Worcestershire Archaeology Research Report No.10

Archaeological excavation at the site of

THE HIVE, THE BUTTS, WORCESTER

Richard Bradley, C Jane Evans, Elizabeth Pearson, Suzi Richer and Simon Sworn

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(WCM 101653, 101655, 101656, 101657, 101658, 101830, 101832, 101890)

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worcestershire county council

2018

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Published by Worcestershire Archaeology
Archive & Archaeology Service,
The Hive, Sawmill Walk,
The Butts, Worcester.
WR1 3PD

ISBN 978-1-9998288-0-6

Worcestershire,County Council
County Hall, Spetchley Road, Worcester.
WR5 2NP

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Front cover illustration: aerial view of the aisled building, facing south (Aerial-Cam)

This report is dedicated to the memory of Hal Dalwood (1957–2015), who contributed so much to our knowledge of the archaeology of Worcester

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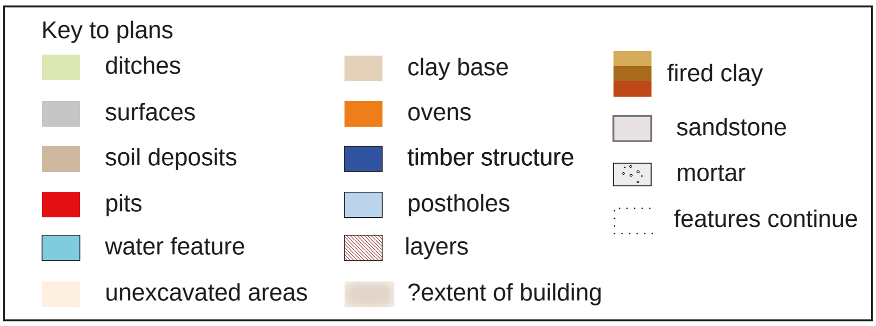
Abbreviations

AMS	Accelerator Mass Spectrometry
AOD	Above Ordnance Datum (sea level)
ARCA	ARCA is a specialist geoarchaeological consultancy based at the University of Winchester
AU	Activity Unit, see 4.3 Structural Data
CG	Context Group, see 4.3 Structural Data
CIfA	Chartered Institute for Archaeologists, formerly the Institute for Archaeologists (see IfA)
Rim EVE	Estimated vessel equivalent for ceramic vessels based on the proportion of rim surviving
FRG	Finds Research Group
GPS Ltd	Global Probing and Sampling Ltd
HEAS	Historic Environment and Archaeology Service
HER	Historic Environment Record
IfA	Institute for Archaeologists, now the Chartered Institute for archaeologists, see CIfA
kya	Thousand years ago
MNI	Minimum number of individuals (animal bone)
MNV	Minimum number of vessels
NCIET	Northern Centre for Isotopic and Elemental Tracing
NHLE	National Heritage List for England, https://historicengland.org.uk/listing/the-list/
NISP	Number of identified specimens (animal bone)
NRM	natural remanent magnetisation
OSL	optically stimulated luminescence (scientific dating technique)
PFI	Private Finance Initiative (a way of creating ‘public–private partnerships’ by funding public infrastructure projects with private capital)
RFG	Roman Finds Group
TLP	Total Land Pollen
SUERC	Scottish Universities Environmental Research Centre
WAAS	Worcestershire Archive and Archaeology Service
WCM	Worcester City Monument (HER number)
WCM	With reference to cattle mandible samples, WCM 1–6 denote the six samples submitted for isotope ratio analysis
WCMAS	Worcester City Museum Archaeology Section
WHEAS	Worcestershire Historic Environment and Archaeology Service
WSI	Written Scheme of Investigation
WSM	Worcestershire Sites and Monuments (HER number)



In fact, every succeeding year discovers the incorrect views of those antiquaries, who like Mr Abingdon, suppose that Worcester had no existence in the time of the Romans. I would suggest to antiquaries the more particular examination of the rising tract of ground along the line of the Butts, from old St Clement's church to Angel Street, it is not improbable their trouble might be repaid.

Ambrose Florence 1828

Summary

Archaeological fieldwork undertaken prior to and during redevelopment for the Worcester Library and History Centre (The Hive) included area excavations, evaluation trenching, building recording and watching brief observations. The investigations successfully retrieved a range of evidence for settlement of Roman date, Civil War period defensive features (including re-cutting of the medieval city ditch) and for less intensive land use during later periods before 19th century buildings were constructed. The wider landscape was also investigated and interpreted, mainly through ecofactual and geoarchaeological evidence.

Modern archaeological fieldwork in the area north of the medieval city wall has led to the understanding that this area is a significant part of the Roman settlement at Worcester. Excavation along The Butts, Farrier Street, Castle Street and at City Campus (formerly Worcester Royal Infirmary) has demonstrated variable Roman occupation, including domestic and agricultural activity, timber buildings, surfaces and quarrying, as well as extensive domestic and industrial rubbish disposal.

It is alongside this expanding knowledge that the archaeology at The Hive has been considered, and it is apparent that the site articulates and informs understanding of this area during the peak of Roman occupation at Worcester. The project also adds many new insights into the character and development of the 'small town' and for this reason can be viewed as an accumulation of archaeological evidence that is nationally important.

A range of features demonstrated the organisation and development of the Roman settlement, particularly the layout of a street frontage and the types of buildings constructed. Alongside this, secondary deposition indicated the suite of material culture associated with the population and supported and expanded on existing knowledge for the economic base of the settlement. Roman activity was recorded on the edge of the gravel terrace and the terrace slope, and down across the floodplain of the River Severn, where extensive dumping of slag demonstrated that large-scale land reclamation was occurring. Structural and occupation evidence was focused along the northern edge of the excavated area, where the gables of three small buildings abutted a road aligned east to west which probably led to the river frontage. The buildings have been interpreted as commercial in function and perhaps represent a small-scale trading district that serviced riverside and roadside industrial working.

Roman occupation was dated between the 1st century and the late 4th century AD, but was most intensive between the mid- to late 2nd century and the early 4th century. In this period the settlement at Worcester was at the height of its economic development, during which ironworking was a major focus, potentially alongside cattle trading. A later change of land use saw the construction of a large aisled building, probably part of a suburban property associated with, or subsidiary to, a large town house or villa nearby. High status building material has been recovered from a number of features on sites in this area of the settlement, and later finds from The Hive, including stone roof tile, box flue tiles, an antefix, and slipped *tegula*, correlate well with this localised evidence.

Accumulation of tillage soil occurred from the late Roman period onwards, but apart from this substantial layer of ploughsoil there was little demonstrable post-Roman or early medieval activity on the site. This pattern is consistent with that observed on adjacent sites and much of the surrounding area. Throughout the medieval and earlier post-medieval periods the site was open land, lying immediately beyond the city wall and dominated by gardens and pasture on which domestic animals were managed or grazed.

A section through the city ditch was excavated, the first near complete profile exposed for many decades. This was shown to have been entirely re-cut in the late medieval period, as well as in the mid-17th century on two occasions. This was indicative of re-establishment of the defences during the Civil War. Further information on the character of the city wall itself, particularly strengthening elements added at the rear, can be combined with evidence from other sites to improve knowledge of the city defences.

Further out from the main defences activity was very limited, although a few pits contained medieval pottery and on the floodplain a 17th century pit containing a dump of casting moulds provided evidence for post-medieval cauldron manufacture in Worcester. Ditches transecting the main part of the site may have dated to the Civil War period and relate to extra-mural defensive circuits associated with the siege of the city, correlating well with nearby excavations.

Overall, the excavation is integral to understanding of the character of the northern area of the Roman town and its development through time, and will inform any future work in this part of the settlement.

Background

Richard Bradley, Hal Dalwood and Simon Woodiwiss

Reasons for the project

From July 2008 to July 2011, the Field Section of Worcestershire Historic Environment and Archaeology Service (WHEAS; now Worcestershire Archive and Archaeology Service) carried out archaeological field evaluation, excavation, watching brief and building recording, and a programme of community engagement at land off The Butts, Worcester. This occured prior to and during redevelopment of the area as the Worcester Library and History Centre (NGR: SO 8463 5507; Fig 1). The building constructed on the site was officially named as 'The Hive' in 2011 and was opened by Her Majesty the Queen on 11 July 2012.

Development of the site was first proposed in 2004, when Worcestershire County Council and the University of Worcester began working together (through a Joint Project Team) to create a unique combination of services within one building. These were a joint public and university library (the first in Europe), a public area and offices for WHEAS and Worcestershire Record Office, and a City and County Council customer services hub.

It was recognised at an early stage that there would be implications and opportunities for the historic environment during the construction of The Hive and the Joint Project Team worked closely with the planning authority (Worcester City Council) to address and realise these.

Project design and the planning process

A desk-based assessment was prepared in 2005 (Miller *et al* 2005), and was revised at various times to incorporate new information as the project progressed. This anticipated numerous archaeological deposits and structures of various dates within the site area. An initial stage of fieldwork, involving two phases of evaluation, was undertaken in 2006 and 2007 (Sworn and Phear 2007). Although fieldwork was limited in extent due to the presence of standing buildings and the need to retain access to the occupied site, there was evidence for extensive archaeological remains of Roman and post-medieval date across the whole development site. The final revision of the desk-based assessment was in 2008 (Miller *et al* 2008). Outline planning permission and conservation area consent for demolition was obtained on 12 October 2006 (application numbers P06D0271 outline planning application for erection of new library and history centure, and L06D0044 demolition of buildings at Coomber Electronics, City Council depot and Transwipers). Final planning permission and conservation area consent was obtained on 23 July 2009 (application numbers P09D0168 installation of a water abstraction and discharge unit on the bank of the River Severn and the installation of pipework, underground, from the abstraction unit to the boundary of the proposed library and history centre (at The Butts) to provide a water resource for the cooling of the building, P09D0169 development of a library and history centre, hotel, various commercial premises including shops and restaurants, landscaping and associated works, and L09D0032 demolition of part of the former office of Joseph Woods).

The planning permissions required conditions relating to archaeology. These included:

- A written scheme of investigation (archaeological mitigation strategy/ programme of archaeological work).
- Provision for the preservation of significant remains or their recording.

- Provision for substantial public involvement during excavation.
- Recording of historic buildings.
- Monitoring of burial environments.
- Arrangements for dealing with unexpected discoveries.
- Arrangements for publication and archiving.
- A requirement to agree design of groundworks and foundations.

The development project was to be funded by means of a Private Finance Initiative (PFI). A key aim of the Joint Project Team was to use the time between obtaining outline planning permission and the award of the construction contract (associated with obtaining detailed planning permission) to 'de-risk' the development site as far as possible. Archaeological works are generally undertaken at the start of any construction programme and as such any delays are likely to have significant cost implications. Removing this risk was likely to result in lower costs throughout the 25 years of the financial programme. A written scheme of investigation (WSI; HEAS 2008) was prepared at the request of the Joint Project Team, co-ordinated by Strategic Projects, Worcestershire County Council. The WSI was developed to address the conditions of the outline planning permission, and to conform to a series of written briefs prepared by Worcester City Council (WCMAS 2008a, 2008b and 2008c). A major component of this project design was the implementation of a ten-week programme of public engagement, comprising on-site training in a community excavation, daily site tours and educational activities. This was to be carried out concurrently with a professional archaeological excavation. The WSI also included evaluation of areas for which access became available. Recording of historic buildings was to be undertaken just prior to demolition in advance of the archaeological excavation.

The main design and build contract was subject to tender. As well as being supplied with documents prepared to inform the design process (the desk-based assessment, evaluation reports etc), tenderers received feedback on the impact of designs and suggestions for opportunities for historic referencing resulting from the ongoing fieldwork. There was a continuous dialogue between the tenderers and the Joint Project Team's archaeological advisor. The tender for the archaeological work was won by WHEAS.

When WHEAS developed and costed the archaeological fieldwork project the design of the building had not been finalised. The PFI competition process meant that multiple designs for the building existed until very late in the archaeological fieldwork programme. The scope of the archaeological work was, therefore, revised as decisions were made as to which design was to be built. The winning building design was later modified as a result of dicussions with the Joint Project Team, which had implications for the archaeological fieldwork project. WHEAS worked closely with Worcester City Council's Archaeological Officer during this process.

The archaeological mitigation strategy aimed to preserve important archaeological deposits *in situ* or, where that was not achievable, to undertake archaeological excavation (preservation by record). Excavation was focused on the parts of the development site which would be impacted by construction of the new buildings. The depth of excavation was dictated either by the level of the natural deposits or by the formation level required by the development, each of which varied across the site. As the archaeological project advanced it included additional evaluation elements (as areas of land became available, such as the area under Coomber

Electronics) and watching brief work (for instance during geotechnical investigation as the main project design progressed).

Further fieldwork, consisting of a watching brief on various elements of the construction work, was undertaken during 2010 and 2011, with a scope of work set out in a separate WSI (HEAS 2011b). This project was commissioned by Hyder Consulting on behalf of their client, Galliford Try, the main contractor for the construction project. The watching brief focussed on particular elements of construction (such as foundations for ‘Story Island’ (Trench 27), services alongside the viaduct, the attenuation tank, and the city wall). The watching brief also included an area about 125m to the west of the main development site on the embankment of the River Severn. This was where water was to be abstracted from the River Severn and fed to the main building via a pipeline (directionally drilled but with access pits). The results of the watching brief were of direct relevance to the main stages of fieldwork and have, therefore, been integrated into this report.

The archaeological fieldwork recorded extensive and significant structural remains and associated deposits relating to historic buildings. All the historic buildings and boundary walls on the site were fully recorded prior to demolition or refurbishment. Where deposits are related directly to the recording of historic buildings they are covered in detail in a separate report focused solely on the building recording (Robson-Glyde 2016), but are summarised below. Two very small interventions were also carried out through the brick facing of the extant city wall aiming to establish the potential for survival of stonework behind. The section of wall within the site limits is scheduled as an ancient monument under the *Ancient Monuments and Archaeological Areas Act 1979* (NHLE 2014, 1003778); it is also a Grade II Listed Building (NHLE 2014, 1390186). The city wall was first listed in 1971. Scheduled Monument Consent was given for this part of the project.

Aims and objectives

Richard Bradley

Aims

Following the fieldwork stage and initial assessment of results, both of which revealed that the archaeological results were more extensive and wide-ranging than had been originally anticipated, an updated project design was issued (HEAS 2011c). Revised aims for the project were therefore identified, based on the new understanding of the archaeological potential for the site. These were:

- To produce a full understanding of the Roman occupation for this part of the Roman settlement and activity on the floodplain. This analysis will lead to a new knowledge framework for the development and character of the Roman town at Worcester.

- To produce a full understanding of the evidence relating to the development of the defences of Worcester and the periphery of the town in the medieval period and during the Civil War.

- To produce a detailed investigation into 19th century buildings and land use in The Butts area of Worcester.

Objectives

The primary objectives for the fieldwork were based on research priorities identified by the Worcester City Council Archaeological Officer, augmented to include additional priorities highlighted as a result of the revised desk-based assessment (Miller *et al* 2008). These objectives were detailed in the WSI (HEAS 2008) and were largely drawn from the published research framework for the City of Worcester, which identifies a wide range of archaeological Research Priorities for broad periods and for cross-period themes (Worcester City Council 2007).

It was evident at the outset of the work that the project would contribute towards several of the Research Priorities. In the event, the objectives for the project were slightly revised as a result of fieldwork and the assessment stage of work (HEAS 2011c), highlighting the following overall research priorities for the project (**RP** – Research Priority; **ARP** – Additional Research Priority):

- The dating, character and origins of the River Severn alluviation (**RP 1.3**).

- Stream valleys and gullies on the east bank of the Severn – their identification, character and significance (**RP 1.6**).

- Analysis of Neolithic – early Bronze Age flint and other finds and their distributions (**RP 2.2**).

- The Roman road network (**RP 3.7**).

- Dumping of Roman iron slag (**RP 3.8**).

- The Roman iron industry (**RP 3.19–3.23**).

- Other Roman industries (**RP 3.24**).
- The consumption of iron (and other materials) within Roman Worcester (**RP 3.25**).
- Sampling and analysis of ‘dark earth’ (**RP 3.26**).
- Collation of data on Roman building materials (**RP 3.29**).
- Documenting the extents of Roman Worcester (**RP 3.30**).
- Northern medieval defensive sequence (**RP 5.23**).
- City defences in the post-medieval period, including those of the Civil War (**RP 6.14**).
- Landscape of the 1651 battle (**RP 6.15**).
- The late Roman to post-Roman transition (**RP 7.12**).
- Environmental change in Worcester’s hinterland (**RP 7.21**).
- The development of post-medieval industry in Worcester (**ARP 1**).

The site in context

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Location, topography and former land use

The development site occupies an area of approximately 1.2ha in close proximity to the centre of Worcester, immediately north of the medieval city wall, and almost 125m from the eastern bank of the River Severn (Fig 1). It is located between 18m and 14.50m AOD (pre-development levels) on broadly level ground before sloping down to the river floodplain in the west. A modern residential development (Magdala Court, formerly 14–24 The Butts) exists to the east. To the north, the site is bounded by the viaduct carrying the Worcester to Hereford railway (WCM 98522) and a second viaduct that carried The Butts branch line (WCM 98523), which once descended from Foregate Street Station to riverside quays. The planning application boundary extended slightly to the north of the railway viaduct onto land previously occupied by Worcester Royal Infirmary, but no significant archaeological works were undertaken here during this project. The land to the west is occupied by the Cattlemarket Car Park, located on the floodplain of the River Severn. The main part of the development site is bounded on the south by The Butts road. A small part of the development is on land to the south of The Butts, and includes the line of the city wall, which here follows an east to west alignment as the northern defences of the medieval city.

Prior to the project commencing, the eastern half of the development site (Area 1; Fig 2) was occupied by 19th century and modern buildings, together with hard standing associated with the former Joseph Wood timber yard and its subsequent use as a Worcester City Council depot. The south-western portion of the site comprised part of the Cattlemarket Car Park (Area 3), formerly a Victorian cattle market (in use until the late 20th century). The north-western part was occupied by Coomber Electronics, using a former abattoir building (1970s) from the cattle market. Croft Walk ran between the council depot and Coomber Electronics. The area on the southern side of The Butts (Area 2) was formerly a 19th century building occupied by Transwipers, and Rack Alley, which heads southwards from The Butts before turning east just to the south of the city wall.

Geology

A thorough geoarchaeological assessment involving borehole survey was undertaken during the evaluation stage of the project and provided detailed information on geological formations (Wilkinson and Marter 2006). This is considered in more detail below (see Period 1: Geological deposits and Appendix 2) but is briefly summarised here.

Existing information indicated a provisional outline of gravel, mudstone, and alluvium from east to west in this area (Fig 6; as shown by geology maps at a scale of 1:50,000; British Geological Survey 1983 and 1984). The geoarchaeological assessment revealed more detail, but broadly confirmed this sequence. Immediately to the east of the site, there are the sand and gravel deposits of the 2nd Worcester Terrace of the River Severn. The site itself straddles sandstones and mudstones (Sidmouth Mudstone Formation; formerly the Eldersfield Mudstone Formation), being the very western edge of the 2nd Worcester Terrace (below the superficial sand and gravel deposits further east), and bedded alluvial sands and silts across the Severn floodplain (Holocene Elmore Member).

Archaeological context

Prehistory

There was little previous evidence to suggest that the area of the site was occupied in earlier or later prehistory, and no deposits of prehistoric date were found in the evaluation and borehole work (Sworn and Phear 2007; Wilkinson and Marter 2006). The desk-based assessment did, however, highlight the potential for alluvial deposits of prehistoric date across the floodplain in the western part of the site (Miller *et al* 2008).

It was noted over 40 years ago that prehistoric settlement within the City of Worcester appeared limited (Barker 1969a, 13–14), despite the apparent suitability of the gravel terrace for settlement. Isolated examples (although the picture is developing) include the excavations at Lich Street in the 1960s, which produced small-scale evidence of early prehistoric occupation in the form of Bronze Age pottery, but also a large ditch dated to the Iron Age (Barker 1969b), and the limited range of Bronze Age and Iron Age artefacts and features recorded during the Deansway excavations (Dalwood 2004b, 36–9). A limited number of Dobunnic coins have also been recorded (Fendall 1969, 106). Further to the south of the city, during excavations at Bath Road in 2006 and 2007, Mesolithic pits with struck flint and an Iron Age enclosure ditch were discovered on a ridge overlooking the River Severn (Rogers 2014). Overall, however, the form and character of prehistoric occupation within the historic city and its suburbs is poorly understood and appears to have been widely dispersed. Therefore, there remains a major question over the continuity of any settlement from pre-Roman times.

The suggestion has been made that the Roman 'small town' developed as an intensification and urbanisation of a pre-existing Iron Age centre of occupation (Worcester City Council 2007, 22; Butler and Cuttler 2011, 3). Cunliffe (1991, 174) previously proposed that this may have taken the form of a political centre for the Dobunni tribe, though this hypothesis has not been revisited in more recent editions of his text. Support for earlier assessments of the Iron Age origins of the Roman town has recently been revealed beneath the site of the Norman castle, with the important discovery of a palisaded rampart dated to the 7th to 5th centuries BC. This sealed artefacts of Neolithic to Bronze Age date, suggesting that there is the potential for the survival of similar deeply buried deposits elsewhere in the city where later soils protect them from truncation (Napthan 2014).

Borehole survey and environmental analysis on the west bank of the River Severn at Worcester Arena, around 400m south west of the current site, has provided important new information on the prehistoric environment in the wider surrounds of Worcester. Two palaeochannels were identified either side of a gravel ridge; one was radiocarbon dated to the early Neolithic period, the other to the early Bronze Age. Environmental indicators suggested woodland clearance during the Iron Age, probably for agricultural purposes. The identification of stratified early prehistoric deposits represents highly significant archaeological information and suggests that deeply buried archaeological and palaeoenvironmental remains could exist across the area, despite extensive post-medieval and modern truncation (Daffern 2016).

Roman period – the 'small town'

Excavations since the 1960s, prior to major redevelopment of the historic core of the city centre, have provided an insight into the urban development of Worcester, demonstrating intensive areas of occupation throughout the Roman period (see Figs 7 and 8). This dates from the later 1st century AD onwards, after which Worcester is thought to have become a major ironworking centre (Dalwood 2004a, 13–22; Jackson 2004a, 102).

As noted above, the origins of the Roman settlement remain unclear due to an absence of evidence for prehistoric occupation, but this is also hindered by a lack of any activity associated with the Roman conquest. Although it has been suggested that a fort was established at Worcester and occupied up to AD 75, no convincing structural or artefactual evidence has been recorded for its location (Dalwood 2004a, 13; Dalwood 2004b, 41–2). A fairly substantial civil settlement appears to have developed during the late 1st century, with an economy based on both agriculture and some ironworking (Dalwood 2004b, 42), but the early civilian settlement is less well understood than the more extensive occupation of the 2nd century onwards. At present, it appears that Roman occupation was focused on the gravel terrace, although there is some indication of use of the floodplain (eg at Newport Street; Davenport 2015, 234). Evidence for ironworking during this period is widespread in the form of production areas for iron smelting, as well as smithing, and large waste dumps of iron slag, attesting to the scale of the industry (Jackson 2004a, 100). It is clear that very large quantities of iron slag were dumped on the floodplain close to the Roman settlement area (Davenport 2015, 234), and slag has also been noted on the floodplain west of the river (Daffern 2016). Iron slag was also used for surfacing and road repair, as observed in the excavations of a road leading north from the Roman town at Broad Street, Blackfriars and Farrier Street (Barker 1969c, Mundy 1985, Dalwood *et al* 1994).

