crenata	1	-	oa
Omalium sp. A	1	-	rt
Omalium sp. B	1	-	rt
Syntomium aeneum	1	-	oa
Anotylus ?tetracarinatus	1	-	rt
Stenus sp. B	1	-	u
Staphylinus olens	1	-	u
Staphylinus sp.	1	-	u
Tachinus sp.	1	-	u
Drusilla canaliculata	1	-	u
Aleocharinae sp.	1	-	u
Aphodius sp. A	1	-	ob-rf
Aphodius sp. C	1	-	ob-rf
Oxyomus sylvestris	1	-	rt-sf
Agrypnus murinus	1	-	oa-p

?Athous haemorrhoidalis	1	-	oa-p
Prosternon tessellatum	1	-	oa
Agriotes pallidulus	1	-	oa-p
Agriotes sp.	1	-	oa-p
Brachypterus sp.	1	-	oa-p
Cryptophagus sp.	1	-	rd-sf
Atomaria sp. A	1	-	rd
Chaetocnema concinna	1	-	oa-p
Apion (Erythrapion) miniatum	1	-	oa-p
Apion sp. C	1	-	oa-p
Sitona sp.	1	-	oa-p
Hypera punctata	1	-	oa-p
Gymnetron sp.	1	-	oa-p
Coleoptera sp.	1	-	u
*Acarina sp.	15	m	u
*Hymenoptera sp.	6	s	u
*Aranae sp.	1	-	u

Context: 999 Sample: 461 ReM: S

Weight: 0.00 E: 3.50 F: 3.50

Notes: Recorded HK 12th August 2010. Tube of remains from AH; many fragmentary, distinctly decayed, some floppy. E 2.5-4.0, mode 3.5 weak; F 2.5-5.0, mode 3.5 weak.

Taxon	**n**	**?sq**	**ec**
Megasternum obscurum	3	-	rt
Aphodius contaminatus	3	-	oa-rf
Aphodius prodromus	3	-	ob-rf
Calathus fuscipes	2	-	oa
Harpalus rufipes	2	-	oa
Catops sp.	2	-	u
Geotrupes sp.	2	-	oa-rf

Aphodius sp. B	2	-	ob-rf
Clivina sp.	1	-	oa
Trechus ?quadristriatus	1	-	oa
Trechus micros	1	-	u
Pterostichus melanarius	1	-	ob
Pterostichus sp.	1	-	ob
Calathus ?melanocephalus	1	-	oa
Amara sp.	1	-	oa
Harpalus sp.	1	-	oa
Harpalus sp.	1	-	oa
Carabidae sp.	1	-	ob
Helophorus sp.	1	-	oa-w
Cercyon analis	1	-	rt-sf
Cercyon haemorrhoidalis	1	-	rf-sf
Cercyon unipunctatus	1	-	rf-st
Cryptopleurum minutum	1	-	rf-st
Hydrophilinae sp.	1	-	oa-w
Lesteva ?longoelytrata	1	-	oa-d
Anotylus nitidulus	1	-	rt
Lathrobium sp.	1	-	u
Othius sp.	1	-	rt
Xantholinus sp.	1	-	u
Philonthus sp.	1	-	u
Staphylininae sp.	1	-	u
Tachyporus ?hypnorum	1	-	u
Aphodius granarius	1	-	ob-rf
Aphodius sp. A	1	-	ob-rf
Onthophagus sp.	1	-	oa-rf
Hoplia philanthus	1	-	oa-p
Elateridae sp.	1	-	ob
Anobium punctatum	1	-	l-sf

Lathridius minutus group	1	-	rd-st
Corticariinae sp.	1	-	rt
Phyllotreta sp.	1	-	oa-p
Halticinae sp.	1	-	oa-p
Apion sp. A	1	-	oa-p
Apion sp. B	1	-	oa-p
Apion sp. C	1	-	oa-p
Apion sp. D	1	-	oa-p
Rhinoncus sp.	1	-	oa-p
Curculionidae sp. A	1	-	oa
Curculionidae sp. B	1	-	oa
*Dermaptera sp.	1	-	u
*Aranae sp.	1	-	u

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