The basic layout of the roads running into and through the settlement is rather obscure however (Fig 8). The road heading north has been suggested to have led to Greensforge in Staffordshire (Barker 1969a, fig 1; Dalwood *et al* 1994, 107; Butler and Cutler 2011, 5), but has not been traced beyond the city. Excavations at Farrier Street (Mann 2009; Daffern and Arnold 2010), and Castle Street/Love's Grove (Edwards *et al* 2002) included extensive Roman slag deposits interpreted as yard surfaces, but did not locate the road itself. The postulated route is approximately 130m to the east of the site of The Hive (Dalwood *et al* 1994, fig 13) and it is likely that the northern suburbs of the Roman settlement developed alongside it. A second road, from Droitwich, entered the settlement from the north-east (Barker 1969a, fig 1; Butler and Cuttler 2011, 5). There is some evidence of its alignment in earthworks in Hindlip Park (WSM 30529), and the route of Astwood Road/Rainbow Hill (WCM 96405). Recent work in Lowesmoor, close to St Martin's Gate, has revealed a number of cobble and slag surfaces (in small areas) across the site that are potentially the road from Droitwich (WA 2014, 20, fig 2). Another road, from Gloucester, probably entered the town at Sidbury in the south-east (Barker 1969a, fig 1; Carver 1980a, 165–75; Darlington and Evans 1992, 95 and fig 1). Within the town, the Deansway excavations suggested a network of small-scale cobbled streets, but the form of the street layout has not been established in any coherent pattern (Butler and Cuttler 2011, 5).

Just to the west, the River Severn would have acted as a major arterial route throughout the Roman period. It offered an accessible method of transport for the region and the town, bringing iron ore from the Forest of Dean (Jackson 2004a, 103), together with other imports (such as wine and olive oil), and allowing the easy export of salt from Droitwich and pottery from the Malvern area (Dalwood 2004b, 47). The question of how the river was crossed in the Roman period remains a topic of enquiry, and the inferred location of a bridge is circumstantial. A metalled road uncovered at Newport Street led towards the river, close to the location of the medieval bridge, suggesting that it was probably aligned on a pre-existing ford (Dalwood 2015b, 232–33).

Site name	Publication
1 The Butts	Napthan in Butler and Cuttler (eds) 2011
8–12 The Butts	Napthan in Butler and Cuttler (eds) 2011
14–24 The Butts	Cuttler et al in Butler and Cuttler (eds) 2011
Blackfriars	Unpublished
Broad Street	Barker 1969
City Arcades	Griffin et al 2004
City Campus	Sworn et al 2014
Conder Building	Unpublished
County Education Offices	Dalwood et al 1997
Deansway	Dalwood and Edwards 2004
Farrier Street	Dalwood et al 1994
Kardonia/Sanctuary House	Unpublished
Lich Street	Barker 1969
Lowesmoor	Unpublished
Magistrates Court	Unpublished
Newport Street	Davenport 2015
Police Station	Edwards et al 2002
Sidbury	Darlington and Evans 1992
Warner Village Cinemas	Jackson et al 2002
Worcester Arena	Daffern 2016
Worcester Cathedral Chapter House	Unpublished

Table 1: Major archaeological projects in Worcester City (shown on Fig 7)

With regard to the later Roman period, it has been suggested that widespread changes in land use took place during the 4th century, with possible uneven contraction of the settlement (Butler and Cuttler 2011, 5). In places, occupation seems to have continued, but in other areas agriculture had clearly overtaken former parts of the settlement. At Deansway, buildings previously used for industrial purposes were replaced with animal pens and a small cemetery by the mid-4th century (Dalwood 2004b, 48–51). Beyond a few examples that are emerging from a growing body of evidence, the later chronological development of the settlement remains poorly understood.

Roman period – the site within the 'small town'

The site is located to the north-west of the reputed focus of the Roman town, west of the alignment of the road leading away to the north and mostly beyond the hypothesised extent of the northern roadside suburbs (as identified in Dalwood 2004a, fig 11). Cumulative archaeological evidence from this part of the settlement indicates areas of intensive occupation on the gravel terrace, probably conjoined with that further to the south, as well as much less intensively occupied areas. The overall impression to date is of an area comprising mixed industrial, agricultural, commercial and residential uses in this northern suburb (Butler and Cuttler 2011, 5–7). Occupation seems to have been largely disjointed, and comprised clay-built and timber buildings, with areas used for industrial production. There is also, however, some indication of masonry structures. Evidence for high-status buildings has been observed at Britannia Square, 500m to the north, where stone foundations were first uncovered in 1829 (Barker 1969a, 15; Napthan 1992). Building debris, including a small fragment of mosaic, alongside foundations and robber trenches, has also been identified at two properties on the south side of Britannia Square (Worcester City Council 2007, 39; Wainwright 2010).

Excavations undertaken within the vicinity of The Hive illustrate the varying intensity of Roman occupation in this area. Redevelopment along The Butts led to fairly concentrated archaeological investigation between 2000 and 2004, with excavation of three sites in close proximity which all revealed Roman features (Fig 8). At 1 The Butts, on the south side of the road, a stone-lined well was partially excavated and found to contain an upper backfill of late 4th century date (Napthan 2011a). This included a substantial dump of building rubble, comprising tesserae (*c* 200 items), painted plaster (4.5kg), ceramic building material (including pilae and box tiles), stone roofing tiles, and a fragment of limestone column; this was interpreted as demolition debris from a public or high status domestic building, or series of buildings, located nearby (Napthan 2011a). Similar building material, in much smaller quantities, has been noted from other nearby sites, such as Sanctuary House (formerly the Kardonia factory) on Farrier Street (Mann 2009; Daffern and Arnold 2010), and at the Conder Building, Infirmary Walk (Pikes and Sherlock 2003), where painted wall plaster and high-status building material was recovered.

Excavation at 8–12 The Butts revealed gravelled surfaces, pits and a stake-built structure, and the earliest features appeared to date from the late 1st to early 2nd century AD, with occupation continuing into the 2nd and 3rd century (Napthan 2011a). Adjacent to this, at 14–24 The Butts, occupation was identified from the 2nd century AD onwards (Cuttler *et al* 2011). The earliest features included shallow pits and ditches, the pits being the result of gravel quarrying on a small-scale. Further gravel quarrying was dated to the 4th century AD. The fills of features contained a range of artefactual material of different date, interpreted as waste dumping on the edge of the occupied area. A stone-lined well dated to the late 3rd to 4th century AD contained environmental remains indicating that the area was pasture or waste ground in the 4th century. Additionally, a road running east to west across the site probably originated in the 4th century; it was maintained with a metalled surface and appears to have been used for the dumping of domestic rubbish when it went out of use (Cuttler *et al* 2011, 127–8). The alignment of the surface suggested that it would extend into The Hive site, and that it was probably flanked by ditches.

Directly to the north of The Hive, on the other side of the railway viaduct, excavation and watching brief work was undertaken between 2007 and 2012 at the City Campus of the University of Worcester (Sworn *et al* 2014). Occupation here was concentrated in the 2nd to 3rd century AD, frequently demonstrated to be the most intensive period of Roman settlement at

Worcester (as detailed above). This included small agricultural buildings, distinct groupings of quarry pits with later dumping of domestic rubbish, and an enigmatic small circular enclosure, variously interpreted as a livestock pen, a demarcation for craft working, or perhaps the site of a shrine. Domestic refuse was also identified in open midden form and a fragmentary burial was recorded. Radiocarbon dating of this produced a late 3rd or 4th century date and suggested that agriculture was occurring across the area in the later Roman period; the inhumation was found in tillage soil covering archaeological features of 2nd to late 3rd century date (Sworn *et al* 2014, 24–5).

The topography of the City Campus site is very similar to that at The Hive, and Roman deposits extended across the level terrace and down onto the floodplain of the river. At the outset of the fieldwork at The Hive (Miller *et al* 2008), the expectation was that Roman occupation would be dispersed but extensive, comparable to the surrounding activity of this date, and that it would relate to ironworking and settlement. The potential for a Roman road to be present, continuing from the site at 14–24 The Butts (Cuttler *et al* 2011), was also identified.

Post-Roman and medieval land use

There was no pre-existing information to suggest the potential for Anglo-Saxon archaeology on the site: the documentary record and results of previous fieldwork are unclear as to the location of settlement in this period. Some suggestions have been made that deposits of this date are concentrated within the area of the later burh (Miller *et al* 2008). It is most probable, however, that the area of The Hive was peripheral to the early medieval settlement, for which a range of evidence has been argued for the continuity of occupation at Worcester between the 5th and the 7th centuries and then on into the medieval period (see Carver 1980b, 2–7; Dalwood 2004a, 19–22). Away from the settlement core, archaeological attention has focused on soil deposits overlying Roman archaeology and often containing the only objects demonstrating early medieval activity.

At 14–24 The Butts, deposits of post-Roman date were represented by an extensive layer of reworked soil which contained abundant Roman artefacts and some medieval and post-medieval pottery. The layer sealed the concentration of Roman features and deposits, and was cut by post-medieval and modern features (Cuttler *et al* 2011). Elsewhere in Worcester, such as at Deansway *c* 300m to the south-east, similar layers formed during the later Roman period in areas of animal pens, and were subject to biological reworking in the post-Roman period when the land was used as pasture (Macphail 2004). Subsequently, these deposits were sealed by later occupation, and had not been greatly affected by reworking. These are probably better identified as true ‘dark earth’ deposits, formed and then sealed broadly intact, rather than being agriculturally altered in later periods. External to the city, where later cultivation has occurred, the term ‘tillage soil’ is more commonly used. With these, the significance of the soils for research into the post-Roman period is much reduced, though soil micromorphology may still be of interest for the medieval/post-medieval periods. At Farrier Street, 200m east of The Hive, there was little trace of animal penning, and the soil deposits were largely the result of accumulated debris from Roman ironworking and domestic waste that was subsequently cultivated in the medieval period (Macphail 1994b). Analogous deposit formation was identified with the thick deposit of tillage soil recorded at the City Campus site, which was interpreted as having been deepened through the addition of organic material and then cultivated. Constant reworking of the upper part of the tillage soil here occurred during the medieval and post-medieval period, but the lower levels were not wholly disturbed after the late Roman period, as attested to by the discovery of a 3rd to 4th century Roman burial within the soil (Sworn *et al* 2014, 24–5).

The majority of the site is a short distance from the defended medieval settlement, but is bounded at the southern limit by the city wall, thought to date from the late 12th to early 13th century (Beardsmore 1980, 59; Dinn 2012). A *c* 5.5m berm probably existed between this and the substantial ditch circuiting the city, which was approximately 16m wide and 3.5m deep in this area (Jackson 1992). It is recognised that the mapping from different periods is in relative agreement over the line of the walls around the city (see Dinn 2012, 56–62), although it is difficult to establish with any precision the location of possible towers along The Butts (Miller *et al* 2008).

Excavations and various documentary sources suggests that land north of the city wall was used for horticulture, agriculture and possibly some industries in the medieval and into early post-medieval periods, and that the floodplain to the west was managed continuously as meadow and pasture (Whitehead 1996; Kenyon 1999). The earliest map of the area is Speed's 1610 map of Worcester, which shows the area as undeveloped, but the amount of 14th to 16th century pottery found at 14–20 The Butts was thought to represent more intensive use than simple manuring with midden material. The suggestion was made that there may have been some late 15th century occupation within the vicinity (Cuttler *et al* 2011, 108–9). This is difficult to prove without structural evidence however, as extensive dumping of occupation waste was likely to have taken place in the immediate environs of the city and could thus account for this material. It is recognised, for instance, that there was medieval and post-medieval dumping on 'miskins' (middens) in the area of The Butts, with documents suggesting there was one a little to the west of the current site, close to St Clements gate (Bryant 2011, 4–5 and fig 1).

Post-medieval development

It is possible that post-medieval features and artefacts found at 14–20 The Butts belong to early post-medieval houses and workshops, and that similar remains might have once been present further to the west on the site of the Hive. If buildings were previously in existence, then reported clearance during the period of the English Civil War (1642–51) may have removed structures in the suburbs on the north side of the city (Atkin 1995, 57–9; Hughes 1980, 285–91). The Vaughan map, published in 1660 (*An exact ground plot of the City of Worcester, as it stood fortified 3 Sep 1651*), shows four bastions, probably added to the north wall of the city in 1642 (Atkin 1995, 56–8). This map has been broadly aligned with the modern Ordnance Survey (Atkin 1995, 106) and indicates that The Hive was very close to one of the projecting bastions (see Fig 9). In addition to the Vaughan map, contemporary written sources suggest an elaborate system of earthwork defences was planned for the city, but how far these were completed is unclear (Atkin 1995, 54–66). Following the Battle of Worcester (1651), Oliver Cromwell ordered the slighting of the city wall and the earthwork fortifications were levelled (Atkin 1995, 66; Whitehead 1996, 6).

In the later post-medieval period, several 18th and 19th century maps allow the development of The Hive area to be traced with considerable accuracy. The Doherty map (1741) shows that the landscape of this part of Worcester was still fields and open land in the mid-18th century, west of the large Netherton House, the property boundary of which survives as Netherton Lane. Plans produced by Worcester City Corporation show a clear change from pasture to formal gardens between 1784 and 1826 (Miller *et al* 2008, figs 4–5). After 1826 the area took on a more urban character, with a timber yard constructed on the eastern part of the site that was taken over and redeveloped from the 1850s onwards as the Joseph Wood timber yard and saw mill. The firm of Joseph Wood and Company was founded in the early 1800s, first appearing in the trade directories from around 1830, and was recognised as a prestigious building firm. The buildings of Nash's Almhouses stood on the north-west part of the site, from around 1838 until demolition in the autumn of 1976. Also during the earlier 19th century (from 1836), the cattle market, including an octagonal counting house, was built across the western area of the site on the floodplain. This is visible on the first edition Ordnance Survey mapping (Miller *et al* 2008, fig 7). Further comprehensive information regarding the later development on the site can be found in the separate detailed building recording report (Robson-Glyde 2016).

The Worcester to Hereford railway line along the northern edge of the site lies on a substantial brick viaduct constructed in 1859, opened in 1860, with the adjacent Butts branch constructed a few years later and in use by 1865. The branch extended on a viaduct over Croft Road and to the riverside, servicing riverside quays. The main line is still in use, although the branch closed in 1955 and is now partly demolished.

The modern period

A number of buildings survived on the site from the Joseph Wood timber yard, despite the company moving before the Second World War (the 1940 Ordnance Survey shows it as a corporation yard). In the later 20th century, the site was utilised as a refuse depot for the city council and the cattle market to the west was converted into a car park.

Previous archaeological work on the development site

No archaeological investigations are known to have taken place on the site before 2005.

Methods

Richard Bradley

Documentary research

In 2005, prior to fieldwork commencing, the desk-based assessment (Miller *et al* 2005; WCM 101346) was carried out by Worcestershire Historic Environment and Archaeology Service (now Worcestershire Archive and Archaeology Service). This was subsequently revised and updated to incorporate the results of the two stages of field evaluation and provided a comprehensive historic and archaeological background for the archaeological investigations (Miller *et al* 2008).

Alongside the desk-based assessment, a preliminary archaeological assessment of the standing buildings was carried out. This supplemented an existing historic and architectural appraisal of the structures on site carried out by Nick Joyce Architects (Joyce 2006). The subsequent detailed building recording report includes extensive documentary information on the upstanding buildings (Robson-Glyde 2016).

A search of the planning record archives was kindly undertaken by James Dinn (Archaeological Officer, Worcester City Council).

Fieldwork strategy

Area reference	Initial evaluation trenches (2006–2007)	Additional evaluation (2008–2009)	Excavation areas (2008–2009)	Watching brief observations (2010–2011)
Area 1 former council depot	Trenches 1–5, Trenches 8–11 (Trench 7 not completed)	Trench 17	Area 1a (community project), 1b, 4, 5, 6, 7, 8	Trenches 21 and 22 (services parallel to the railway viaduct)
Area 2 former Transwipers		Trenches 12, 13 and 14	Area 2	Trenches 18, 19 and 25 (groundworks at Transwipers) Trenches 20 and 26 (groundworks at the city wall) Trenches 23 and 24 (groundworks at Rack Alley)
Area 3 former Cattlemarket car park	Trench 6	Trenches 15 and 16		Trench 31 (attenuation tank)
Watching brief separate from main areas				Trench 27 ('Story Island') Trenches 28 and 29 (riverside directional drilling) Trench 30 (Hive directional drilling connection)

Table 2: Site areas and trench references during fieldwork

Initial evaluation

Two stages of archaeological evaluation involving sample trenches and geoarchaeological observation of boreholes took place in February 2006 and between March and May 2007, providing comprehensive coverage of the main areas of the site (terrace top, terrace slope and floodplain; Trenches 1–6 and 8–11; Boreholes 1–8). The results of this work, which identified extensive archaeological remains of Roman and post-medieval date, are detailed in a combined evaluation report (Sworn and Phear 2007; WCM 101277; WCM 101428; WCM 101511; WCM 101530).

Excavation and additional evaluation

The archaeological excavation targeted areas of the development site that would be impacted by the ground works for construction, and was designed to mitigate those impacts. This strategy aimed to preserve important archaeological deposits *in situ* or, where that was not achievable, to undertake full archaeological excavation (preservation by record). A detailed specification was prepared prior to the commencement of fieldwork and excavation was undertaken in line with this specification (HEAS 2008).

The site was broadly divided into three areas (Areas 1 to 3; Fig 2) but excavation of each could not be completed concurrently. Additional evaluation trenching was also undertaken during this excavation element of the project. Therefore, a series of sub-areas/trench identifiers was defined as the project developed, particularly in Area 1, as access to different parts of the site was facilitated.

Area 1 comprised the main excavation area on the former council depot, between The Butts to the south and the railway viaduct to the north. Area 1 was opened up over eight separate phases of excavation, named as Area 1a (community programme area, see below), 1b, 4, 5, 6, 7, 8, and Trench 17. Trench 17 was located to test the extent and depth of any Roman deposits towards the west, and to ensure that any Roman deposits identified were below construction impact levels. This was confirmed and no further excavation was undertaken. Similarly, a small area slightly to the south-west lay on the edge of the terrace slope and floodplain, but was only excavated to the formation level, which equated to the upper levels of structures forming part of the Joseph Wood timber yard. The extant walls and floors were recorded and then left *in situ*. The south-east area of the site was subject to rapid investigation at the end of the excavation phase, after the demolition of part of the extant Joseph Wood building. Once the fieldwork was completed, the records from these areas were considered together as one contiguous excavation area, identified more simply as Area 1 and forming the central focus of this report. This part of the project is referenced by the Worcester City Historic Environment Record as WCM 101653.

Area 2 occupied the site of the former Transwipers building on the south side of The Butts, bounded to the south by a substantial (mostly) brick revetment wall on the line of the city wall (Fig 2). This was evaluated (Trenches 12–14; Rogers *et al* 2009; WCM 101654) and then subject to a follow up excavation in a small area to investigate the city ditch, the results of which are detailed here. This part of the project is referenced by the Worcester City Historic Environment Record as WCM 101658.

Area 3 covered part of the Cattlemarket Car Park and consisted of the excavation of two substantial evaluation trenches (Trenches 15–16) aligned east to west and lying at the eastern edge of the Severn floodplain (Sworn 2009). This part of the project is referenced by the Worcester City Historic Environment Record as WCM 101655.

In total, the excavations amounted to approximately 3307m² in area.

In all areas, deposits considered not to be significant were removed using a 360º tracked excavator employing a toothless bucket and under constant archaeological supervision. Subsequent excavation was undertaken by hand. Clean surfaces were inspected, and selected deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature. Deposits were investigated and recorded according to standard Service practice (WA 2012). Sample percentages are shown in Table 3.

Excavation of the different parts of the site took place in a series of discrete areas dictated by practicalities such as site access, the ongoing demolition program, storage of soils and the presence of underground services. This commenced with the mechanical removal of modern surfacing and underlying make-up deposits associated with a car park and recently-demolished buildings, including the majority of the modern intrusions relating to the 20th century development, such as manholes and concrete footings. However, some of the deeper brick structures that extended into the underlying natural deposits were left *in situ*.

Table 3:

Type of context	Percentage of each feature excavated (minimum)
Structural features (hearths), burials, industrial structures (ovens, kilns)	100
Structural features (postholes, floors, wall foundations)	50
Pits	50
Gullies and ditches	10–20
Layers	50

Table 3: Minimum requirements for fieldwork sampling

All modern deposits were removed to the upper level of a thick layer of tillage soil, which was identified across the entire site. The tillage soil was removed by mechanical excavator under archaeological supervision in a series of thin spits for artefact retrieval and to check for features cut through it at different levels. On removal, the exposed archaeological features were excavated by hand, down to the undisturbed underlying geology, or to a level where the proposed development would not disturb significant deposits.

The formation level for construction was specified as 15m AOD for the central area and 15.60m AOD for the northern part of the main site (Area 1). The excavations to the south of The Butts, adjacent to the city wall (Area 2), and in the Cattlemarket Car Park (Area 3) were excavated to either a safely accessible depth or to the base of the archaeological deposits, whichever was higher.

Periodic low-level aerial photography was undertaken by a specialist contractor (Aerial-Cam).

Watching brief

In addition to the main programme of work, further fieldwork involving a watching brief during ground works was undertaken throughout 2010 and 2011. This project was intended to observe construction works and record at an appropriate level any significant deposits, without interrupting the progress of construction. A scope of work was set out in a separate WSI (HEAS 2011b) which focused on the following areas across the site:

- Connections to mains services on The Butts.
- Services parallel to the railway viaduct at the north of the site.
- Groundworks at Transwipers, the city wall and Rack Alley for the installation of a footbridge.
- The construction of shafts for directional drilling at the riverside and The Hive.
- Foundation works for ‘Story Island’, a small separate structure west of The Hive main building.
- Ground works for an attenuation tank.

Observation and recording of archaeological deposits was restricted to areas of ground disturbance following the progress of the construction team. It was anticipated that safe access for archaeological recording would not always be available and this did occur in some cases. During the work, however, a number of design solutions were implemented to protect significant archaeological deposits, or to allow unimpeded recording without interruption to the programme. At the northern part of the site, close to the railway viaduct, the Worcester City Council Archaeological Officer agreed that two trenches perpendicular to the service trench, and for which safe access was available, would be excavated (Trenches 21 and 22). These trenches were opened using a mechanical excavator with a toothless bucket to the top of significant deposits. Subsequently deposits were cleaned and recorded by the archaeological team. For the attenuation tank (Trench 31), careful design was utilised to allow the tank to be constructed in as shallow an excavation as possible to minimise ground works to a depth that would not impact on significant buried deposits.

Throughout the watching brief, where practicable, archaeological deposits were investigated and recorded with artefactual and ecofactual evidence obtained according to standard Service practice (WA 2012).

This part of the project is referenced by the Worcester City Historic Environment Record as WCM 101830, WCM 101832 and WCM 101890.

Community programme

The project included a ten-week community excavation and public engagement programme, as well as a subsequent oral history project. The first stage was conducted between August and October 2008 alongside the main archaeological excavation, with fieldwork restricted to the north-east part of the site, termed Area 1a. The oral history stage ran from June 2011 to March 2012.

Ninety volunteers were recruited from known interested parties, universities (particularly undergraduates), groups who used the Worcester City and Worcestershire County Adult and Community Services, and by targeting volunteers who had helped on previous community excavations in the city. Excavation was under the supervision of professional archaeologists but all tasks were completed by the volunteers who received training in archaeological field techniques and recording methods. The finished records from the site were intended to be of a standard acceptable for use in the project archive. Finds processing tasks and environmental sieving were also completed by volunteers.

The community excavation was fully accessible to the public and was promoted through a proactive media strategy covering traditional formats; print and radio media were invited onto the site and studio interviews were also recorded. Site tours took place and an exhibition space was established in buildings on site, with information and finds from the excavation on display. This allowed visitors to learn more about the history of the site and see finds from the dig itself. School groups booked visits and participated in exercises on excavation techniques in a small sand pit created next to the main excavation, as well as in classes on finds and environmental remains in the exhibition space. A major open day with site tours, activities and re-enactment displays also took place. In total, approximately 3000 people (including numbers from school groups) visited the site during the community programme. A separate report was produced to detail the results of this part of the project (Hughes 2008); this was then followed up with a reflective article that encompassed the whole programme of works, including the oral history element (Hughes 2016).

Artefact recovery

C Jane Evans and Richard Bradley

The artefact recovery policy conformed to standard Service practice (WA 2012 appendix 2). This, in principle, determines that all finds of whatever date must be collected. Initial processing and recording were undertaken on site, often with volunteer assistance, under the supervision of a finds specialist. On-site sampling and discard strategies were considered during fieldwork for large assemblages of Roman slag, Roman stone building material and 19th century building material. Strategies were discussed and agreed with James Dinn (Archaeological Officer, Worcester City Council) and Deborah Fox (Museums Worcestershire), as follows:

Roman slag

Nearly 5 tonnes of Roman iron slag were recovered, largely from Roman deposits. Specialist David Starley visited the excavations to provide advice on methods for recording all the slag and identifying significant material for retention for future analysis so that a discard policy could be implemented on site. The slag was predominantly redeposited, being used to form metalled surfaces or disposed of in a large pit. None of the features recorded were unequivocally associated with ironworking and the low proportion of tap slag suggested that smelting was not undertaken on site. A range of waste products were noted, including some tap slag with characteristic flow patterns; rods of slag that solidified within the furnace tap-hole; and irregular blocks from inside the furnace, particularly at the hearth bottom. Samples of these were retained. It was noted that while much of the slag used for metalling appeared to have been broken down to achieve fairly even surfaces, other deposits included a wide range of sizes. Consequently, slag pieces of a variety of sizes were retained.

Consideration of the research framework for the Roman iron industry in Worcester indicated that despite the size of the assemblage, its lack of direct association with production limited its research potential (Jackson 2004a; Worcester City Council 2007, 40–3). It was therefore agreed that the majority of the slag did not therefore have potential for detailed analysis, but could be quantified by weight prior to discard on site so that overall quantities and distributions across the site could be analysed. The outcome of this process was that only a small proportion of the iron slag was selected for retention in the archive, while the majority was quantified and discarded. A record was kept of retention, discard and sampling by context.

This discarded slag was temporarily stored at the request of the client for potential reuse as raw material for an artwork project in the grounds of The Hive. In the event, this scheme was not fulfilled and the majority was discarded, with only a few examples put on display in an interpretation panel.

Roman stone building materials

A substantial quantity of Roman building stone was excavated. Specialist Fiona Roe visited the site to advise on identification and the potential for selection and discard. Much of this material was fragmentary, and similar to the range of Roman building materials from Deansway (Roe 2004). The assemblage was scanned by the specialist alongside the finds team and geological identifications were provided. It was agreed that diagnostic stone roof tile would be retained for analysis (ie fragments with edges and/or peg holes). Fragments without diagnostic features were recorded and discarded on site. All large pieces of Roman masonry were retained and stone from a late Roman malting oven structure was catalogued, dismantled and then reconstructed inside The Hive once the building was complete.

19th century building material

Around 30 used and damaged terracotta mouldings (similar in style to late 18th/early 19th century 'Coade stone') were recovered during the machine opening of the site. Their original provenance is uncertain, but very similar mouldings were used in the 19th century buildings in Worcester constructed by Joseph Wood and Sons, the building company which occupied the site at the time. It is possible that they had been stored for reuse and were later abandoned when the company moved, before subsequently being mixed in with general demolition and infill material. These were not all retained for post-excavation analysis but as some of the pieces are highly decorated, they were kept for reuse in the 'Story Island' element of the construction of The Hive. This installation was only partially realised.

Other substantial ashlar blocks were recovered, also of 19th century date. These were recorded on site and discarded.

Environmental sampling

Elizabeth Pearson

The environmental sampling strategy conformed to standard Service practice (WA 2012 appendix 4). Large animal bone was hand-collected during excavation. Bulk samples of up to 80 litres were taken from 363 contexts of Roman to post-medieval date, from deposits considered to exhibit potential for the recovery of environmental remains. A total of 235 samples were initially assessed. As environmental remains were poorly preserved in many of the samples and the composition of charred plant remains was relatively uniform, a proportion of the total (38 samples) was selected for final analysis of all macrofossil remains (Table 55). During excavation, the environmental team advised that there was potential for a range of analyses requiring specialised sampling, including archaeomagnetic dating, geoarchaeological analysis of sediments and micromorphological analysis of soils. Appropriate specialist advice was sought, and in each case an appropriate methodology for on-site sampling was agreed, as summarised below.

Archaeomagnetic dating

David Greenwood and Cathy Batt

Two small clay oven bases, identified as of probable Roman date, were subject to archaeomagnetic dating during the excavation. This was undertaken by the University of Bradford to help refine the chronological sequence and with the following objectives:

- To determine whether the material from both features had been heated *in situ* to a high enough temperature to record the geomagnetic field.
- To provide a date of last use of the features.

A total of 45 *in situ* samples were taken from cleaned horizontal surfaces within the features using the tube method (contexts 6364 and 6365). All the samples were north-oriented using a magnetic compass, and there appeared to be no local disturbances to the geomagnetic field caused by the feature itself or other factors. The features were successfully sampled using standard methods. The separate specialist report (Greenwood and Batt 2009) outlines the full methods used and the processes involved in this dating; this is attached in full as Appendix 7, and a summary of the post-excavation analysis methodology is included below.

Geoarchaeology: cores and monoliths

Keith Wilkinson, Phil Marter, Nick Watson and Suzi Richer

Two geoarchaeological assessments were undertaken by ARCA (University of Winchester) with the following objectives:

- To characterise late Quaternary deposits and soils present on the site.
- To determine the archaeological and palaeoenvironmental potential of the soils and deposits on the site.
- To map the spatial extent of deposits with high archaeological and palaeoenvironmental significance.
- To make recommendations for further geoarchaeological investigation.

The first stage of work was carried out in 2006 by Keith Wilkinson and Phil Marter during the evaluation trenching (Appendix 2 below; Wilkinson and Marter 2006). This was primarily a borehole survey across the site that allowed the deposits to be mapped and assessed, providing information about the wider landscape. The second analysis (Appendix 3; Watson 2013) was principally concerned with the description and analysis of monoliths taken during the archaeological excavation and provides more detail concerning site formation processes. The objectives of both stages of work were to understand Research Priorities 1.3 and 1.6 (see Aims and objectives, Objectives), with the boreholes allowing the sub-archaeological deposits to be assessed and the monoliths allowing the soil deposits to be assessed.

A geoarchaeological investigation of deposits retained in cores obtained from eight boreholes was then undertaken. The boreholes were drilled by a geotechnical sub-contractor, Global Probing and Sampling Ltd (GPS Ltd), under the supervision of Dr Katie Head (WAAS). GPS Ltd used a track-mounted percussion window sampling system that retrieves continuous cores to a maximum operating depth of 12m. All the cores were labelled, sealed and the boreholes were accurately located. On completion of the boreholes, cores were removed to the WAAS offices for temporary storage.

In Area 3 (Trench 15) two further boreholes were drilled by ARCA in 2008 with the objective of sampling the base of the archaeological sequence and the underlying alluvial strata. The drilling was carried out using a 50mm diameter Eijelkamp core sampler propelled by an Atlas Cobra petrol-powered pneumatic hammer. Continuous cores were taken from the base of the trench until the sediments became impenetrable at 3m below ground surface. Gravels prevented the drilling of borehole 1 (BH1) while compact medium red sands also stopped penetration of BH2 below 3m from the top of the borehole. The top metre of deposits was not collected in the case of BH2 as a piece of the sampling device broke off and became trapped in the core chamber, preventing sediment from entering.

WAAS archaeologists took monolith samples for the second phase of geoarchaeological analysis with the aim of investigating the nature of the floodplain environment of the site (the fluvial and alluvial environment, changing vegetation and human use of the floodplain). This related to identified research objectives focused on contributing to the dating, character and origins of the River Severn alluviation, an understanding of the stream valleys and gullies on the east bank of the Severn, and environmental change in Worcester's hinterland (see Aims and objectives, above). Samples were taken according to standard Worcestershire Archaeology practice (WA 2012) by cleaning the relevant area of the section, cutting a 100mm deep rectangle of 500x100mm in the sediment, placing a piece of square section plastic guttering over the block and then removing the block and guttering. Monolith samples were labelled and wrapped in plastic film on site, while the position of the monolith samples was marked on section drawings.

Geoarchaeology: soil micromorphology

Steve Lancaster and Suzi Richer

Two phases of micromorphological work were completed during the fieldwork program. The first, an assessment undertaken during a site visit by Steve Lancaster (Headland Archaeology) in 2008, examined soil horizons in Areas 1 and 3. This initial assessment aimed to clarify the value of undertaking thin-section analysis on possible post-Roman tillage soil (see Archaeological Context Post-Roman and medieval land use for explanation of the use of this term) encountered on both parts of the site. It followed the discovery of a variety of different dark earth and tillage soil deposits in excavations in other nearby parts of the city (ie Farrier Street, Macphail 1994a and Deansway, Macphail 2004). Samples from these sites were also subject to thin section analysis, which led to an interpretation that suggests different and changing conditions of soil formation, therefore pointing to variable land use around the outskirts of the town.

During the specialist visit to Areas 1 and 3, Kubiena tins were used to sample two sequences of deposits. The first sequence was collected in Area 1 and consisted of four samples through the tillage soil at the northern limit of the site (context 6004). The second sequence of three samples was taken through deposits in Trench 15, Area 3. A summary report can be found in Appendix 4.

The second phase of micromorphological sampling was undertaken during site work in 2009 and as a result of advice from the earlier specialist visit. During this phase, a section in Area 1 was sampled by excavation staff using seven 8cm Kubiena tins, see Table 85. This section covered a tillage soil sequence in the southern part of the site (contexts 8856 and 8882). Parallel bulk sampling for finds was undertaken to assist with determining dates for deposit accumulation and the degree of gross disturbance. This area was chosen because of the presence of tillage soil in an area of known later Roman land use; in particular, the presence of a stone malting oven or corn drier (CG1049).

Lancaster's assessment in 2008 highlighted the potential for further information to be drawn from the tillage soil. Therefore, detailed analysis was subsequently undertaken on samples from Area 1 during post-excavation assessment (Macphail and Crowther 2012; Post-fieldwork analysis below), with the aim of reconstructing change in the patterns of deposition in the area, which are thought to reflect varying cultural activity.

Monitoring of burial environments

Simon Woodiwiss and Richard Bradley

Monitoring of the burial environment for changes in groundwater levels was originally part of the project design. Part of the site lay within the floodplain (see alluvial deposits, Fig 6), and evaluation trenches demonstrated the preservation of organic material (cf wooden pipes Fig 83, a,b,c) for which the presence of groundwater was the main reason for producing these circumstances of preservation (Fig 83 a, b, c). The value of monitoring was subsequently reassessed (Pearson 2009) and it was decided not to implement the monitoring. The groundwater in this area was fed by the River Severn and the hydraulic connection between the river and the archaeological/palaeoenvironmental deposits was likely to remain effective both during and after construction work (Appendix 6 ; Panter 2009).

Preservation *in situ*

Simon Woodiwiss and Richard Bradley

Significant archaeological deposits survive below the present built and landscaped areas. The measures adopted throughout the project to enable this included the following:

- Close liaison between WAAS and the bidding consortia designing the construction elements in order to minimise impact on archaeological deposits at the competition stage. Impact was a factor in the assessment process.
- Continuation of this liaison with the successful consortium (Galliford Try) during detailed design and construction. This included alteration of the pile layout to avoid significant features (eg two wells) and alteration in design and location of an attenuation tank.
- Induction of the construction team to highlight the significance of the archaeology, thereby encouraging site staff to be more mindful of working practices in the vicinity of the archaeological remains.
- The exposed level of significant deposits at the base of archaeological excavation areas (in Area 1) was covered by a 100mm layer of inert sand, prior to installation of the piling mat and thus offering protection to the archaeological remains when piling was taking place. This was monitored by archaeological staff from Hyder Consulting (now Arcadis).

Post-fieldwork analysis

Structural data

Richard Bradley and Simon Sworn

At the post-excavation assessment stage, all fieldwork records were checked and cross-referenced (HEAS 2011c). The drawn record from the main excavation was digitised and amalgamated with the site survey to provide a comprehensive digital record of the site in plan. A sequence of site periods was established based on the stratigraphic sequence and existing knowledge of pottery dates. The site period divisions defined during the assessment were maintained throughout all subsequent analysis for the purposes of data organisation and specialist assessment, though in some cases the date range for each period was subsequently slightly adjusted.

A series of Harris matrices for each of the site areas was created and dating information based on finds analysis (spot-dates) was integrated. Preliminary grouping of contexts from specific structures was undertaken to refine the artefactual and ecofactual analysis, and summary site plans were produced in accordance with standard assessment procedures. This was based on the overall stratigraphic information combined with the assessment of the pottery and other artefacts, such as coins and brooches, and included the data from the car park evaluation trenches (Area 3) and the watching brief phase of work.

Further comprehensive analysis took place for the production of this report, which was completed through consideration of structural, artefactual and ecofactual evidence, allied to the information derived from other sources such as the sedimentological observations and samples, and the geoarchaeological record. Where applicable, deposits were grouped by feature type (eg elements forming an oven or floor surface). These were allocated context group numbers from CG 1000 for the excavation and trenching, or CG 1200 if part of the watching brief, and a series of context group matrices were produced. The context groups were then amalgamated into areas of associated activity (eg within a building or as a surface including a series of pits). These were allocated activity unit numbers from AU 500 for the excavation and trenching or AU 550 if part of the watching brief. Particular attention during post-excavation analysis focused on the potential of the structural evidence and other data to meet the project aims and to contribute to local, regional and national research agendas.

Artefact analysis

C Jane Evans

A primary record was made on a Microsoft Access 2000 database, including quantification of the sampled finds mentioned above (Fieldwork strategy), all other hand-retrieved finds, and small quantities of finds from processed environmental samples. Artefacts were provisionally identified and dated, where possible, providing a *terminus post quem* date for each stratified context. Metal artefacts were X-rayed and assessed by Kelly Abbot, and leather artefacts X-rayed and conserved by Beth Werrett, both of Wiltshire Conservation Service. The leather was conserved by freeze-drying and packed for long term storage, in line with Worcester City Museum Guidelines (Worcester City Museum Service). Finds specialist Hilary Cool identified the need for additional X-ray and investigative conservation prior to analysis of a number of small finds. This was undertaken by Graham Morgan of the University of Leicester Archaeological Service. All the objects requiring this investigative conservation were examined microscopically and cleaned using mechanical tools and an 'Air-Brasive' machine, using either glass beads or alumina powder.

Details of analytical methods utilised in post-excavation assessment and analysis are set out below. For most categories of finds, only material from stratified Roman deposits and the tillage soil was included in the study. Exceptions to this are described below. Prehistoric, medieval and post-medieval artefacts were also recovered. Most of this material was assessed but not analysed as it was deemed to have a low research potential (HEAS 2011c). Exceptions to this were the copper alloy casting waste from Trench 15, (Blaylock, Medieval and post-medieval finds), and the leather (Mould, Medieval and post-medieval finds) which were analysed in detail. The rest of the assemblage included: a small quantity of medieval pottery, largely residual in post-medieval contexts; post-medieval pottery, often residual in modern contexts; clay pipe dating from the 17th century onwards; brick and tile; vessel, bottle and window glass, mainly from periods 11–12 and 12; assorted iron finds, including 164 nails; and a small number of other metal finds. All artefacts from environmental samples were scanned, metal finds were X-rayed and included in the analysis; other find types were so small and fragmentary as to not be possible to examine in detail and are therefore not included in the tables or discussions presented.

Roman pottery

C Jane Evans

Given the exceptionally large size of the assemblage, a sampling policy was devised for detailed recording of the coarse wares, whereby 68% of the assemblage was fully recorded. This is described in detail in the pottery report (Roman pottery). The pottery was recorded following standard procedures (HEAS 2009). Fabrics were recorded with reference to the Worcestershire fabric series (Hurst and Rees 1992, 200–9; Worcestershire County Council 2014), cross-referenced to the National Roman Fabric Reference Collection (Tomber and Dore 1998). Where new fabric variants were identified, these were allocated a site-specific code (Fig 91). An attempt was also made to cross-reference fabrics with those used for the nearby Magistrates' Court site on the north side of Castle Street (Evans in prep), though it was not possible to directly compare sherds in the absence of a completed publication or time to examine the original archive. Forms were recorded by broad vessel class (jar, bowl etc) and specific form type. A site-specific form type series was devised (due to limited funding this cannot be published in this work; see archive), building on analysis of the neighbouring City Campus assemblage (Evans *et al* 2014). Forms are described in relation to published corpora where possible. Decoration, and evidence for manufacture (eg misfired sherds), use (eg soot, limescale, wear etc) and reuse (eg rivets and repair holes) were recorded where this survived. The pottery was quantified by sherd count, weight and estimated vessel equivalent for rims (henceforth rim EVE). Diameters and percentages were not recorded for bases as earlier work indicates that the data obtained by this does not justify the additional time required. Data were analysed using Microsoft Access 2000 and Microsoft Excel 2007. Forms from the Period 6 quarry pit (AU 510) are illustrated, in fabric groups (Figs 104–110). These figures characterise this large assemblage and are referred to elsewhere in the pottery report as a form type series. Additional sherds of specific form from other deposits are illustrated separately. In addition to the Roman pottery from Periods 3 to 6–7, all the samian was analysed, even if in later contexts, to provide information on 1st to 3rd century activity across the site.

All the samian was recorded, being quantified by count, weight and rim EVE. Fabrics, and hence the kiln site or production centre, were identified by examining a fresh fracture, using a x10 hand lens where necessary. The data were recorded in Microsoft Excel, with reference to the HEAS fabric series (Hurst and Rees 1992, 200–9; Worcestershire County Council 2014), where possible, and site specific codes where necessary. Moulded decoration and potters' stamps were recorded using graphite rubbings, copies of which may be found in the archive. The records include: context number, fabric code, presence of cross-context joins, vessel form, sherd type, count, weight, condition, rim diameter and EVE, presence of decoration and potters' stamps, and spot-dates (early–late date). Additional comments were recorded for some sherds; for example, a note was made of use-wear and graffiti where observed (Roman pottery).

Roman coins

Cathy King and C Jane Evans

An initial rapid survey to assess coin condition and provide preliminary identification was undertaken at the assessment stage (HEAS 2011c). Further detailed analysis was completed in 2013. The Roman coins ranged in date from the 1st century to the late 4th century and have been given close dating wherever this was possible. When the identification is less certain, the parameters were expanded or expressed as 2nd, 3rd, 4th etc. Coins with a *circa* date (eg *c* AD 260–8) are mostly ancient copies. They are dated to the earliest period in which they could have been issued but could have been produced later. As their individual date cannot be determined, the identification reflects this uncertainty. Where individual rulers can be identified but the actual date of the coin cannot be confirmed, they were given their regnal dates or where possible the date within which the series was minted. Many of the coins were encrusted or had bronze disease, so it was not possible to assess patterns of wear in any detail. The assemblage was quantified by Reece coin loss period, and compared to data from the Portable Antiquities Scheme, provided by Sam Moorhead (Roman coins).

Roman small finds and glass

Hilary Cool

Initial assessment of small finds and glass from Roman and later contexts was undertaken in 2010 and further analysis was completed in 2013 and 2014. This analysis included finds from Periods 3 to 6–7, and all typologically Roman finds from later contexts. Where necessary, a scan of the X-radiograph plates was used to identify items of interest (Roman small finds and glass).

Roman industrial residues

C Jane Evans and Dennis Williams

A large quantity of Roman slag was retrieved. This was scanned and quantified on site, following specialist guidance, but only a sample was retained, as detailed above (Artefact recovery, Roman slag). The data recorded was analysed (Roman industrial residues).

Roman oven material

C Jane Evans

A large quantity of Roman 'oven material' was identified during the assessment (HEAS 2011c), consisting of fragments of 'ovens' and 'platters'. This assemblage provides the best evidence to date for how these ovens were constructed, so fragments from both Roman and post-Roman contexts were examined and quantified. Given the significance of this material, the whole assemblage was analysed in detail. Each fragment was recorded macroscopically by fabric, by form (flanges, bases, wall fragments, ledges etc) and quantified by count and weight. Thickness and diameter were measured where applicable. All evidence for manufacture (eg surface finish, flange formation) and use (eg sooting patterns) was noted.

Information was recorded on a Microsoft Access 2007 database. The material was recorded by fabric type according to the County fabric reference series maintained by the service (Hurst and Rees 1992 and Worcestershire County Council 2014). A site specific form classification was used (Roman oven material).

Roman fired clay

Dennis Williams and C Jane Evans

A number of fired clay fragments were recovered from Roman deposits. These were quantified and scanned for diagnostic features (Roman fired clay).

Roman ceramic building material

Laura Griffin

All material from Roman contexts was quantified and visually scanned. A sample, 427 fragments, was analysed in detail. The latter comprised material from the quarry pits (CG 1057 and 1108), together with material from other key contexts and other fragments of particular note. This fully analysed material was identified by fabric and the following aspects recorded uniformly: class of tile, presence/absence of flange, presence of upper and/or lower cutaways, and of signature marks. A summary of the tile types and fabrics identified within the assemblage can be seen in Table 40 (Roman ceramic building material).

Roman stone building material

C Jane Evans

The excavations produced the largest assemblage of Roman building stone found to date in Worcester. This material was sampled on site as described above (Artefact recovery, Roman stone building materials). The stone was recorded by Angus Crawford under the guidance of Fiona Roe, who provided geological identification; the majority (81%) was recorded on site, where undiagnostic fragments were discarded (365 fragments, *c* 433kg, representing 51% of the assemblage by count, 86% by weight). The data recorded on site was analysed during post-excavation by Jane Evans (Roman stone building material).

Roman stone objects

Ruth Shaffrey with Katherine Andrew

Initial geological identification was undertaken by Katherine Andrew, of the University of Worcester. Functional analysis of the stone objects was undertaken by Ruth Shaffrey (Roman stone objects).

Roman plaster and mortar

C Jane Evans

The plaster and mortar from stratified Roman deposits was classified and quantified; no scientific analysis was undertaken (Roman plaster and mortar).

Roman and post-medieval leather

Quita Mould

The conserved leather was examined, identified and diagnostic pieces dated. A basic record and catalogue of the entire assemblage was made (as defined in the RFG/FRG Guidelines 1993), including measurement of relevant dimensions and species identification where possible. The information gathered has been correlated with the available contextual information.

All measurements are made in millimetres (mm). No allowance has been made for shrinkage. Any shoe sizing has been calculated according to the modern English shoe-size scale. Leather species were identified by hair follicle pattern using low powered magnification. Where the grain surface of the leather was heavily worn identification was not always possible. Where mature cattle hide could not be easily distinguished from immature calfskin the term 'bovine leather' has been used. Shoe soles, welts and repairs are assumed to be of cattle hide unless stated otherwise.

The leather had been conserved by freeze-drying and packed for long-term storage by the Wiltshire Conservation Service (Roman and post-medieval leather).

Post-medieval coins and tokens

Cathy King

Nine post-medieval coins, three trade tokens and a jeton were recorded during the assessment (HEAS 2011c). These are quantified and described but no further analysis was undertaken. (Post-medieval coins and tokens).

Post-medieval vessel moulds

Stuart Blaylock

A total of 40kg of vessel-casting mould was recovered from thirteen separate contexts on the site, although the greatest amount was from two deposits in Area 3, Trench 15 (contexts 15077 and 15137), which together produced 38.5kg of mould, or 95% of the whole collection. The deposits are dated broadly to the early post-medieval period, perhaps with a preference for the 17th century.

A standardised approach to studying a corpus of casting mould was followed (see Blaylock 2000, 36–8): a preliminary quantification of the collection by weight and number of fragments was produced, and subdivided according to type of material and section of the mould. From this initial overview, a selection of diagnostic pieces was made for cataloguing and/or drawing. This was followed by catalogue descriptions and measurements of individual pieces, including diameter measurements to attempt to establish the range of sizes of vessels represented (on the basis of curvature of measurable pieces, mainly rim fragments, but also including some large body fragments). During this selection a two-fold division of interesting or diagnostic pieces was made. A primary collection included pieces with enough profile to contribute to the reconstruction of vessel shapes made on the site, or with other key details of form or features of the vessels (such as handles, legs, etc), or details of mould making (in-gate fragments etc). These were allocated for drawing and full catalogue entries, eventually amounting to 28 pieces. A further 28 pieces still had features of interest or contributed information on mould making techniques or vessel form; these were not identified for drawing, but were still described in a catalogue entry.

Once quantified the material was sorted to divide the collection between pieces for long-term storage and those that could be safely discarded. It was initially agreed, following discussion with Worcestershire Archive and Archaeology Service, that featureless mould fragments would be discarded after quantification, but more of the larger fragments would be retained, irrespective of whether they were measurable or suitable for illustration, to fit in with Worcestershire Museum's discard policy. Thus, the retention policy as codified was to retain all fragments with a measurable diameter or tangible profile, plus all fragments retaining mould surface over *c* 10mm in size. However, after further consideration this policy was modified so that during processing many of the less diagnostic pieces were sorted into separate bags by context and marked for disposal, although they are currently still stored with the main collection.

In addition to describing the mould material itself, the study of this collection had two further aims: firstly, to produce reconstruction(s) of the forms of vessels produced, and of such diagnostic features that might enable products to be identified now or in the future; secondly, to provide a comparison for mould-making and casting practices represented in the collection with other known bronze vessel-casting sites both regionally (ie in the west of England, where most of the excavated sites lie) and nationally (Post-medieval vessel moulds).

Other medieval and post-medieval finds

C Jane Evans

Small quantities of medieval and post-medieval pottery, clay pipe, brick and tile, and a couple of iron objects were recorded during the assessment (HEAS 2011c). No further work was undertaken on these, but the finds have been quantified and summarised (Other medieval and post-medieval finds).

Environmental analysis

Elizabeth Pearson

Plant macrofossils

Waterlogged deposits

Sub-samples (1 litre size) processed by the wash-over technique at the assessment stage (HEAS 2011c) showed that rare cultivars and crop weeds present in samples were the most important for addressing the project aims and objectives (Aims and objectives). As a result, a decision was taken to scan larger volumes of flots from the majority of spit samples in order to identify these remains and investigate changes through deposit profiles. In the case of a large Roman quarry pit, analysis was focussed on contexts at the base of the feature where organic plant remains were well preserved. The samples were processed on a flotation tank (generally the remainder of 10–40L bulk samples) using a 300μm sieve for the flot and 1mm mesh for the residue (Plant macrofossils).

Charred plant remains

Following assessment (HEAS 2011c), samples rich in charred cereal crop debris were selected for further analysis.

Samples were processed by flotation using a Siraf tank. The flots were collected on a 300µm sieve and the residue retained on a 1mm mesh. This allows for the recovery of items such as small animal bones, molluscs and seeds. The residues were fully sorted by eye and the abundance of each category of environmental remains estimated. A magnet was also used to test for the presence of hammerscale. The flots were fully sorted using a low power Meiji stereo light microscope and plant remains identified using modern reference collections maintained by Worcestershire Archive and Archaeology Service, and a seed identification manual (Cappers *et al* 2012). Nomenclature for the plant remains follows the *New Flora of the British Isles*, 3rd edition (Stace 2010) (Plant macrofossils).

Charcoal analysis

Elizabeth Pearson

A selection of samples rich in well-preserved charcoal was selected for species identification, focussing on Roman material in order to investigate the types of timber used in the locality for fuel or for other general purposes (perhaps becoming accidentally charred). Contexts were, therefore, not necessarily selected from features associated with specific fuel burning.

The cell structure of all the non-oak identification samples was examined in three planes under a high-power microscope and identifications were carried out using reference texts (Schweingruber 1978; Brazier and Franklin 1961; Hather 2000) and reference slides housed at Worcestershire Archive and Archaeology Service.

In addition, more detailed wood technology recording was carried out on roundwood charcoal found in a large Roman quarry pit associated with ceramic oven material. Significant quantities of large fragments of well-preserved roundwood charcoal were present; two contexts were chosen for analysis. It was thought that the charcoal may be directly associated with oven use, and many of the fragments had the appearance of charcoal fuel, potentially produced in a clamp, or similar structure (Charcoal).

Palynology, non-pollen palynomorphs and parasite ova

Suzi Richer and Nicholas Daffern

The samples for pollen analysis were submitted to the laboratories of the Department of Geography and Environment at the University of Aberdeen for chemical preparation following standard procedures as described by Barber (1976) and Moore *et al* (1991). The full methodology is described in Appendix 1.

Where preservation allowed, pollen grains were counted to a total of 150 land pollen grains (TLP) for assessment purposes and 300 TLP for full analysis using a GS binocular polarising microscope at x400 magnification. Identification was aided by using the pollen reference slide collection maintained at the Worcestershire Archive and Archaeology Service offices, and the pollen reference manual by Moore *et al* (1991) and Beug (2004). Nomenclature for pollen follows Stace (2010) and Bennett (1994).

Fungal spores and parasite ova were noted in the assessment of the monoliths; rapid identification was undertaken to genus level. Identifications were aided through reference material maintained at the Worcestershire Archive and Archaeology Service offices and reference manuals by Kirk *et al* (2008) and Grant-Smith (2000) (Palynology, non-pollen palynomorphs and parasite ova).

Insect remains

David Smith

Six sub-samples of material were submitted for insect analysis, coming from a continuous section through the Civil War period city ditch. The samples had been taken in a spit sample sequence at 5cm and 10cm intervals through lower organic deposits. It was hoped that an examination of the insect remains from these contexts might help understand how the ditch had filled and what materials may have been dumped into this feature. Equally, it was anticipated that the insects may provide information on the nature of the environment and land use in the area.

The six samples presented were not processed using the standard method of paraffin flotation as outlined in Kenward *et al* (1980) as the material sampled had initially been assessed as having a very low potential for insect analysis. This was mainly due to time and budget restraints; the number of samples assessed from the city ditch was limited as, overall, multiple sequences of waterlogged deposits across the site, made up of many spit samples, required assessment. Abundance of all categories of environmental remains was variable throughout the sequence and rich assemblages of insect remains only became apparent during full analysis at a later stage. The samples were, therefore, originally processed for the extraction of charred archaeobotanical remains. Thus, the insect remains studied come from both the 'flots' collected on a 300µm mesh sieve and the 'residue' collected in a 1mm mesh sieve. Unfortunately, this method of extraction means that the faunas recovered are incomplete and biased. Previous work has suggested that this form of floatation mainly extracts insect remains that contain air or have a large surface area. Despite this, an initial survey of the insects obtained suggested that they could be broadly informative.

The insect remains were sorted from the flots and residues by hand under a low-power binocular microscope at magnifications between x15–45. They were analysed using the 'intensive scan' system (Kenward *et al* 1985; Kenward 1992). Each insect fauna was scanned in a petri dish for between 15–30 minutes. The full range of insects present was identified to either Genera or species level where possible. The number of individuals for each taxa recovered were estimated using the following 'star system':

- 1 individual = +
- 2–5 individuals ++
- 6–10 individuals +++
- more than 10 individuals ++++
- more than 20 individuals +++++
- hundreds of individuals ++++++

Where achievable the insect remains were identified to species level by direct comparison to specimens in the Gorham and Girling insect collections housed in the Department of Classics, Ancient History and Archaeology, University of Birmingham. The dipterous (fly) pupae were identified using the drawings in Smith (1973 and 1989) and, where possible, by direct comparison to modern specimens (Insect remains from the city ditch).

Molluscs

Michael Allen

A column of seventeen contiguous samples was taken on site through the upper portion (above the medieval city ditch deposits and water level) of the Civil War ditch. Samples were taken at 5cm intervals throughout the sequence and processed by standard flotation methods. The flots were fully sorted by the environmental team at Worcestershire Archive and Archaeology Service and following initial assessment a series of eleven samples were selected for mollusc analysis. The residues were scanned and molluscs identified using a stereo-binocular microscope under x7–45 magnification. The results of analysis are presented below (Molluscs from the city ditch), where the nomenclature follows Anderson (2005) and habitat preferences follow Evans (1972), Kerney (1999), with freshwater mollusc groups following Sparks (1961), Sparks and West (1959) and Robinson (1988).

The samples were examined to define major changes and distinguish, where possible, the presence of local shady vegetation adjacent to the ditch and to determine if there was any maintenance of the ditch. Other environmental evidence suggested local tree growth (alder for example), so the mollusc evidence was considered likely to complement the plant macrofossil analysis. Mollusc remains were not sufficiently abundant from earlier medieval city ditch deposits to enable interpretation of any pre-Civil War ditch land use and environment.

Animal bone

Ian Baxter

Full analysis of the animal bone was undertaken following the assessment stage (HEAS 2011c). Most of the animal bones from The Hive were hand-collected and consequently an under-representation of smaller bones from the main domestic species and bones from small wild mammals, birds and amphibians is to be expected. The Davis (1992) recording strategy has been employed in all counts of material from the site. In this method, all teeth (lower and upper) and a restricted suite of parts of the skeleton are recorded and used in counts. These are: horncores with a complete transverse section; skull (zygomaticus); atlas; axis; scapula (glenoid articulation); distal humerus; distal radius; proximal ulna; carpal 2+3; distal metacarpal; pelvis (ischial part of acetabulum); distal femur; distal tibia; calcaneum (sustenaculum); astragalus (lateral side); centrotarsale; distal metatarsal; proximal parts of the 1st, 2nd and 3rd phalanges.

For birds, the following were always recorded if present: scapula (articular end); proximal coracoid; distal humerus; proximal ulna; proximal carpometacarpus; distal femur; distal tibiotarsus; and distal tarsometatarsus.

The separation of sheep and goat was attempted on the following elements: horncores; dP_3; dP_4; distal humerus; distal metapodials (both fused and unfused); astragalus; and calcaneum using the criteria described in Boessneck (1969), Payne (1969 and 1985) and Schmid (1972).

The shape of the enamel folds (Davis 1980; Eisenmann 1981) was used for identifying equid teeth to species. Equid postcrania were checked against criteria summarised in Baxter (1998).

Wear stages were recorded following Grant (1982) for all P_4s and dP_4s as well as for the lower molars of cattle, sheep/goat and pig, both isolated and in mandibles. Cattle horncores were classified according to the method of Armitage and Clutton-Brock (1976) and relatively aged based on the criteria of Armitage (1982).

Measurements, in general, follow von den Driesch (1976). All pig measurements follow Payne and Bull (1988). Humerus HTC and BT and tibia Bd measurements were taken for all species as suggested by Payne and Bull (1988) for pigs. The crown heights of equid teeth were measured following Levine (1982). SD on dog long bones is measured as suggested by Harcourt (1974) and represents the midshaft diameter (msd).

The survival of skeletal elements for the main taxa, cattle, sheep/goat and pig, is compared with the sequence of survival suggested by Brain (1976) based on experimental work carried out on goat skeletons near the Kuiseb river in southern Africa. This sequence is used simply to facilitate an easier comparison between the survival of body parts of the three main domesticates (Animal bone).

Photographs of animal bones of interest or with pathologies were taken for the site archive.

Isotope ratio analysis on cattle mandibles

Janet Montgomery, Yee-Min Gan, Geoff Nowell and Jacqueline Towers

Tooth enamel from six cattle mandibles from The Hive site was analysed for strontium, oxygen and carbon isotope ratios ($^{87}Sr/^{86}Sr$, $\delta^{18}O$ and $\delta^{13}C$ values). All the mandibles were from Roman period contexts and care was taken to ensure that they were from different individuals, designated WCM 1–6 for identification purposes. The primary aim of this analysis was to obtain information regarding the origins and movement of the cattle. Strontium and oxygen isotope ratio analysis have the potential to determine whether cattle were of local or non-local origin, while carbon isotope ratio analysis can inform on diet and the environment in which the cattle were living during tooth formation.

For the strontium isotope ratio analysis, initial sample preparation was carried out in the Department of Archaeology, Durham University. Enamel samples were collected from the first, second and third molars of each animal following the procedure given in Montgomery (2002). A single chip of enamel weighing approximately 20mg was collected using a diamond tipped rotary dental saw and surfaces of the enamel samples were cleaned and polished with a diamond tipped dental burr to a depth of >100μm to remove traces of contaminants such as soil and dentine. Cleaned enamel samples were sealed in containers and transferred to the Northern Centre for Isotopic and Elemental Tracing (NCIET) at Durham University Earth Sciences Department for strontium isotope analysis using column chemistry methods outlined in Charlier *et al* (2006).

For the oxygen and carbon isotope ratio analysis, sample preparation was carried out in the Department of Archaeology, Durham University and the Stable Light Isotope Facility at the University of Bradford. Enamel samples were collected from the second and third molars of each animal. For each molar, a single lingual lobe was selected for sampling. Before sampling could commence, the cementum was removed from the selected lobe and the enamel surface cleaned using a diamond-tipped dental burr. Using the burr, intra-tooth samples of powdered enamel were then obtained along the length of the lobe from cusp to cervix. Approximately 15mg of powdered enamel were obtained for each sample. Details of the method used to treat and analyse the samples are given in Towers *et al* (2014) following a protocol modified after Sponheimer (1999) (Isotope ratio analysis on cattle mandibles).

Fish and other small bones from sieved samples

Sheila Hamilton-Dyer

The fish remains and other bones were extracted from 55 bulk samples. Taxonomic identifications were made using modern comparative collections. All fragments were recorded and were identified to taxon and element where reasonably possible. The archive includes further details of the individual bones not presented in the text (Fish and other small bones).

Human bone

Gaynor Western

A limited amount of human bone was recovered from the site, both articulated and disarticulated, including a burial of a neonate (CG 1105; Unphased Roman features (Periods 3–6)). All came from contexts considered to date to the Roman period.

The skeletal material was analysed according to the standards laid out in the guidelines recommended by the British Association of Biological Anthropologists and Osteologists in conjunction with the CIfA (Brickley and McKinley 2004) as well as by English Heritage (2002). Analysis was undertaken macroscopically and where necessary with the aid of a magnifying glass for identification purposes, without prior knowledge of associated artefacts so the assessment remained as objective as possible. Recording was carried out using the recognised descriptions contained in Standards for Data Collection from Human Skeletal Remains by Buikstra and Ubelaker (1994). Comparison of the results was made with published osteological data from contemporary skeletal populations.

The osteological analysis was carried out to ascertain the following:

- Condition of bone present.
- Completeness of the skeleton.
- Inventory of the skeletal material.
- Sex determination.
- Age assessment.
- Non-metric traits.
- Stature.
- Skeletal pathology.
- Dental pathology.

The results are summarised below (Human bone), and presented in full in the specialist report as Appendix 8.

Radiocarbon dating

Beta Analytic, SUERC, Nicholas Daffern and Suzi Richer

Four samples were submitted to Beta Analytic and Scottish Universities Environmental Research Centre (SUERC) for Accelerator Mass Spectrometry (AMS) radiocarbon dating to assist in establishing the chronological framework for the site. Samples were selected to aid in understanding specific questions, such as: the dating of the later deposits in the Roman sequence, the dating of the backfill of a large quarry pit, the construction of an aisled building, and the use of the riverside. One date was attempted for each question.

Where possible samples were obtained from shorter lived species; in this instance samples were obtained from *Acer* sp, *Castanea* sp, *Quercus* sp and a sample of leather.

While *Quercus* (oak) is not short-lived species, the sample in question was obtained from a post with extant bark indicating that the tree was young (~40 years old) when it was felled and therefore the possibility of the 'old wood effect' is excluded. No sources of contamination or non-contemporaneous carbon were evident during the fieldwork or during the sub-sampling. All calibrated dates are identifiable by the prefix 'cal'. Where calibrated date ranges are cited in this report, these are for 95% confidence.

The results are conventional radiocarbon ages (Stuiver and Polach 1977) and are listed in Table 84. The calibrated date ranges for the samples have been calculated using the maximum intercept method (Stuiver and Reimer 1986), and are quoted with end points rounded outwards to ten years. The graphical distributions of the calibrated results are derived from the probability method (Stuiver and Reimer 1993) and are shown in Appendix 9. Radiocarbon dates have been calibrated using OxCal v4.2 (Bronk Ramsey 1998; 2001; 2009) and the current internationally-agreed atmospheric calibration dataset for the northern hemisphere, IntCal13 (Reimer *et al* 2013).

Archaeomagnetic dating

David Greenwood and Cathy Batt

Post-excavation analysis was undertaken at the University of Bradford, where the direction of natural remanent magnetisation (NRM) of the 45 samples from the Roman ovens was measured using a Molspin fluxgate spinner magnetometer. The stability of the magnetisation was investigated by the stepwise demagnetisation of five pilot samples from context 6364 (CG 1019) and four pilot samples from context 6365 (CG 1070; representing 20% of the samples from each sample set). Fields of 2.5, 5, 7.5, 10, 12.5, 15, 20, 30, 40, 50, 60, 80 and 100mT (peak applied field) were used, with the magnetisation being measured after each step. These pilot samples were chosen for three principal reasons, namely that their declination and inclination values represented a spread of magnetic directions exhibited by all the samples in that particular set; their initial magnetic strengths were sufficiently high enough to obtain meaningful results; and, that the pilot samples were spread physically over each of the areas under investigation. The mean declination and inclination of both sample sets after demagnetisation, and the removal of outliers, were corrected to Meriden; the reference locality for the British calibration curve using the standard method (Noel and Batt 1990). The corrected mean direction was then dated using the RenDate calibration programme. The results of this analysis are summarised in Scientific dating below and presented in full in the specialist report as Appendix 7.

Geoarchaeology: cores and monoliths

Keith Wilkinson, Phil Marter, Nick Watson and Suzi Richer

Following completion of fieldwork, the cores and monoliths taken for geoarchaeological analysis were transported to laboratories at the Department of Archaeology, University of Winchester for detailed study. The plastic tubes containing the cores were slit open and the sediments contained within were hand cleaned and the freshly exposed sediments were described. All archaeological sections, cores and monoliths were lithologically described according to standard geological criteria (Tucker 1982, Jones *et al* 1999, Munsell Color 2000).

It should be noted that sediment recovery from the coring method used during the evaluation in 2006 (Appendix 2; Wilkinson and Marter 2006) was variable, with an average loss of 0.2m from each 1.0m long core. In respect of sediment 'loss' the cause was mainly because the percussive auger systems of the type operated by GPS Ltd tend to compress sediments retained in the recovered cores. Compression is a factor of sediment water content, which in turn is related to water table height, grain size and organic content.

Lithological data from the borehole cores were entered into a database within the RockWorks geological utilities software (RockWare 2005), and that software was then used to generate the composite cross-sections presented in Appendix 2.

The archive resulting from geoarchaeological study on the site comprises a paper and a digital record.

Geoarchaeology: soil micromorphology

Richard Macphail, John Crowther and Suzi Richer

The assessment stage and focus on research questions allowed strategic decisions to be made about the full analysis of samples. When the location of samples taken from the northern part of Area 1 was combined with the dating evidence, it was decided not to proceed with analysis of these. Only the bottom two layers of context 6004 were thought to be Roman in date, with the top two layers dating to the 17th–18th centuries. Therefore, the research potential of these samples was limited. Geoarchaeological analysis and dating evidence also indicated that the samples taken from Trench 15 in Area 3 were through a later soil horizon, probably of medieval date, rather than being a late Roman or post-Roman 'dark earth', as previously identified on site.

Further work continued with analysis on the samples from the southern part of Area 1 because these came from deposits (contexts 8856 and 8882) dating to the Roman period, principally from the 4th century. Six of the seven kubiena tins were chosen for analysis. The lowest tin (M421G, 0.36–0.42m) was not analysed as this contained purely natural deposits and was not deemed to be useful in light of the aims of the analysis. These natural deposits were also represented in sample M421F.

Four bulk samples were extracted from the monoliths prior to resin impregnation and thin sectioning. The thin sections and bulk samples were analysed employing soil micromorphology, chemistry and magnetic susceptibility. The full report can be found in Appendix 5.

Project Archive

Simon Sworn and Richard Bradley

The site records and quantities of material from the excavation, and detailed descriptions and discussion of each category of evidence and class of material, are set out in the assessment report (HEAS 2011c). The stratigraphic record also includes the archive generated during the preceding archaeological evaluation (Sworn and Phear 2007) and from the trenching and observations completed during the watching brief.

It is intended that the entirety of the project archive will be placed with Museums Worcestershire following publication of this report.

Structural analysis

Simon Sworn, Richard Bradley, Shona Robson-Glyde and Hal Dalwood

Stratigraphic overview

A series of twelve site periods were defined and archaeological features were separated into individual periods within the chronological outline presented below (Table 4). These broad, site-specific periods were defined using existing knowledge of pottery dates, combined with other artefacts such as coins and small finds, as well as scientific dating. Context dates were then reviewed alongside the stratigraphic evidence to refine the phasing. Contexts that could not be allocated to a particular period, mainly through a lack of finds or stratigraphic relationships, were defined as 'Undated'.

Table 4:

Site period and date	Character
1 Geological deposits	Underlying marl (Mercia Mudstone) noted across Areas 1 and 2; fine-grained alluvial deposits within the floodplain (Area 3)
2 Prehistoric	Palaeochannels in the floodplain; residual worked flint
3 Early Roman (late 1st–early/mid-2nd century)	East–west aligned ditch alongside road; limited occupation
4 Roman (mid-2nd–early 3rd century)	Extensive Roman occupation develops south of road; riverside deposits
5 Roman (early/mid-3rd–early 4th century)	Continuation of intensive Roman occupation
6 Later Roman (early 4th–late 4th century)	Large quarry pits, aisled building, malting oven, beginning of tillage soil formation
7 Post-Roman (5th–9th centuries)	Further tillage soil accumulation, possible continuation of later Roman features.
8 Early medieval (late 9th–early 11th century)	Continuation of tillage soil formation and the spreading of midden material across the site
9 Medieval (11th–16th centuries)	Medieval pits and possibly earliest city ditch
10 Post-medieval (16th–mid-18th century)	Civil War activity and the later infilling of the Civil War defences, casting waste on the floodplain
11 Late post-medieval (mid-18th–19th century)	Landscape of Netherton House gardens, timber water pipes
12 Modern (19th–20th centuries)	Construction of the cattlemarket (1830s), structures associated with Joseph Wood's timber yard and Nash's Almshouse. Cellars and other structures above city ditch
Undated	General undated features

Table 4: Site periods

Overview of archaeological deposits by site area

The terrace edge above the floodplain (Area 1, Fig 2, Fig 3)

Of the ten evaluation trenches undertaken in 2006 and 2007 (Sworn and Phear 2007; Trenches 1–6 and 8–11) prior to the main excavation phase, only one was not incorporated into the main works. This trench (Trench 2) was located in the far north-east corner of the site.

A metalled surface was observed and is thought to be a continuation of the road located within a shallow hollow, recorded in the excavation to the east at 14–24 The Butts (Butler and Cuttler 2011, 56–130). The surface discovered there was sealed by deposits containing two coins of Constantine I (early 4th century AD).

The northernmost part of Area 1 was the main focus of excavation and contained extensive archaeological remains. A series of Roman properties and associated deposits extended southwards from a road running east to west, heading towards, and perhaps extending over, a riverside area. Building footprints, multiple ovens, a well, numerous pits and sequences of occupation deposits were identified. The area also contained a late Roman aisled building and two conjoined quarry pits. Post-medieval and modern deposits in the northern part of the site consisted of a substantial ditch of 17th to 19th century date, and the structural foundations of Nash's Almshouses.

In the central part of the site, a malting oven was located on the lower slopes of the terrace, dated to the later part of the Roman period. Just to the south of this structure was a large pit containing Roman material, including a sandstone trough. Another Roman feature contained the partial fragmentary remains of a neonate human burial. To the east there were fewer Roman deposits, but the area included a single large well. There were also further buildings associated with the 19th century timber yard, including an extension of a prop shaft, a timber saw pit and the footprint for a large shed.

To the south-west, very limited Roman activity was identified. A ditch thought to date to the Civil War period could be seen extending northwards away from the city wall, before turning at a sharp angle to the east. At the south-eastern edge of the site, which was rapidly investigated, the same ditch was observed to continue further east. There were also a small number of pits, mostly post-medieval in date. The shallow depth at which the natural substrate was encountered in this area suggested that during the use of the timber yard a considerable amount of remodelling of the topography had taken place, perhaps terracing of the slope to level the site for the Joseph Wood building range. It is probable that this removed any evidence for Roman remains, if these had ever been present, but the absence of any deep Roman features (that could potentially have survived truncation) may suggest that even in the Roman period this area was sparsely utilised.

South of The Butts (Area 2, Fig 2, Fig 4)

Here, the city ditch was exposed. It was evident that the medieval ditch had been comprehensively re-cut during the Civil War period, probably on two occasions. By the 19th century the ditch had been infilled, at which point the land had been reclaimed for industrial purposes and the road. Later brick walls, cellars and drainage culverts truncated the upper deposits of the earlier ditch. To the rear of the city wall, a buttress and revetment deposits probably related to strengthening of the defences in the Civil War.

Floodplain and riverside (Area 3 and Trenches 28 and 29 Fig 2, Fig 5)

In Area 3 (Trenches 15 and 16), deposits included later prehistoric natural channels formed by the braided River Severn, Roman landscaping, late medieval or early post-medieval pits containing casting waste, a large V-shaped ditch aligned north to south (the origins of which probably date from the Civil War), and also 19th century structures associated with the cattle market. At the riverside (Trenches 28 and 29) there was extensive dumping of iron slag, possibly to create a revetment or quay during the Roman period. An *in situ* timber post, possibly for mooring, was also found.

Period 1: Geological deposits

The geological deposits were identified by Wilkinson and Marter during the initial site evaluation and borehole observations (2006). These comprised:

- Sandstones and mudstones (Mercia Mudstone) of the Triassic period Sidmouth Mudstone Formation in the eastern part of the site.

- Bedded alluvial sands and silts (terrace gravels) of the late Quaternary Elmore Member in the western part of the site.

Triassic Sidmouth Mudstone Formation was recorded at a depth of between 1.40m and 1.50m (all depths are below the existing ground surface before excavation/development). Two boreholes and two archway rig holes observed during the watching brief also recorded this mudstone formation, three at a depth of 1–1.27m, and one slightly deeper at 3m. The Triassic Sidmouth Mudstone Formation dips to the west and was downcut by the River Severn and infilled by deposits of the Elmore Formation; the boundary between the two deposits runs north to south through the site (Wilkinson and Marter 2006; Fig 6)

Elmore Member deposits were recorded at a depth of 3–6.60m, and between 2–4m in the watching brief. The Elmore Member comprised a fining upward sequence of channel gravels and sands to silt and clay floodplain deposits and thickens from east to west, reaching depths of at least 6m at the western edge of the site. These deposits drop in maximum height by 3m from north to south, probably due to channelling which removed the upper part of the deposit before the Roman period. Although it is not known when the basal deposits (channel facies) of the Elmore Member accrete, except that this occurred before the Roman period, the high-energy environment needed to emplace such sands and gravels will have mitigated against human use of the area during this time (Wilkinson and Marter 2006).

It was concluded by the geoarchaeological assessment that the surface of natural deposits was much more varied than the modern surface topography, and that subsequent deposition had evened out the underlying topography. This supports other evidence gathered during interventions over at least the past 50 years that has demonstrated that there was an undulating and irregular natural substrate across this area of the city (as noted in Barker 1969a, 12). The natural deposits were encountered in all areas of the archaeological excavation.

Period 2: Prehistoric

Possible prehistoric activity was mostly confined to the floodplain (Trenches 15 and 16, Area 3, Fig 10). This may be a clear differentiation between the terrace and the floodplain in this area, but could also be a reflection of the depth of investigation across the site. This was restricted by the impact of the development on the edge of the terrace and therefore did not always continue down to earlier deposits.

Palaeochannels, AU 500

Two parallel palaeochannels were identified in Trench 15 and were also partly observed in Trench 16, aligned north to south (CG 1000). These could not be fully investigated due to practical constraints caused by water inundation, but the eastern of the two channels was seen to be at least 7.50m wide and only 0.50m deep. Although there was no direct dating for the formation of the channels, the primary fill (15112) of the eastern channel contained artefacts of early Roman origin and appeared to have formed gradually, through natural processes. This suggested that the channel in which the deposit accumulated was earlier, probably dating to the late prehistoric period (Period 2–3).

The uppermost fills (15051 and 15092) of the two palaeochannels were dated to the mid-Roman period (Period 4–5). Both fills were similar in form and appeared to have been laid down by natural processes. This was indicative of the two channels being open both before and during the main phase of Roman occupation within this area on the eastern side of the River Severn. The western channel was also overlain by a 0.20m deep compacted layer of iron slag (15050), dated to the mid-Roman period, but given the dating evidence for the fill must have been open and in use prior to this date.

The slag is evidence of nearby industrial working, but is also suggestive of attempted land reclamation in this area by firming up the ground on the margins of the floodplain. It is doubtful whether the reclamation was successful, because the slag was overlain by alluvial clay containing Roman pottery (context 15049), suggesting that this area was still subject to flooding during the Roman period and beyond.

Prehistoric finds

Two flint flakes were recovered from the upper and lower fills of a pit (15087 and 15088), another from an alluvial deposit (15051) overlying a buried Roman soil horizon, and a small flake was found within the iron slag layer (15050) above the western palaeochannel in Trench 15 (Area 3). Two flint flakes were also retrieved from the tillage soil (8512) on the main part of the site (Area 1) and others were found in four Roman and later pits across this area (6052, 6543, 6745 and 6952). The manufacturing technology of the assemblage was consistent with a Neolithic to early Bronze Age date (see Prehistoric lithics), but the prehistoric finds were clearly residual, having come from features containing Roman and later pottery, and therefore do not demonstrate direct prehistoric land use on the site.

The flints probably originated from occupation or hunting sites further upstream. It is possible that they were deposited in this area during flooding episodes, but several were relatively unabraded, suggesting that they had not travelled far away from their original depositional context or spent a long period of time being moved around in the river. In general terms, the flint represents a prehistoric presence in the wider landscape, but provides little information about the nature of this (see Prehistoric lithics).

Period 3: Late 1st century to early/mid-2nd century (AD 69–*c* 140)

Activity during this early period was not extensive, but was focused on the northern extremity of the site in close proximity to a road aligned east to west. As with the prehistoric period, the limited evidence for early Roman occupation could reflect the restricted impact depth of the development, although the relative absence of residual pottery of 1st century date would suggest that the area remained largely undeveloped until at least the beginning of the 2nd century AD.

Road, AU 550 (Figs 10, 11)

Compacted surfaces constructed from cobbles and slag (CG 1200 and CG 1201) were encountered adjacent to the northern limit of the main area of excavation, during the watching brief on trenches opened for the installation of services (Trenches 21 and 22). In Trench 21 the uppermost of these (21108) was found in a 1.0x0.5m sized area. It extended beyond the limit of excavation, and was a repair of an earlier surface (21109). The earlier surface was only partly visible but was built from rounded and sub-rounded cobbles and was comparable in form to two other patches of surface found elsewhere in the trench (21112 and 21113). These were heavily disturbed by modern services but it was clear that they were of Roman date, all being overlain by two similar dark yellow black silty layers that contained 2nd century pottery. The deposits represent build-up of material on the surface, probably within worn patches or potholes. The surface appeared to continue from Trench 21 into Trench 22, located approximately 13m to the south-west, where it was more substantially preserved. Here, it was mainly constructed from compacted slag and was approximately 4m wide and 0.12m thick (Fig 11). Pottery from above it was dated to the later 2nd century AD and an earlier rounded cobble surface was seen in a small area beneath this layer.

These surfaces, combined with the presence of a ditch along the southern side (AU 501, Fig 13) and adjacent deposits and features representing substantial later occupation, indicate a road aligned east to west, running down from the terrace towards the floodplain and the River Severn.

Because only a limited part of this was observed, the original date of the road construction was unclear. However, the multiple layers of surface and the proximity of 2nd to 4th century Roman occupation extending away from the alignment of the road suggests that it was visible and in use throughout this period. It is probable that the surface found in evaluation Trench 2 (Sworn and Phear 2007), located in the far north-east corner of the site, was the same roadway and that this links to the surface found around 40m to the east at 14–24 The Butts, dated to the late 3rd or early 4th century (Butler and Cuttler 2011, 56–130).

Roadside ditch, AU 501

An east to west aligned ditch (CG 1003) was revealed in the north-eastern part of the site and continued along the edge of the road, defining it on its southern side (Figs 10, 12, 13). The ditch was one of the earliest features in Area 1, and its fills were truncated and overlain by Roman occupation dating from the late 2nd century onwards. This may suggest that the adjacent road (AU 500) was also one of the earliest features on site. The ditch had steep regular sides, was up to 3m wide and varied from 0.90m deep at the eastern end to 1.30m deep at the edge of the excavation. This variation in the size of the ditch is probably a result of later truncation and ground reduction on the higher, eastern slopes, rather than an original design feature.

The fills of this ditch consisted mainly of eroded surrounding natural material. Artefacts recovered from the primary fills included samian pottery and a coin of Vespasian (AD 69–79; small find SF117), indicating a late 1st to early 2nd century date for this feature. This date is also suggested by the presence of a re-cut dated to the early to mid-2nd century (see Period 4, CG 1005). A single posthole (7219) was seen in section to cut through the fills of the earlier ditch, but was in turn cut by the later re-cut. This feature was 0.8m deep and possibly 0.55m in diameter, though as it was only partially revealed, its overall size and function was unclear. Two small intercutting pits (CG 1011), 0.23m and 0.38m in depth, were also partly cut by the later re-cut (CG 1005) and contained pottery of late 1st to early 2nd century date. A limited portion of each pit had survived because of the truncation, but the fills, with slumped natural material, suggested that these may have been open for a period of time.

The excavation at 14–24 The Butts to the east also identified a ditch, thought to be a boundary, which is most probably the same ditch as found at The Hive (Butler and Cuttler 2011, 58–62). At 14–24 The Butts, the ditch had three distinct fills. Whilst the primary fill contained no dating material, the upper fills contained over 200 sherds of Roman pottery, including a 2nd century Central Gaulish samian ware beaker rim (Butler and Cuttler 2011, 58). It is possible that the latest fill may represent the fill of the re-cut seen in the ditch here at The Hive (Period 4; CG 1005).

Colluvial and buried soil horizon deposits, AU 505

Away from the roadside ditch, further to the south, the rest of the site area appears to have been left as open ground until at least the mid-2nd century (Period 4). Colluvial deposits and buried soil horizons (CG 1013, Fig 10) were noted below the later Roman deposits and it is possible that the area was in agricultural use. Pottery from these contexts was typically of early Roman date, the late 1st to early 2nd century.

Period 4: Mid-2nd century to early 3rd century (*c* AD 140–225)

This period is characterised by more development and occupation across the site, represented by earlier phases of timber buildings and internal and external features related to these structures (Fig 14). Some of the ovens or hearths in this earlier phase appeared to have been used for iron working. A Roman presence along the riverside is also dated to this period, probably associated with occupation on the main part of the site.

Re-cut and infill of the roadside ditch, AU 502

By the middle of the 2nd century the roadside ditch (AU 501) was re-excavated, following the same alignment but on a smaller scale, being slightly narrower and shallower at 1.7m wide and 0.55m deep (CG 1005, Fig 12). As with the earlier form of this feature, the fills showed some initial natural erosion of the sides, though the majority of the infill appears to have come from deliberate backfilling. There was a good assemblage of 2nd century pottery, suggesting that the infilling of the ditch could be dated to the latter half of the 2nd century, probably just before or during the initial urban development of the area. This is also demonstrated by the ditch being sealed by deposits including surfaces and layers associated with later occupation (see Buildings 1, 2 and 3 below).

A possible posthole was seen in one of the sections through the re-cut of the ditch, cut through the upper fills (Fig 12). This feature was 0.50m deep with steep sides and a rounded base. No other features were clearly associated with it, but it was sealed by a later cobbled surface of 3rd to 4th century date (Period 5; CG 1098).

Buildings 1, 2 and 3

Roman occupation deposits were identified partly overlying the early ditch, and concentrated in the northern part of the site along the roadside. These comprised a series of buildings with associated features (Figs 14, 15, 16). The intensive development of the area that these buildings represent began in the later 2nd century and the artefacts demonstrate that occupation continued from the 2nd century through to the early 4th century (Periods 4–5). The remains also suggest that these buildings were of limited lifespan and that they were constantly being repaired or rebuilt on the same or similar footprints.

At least three separate buildings were observed and all extended south from the road (AU 550 above). The buildings would probably have been roughly 8–9m in length and around 6m in width, consisting of compacted clay floors and associated structural elements, although later truncation had somewhat distorted the identified extents. It is possible that these were small versions of 'strip buildings', a characteristic building type found on street frontages of Roman small towns. Building 1 was located in the far north-west corner of the site, and was simply recorded as it appeared in plan (Fig 17). A narrow gap of about 1.5m separated this from Building 2 to the east. Building 3 (located further east and below the footprint of a later aisled building) was also separated from Building 2 by a narrow gap. It is possible that these spaces were alleyways which led to an extensive cobbled yard; this was located to the rear (south) of the properties.

The buildings were not fully excavated: Building 1 lay largely outside the area of disturbance by development, and the earliest phase(s) of Buildings 2 and 3 were unexcavated as they were below the construction impact level. Four main phases of Building 2 were identified: 2A, 2B, 2C and 2D. The different phases of Building 3 were more difficult to determine than those of Building 2, as deposits relating to Building 3 had been partly removed by the Period 6 aisled building (AU 508), and the earliest deposits were not excavated. Building 3 has been assigned to Period 5, but it is possible that it did have its origins in Period 4. Within the footprint of Building 3 was an oven (CG 1074, Fig 14) that may belong to Period 4, but which is described below with Building 3 under Period 5 due to the uncertainty.

Building 1, AU 528 (Fig 17, Fig 15)

Where observed, this building was preserved *in situ* and remained unexcavated because associated deposits were below the impact level of the construction work. Therefore, any earlier surfaces and associated postholes or other structural elements remain unknown. It is considered that this building was established during a similar period to Building 2, thought to date from the later 2nd century onwards.

Additionally, in Trench 22 (opened just beyond the main excavation area during the watching brief phase) a compact yellow clay layer, possibly forming a floor (CG 1202), was revealed. This was located in the south-east corner of the trench, around 1.2m from the north-west corner of the main excavation area and adjacent to the road surface (AU 550; Period 3 above). The clay was laid on top of a levelling deposit (22203) which contained a range of Roman pottery dating from the late 2nd century onwards, and a possible whetstone. Due to its proximity to Building 1 it is thought that this clay layer is part of the same building. Similarly, two unexcavated postholes (CG 1203), found in the same trench adjacent to the clay floor, may also be structural elements of this building.

Building 2, Phase 2A, AU 503 (Fig 18)

It is possible that this phase of Building 2 (Phase 2A) was more extensive but was not seen during the excavation because the deposits were below the construction impact level; they were only recorded in the excavation of a 2x2m test pit. The earliest associated deposits consisted of a truncated sandstone oven or hearth (CG 1007), part of a packed clay floor surface, and a large pit (CG 1008). Material from these features was late 2nd to 3rd century in date.

Oven/hearth, CG 1007

This oven was built on a cobbled surface which contained a significant quantity of slag (6881), overlying a buried soil horizon (see AU 505 above). It measured 1.20x1.10m and was roughly 0.35m high. The structure consisted of sandstone blocks with a clay lining showing signs of intense burning *in situ* (Fig 19). A flue was located on the higher, eastern side, and the western side consisted of the clay floor for the internal structure. It was truncated on both sides by features relating to later phases. Material from the fills within and the deposits overlying it, probably from the collapse of the superstructure, suggest a 3rd century date for its disuse. This is one of the few features on site that demonstrates an obvious industrial use, possibly for iron working.

Abutting the oven, and appearing to be associated with it, was a thin floor of compacted and beaten clay (6747). This showed signs of scorching, suggesting that this was contemporary, and was potentially part of the earliest floor surface for this building.

Pit, CG 1008

The oven (CG 1007) was cut by a large pit containing two fills. The pit was only seen in the profile of a deeper section as it lay below the impact level, but was 1.20m deep and 2.30m wide. Both the fills consisted of brown sandy silt, the upper fill containing a higher percentage of clay and appearing to be a deliberately dumped deposit. Material from the pit was dated to the 2nd to 3rd century and may relate to clearance before a new floor was laid down (CG 1055 below). The oven had clearly had gone out of use by the time this pit was dug. In turn, this pit was sealed and cut by features in a later phase of Building 2 (Phase 2B, AU 504 below).

Building 2, Phase 2B, AU 504 (Fig 20)

This phase of Building 2 was more readily identifiable and consisted of floors, pits, a posthole and the remains of an oven or hearth. The dating of this phase is comparable to that of Phase 2A and so the occupation of this building was probably continuous. These separate phases therefore represent slight re-modelling or repair, rather than a clear sequence of use and abandonment followed by re-use.

Clay floor, CG 1055

A floor surface consisting of a layer 0.05–0.10m thick, composed of compacted greyish-yellow clay, was identified in the profile of a deeper section. The full extent of this floor was unclear (as it was not fully excavated), though it was wholly within the confines of the later floors of Phases 2C and 2D of this building (see Period 5 below) and it did not appear in any of the more deeply excavated areas away from this footprint. Part of the surface was very fragmentary and included a thin layer of red marl that was thought to be a bedding deposit.

The clay floor sealed earlier features associated with Phase 2A of this building, such as pit CG 1008. Pottery within the clay floor was mid-2nd to early 3rd century in date.

Oven or hearth, CG 1012

Cut into the floor surface (CG 1055) were the shallow remnants of a clay-built oven or hearth. Only the burnt clay base remained, but dark red oxidation was visible in the surrounding clay floor surfaces. The remains measured 1.20m in length and 0.40m wide, with the heat affected area extending 0.80m to the west. The base of the oven or hearth was overlain by numerous thin lenses of burnt clay, ash and charcoal that probably relate to its use.

Pit, CG 1009

Cut through the floor, was a pit containing various thin layers of dumped occupation debris, dated to the late 2nd and early 3rd century. This pit was not seen in plan, only in profile, again because it lay below the impact level, but it cut the upper fill of Phase 2A pit CG 1008. The pit measured 2.08m wide and 0.20m deep, and contained seven thin fills, deposited in defined bands of material.

Small pit, CG 1010

A small pit had four fills that included material from the 2nd and early 3rd century. The pit, measuring 0.54m in diameter and 0.34m deep, contained clayey deposits very similar to those of the surrounding floors. A near complete Severn Valley ware jar was found that had perhaps served a specific functional purpose within the building (Fig 21). This pit cut part of the oven or hearth from the earlier Phase 2A building (CG 1007) and was sealed by the floor of the later building phase (CG 1061; Period 5), so is therefore considered to be associated with this phase of use (Phase 2B).

Other features, CG 1011

A number of other features also represent this phase within the building, identified either through stratigraphic relationships and/or artefactual material. These included three truncated pits, varying in size from 0.30m deep to 0.69m deep, but all roughly 0.40m in diameter.

A single isolated posthole, 0.72m diameter and 0.62m deep, contained four fills, with a very clear post pipe, 0.31m in diameter, and a quern stone laid flat at the base and reused as a post-pad.

A small section of a gully was observed only in a 2x2m sondage; this was seen to extend for 0.80m in length before being truncated by later pits at each end. The gully was only 0.13m wide and 0.07m deep, and its original function remains unclear.

Cobbled surface to the rear of Buildings 1 and 2, CG 1045

To the rear of the properties was an expanse of cobbled surface, roughly 19x9.5m in extent but disturbed by later truncation. The surface survived in patches, consisting of a single course of deliberately laid rounded cobbles, each roughly 0.05m in diameter (Figs 14, 22). This is probably contemporary with the buildings to the north and finds recovered from the surface were dated to the late 2nd or early 3rd century. Although it was difficult to ascertain exactly which phase of occupation it related to, and where the artefacts originated from, this date would tie in with the period of use identified for Phase 2A and 2B of Building 2. Although the surviving surface was predominantly to the rear of the buildings, a 1m wide cobble path extended northwards between Building 2 and the location of Building 3 to the east. This could have formed an alleyway that would have facilitated access from the road at the front of the properties.

The surface sealed earlier deposits and two pits (CG 1048, see below) which contained material dated to the latter half of the 2nd century. The surface was not fully excavated, but excavation of features that cut through this surface revealed earlier archaeological deposits below. The surface was overlain by possible demolition deposits (see Period 5; AU 523).

Features sealed by the cobbled surface, CG 1048

Two pits and two dated deposits were sealed by the cobbled surface, and have been grouped as CG 1048. Pit (7201) was a large feature, 1.20m diameter and 0.55m deep, containing numerous fills but little firm dating material. A smaller pit (7121), 0.55m in diameter and 0.45m deep, was dated to the 2nd century. Two deposits (6519 and 7068) sealed by the cobble layer were also noted. These were dated to the latter half of the 2nd century and relate to earlier use, probably to the initial phase of occupation in this area. This indicates that the surface at the rear of the buildings was not in place before the end of the 2nd century. Unfortunately, the original function of these pits and deposits remained unclear, as the cobbled surface was left *in situ*.

Posthole group to rear of buildings, CG 1110

To the south-east of the cobbled surface, and found beneath the northern range of the 19th century timber yard buildings (Period 12; CG 1022), was a group of six postholes in a 5x5m area (Fig 14). These were around 0.40m to 0.75m in diameter and 0.16m to 0.33m in depth. There was no clear structural arrangement to identify a specific purpose but they were suggestive of a temporary wooden construction. They formed a partial alignment in a possible L-shape and it may be that further postholes that once formed this group have been lost to later truncation. Pottery from the postholes was 2nd to 3rd century in date and they are probably associated with the earlier phases of occupation in the buildings to the north.

Large pit to south of buildings, CG 1092

A series of pits were identified in the central part of Area 1, to the rear of the buildings. The earliest of these contained four fills that included material dating from the mid-2nd century to the early part of the 3rd century.

The pit was only partially exposed; its full extent had been lost due to intrusions from later features, but was at least 1.20m deep. This feature is potentially associated with the earlier phases of Building 2 and appeared to contain domestic rubbish, perhaps from previously middened material at the rear of the properties cleared away when a pit excavated for another purpose was open (as evidenced in later periods in Worcester; see, for example, Bryant 2011). One of the features cut through this was a larger pit, 2m in diameter, which contained at least eleven fills with material of a late 3rd–4th century date (CG 1093; see Period 5).

Base of oven or hearth within footprint of later aisled building, CG 1102

A possible oven was noted within the area of the later aisled building (AU 508; Period 6), but was considered to relate to earlier activity. This comprised an orange coloured fired clay structure 1.60m long and at least 0.90m wide (7128), which was probably the base, overlain by an ashy deposit and a clay layer. The clay base was shaped to create a possible flue, but due to later truncation the original form was unclear (Fig 23). Pottery from the upper clay layer was dated to the later 2nd century.

Possible oven or hearth, CG 1109

Of similar date to the base (CG 1102) were the remains of what may have been another oven. This consisted of a shallow, irregular depression filled with compacted pebbles and fired clay, which would once have formed an oval or circular shape, but for a later intrusion by a post-pad marking the western side of the aisled building (AU 508; Period 6). The stone fill probably represented the only surviving element of the structure, acting as a solid base (Fig 24). Sealing this were a series of reddish brown marl and clay deposits, some of which were highly fired and contained charcoal. These were probably the collapsed superstructure and packing. Pottery in a number of these layers was dated to the 2nd and early 3rd century. There is a possibility that the oven or hearth was once inside the projected footprint of a small enclosing structure, discussed below (CG 1111).

Possible timber structure, CG 1111

Not directly cut by, but within the footprint of the aisled building, were a group of similar postholes and an L-shaped beam slot that may represent the remains of a small timber structure to the rear of Building 3 (Fig 25). The alignment of the beam slot and the location of the postholes indicate a possible structure 5m long and around 2.8m wide, although with only a few elements of this visible, the full outline is not clear. This may have been a small structure or shelter over the oven and associated working. Seven postholes were variably truncated and ranged from 0.15m to 0.70m in depth and 0.43m to 0.60m in diameter. Three of these potentially acted as external supports, but the exact purpose was not identifiable. The beam slot (7097), probably forming the north-east corner, was 0.42m in width and 0.18m in depth and truncated one posthole (7123), appearing to create a junction between an upright and horizontal timber. A layer of cobbles and compacted silts, probably the remains of a floor, survived within this area defined by the beam slot and the postholes. All of these features were stratigraphically of Roman origin, with four postholes and the beam slot containing pottery dating to the 2nd to early 3rd century, comparable with the possible oven which may have been contemporary (CG 1109). The floor contained fragments of late 1st to early 2nd century rusticated ware, probably residual given the dating of the postholes, but also hinting at earlier features across this area of the site.

Earlier pit, CG 1100

Located at the south-west corner of the later aisled building, and cut by the rectangular foundations (CG 1017), was a sub-circular pit approximately 1.75m in diameter and 0.63m deep. Part of the pit may have been re-excavated when the aisled building was constructed as it contained compacted marl, probably to support the foundations above this, but it also included a silty fill where it extended beyond the building footprint. This is of particular note in that it demonstrates a consideration for creating secure load-bearing ground in the construction of the aisled building, something also apparent with post pads at the northern end (see CG 1040, Period 6). Roman coarseware pottery and samian of mid- to late 2nd century date was recovered from this pit, which would suggest that it was associated with the earlier phases of occupation in the buildings.

Stone-lined well, AU 506, CG 1014 (Fig 26)

Located just to the east of the three buildings, though partially truncated by the large aisled building of later date (AU 508; Period 6), was a stone-lined well, initially constructed during the late 2nd or early 3rd century (Figs 27, 28). The well was not fully excavated as the foundations for the new building were altered to avoid any impact. Therefore, it was only archaeologically excavated to 2.10m deep, at 13.65m OD. The full depth was recorded using an auger and the well extended down to 9.95m OD, about 5.50m below the surface.

The well was constructed using roughly hewn limestone blocks (*c* 0.30x0.25x0.05m in size) within a large circular construction pit. Only the northern side of the stone lining remained; the southern half appeared to have been deliberately robbed out in the 4th century by the digging of a pit on this side (CG 1015; see Period 6). Rather unusually, the well was carefully half-sectioned by this process and it did not cause the collapse of the stone work. Very little of the original well fill was observed, the majority having been disturbed and removed by the intrusive pit. However, as the excavations ceased almost at the same level as this pit, the original fills of the well have been preserved *in situ* below the present building.

Material relating to the original infilling of the construction pit was found behind the stone lining of the undisturbed northern part of the well. This contained artefacts that suggested a construction date of late 2nd to early 3rd century. Finds from the surviving well fills indicated a 3rd century date for disuse and backfilling.

On the eastern and southern side of the well, where the stone had been removed, the original material from behind the former stone structure had slumped into the void left by the robbing. Although dating material from these deposits was also indicative of a construction date for the well in the late 2nd to early 3rd century, a single coin (small find 290) from one of the fills dated to AD 310–17. Due to the disturbance of the pit it is almost certain that this came from a later phase. If the accepted date of the well is late 2nd to mid-3rd century, then it may have been contemporary with the initial occupation in the buildings to the west. To further support this, the well was found to have been cut into part of the earlier roadside ditch that pre-dates the expanding urbanisation of the area.

Earlier pit group on the floodplain, CG 1112

Between the palaeochannels identified in Trench 15 (AU 500), on slightly higher ground, were a series of intercutting pits within a small area. Seven of these contained pottery that suggested they were infilled during the 2nd century, whilst others appeared later in date (CG 1113; see Period 5). They were of variable size, ranging from 0.10m to 0.74m in depth and 0.40m to 1.52m in width, and some contained substantial dumped deposits of slag and pottery waste. Others had fills more indicative of low-action silting, probably resultant from inundation across the floodplain.

Due to the limited area observed, the exact function of these pits is not clear, but they do represent Roman use of the floodplain, possibly in close proximity to industrial working. The pits demonstrate that Roman activity extended from the known occupation on the terrace down onto the floodplain itself, perhaps being part of the eastern limits of an as yet undefined riverside industrial area.

Riverside activity, AU 551

In situ timber, CG 1206 (Fig 29 and Fig 30)

In Trench 28, at the riverside, the stump of an upright timber post (28115) was exposed and observed to have been driven through alluvial clay (28117) into the underlying Mercia mudstone (28113) of the riverbank. The post was 0.34m wide and had been shaped flat on one side creating a 'D' shaped profile. It was also tapered to a rounded point and had been charred along its length. It is thought that this could have acted as a mooring point (as no similar posts were observed in the small area excavated), but it is also possible that this was part of a larger structure, such as a quay or jetty. The timber represented a whole trunk and exhibited extant bark, being identified as a young oak tree of around 40 years growth and hence unsuitable for dendrochronology. Radiocarbon dating of the sapwood produced a date of cal AD 70–230 (1865±30BP; SUERC-38442), suggesting that the felling and use of this wood occurred in the 2nd century AD.

Dumped slag deposits, CG 1205 (Fig 29)

Sealing the post were a number of iron slag deposits intermixed, occasionally, with stone rubble (Fig 31). These were very substantial, being at least 3m in total depth, with tip lines down towards the present river. In one context (28105), the stone comprised mudstone/ siltstone pieces up to 300mmx100mmx50mm in size and packed in a localised area, probably as a retaining or consolidation layer above the slag. The slag was smelting waste typical of Roman sites in Worcester, and included some good examples of rods as well as a sample of un-reacted ore (see section 6.5 for information on the slag found across the site). Associated with this material was a rim from black-burnished ware pottery dated to the late 2nd to early 3rd century. One of the upper deposits (28104) also produced a small quantity of other pottery, which was only broadly dated as Roman. This is consistent with the slag being dumped here during the earlier periods of occupation along the roadside at the northern edge of the main site area (see AU 550; Period 3).

It is difficult to be certain as to how long it had taken to build up the slag deposits in this location, but the amount of material would certainly have required considerable effort to move. There is the possibility that this accumulated on the riverside as it was a convenient disposal area for industrial waste, away from areas of processing, although why this would develop is not clear. More plausibly, especially given the presence of a similarly dated timber post suggesting management of the riverside area, it may have been deposited in a relatively short space of time as a deliberate act in order to form a solid foundation at the riverside. It is apparent that the floodplain was being used in the 2nd century (CG 1112) and this could have required a firmer, more substantial riverbank than that occurring naturally, possibly for the off-loading of material. Although not observed in the intervention here, there would probably once have been some form of revetment protecting this material to prevent the stone and slag from washing away.

Period 5: Early/mid-3rd century to early 4th century (*c* AD 225–320)

This period is defined by sustained development and occupation, represented by continual repair or rebuilding of the buildings, the construction of associated features and a period of stasis in soil formation (Fig 32). It is considered that this period marks the main urbanisation of this area; the majority of the artefacts across the site as a whole dated from the later 2nd century through to the early 4th century. There is no indication of use of Buildings 1, 2 and 3 after the earlier 4th century.

Building 2, Phase 2C, AU 518 (Fig 33)

The earlier phases of Building 2 were only revealed by limited deeper investigation (Period 4 above; AU 503 and AU 504). This building, as it was occupied in Period 5, was observed across a much larger area. It consisted of a well-defined, deliberately laid compacted yellow clay floor measuring 7.60x6m. Associated with this floor were a number of construction elements including postholes, and occupation features or deposits in the form of ovens and layers.

Earlier floor, CG 1062

It was apparent that the floor had been repaired, probably after heavy wear. A 2x3m patch of yellowish clay filled a wide, shallow depression, possibly a foundation cut for this phase of the building. The finds recovered from this suggested a date of the mid- to late 3rd century. A burnt clay deposit partially overlay this and a further 1.5x2m area of grey silt was found above this layer, perhaps relating to later oven use in this building, although this was not certain.

Clay floor, CG 1061

The main surviving floor of this building, covering an area of 7.60x2.50m, sealed the patched deposits beneath. This consisted of compacted yellowish clay with occasional pebbles (6984, 6985 and 6633). It was around 0.06m deep and covered some of the features relating to the earlier phases of the building (Period 4 above). Half of a *tegula* came from context 6984 and other material in the floor deposits was dated as 2nd century. As this overlay the 3rd century patching, this material must be residual. This is unsurprising given the evident continual use of the building and is again suggestive of re-modelling or repair during occupation.

Post-pads, CG 1063 and CG 1065

Two post-pads formed associated structural elements and both were seen to be cut into the patches of clay forming the earlier part of the floor layer. The first was a very shallow pit, 0.56x0.38m in size, of which little had survived. The second was better preserved and was a more substantial feature. It was 0.76x0.6m in size, and contained a large shaped sandstone block (Fig 34), the remainder of the pit being packed with pebbles.

Oven, CG 1064

Within this building an oven base existed but was not excavated as it was below the depth of construction impact. Despite later truncation, it was visible as an area of burnt clay with a ‘keyhole’ shaped structure of clay and tile, forming an oven base with adjoining flue facing east. Overall, it was around 0.90x0.45m in size.

Above the main clay floor (CG 1061) was a further possible oven base, consisting of reddish brown fired clay 0.46x0.25m in size (6973). This was not excavated, so its full extent was not confirmed.

Building 2, Phase 2D, AU 519 (Fig 35)

The latest use of this building was represented by another compacted yellow clay floor (8.75x6m) which overlay the earlier occupation deposits. Associated with this were a series of clay built ovens and a number postholes and layers, dating from the later part of the 3rd century into the earlier 4th century.

Clay floor, CG 1066

The main floor area of this phase comprised a large area of packed yellowish clay with smaller areas of pebbles, which was cut by a number of internal features. This layer overlay the structural features and the floor layers of the Phase 2C building (AU 518). Pottery of 3rd and early 4th century date was recovered.

Possible oven, CG 1067

At the northern limit of excavation a possible oven was recorded in the form of an irregular orangey-red area of burnt clay. No structural elements related to this were seen within the excavation area but it overlay the main clay floor so probably represents activity inside the building. Pottery dated this deposit to the latter half of the 3rd century. It was cut by a pit (6797; CG 1068).

Oven, CG 1069

Towards the centre of the building were the remains of a clay-built oven. This consisted of a construction cut packed with compacted brown clay that formed the base of the oven. A number of burnt clay lenses from earlier firings were recorded within this that were in turn overlain by a clay packing deposit for an oven floor built of baked clay, oven material and broken tiles (6850). This may suggest a level of re-use and re-building in this structure across a number of firings. Abundant charcoal was recovered from samples taken from the clay packing. A shallow depression denoting an area of wear at the eastern edge of the oven was identified (6844) in which a number of burnt deposits had accumulated (6843, 6845, 6852 and 6853). A series of destruction deposits covered the oven base (6849 and 6830). Much of the pottery from this feature was of 2nd and 3rd century date and therefore residual but a hair pin (small find 216) found within the clay packing suggests at least a later 3rd century date for the use of this oven.

Sub-circular oven, CG 1070

Around 1.5m to the north-west of the oven CG 1069, was a further clay-built sub-circular oven, with a flue on its eastern side (Fig 35, 36). A sub-oval cut 0.90x1.50m in size had been packed with a brownish-yellow clay deposit. Lenses of clay and charcoal overlay this, potentially from earlier firings, and were sealed by a later clay lining (6575) used to support the upper oven structure. This clay had been embedded with a layer of broken oven material and pottery forming the structure of the oven base (6584). Demolished oven superstructure covered this deposit. The feature contained pottery dated to the 2nd century, but based on its stratigraphic position it is broadly contemporary with the other later 3rd century ovens in this building.
The oven was well-preserved and was selected for archaeomagnetic dating. The results, however, were inconclusive. Given the stratigraphic evidence, the relevant archaeomagnetic date bracket was that covering the period AD 110-560 (rather than the two later options, see

Greenwood and Batt 2009; Appendix 7). Unfortunately, the scientific dating for this feature did not provide any greater precision than the stratigraphic and artefactual evidence.

Other activity, CG 1068

The Phase 2D building included a series of pits and postholes identified within the clay floor surface. Pit (6797) was a shallow oval feature, 0.14m in depth, which cut the possible earlier oven (CG 1067) and was in turn cut by the sub-circular oven (CG 1070). This pit also cut a further shallow oval pit (6795), 0.10m in depth. Pottery dated to the 2nd and 3rd century was recovered from these pits, which were more akin to depressions in the floor surface that had filled in with accumulated waste, rather than being deliberately dug features. Three possible postholes were also recorded as being part of this building. These are probably heavily truncated structural elements of the Phase 2D building, as with the post-pads identified for the Phase 2C building (AU 518, see above).

Building 3, AU 521 (Figs 37,16)

Building 3 was located within the footprint of the later aisled building (AU 508, Period 6) and contained various occupation layers, as well as structural features such as postholes, ovens and beam slots. It was identified by a rectangle of dark compacted material, measuring 6.60x3.20m (Fig 16). It appeared that this building may have had at least two phases of use, but these were less clear than those of Building 2, both due to truncation by the foundations for the later aisled building and the depth at which excavation ceased.

Other features were noted close to this building and although not securely dated probably relate to the occupation and use of this structure. These included an oven or hearth (CG 1073) and a series of pits cut into the cobbled surface to the east of this building (CG 1042; see below).

Earlier oven, CG 1074

This comprised a series of clay layers in a shallow oval depression (Fig 37), the uppermost of which acted as bedding for broken pottery, oven material and tile which formed the base of the oven itself (6371). The pottery was of later 2nd century origin. Just to the west of the oven base was a cobbled surface (6373), possibly associated with the use of the oven. This sealed a shallow rectangular feature of uncertain purpose. The oven had been cut by a post-pad for the later aisled building (AU 508) so the original form was not clear, but the pottery suggested that this oven could potentially be part of an earlier phase of Building 3.

Possible oven or hearth, CG 1073

Seen in the section created by the intrusion of a later post-medieval pit (CG 1103) was a possible oven or hearth. It may be that this was part of an earlier phase of use of Building 3, as it was only tentatively dated to the 3rd century, but this is not definitive because the feature was not excavated. It was partly overlain by a layer of 4th century date (7193) and consisted of a series of yellow, red and orangey-brown clay layers that appeared to have been subjected to high temperatures, as well some ashy, charcoal-rich deposits. Two associated stakeholes were identified, which may have been part of the surrounding structure. The stratigraphic sequence demonstrated that this was earlier than circular oven (CG 1083), thought to be a later internal feature associated with the use of this building.

Base of oven, CG 1075

Partly overlain by the floor layers of Building 3 (CG 1076) were the remains of the base of another oven. This was formed of a heavily burnt area of packed clay (7273), 1.05x1.35m in size, into which a mix of pottery and clay had been set. A further part of the structure was defined by a ceramic oval 'platter' (7270) which had also been positioned within the clay (Figs 37, 38). A deposit of burnt yellow and red clay overlay the oven, probably the remains of the collapsed superstructure. A coin from this layer was dated to AD 295–305 (small find 288), suggesting that the latest use of Building 3 was from *c* AD 300 onwards.

Other associated features, CG 1044

Building 3 had surviving earlier floor deposits laid down within a shallow construction trench, identified after removal of the main floor layers (CG 1076). This also suggests an earlier phase of this building. However, this could not be fully established because the contexts were only observed in plan and remained unexcavated below the impact depth of the construction.

Internal floor layer, CG 1076

The main surviving floor of Building 3 was identified as a blackish brown silt layer with mixed patches of ashy and clayey material denoting the occupation area. This was probably related to the last use of Building 3, and finds from these deposits were dated to the late 3rd century, which correlates well with the date of the coin found just beneath the floor (CG 1075).

Structural elements, CG 1078

Two possible postholes, a cobbled layer and what may have been a beam slot potentially represented the structural remains of this building, although these were only observed in a small sondage so this is not definitive. A surface (7276) comprising a silty deposit packed with cobbles, was thought to be the remains of an external yard or pathway around the building. A small posthole (7275), 0.23m in diameter and 0.31m deep was cut into this layer and a similar feature, 0.22m in diameter (7280) was unexcavated but situated at the eastern edge of the building. A rectangular pit (1.55x0.35m) was also located in this area and was packed with cobbles in a silty clay matrix. It is possible that these features are the surviving elements of the timber foundations for this building.

Occupation debris, CG 1077

Within the footprint defined by the floor layer were a series of lenses and small deposits identified as occupation debris. These were dark coloured silty clay and marl layers containing pottery dated to the late 3rd century.

Circular oven, CG 1083

Also in the area defined as Building 3, and cut by a post-pad for the later aisled building (AU 508), was a clay-built circular oven associated with the final phase of use (Fig 37, 39). This consisted of a circular pit, 1.44m in diameter, lined with baked clay (7172) and containing the surviving part of a compacted clay structure (7171). The collapsed elements of the superstructure of the oven were found within this and were covered by silty clay dumped deposits. The entrance to the oven was marked by a defined depression (7167) on the south side of the feature and this contained the remains of a hobnailed boot.

Surface repairs and dumps, CG 1079

A number of small dumps and patches of cobbled surface were identified adjacent to the building. These were the remnants of external areas associated with the latest phase of occupation. A partial skeleton of a sheep was recovered from a dumped deposit (7208), indicative of the abandonment of this surface. These dumps and cobbled patches partly overlay earlier structural elements (CG 1078) and were themselves overlain by the cobbled surface to the north-east of Area 1 (see CG 1041 below). Later 3rd to early 4th century pottery was found in these deposits.

Surfaces relating to the later phases of the buildings, AU 525 and AU 526

Deliberately laid, compacted cobble surfaces comprising at least two phases were located to the east of the buildings (Fig 32, 40). It is probable that these were in use during the later phases of occupation and provided hard standing in the immediate vicinity of the properties. Repairs were noted, and a number of features cut through the earlier phase of the surface.

Earlier cobbled surface, CG 1041

This was located in the north-east of Area 1 and constructed from a single course of small rounded stone cobbles, extending out from the northern limit of the excavation for about 12m and roughly 11m in width. It appeared that it would once have linked up to the east–west road, but its full dimensions were unclear due to later truncation.

The early roadside ditch (Period 3; CG 1003) with re-cut (Period 4; CG 1005) and a deposit from the construction of the stone-lined well (Period 4; CG 1014) were sealed by this surface, which contained material of late 3rd to early 4th century date. A few of the deposits relating to Building 3 were also sealed by the surface, suggesting that this was probably in use during the early 4th century. It is possible that this was contemporary with the construction of the later elements of that building and then continued in use when the aisled building (AU 508; Period 6) superseded these structures.

The date for this surface is broadly contemporary with the features post-dating the cobbled surface (Period 4; CG 1045) to the south of the buildings (see AU 523). Cut through this surface were a number of features and deposits (CG 1042 and CG 1043) that may have been contemporary with its use.

Features associated with the cobbled surface, CG 1042

Cutting the earlier cobbled surface (CG 1041) to the east of the buildings was a group of pits. One, (6672), was around 3m long but slightly irregular in shape; another was steep-sided and circular, with a diameter of 2.40m (7023). A further 1.10m diameter circular pit (6893) and an elongated oval feature (6601), over 4m long, completed the group. These contained a range of material of 2nd century to early 4th century date and are associated with the adjacent occupation and use of the surface in this area. It is possible, given the position of these pits, that they were directly associated with the later occupation and use of Building 3, or perhaps clearance of the area.

Deposits sealing the cobbled surface, CG 1043

The surface was overlain by a thin sequence of deposits containing late 3rd to 4th century material, probably representing the last period of use of the surface before it was replaced.

These layers also covered the pits cut into the surface and may be resultant from a build-up of material following the disuse of the buildings to the west during the earlier 4th century.

Later cobbled surface, CG 1098

Overlying the deposits of later 3rd to early 4th century date was a partially preserved surface, constructed from rounded cobbles and iron slag to form an area of hard-standing. This was the same length as the earlier surface, but it did not extend as far to the west having been heavily truncated by post-medieval structures (see Period 12; AU 517). Pottery from the later 3rd and early 4th century was recovered, and a coin minted AD 330–348 was found (small find 221). A cable-twist bracelet, common in the 4th century, was also associated with the surface (small find 34). Therefore, the finds suggest that the surface was in existence and being used by the early 4th century, and possibly into the middle 4th century as well (Period 6). Part of this was cut by the footings for the aisled building (Period 6; AU 508).

Intrusions in the buildings, AU 520

Clay-lined pit, CG 1071

Towards the northern end of the latest phase of Building 2 (AU 519, Phase 2D), and just to the west of the later aisled building (AU 508), a large pit was identified and seen to extend beyond the limit of excavation under a modern wall (Fig 32). This cut the floor of the building and had been lined with clay, probably to retain water for quenching, or maybe as a cess pit that could be easily accessed from the roadside. This had later been re-cut by a new pit (CG 1072) which had partly removed the clay lining, suggesting that the original pit was no longer in use. It is possible that this served a purpose associated with the activities taking place when the Phase 2D building was occupied, or, more likely, it was an intrusive feature. Unfortunately, as the full extent was not visible within the excavated area its overall dimensions and function could not be identified. The finds from within the pit demonstrate a backfilling date of 3rd to early 4th century and suggest that it pre-dated the construction of the aisled building (Period 6).

Features post-dating the surface at the rear of the buildings, AU 523

The pottery recovered indicated that the cobbled surface found to the rear of the buildings (see Period 4, CG 1045 above) related to the earlier phases (2A and 2B) of use at these properties (Period 4; AU 503 and 504). This is supported by the dating of a number of features that cut the surface and which are probably contemporary with the later phases of the buildings (Phase 2C and 2D; AU 518 and 519; Fig 32). Some of the deposits observed may also post-date the buildings and relate to disuse and abandonment of the area, probably in the early to mid-4th century.

Pit, CG 1046

A 2.8m diameter circular pit over 1m in depth was cut into the cobbled surface and contained a series of fills including later 3rd to 4th century pottery, as well as a coin of 4th century date (small find 23). This may have been used for the disposal of domestic waste that had originated in the nearby properties.

Pit or well, CG 1085

A 2.40m wide pit, which was not fully excavated, may have been an infilled well. A number of thin lenses of material were suggestive of a gradual accumulation of deposits following disuse, rather than a rapid backfill. The well had probably gone out of use during the latter half of the 3rd century.

Pit, CG 1087

A large pit, 3m in diameter and 1.21m deep, was also found in this area and it partly truncated the possible well. A number of dumped fills were within this feature and the pottery was dated mainly to the 3rd century, although early to middle 4th century pottery was also present. This suggests that this feature was infilled towards the latter part of occupation in the buildings. Apart from the pottery, finds from this pit included ceramic roof tile, stone roof tile, mortar, fragments of oven wall, slag, and the only known antefix from Worcester, demonstrating that it contained demolition material from substantial buildings.

Smaller features, CG 1086

Two other features could be interpreted as either small drainage gullies or perhaps beam slots although, if beam slots, they appeared to stand in isolation and may only have formed slight temporary structures to the rear of the buildings. The latest of these cut the upper fills of the large pit (CG 1087) and contained mid-3rd to mid-4th century pottery.

Another isolated feature (7033), rectangular in shape and 0.16m in depth, appeared to have been packed with some sandstone pieces, suggesting it may have held a post, and was dated to the later 3rd century.

A 0.40m deep feature thought to be a pit (6589), found at the western limit of excavation, may actually be the result of the cobbled surface slumping into softer deposits below, and the resulting depression becoming filled with later material. A coin from this feature was probably of early 4th century date (small find 38).

Demolition layers above the cobbled surface, CG 1047

Overlying the cobbled surface was a sequence of layers that consisted of probable demolition material. These deposits contained domestic pottery, but also a high proportion of clay and wall plaster in a localised dump (6836). In addition, a concentration of pottery and broken amphora (6376 and 6377) was noted lying directly on top of the cobbled surface (Fig 41). This material was of 3rd to 4th century date and the deposits appeared to have derived from the abandonment and subsequent collapse of the final phases of the buildings to the north, although it is possible that some of the amphora had been deliberately used in patching the surface.

Of particular note was pottery found here which cross-joined with pottery recovered from the upper fill of the large quarry pits discussed below (Period 6; AU 510). This may suggest that the area, or perhaps just part of it, had become more run-down and disused at this time.

These deposits marked the interface between the final activities taking place on the cobble surface (CG 1045) and the later tillage soil that accumulated from the end of the Roman period and sealed features of Roman date (Period 6 onwards; see CG 1056).

Later activity to the rear of the Buildings 1 and 2, AU 527

Further away from the buildings, to the south of the cobbled surface, two substantial pits had probably been used to dispose of midden waste. One of these (CG 1093) cut the earlier pit of 2nd to 3rd century date discussed above that was used for the same purpose (see Period 4; CG 1092).

Pit, CG 1093

This pit was sub-circular in plan, around 2m in diameter and over 1.4m deep, but it extended beyond the limit of excavation and had been truncated by a 19th century pit so the full dimensions were not clear. Due to water inundation and safety reasons, the full depth of the feature was not reached, but at least eleven fills were recorded and these all appeared as layers of dumped material. This pit cut the earlier pit (CG 1092) and the pottery recovered from this was late 3rd to 4th century in date.

Pit, CG 1095

This large oval feature also extended beyond the limit of excavation and was truncated by the same 19th century pit as CG 1093. It was around 2.39m wide, over 3.3m in length and 1.22m deep and contained ten fills representing a series of dumped deposits. One of the middle fills, (6901), was particularly rich in environmental remains, with abundant charcoal and charred cereal crop waste, as well as iron slag. Pottery from the pit ranged in date from the 2nd to early 4th century, again suggesting it was in use during the main phases of occupation in the buildings to the north.

Dispersed Roman pits, CG 1051

Towards the central part of the site area, to the south of the main occupied area, were a number of isolated pits. Some of these features were overlain by a later malting oven (see CG 1050) and others were only beneath the later tillage soil (Period 7; CG 1056) that extended across the site. The majority of these were pits that contained a mix of material that could be dated from the later part of the 2nd century and into the earlier 4th century. A number contained relatively high quantities of domestic material and one (8876) contained an almost intact sandstone basin discarded in the upper fill (Figs 42, 43). This had probably been used as a container for animal feed or water. The features were of varying sizes and appeared to form a dispersed group of rubbish pits. No associated structures were identified in the vicinity and the location of these, roughly 25m away from the main focus of occupation to the north, again suggests a possible use as an area of small scale rubbish disposal.

Clay-lined pit, CG 1107

In this area of dispersed pits, towards the centre of the site at the rear of the buildings, a shallow feature was revealed that may have been used for the storage of water (Fig 44). This was circular, 0.80m in diameter, and 0.17m deep. It was only the base that had survived later truncation, but it was lined with compacted yellow clay 0.08m thick that would have sealed the pit. The fill of this feature contained pottery dated to the mid- to late 3rd century, suggesting this was contemporary with the occupation of the buildings to the north.

Features pre-dating the malting oven, CG 1050

Below the later Roman malting oven (see Period 6; CG 1049), were a number of small features and deposits. Material from these was dated to the late 2nd to early 4th century, suggesting that the later structure was not built until after the early part of the 4th century. The features were not identified as of any particular purpose, but were probably of a similar date and function to the other isolated pits in the vicinity (see CG 1051).

Later pit group on the floodplain, CG 1113

In addition to the pits infilled with 2nd century material found in Trench 15 (CG 1112; Period 4) was a group of five pits in the same area that could be attributed to the 3rd and 4th centuries. These ranged from 0.12m to 0.74m in depth and 0.40m to 1.50m in plan, and some intercut and truncated the earlier features. As with the other pits, slag and pottery were recovered. This later pit group, combined with the earlier pits, demonstrates that the eastern edge of the River Severn floodplain was being utilised from at least the 2nd century and into the 4th century.

Period 6: Early 4th century to late 4th century (*c* AD 320–400)

The area of the site in the 4th century is defined by disuse of the earlier buildings and re-development in a different format, reflecting changing land use (Fig 45). There are also indications that the tillage soil found across the site was accumulating towards the end of this period; the soil micromorphology suggests that domestic animals may have been managed or grazed on wastelands. Although there was much less pottery than in the preceding periods, occupation was still demonstrated through the artefacts.

Pit cutting the stone-lined well, CG 1015

During the mid to late 4th century the stone-lined well (CG 1014; see Period 4) was partially robbed during the excavation of a large pit on its southern side (7054). This cut vertically through the stone lining and removed it cleanly and carefully. The entirety of the stone was not removed, so it is possible that this robbing was a more opportunistic event during excavation of a pit for another purpose, or that only a small amount of stone was required. The ten fills of the pit consist of a mix of deliberately in-filled material and slumping of the original construction material from behind the removed stones.

The *terminus post quem* for the pit is AD 350; finds within the backfill included two coins dated to AD 348–60 and AD 350–3 (small finds 71 and 93), another dated AD 295–388 (small find 159), and fragments of cable twist bracelets, mainly a late Roman type (small finds 102 and 157). The pottery also correlates with these dates, with 4th century material recovered from the backfill. Furthermore, a rectangular buckle plate, probably 4th to 5th century in date, came from this feature (small find 99). This is consistent with the stratigraphic relationships on site, as the pit cut through deposits post-dating the last use of Building 3 (Period 5; AU 521) which is dated to the very end of the 3rd century or early 4th century. It was later cut by the eastern side of the foundations for the aisled building (AU 508), discussed below, and at the end of the 4th century another small pit (6841) was dug into the upper fills of the pit.

The aisled building, AU 508 (Figs 46, 47)

As with the earlier buildings, which were superseded by this structure, the aisled building extended southwards from the northern limit of excavation (Fig 45). The exposed foundations defined a building shape roughly 22x11m in size, a very typical ratio of 2:1 in length to width (Perring 2002, 53; see also the size of the numerous aisled buildings at Orton Hall Farm in Mackreth 1996, 55–74).

This was the final structure in the densely occupied northern area of the site; there were no later Roman features and the building was sealed by the tillage soil (Period 7; CG 1056), with no overlying building debris resulting from the collapse or demolition of the building observed. It is therefore probable that this building was constructed from timber and compacted earth, leaving little trace in the archaeological record, especially after a period of disturbance during the formation of the tillage soils.

Initial footing to the south-west, CG 1016

At the south-western corner of the aisled building was a deep trench 3m long, 0.4m wide and up to 0.60m deep, which contained four fills. This element of the structure was the primary construction phase of the building. The fills consisted of alternating compacted layers of natural pinkish-brown marl and loose yellow-brown sands, with the upper deposit partially truncated by a later foundation trench for the building (CG 1017). The exact function of this short trench remains unclear, though its proximity, similarity and alignment with the main foundation for the aisled building suggest that it had a specific purpose providing support in this area.

Outer foundation trench, CG 1017

The outer foundation for the building consisted of redeposited and compacted natural marl, laid into a trench that created a near rectangular shape. The pinkish-brown fill was distinctive and clearly definable against the earlier deposits through which it was cut (see Fig 47). On the western side, the trench was up to 1.20m wide by 0.45m deep. The trench on the eastern side was smaller, 0.85m wide and 0.25m deep, and partially removed, probably a result of horizontal truncation (Figs 46, 48). Based on the variation in depth in places along the western side, the trench appeared to have been excavated in segments, perhaps by different groups of workers or across slightly different timeframes. At the northern side the foundation trench was deeper (0.65m), probably to allow for the fact that it cut through softer deposits associated with the early roadside ditch (Period 4; CG 1005). This area also contained further deep foundations in the form of post-pads beneath the foundation trench (CG 1040 below).

The trench extended around internal post-pads (CG 1018 below) but did not form a complete rectangle, with what appeared to be a gap in the south-east corner. It appeared to stop abruptly at this point (the eastern end of the southern side) but the amount of truncation in this area may have been a factor; either way, the trench was certainly less substantial in this part and did not join to the southern side. It is possible that the gap indicates that the building remained incomplete, but it seems more reasonable that this was a feature of the design and that an entrance way or open area was present here. The space was just over 2.75m in width, large enough for a substantial doorway for access into the building.

The pottery recovered from the foundation trench was of 2nd to 4th century date, thought to be residual and a result of the building disturbing the earlier features of this date in this area. The eastern side of the foundation trench cut the upper cobbled surface dated to the first half of the 4th century (see Period 5; CG 1098). It also slightly cut the possible robber pit dug into the earlier stone-lined well (CG 1015 above), the upper fills of which contained coins dated to around AD 350 (small finds 71 and 93). Therefore, both as a result of stratigraphic and artefactual evidence, the construction of the aisled building was undertaken during the mid-4th century at the earliest and, most likely, was a later 4th century structure.

Deeper foundations at the northern edge, CG 1040

Beneath the northern side of the foundation trench were a series of five square post foundations, ranging from 1.0–1.5m in width and 0.80–1.20m in depth (Fig 49). These were again packed with pinkish-brown redeposited natural marl. One of these deeper foundations contained pottery dated to the earlier 4th century within the packing material.

It is to be expected that these deeper foundations supported individual large posts at this end of the structure, perhaps part of a substantial façade on the street frontage, but mainly acting as support for the upper part of the building. It is not uncommon for aisled buildings to be found with more substantial gable end foundations than the side walls, including post or buttress bases, suggesting that the end walls took the majority of the load for roof construction (Perring 2002, 111–2).

Internal post-pads, CG 1018

The internal foundations for the building consisted of nine square footings packed with the same pinkish-brown compacted marl that filled the outer foundation trench. All were spaced equally apart and had vertical sides with a flat base. One contained some iron slag as a bedding layer beneath the marl, lining the bottom of the cut, but this was unusual in comparison with the absence of any other additional slag foundation material in the majority. Seven were in an alignment following the western side of the building, all roughly 1.20m wide and with varying depths of 0.3–0.9m. Two similar square footings were located towards the north end of the eastern side, although these were no deeper than 0.45m. Where present, these were clearly paired with those on the western side. The absence of the square footings for most of the eastern side coincides with the shallower part of the outer foundation trench where there appeared to have been truncation. It is possible, therefore, that the post-pads would have once continued on this alignment down the eastern side up to the point of the gap in the south-east corner.

The post-pads are thought to have acted as bedding for base plates upon which timber posts rested in order to support the roof, and this may also have resulted in the creation of a series of divisions within the building. The eastern of these cut the same upper cobbled surface (CG 1098) as the eastern side of the outer foundation trench. This supports the dating of later than the mid-4th century for the construction of the building.

Aside from the post-pads, there were neither internal features nor any occupation layers that could securely be associated with the building, so its function remains unclear. The absence of internal features may suggest that the building did not serve any domestic purpose, whereby more deposits related to occupation could be expected in and around the structure. This is a fairly common occurrence for later Roman aisled buildings however, which are often simple in form and purely utilitarian, and thought to be mainly for agricultural or light industrial use (Morris 1979, 55–65).

Central oven, CG 1019

Towards the northern third of the visible footprint, and within the central area of the aisled building, was a circular oven (Figs 50, 51, 52). Although this oven had no direct physical relationship with the main building it was late in the stratigraphic sequence and given its central location could be expected to have been associated with this structure.

The oven was constructed in a shallow circular pit (6558) 1.0m in diameter and positioned on a level and well compacted, but thin, clay base (6566). Set onto this clay was a surface of broken Roman pottery and oven material, possibly used for reflecting heat back into the main oven structure or as a bedding layer, and a clay floor that had been well fired *in situ* (6548). Additional clay packing (6549) surrounded the oven (Figs 50, 51, 52). The circular structure of the oven itself (6557) was 0.60m in diameter and would have formed a dome, probably with a 'horse-shoe' opening on the northern side. What remained of this was covered by a demolition layer (6547) consisting of broken fragments of oven structure and the clay that would have originally sealed the entire feature (a more detailed consideration of the form of these ovens is given in Roman oven material: pre-formed ceramic ovens and plates).

This oven was the best preserved of those found on site and as a result was selected for archaeomagnetic dating. A broad date range resulted from this, but there was not a reliable and accurate date for the last firing in the use of the oven as the magnetic direction was too scattered (*pers comm* Cathy Batt, after Greenwood and Batt 2009; Appendix 7). The date range produced was AD 990–1250. It is considered doubtful that this is authoritative; the feature was built using 2nd to 4th century Roman pottery, was within a Roman aisled building, and there was no clear indication of any related Anglo-Saxon features.

Quarry pits, AU 510 (Fig 53)

To the south-east of the aisled building, two large conjoined pits were fully excavated (Figs 54, 55). Whilst they appeared as two large pits on the surface, they were probably once a single pit divided by a ramp of natural material left *in situ* to aid access and egress. This ramp spiralled down into the features. Both contained vast quantities of artefacts, suggesting that they had been used to discard material after their initial purpose was complete. The finds dated from throughout the Roman period and had been deposited in a number of layers indicative of a sequence of dumping, with tip lines evident. Lower deposits were mixed and the varied nature of the finds suggests that the material used to infill these pits had probably come from earlier deposits or midden dumps of accumulated waste. Later dumping probably occurred in a separate phase of infilling once the initial deposits had settled.

The pits formed an irregular 'figure of eight' shape; the northern part of the pit (CG 1057) was around 6m in diameter and 2.20m deep and the southern (CG 1108) was larger in size, being about 6.5m in diameter and 3.5m deep. The sides were steep and almost vertical and the base was irregular. The construction cut of these pits went through features that post-dated the early 4th century surface (CG 1041; see Period 5) east of the buildings. Stratigraphically therefore, they could not have been dug out before the early 4th century. As such, it is probable that at least some of the excavated material taken from these pits was used in the foundations of the aisled building, which contained packed marl and was probably built from the mid-4th century onwards, if not even later. It is estimated that together the pits would have produced 150m^3 of marl when quarried out. The adjacent aisled building foundations and post-pads, as surviving, contained approximately 38m^3 of packed marl. Clay pits have been identified as close to Roman construction sites as was practically possible in a number of locations (Perring 2002, 99).

The southern part of the feature had relatively few fills, and these were fairly homogenous, suggesting that the pit may have been backfilled in one rapid episode. Generally, the pottery was of 3rd to early 4th century date and a lower fill (7050) produced a piece of carbonised wood with a radiocarbon date of cal AD 210–380 (1760±30BP; Beta-290593). In the upper part of the pit, a fragment of leather (small find 193) was radiocarbon dated to cal AD 60–250 (1850±40BP; Beta-287692). A large quantity of slag was also encountered (148kg) and later 4th century pottery recovered.

In the northern part, a different and more complex sequence of fills was identified. The lower fills were quite sterile but included 2nd century pottery and a coin, in poor condition, dated to AD 138–161 (small find 192). Above these were a series of deposits containing large assemblages of pottery dating from the late 2nd to mid-4th century. Whilst still containing late 3rd to mid-4th century pottery, a further fill (6492) of the northern part was a defined by a vast compacted slag rich deposit (3665kg). The amount of slag dumped here demonstrates that there was extensive waste accumulating from iron smelting, although no direct indication of the iron industry was found on the site itself. Fragments of fired clay were also found in this pit, a number of larger pieces of which showed evidence of vitrification consistent with the inner surfaces of iron smelting furnaces. Finds from above the slag layer were noted as more fragmentary in nature but were characterised by the presence of small quantities of late Roman shell tempered ware, dated to the late 4th century, as well as a number of wall plaster fragments. Thirty-three coins came from two fills in the upper part of the pit and many dated to the 4th century. It also contained a square sandstone block 450x410x350mm in size. The stone had a carefully-worked square hole cut into one or its surfaces, either to hold a wooden door jam or to join to a similar sized stone to form a larger structure, such as a column.

Based on the deposition of these artefacts, it appears that the quarry pits had a variable sequence of backfilling, one in which the earlier fills were largely re-deposited material taken from nearby heaps and infilled fairly rapidly once the pits were open in the earlier to middle part of the 4th century. This was probably due to clearance of the area and the open (and dangerously large) pits offered an easily accessible feature for the disposal of this material. This type of disposal of previously accumulated midden material also seems to have characterised much of the pit infilling at City Campus immediately to the north (Sworn *et al* 2014). Latterly, material related to later 4th century use of the area appears to have been deposited in the pits, probably after the initial material had settled and sunk into the hollows. This could have resulted from later occupation represented by the construction of the aisled building, probably built in the mid- to late 4th century but certainly after AD 350.

The environmental remains from these features support this interpretation, being indicative of heavily mixed material dumped in middens and then redeposited into the pits (see Ecofacts). Waterlogged plant remains in samples from the lower fills were dominated by seeds from plants associated with scrub and waste ground, and parasite ova from human and animal faecal waste was recovered. Grass pollen from these deposits is also suggestive of fodder, stabling material, flooring and/or roofing material being infilled with the waste, rather than coming from cultivation of the surrounding land, consistent with the presence of nearby settlement.

Malting oven and associated structure, AU 531 (Fig 56)

On the edge of the terrace slope, approximately 25m south of the aisled building (AU 508), was a sandstone malting oven. Although only the base remained, the surviving elements were in relatively good condition, excepting where the eastern/rear wall had been truncated by a large oval post-medieval pit. This had removed much of the stone on this side. To the west and south sides of the oven were the stone foundations of an associated building that may have enclosed this structure.

The malting oven, CG 1049

The oven, measuring 2.5x2.5m overall, was built on sloping ground, being lower to the west and therefore positioned on a slight angle (Figs 57, 58, 59). Two thick walls built with roughly hewn sandstone blocks survived (8804), each 2.5x1m in size and three courses high, leaving an internal space of only 0.55m wide. The walls were in-filled with a sandstone rubble core. A number of the stones forming the external faces had been reused from earlier structures, including half a rotary quern and a worn stone that may have previously been used as a threshold. The internal surface in the entrance at western end had been partly floored with re-used roofing tiles (*tegulae*). This surface showed some degree of heating, though not from direct high temperatures. A slight depression with a clay layer at the western end was probably the stoking hole at the opening of a flue.

It is considered that this is either the surviving base of a malting oven used for drying barley in the brewing process, or a corn drier. There was no definitive environmental evidence for the exact crop processing taking place, other than occasional recovery of barley and spelt/ emmer wheat from two deposits in the flue area. This is probably because the remaining structure found here was only the foundation of the oven, and the actual drying took place on a mortared or baked clay floor higher up in the superstructure.

Similar Roman period examples are more commonly found during the 3rd and 4th century and often represent large-scale bulk processing, as the drying can normally be completed at a small-scale on a household by household basis (Van der Veen 1989, 315). Of particular interest, given the nearby features on this site, most malting ovens or corn driers tend to be associated with, or within, a villa or an aisled building during the 4th century (Morris 1979, 9).

Pottery recovered from the oven dated to the 3rd century and early 4th century, but it also overlay features containing similar material, suggesting that it was built sometime after the earlier 4th century and that this may be residual. The oven was also observed to truncate some thin ‘dark earth’ soil deposits. It has previously been assumed that these soils began to form in the early post-Roman period following abandonment of parts of the settlement, based on results from the Deansway site (Macphail 2004). More recently however, radiocarbon dating from an articulated burial located within tillage soils at the City Campus, immediately to the north of The Hive, produced a probable late 3rd to 4th century date, cal AD 250–397 (1717±28; UBA-16943; Sworn *et al* 2014, 24–5). It is therefore suggested that these soils had begun to form within the Roman period and that the malting oven was built during the later 4th century. Soil micromorphological analysis conducted on the soil around the oven here also suggests that the soils were forming before and during the period when the oven was in use. Perhaps an initial ‘dark earth’ accumulation took place, associated with abandonment, before later cultivation across the area created a more identifiable tillage soil around the oven. Hearth debris was incorporated into the lower deposits and constructional or demolition waste comprised of plaster, clay and charcoal, probably from the oven, sealed this earlier soil (Macphail and Crowther 2012; Appendix 5).

Associated structure, CG 1114

Three sandstone pads and an upright sandstone block (8816, 8827, 8859 and 8860; Fig 56) were found within the tillage soil surrounding the oven. These were aligned and created an ‘L’ shape defining the west and south sides of the feature and appeared to be the foundations for an associated structure. Although not conclusively identified due to the limited survival, it is possible that post and clay walls were built up from these pads and that a timber framed building or small shelter was constructed around the oven. This would have enclosed it and prevented strong winds and weather affecting the controlled drying process. It is certainly thought that most driers were contained within a structure of some sort, as experimental firings have shown that without it they were far too susceptible to changing winds and sparks from the fire entering the drier (Morris 1979, 11–12).

Well pit, AU 524 (Fig 60)

Located on the higher slope of the terrace was a substantial construction pit for a timber-lined well.

Main construction, CG 1088

The pit (8664) was a slightly irregular oval around 5m in diameter, with near vertical south, east and north sides. The western edge was roughly shaped into a series of small steps, eventually leading to a larger platform around 1.5m down on the southern side (Figs 61, 62). At the base of this was a smaller square shaft, 0.8m by 0.7m in size, delineated by a dark staining. This staining was the highest surviving level for the well shaft and was probably a result of decayed timbers. No remains of the timbers were preserved at this level just above the water table, though the shadows of the former timbers were visible. The stained outline of the well shaft became apparent at 14.67m OD, but excavation ceased at 13.74m OD due to impact depth and safety reasons. The remaining well deposits were augered to test their extent and the fills extended to a depth of 9.94m OD (3.80m below the limit of excavation). This was only a 10mm difference between this and the depth of the earlier stone-lined well to the north (Period 4; CG 1014).

Due to the lack of complete excavation, the form of this well was not entirely clear and it is uncertain as to the date it was initially built. However, finds from the lower deposits contained pottery of 2nd, 3rd and 4th century date, including some of mid- to late 4th century date in a lower fill (8663) just beyond the main limit of excavation.

Upper backfill, CG 1089

Covering the lower deposits and sealing the feature identified as the well shaft, but still within the large overall cut for the construction of the well, were a series of layers of dumped material backfilling the pit. Many of the finds from these deposits could be dated to the 4th century and a coin from an upper fill (8657) was dated to AD 330–78 (small find 247). Also found in this fill was a penannular brooch with a possible later 4th to 5th century date (small find 251).

These deposits were probably the result of a period of infilling during the latter half of the 4th century, possibly continuing into the 5th century, utilising the large well pit as a suitable location for disposal of waste material that had accumulated in the surrounds. This is similar to the later use of the large quarry pits (AU 510) 15m further to the north.

Small pits, CG 1090

Cut into the uppermost backfill of the well pits were two small and shallow pits (8654 and 8701), which contained dumps of Roman stone roofing tile. The pits did not include any other finds but, because of their stratigraphic position, could be expected to be representative of later 4th century or even early 5th century dumping in this area.

Unphased Roman features (Periods 3–6)

Where possible, features have been attributed to a specific site period and are presented as such above. However, a number of features could not be identified more specifically than being probably Roman in date. In many cases this was because the features were found beneath the tillage soil but suffered from a lack of deeper stratigraphic relationships caused by excavation ceasing at the impact level for the new building. Around sixteen small pits and four posthole type features fit into this category, some of which contained 2nd to late 3rd century pottery. Whilst this material could be residual, it correlates well with the main periods of occupation and thus these features are probably associated with the buildings identified here. A heavily truncated possible oven was also only broadly dated as Roman. This consisted of a shallow oval shaped cut and a series of clay layers, the uppermost of which was heavily fired (CG 1084). No finds were recovered from the feature but it was revealed beneath the tillage soil and just within the area of the aisled building (AU 508; Period 6). It was adjacent to a further possible oven dated as 2nd to 3rd century in origin (CG 1109; Period 4).

As noted in Fieldwork strategy, in the north-west corner of the site a narrow trial trench was opened off the main area of excavation (Trench 17). This was to test the extent and depth of any Roman deposits in this location, close to the identified focus of occupation. No excavation of features took place as they were below the impact depth, so they remain undated by finds. However, when compared to the adjacent excavated archaeology, the features were similar in character to those recorded in the main area. This included a yellow clay layer adjacent to an extensive slag surface, a possible posthole and burnt deposits that may have been related to an oven. As with elsewhere, a build-up of tillage soil sealed the Roman deposits.

Neonate burial, CG 1105

A single human burial was excavated just to the north of the malting oven (CG 1049). This was excavated by hand on site (Ministry of Justice burial licence 09-0089, dated 5th May 2009) but was in poor condition; the majority of the human bone was recovered from environmental samples taken at the time from the grave fill (8676). Subsequent analysis of the remains determined an age of death at around 40 weeks (Ossafreelance 2013; Human bone; Fig 63). The burial was isolated and remains undated through artefacts, though it was found after removal of the tillage soil and the grave fill was very similar to that of the other pits in the vicinity (CG 1051), which were dated to the 2nd to 4th centuries. Therefore, it is considered to be broadly of Roman origin. As with the burial found at the City Campus excavation to the north, however (see Sworn *et al* 2014), the possibility that the burial was dug through, and then backfilled with, the tillage soil, could not be ruled out.

Period 7: Post-Roman and early medieval, 5th century to 9th century AD

There was limited activity across the area of the site at this time and no features could be securely attributed to this period. The post-Roman period was characterised by the accumulation of the tillage soil across the site. It is possible that the aisled building (AU 508), as the last phase of occupation, the malting oven, which truncated earlier ‘dark earth’ soils (AU 531), and the well pit (AU 524), backfilled in the late 4th to early 5th century, dated to the early post-Roman period or continued in use into the 5th century, but this could not be definitively demonstrated.

Tillage soil deposits, CG 1056

A thick deposit of dark soil overlay the Roman features and extended across the entire site, including the floodplain. This soil constituted a substantial layer of post-Roman plough soil, containing residual Roman pottery. As mentioned above, a model for the development of 'dark earth' deposits in Worcester has previously been proposed, based on detailed study at the Deansway site (Macphail 2004). The dark earth at Worcester is thought to have originated as midden material mixed with large quantities of silty soil and manure brought in by grazing animals that were penned during the later Roman period, probably following severe contraction of the settlement area in the 4th century. Away from what is thought to have been the core area, such as in the vicinity of the Butts, this soil is more readily identified as accumulating through cultivation and manuring and is better termed as a 'tillage soil'.

The soil contained a range of material from Roman through to late post-medieval, including 14th century sewing pins (small finds 192–4) and 17th century coins of Charles I (small find 255), indicating the constant re-turning of the soils. The two latest Roman coins from the site, dated to AD 383–8 (small find 270) and AD 364–78 (small find 256), came from the tillage soil. The latest Roman pottery within this dated to the 4th century, but also included diagnostically earlier pottery types.

Possible post-Roman features, AU 522

Ditch aligned north to south in Trench 15, CG 1080

Towards the centre of Trench 15 in Area 3 was a ditch aligned north to south (Fig 65). Although cut by a later post-medieval ditch (CG 1060; Period 10), this feature was seen to be at least 1m deep and around 4m in width, containing well-preserved organic material towards the base. These lower organic-rich fills of the ditch are not securely dated, although it was observed that the ditch was stratigraphically later than features of Roman date, such as pits. As the ditch pre-dated the large 'V' shaped ditch (CG 1060), thought to date from the mid-17th century, the stratigraphic sequence places this feature somewhere between the late Roman to medieval period. Given the lack of 6th to 16th century remains found across the site as a whole however, it is considered to be late Roman or immediately post-Roman in origin.

Small ditch truncating aisled building footings, CG 1081

Extending from the northern limit of excavation, a small ditch aligned north to south, 6.7m long, 1.44m wide and 0.48m deep, truncated part of the northern side of the aisled building (AU 508; see Period 6). Although not specifically dated as post-Roman by finds (the ditch included late 3rd to 4th century pottery, as well as 2nd century material, all residual), this ditch was clearly later than the footings of the aisled building, but was overlain by later tillage soil (CG 1056). Therefore, it is thought that it may be an early post-Roman feature.

Period 8: Early medieval, late 9th century to early 11th century AD

There were no features that could be securely dated to this period, although it is equally possible that the ditches described in Period 7 (AU 522) could be of early medieval origin. The accumulation of tillage soil was, however, continuing throughout this period. A copper alloy hooked tag dress fitting was found on the site and though unstratified, represents the only indicator of a late Anglo-Saxon presence (small find 260). It is probable that this small item was imported as a result of manuring rather than demonstrative of settlement in this area, though it could also represent casual loss in the landscape external to the Anglo-Saxon burh.

Period 9: Medieval, 11th century to 16th century

The process of tillage soil formation continued in the medieval period and the constant reworking of these soils made any identification of features within it practically impossible (CG 1056). A very small amount of medieval pottery was recovered, and of particular interest was the recovery of a French jetton, dated to around 1461–97 (small find 266). Medieval pottery was also found occasionally in later contexts, which is unsurprising given the proximity of the medieval city, but there was a lack of any substantial medieval archaeology in the main area of the site.

Medieval pits, CG 1054

Seven small pits containing pottery dating to the 13th–15th centuries, as well as residual Roman material, were found on the upper slope of the terrace in the southern half of the site (Fig 64). These were isolated features but confined within an area of around 23x10m, approximately 40m north of the city wall.

The dating evidence for the pits was limited to one or two medieval pottery sherds per feature but one could be securely attributed to the medieval period through stratigraphic relationships. This was oval in shape, 0.70x0.83m in size and 0.26m deep, and was cut by a ditch thought to date to the Civil War (CG 1058; Period 10 below). A further three small pits were of similar type to this and may suggest low-level medieval land use in an area considered to have been used for horticulture and animal penning. There was some indication that the 13th–15th century pottery within them could be residual, as three of the pits had dark fills of a similar nature to the post-medieval features in this area, although this was not conclusive.

The late medieval city ditch, AU 512

Earlier phase of the city ditch, CG 1035

In Area 2 to the south of The Butts and north of the city wall, the excavation of the city ditch, known to have been re-established in the Civil War, revealed an earlier, wider and deeper feature (2558; Fig 67). The ditch was 10m wide and separated from the wall by a 5m wide berm (Fig 68). Due to the water table encountered the early phase could not be safely excavated to its full extent and so it was investigated using an auger; this suggested that it was around 4.9m in depth. The visibility of this period was limited due to the post-medieval re-cuts, but the lowest part had survived because it had originally been excavated to a greater depth. This demonstrated a steep, v-shaped profile.

The surviving fills (2545; 2563), mainly visible down the sides of the ditch, comprised friable, redeposited and fairly sterile natural pinkish marl that had weathered and washed in from the exposed edge. The limited amount of pottery recovered was of 15th–16th century date, pre-dating the re-modelling of the city ditch in the mid-17th century at the time of the Civil War (see AU 513 below).

There is a possibility that this was the original ditch excavated alongside the construction of the city wall in the earlier medieval period, but more likely that what was observed here was a later medieval re-establishment of the defence. The pottery dates correlate well with historically documented work on the ditch in the later 16th century; it is reported that clearance regularly occurred and that, in one specific instance, the ditch was enlarged in 1588 due to the threat of invasion (Beardsmore 1980, 63; Jackson 1992, 3).

Period 10: Earlier post-medieval, 16th century to mid-18th century

This period is characterised by features though to be associated with the Civil War, both in close proximity to the city wall and further out on the terrace, as well as across the floodplain area (Fig 65). There was also evidence for continued re-working of the tillage soil throughout the post-medieval period, particularly through the recovery of pottery and coins of 16th to 19th century date.

Post-medieval city ditch, AU 513

Civil War city ditch, CG 1036

The Civil War ditch (2559) was roughly 9m wide and 4.5m deep, with a steep but regular profile to the south on the defensive side nearest to the wall (Figs 66, 4, 69, 70, 71). The northern side started with a gentle slope but then sharply dropped to form a steep slope dropping down to the base of the ditch. The alignment and position of the ditch in this period followed that of the medieval ditch. No sign of an earthen rampart or any other structures associated with the city defences were observed. Two fills had survived later truncation: a lower, red brown gravel-rich clay and an upper compact dark grey clay.

Finds from the upper deposit infilling this part of the ditch suggest that this was a substantial re-cutting or remodelling of the medieval ditch (Period 9; AU 512) that took place in the mid-17th century. Clay pipes dated to around 1640–60/80 and ridge tile dated to 1600–1800 were found, as well as slag and building stone. Plant and seed remains recovered from the ditch were representative of a disturbed, wet bankside environment (Plant macrofossils). The pollen evidence was complementary to this and indicated the presence of marginal and aquatic species, suggesting that slow-flowing or standing water existed in the base of the ditch and that animals were grazing in the surrounding area (Palynology, non-pollen palynomorphs and parasite ova). This is consistent with other observations of the ditch on this side of the city (eg Jackson 1992, 9).

Re-cut of the Civil War city ditch, CG 1037

A later clearing out of the ditch (2560) truncated the deposits found in the earlier Civil War period cut (CG 1036). This was shallower, just less than 4m deep, with a more moderately sloped regular profile. Although not particularly prominent, there did appear to be slight tip lines from the southern side. The main fill (2543) comprised organic dark grey clay. This was overlain by dumped deposits of grey brown silty sand.

Finds from the fills of this latest re-cut included late 17th to 18th century pottery and glass. Environmental indicators demonstrate a distinct change at the point of this re-cut. Molluscan remains in the earlier fills below (CG 1036) suggest open conditions, while those in the re-cut (CG 1037) suggest more shade, possibly from overgrown vegetation in waste ground. The land adjacent to the ditch was probably overgrown, with no occupation in this area. The insect remains may show that a stand of nettles grew near to, or alongside, the ditch at this date, and also that there was considerable food or cess waste disposal in the ditch.

It is therefore considered that this re-cut represents strengthening of the defences in this area during the later part of the Civil War, after the earlier ditch had been infilled following the end of the first period of conflict. The surrounding area was probably abandoned and unused when this occured. Although a later clearing out of the ditch after the defences had been slighted after 1651 is also possible, this seems unnecessary and therefore unlikely. The first hypothesis is preferred.

From the end of the 17th century onwards the ditch was gradually infilled with both natural deposits and soil and material culture until it was virtually full and redundant before the start of the 19th century. Cartographic sources do not show the ditch from the later 18th century onwards, although it is still identifiable as a partially visible watercourse on the 1741 Doharty map. At this point the land was reclaimed for industrial purposes, as evidenced by the construction of various brick structures (see AU 515; Period 12). These later walls, cellars and drainage culverts truncated the upper fills of the ditch.

Additional Civil War period ditches, AU 516 (Fig 65)

Within the main excavation site a series of ditches were recorded that may be defensive constructions during the time of the Civil War, although unfortunately there was no direct evidence of the Civil War within the ditches themselves.

Ditch in southern part of Area 1, CG 1058

Extending across the southern extent of Area 1 was an irregular ditch running north from the southern boundary for 25m, before turning through roughly 100–110° back towards the east and continuing towards the edge of the site. The construction of the ditch suggests a defensive nature as it had steep sides and a flattened base, being up to 3.90m wide and 1.14m deep (Figs 65, 72, 73, 74). It was cut through the tillage soils and the sides were clean, with little primary slumped fill or natural erosion in the base. Therefore, the ditch appears to have only been exposed to the elements for a short time before deliberate infilling, probably with the upcast material excavated from the ditch when it was originally opened.

This ditch contained few finds, but did include a clay pipe stem and a sherd of pottery dated as 16th to mid-17th century, as well as residual artefacts. The size of the feature is not overly substantial, but may have been truncated in later periods, and as a subsidiary defence would still represent an awkward obstacle approximately 30m north of the main city ditch.

On the same alignment as this feature was a comparable ditch, recorded but not fully excavated, around 90m to the east during the project at 14–24 The Butts (Butler and Cuttler 2011, 56–130). This was larger, at least 5.40m in width, but had a similar steep-sided with flattened base profile, and was interpreted as part of the Civil War defensive system (Butler and Cuttler 2011, 67). Although there is a considerable distance between them, the alignment and profile suggest that this could the same feature, but perhaps less truncated.

Another ditch, on a different alignment and with a stepped profile, was observed during excavations around 220m to the east at Farrier Street (Dalwood *et al* 1994, 82 and 108). A similar large ditch was also located nearby at 8–12 The Butts; this may have been perpendicular to the one at Farrier Street but the exact alignment was not clear (Napthan 2011b, 7). In neither case was much excavation or detailed analysis of the ditches undertaken, but they were considered to be defensive and of Civil War date. It is possible that they define a projecting bastion visible in this area on the Vaughan map (1660), which shows a number of such features projecting north from the city wall along The Butts (Atkin 1995, 56–8). As an accumulation of analogous features across this area, then it appears that the extent and completeness of the extra-mural defensive system around the city in this period may have been rather substantial.

Ditch in the north of Area 1, CG 1059

Further to the north was another ditch that again may have also formed part of the Civil War defences for the city (Figs 65, 75, 76). This was aligned east to west across the entire width of Area 1 and truncated the earlier Roman features found here. It was roughly 3m wide, but only 0.5–0.8m deep, and the fills of the ditch suggested a gradual silty in-filling, rather than deliberate backfilling. Material within the ditch dated from the 17th century onwards, but was broadly of post-medieval date. There was a slight suggestion from part of it that the ditch had been re-cut at some point in the 18th century. This may demonstrate that the ditch was originally of 17th century date, but had remained in use well into the 18th or even early 19th century.

The ditch does not appear on any of the maps from the 17th century and neither is it clearly identifiable on any later cartographic evidence. This may suggest that the ditch was in existence for only a short time, as with the ditch noted to the south (CG 1058), despite the deposits indicating otherwise. If this ditch is considered to be a Civil War defensive feature, then if may have acted as a primary defence in advance of the main defensive ditch located directly in front of the extant city wall and the other ditch projecting out from it (CG 1058). It is, however, still possible that this ditch may be slightly later than the Civil War, possibly originating as a boundary or landscape feature within the Netherton House estate that once existed to the east of the site.

V-shaped ditch in Trench 15, Area 3, CG 1060

A large V-shaped ditch (15028) was aligned north-west to south-east across the floodplain within Trench 15. The upper fills of the same feature were recorded to the south-east in Trench 16. Similar deposits, undoubtedly from the same ditch feature, were also exposed (but not excavated due to health and safety issues) during the watching brief phase of the project when ground works took place between the two trenches for the installation of an attenuation tank (Trench 31). The ditch contained a number of fills of which the upper deposits consisted principally of brick, mortar, and slate and timber rubble dating from the 19th century. These represent a phase of deliberate in-filling prior to levelling for the later cattle market. To the base of the ditch, two deposits (15027 and 15132) of fine silty clays appeared to have accumulated over a considerable period of time, probably through water inundation. These contained well-preserved organic remains, including leather objects, such as a man's shoe dated to the 18th century (small find 245). The artefactual material from the lower deposits suggests a possible early post-medieval date for its construction.

It is considered that the profile and nature of this ditch suggest either excavation or heavy re-modelling around the time of the Civil War in the mid-17th century, although it was not necessarily dug out purely as a form of defence. A mapped watercourse is known just to the south of this location in the 18th century. This was linked as a channel from the city ditch that fed into another stream and then the Severn to the north-west. It is possible that this ditch is that watercourse; however, the regular form, as opposed to an irregular stream course, and the observation in Trench 27 (CG 1209 below) that it appears to turn to join ditch CG 1059, does not support that identification.

Ditch observed in Trench 27, CG 1209

Probably linking the V-shaped ditch on the floodplain (CG 1060) with another running east to west in Area 1 (CG 1059) was a further ditch only exposed during later watching brief work. These ground works were for the installation of foundations for a hexagonal concrete structure (Story Island; Trench 27) to the west of the main building and, whilst up to 3m deep in places, mainly revealed modern made ground overlying the tillage soil that extended across the site. In the south-east corner of the trench, however, the upper deposits and western side of a ditch could be observed that appeared to contain the same deposits as those recorded in the V-shaped ditch. It was aligned broadly north-east to south-west and was turning from the orientation of the V-shaped ditch to head towards that of the ditch recorded in Area 1. This is suggestive of the feature linking the other ditches observed to act as an enclosing ditch, perhaps as a primary external defence, although as it was not excavated due to safety issues, this is not definitive.

Civil War additions to the city wall, AU 552

To the south of Area 2, on the higher ground behind the line of the city wall, were remains considered to relate to strengthening of the city defences during the Civil War.

Buttress behind the city wall, CG 1208 (Fig 77)

A short section of sandstone wall (26006), 1.70m long, 0.61m wide and about 1.20m high, was found to extend perpendicular to the south from the original line of the city wall (Fig 77, 78). It was constructed from roughly hewn sandstone blocks, up to 450x260x200mm in size, and was at least six courses high. Some of the stones were bonded with a hard, light coloured lime mortar and the rest were simply placed in a light brown silty sand matrix (26008), from which fragments of glass were recovered. To the north, the wall appeared to terminate in a regular square end; the trench (26009) for its construction was visible here. Later walls and modern intrusions, such as services and a 1985 archaeological evaluation trench (WSM 100428, Trench 3), had disturbed this structure.

It was not dated, and the small size and limited depth of its construction in comparison to the original city wall suggests that it was not a return of the main wall or a gateway designed to carry substantial weight. Therefore, it is thought to have been either a buttress or tie-in to support the back of the main wall and add support, possibly added during the Civil War period when the defences were repaired and strengthened (Atkin 1995, 54–64). Documentary sources specifically reference the north side of the city for this refurbishment (Atkin 1995, 62–64; Dinn 2012, 68–69).

Internal revetment against buttress, CG 1207

Observed in a small sondage, two deposits abutting the eastern side of the buttress may also support this inference and have been part of this refurbishment, potentially representing an internal bank (Fig 79). These consisted of a predominantly gravel deposit (26004) with a thick sand layer (26005) above and both sloped to the south and displayed clear tip lines, probably once acting as directly supportive material behind the main city wall. This would have been intended to deaden the impact of artillery shot. Found during the excavation of Trench 26, a clay pipe bowl dating to around 1640–60 could be associated with this, but unfortunately was not directly stratified within these deposits.

Pit with casting waste, CG 1082

A single circular pit was located towards the eastern half of Trench 15 in Area 3 and included material dating to the 17th century (Fig 80, 81). The pit was dug into alluvial clays and contained three separate fills from which a large amount of fired clay ceramic mould fragments were recovered (particularly fill 15137; Fig 81). Similar material was also found in dumped deposit (15077), possibly a shallow pit fill, and in other layers within Trench 15, as were small quantities of copper casting waste. The ceramic moulds were fragmentary but specialist analysis has demonstrated that they were used in the manufacture of vessels such as cauldrons and skillets (Medieval and post-medieval finds).

Curvilinear ditch, CG 1104

In the south-west corner of the main excavation area was a small ditch (8537), aligned north to south but curving to end with a rounded terminus. It appeared to run right along the edge of the terrace and is thought to be a boundary ditch marking the transition from the terrace to the floodplain. It was 0.80m wide and up to 0.33m deep, with sharply sloping sides and a flattened base. Unfortunately it was contaminated with hydrocarbons from former fuel tanks so could not be fully explored, but did contain pottery of 17th to 18th century date, as well as residual Roman and medieval material.

Period 11: Later post-medieval, mid-18th century to early 19th century

The area is mapped as largely fields and open land in the mid-18th century, west of the large Netherton House. This developed from pasture, through formal gardens, then becoming more urban in character in the early 19th century. Early post-medieval ditches were probably still open in some cases, perhaps including the very upper part of the city ditch, but the only feature securely dated to the later 18th century was a group of timber water pipes (Fig 82).

Timber water pipes, CG 1052

In Trench 15 (Fig 5), six timber pipe sections in a good state of preservation were recorded (Figs 83, a, b, c). These consisted of four interlocking timbers aligned in a south-west to north-east direction, joined by two other pipes running north to south. All the pipes were made from hollowed-out trunks of elm, tapered at one end and with an iron band at the other. The external diameters ranged from 0.35m down to 0.22m and the internal diameter of the each timber was 0.17–0.18m. Each timber slotted into one another and formed a longer pipe, which could have been sealed adequately enough to allow for water to be pumped along. The timbers were located in the base of a vertically sided trench (15008), and redware and creamware pottery dating to 1760–1820 was recovered from the backfill (15007), indicating a probable Georgian date.

Period 12: Modern, 19th century to 20th century

In the modern period the area of the site was intensively redeveloped. This included the establishment of the cattle market on the floodplain during the 1830s and the construction of buildings forming Joseph Wood’s timber yard and Nash’s Almshouse, which previously covered much of the site. Upstanding structural remains from this period have been analysed and discussed within the full historic building analysis, which is comprehensively covered in a separate report (Robson-Glyde 2016). The below ground structures uncovered were considered best suited to discussion along with the standing remains, but a brief summary section here details the features recorded during the excavation that represent 19th and 20th century structures (Fig 82); this includes evidence from the buildings analysis where appropriate.

Construction of the cattle market (1836), AU 511

Prior to the 1830s, Worcester's stock market had been held in the city centre, at All Hallows and then Angel Place. In 1836, a plot of land at the river end of The Butts was taken for use as a cattle market and it is shown as such on the 1845 railway plan (WRO ref b496.5 BA9360/Cab25/5/4). Prior to the building of the cattle market, at least part of the land had been pasture and a timber yard. The 1784 City Corporation Plan (WRO ref b496.5 BA9360/C1/2) shows the land as pasture within the grounds of Netherton House. The 1824 Corporation Plan (WRO ref b496.5 BA9360/C1/3) is more accurate and describes the same plot of land as a 'timber yard' in the ownership and occupation of Mr Abraham Edwards.

Final in-filling and capping of ditch, CG 1031

As previously mentioned, the possible Civil War period ditch in Trench 15 (Period 10; CG 1060) was infilled during levelling of the site. This material consisted of rubble deposits including brick, mortar, slate and timber dating to the 19th century. It preceded the build-up of made ground in the area, discussed below (CG 1032).

Made ground and walls, CG 1032 and CG 1033

In both Trench 15 and 16 were indications of major landscaping works, including the raising of the land surface across the extent of the eastern side of the floodplain prior to the new use as a cattle market. After the in-filling of the earlier ditch (see above), the ground level for the entire area of the new cattle market was deliberately raised by 0.75–0.80m. This was achieved through the deliberate dumping of material, including domestic rubbish, charcoal and re-deposited clays and marls. This would have raised the level enough to put the area at less risk from flooding by the nearby River Severn. Within these deposits was a brick wall aligned north to south and a brick culvert, both associated with the construction and use of the cattle market (CG 1033). The wall, roughly ten courses high, appeared to form either a boundary or revetment. It continued southwards from Trench 15 into Trench 16, where it turned 90º to the west.

'Counting House', CG 1034

To the western end of Trench 15 were the partial foundations of an octagonal counting house, central to the cattle market, built around 1836 (Fig 84). The southern half of this building was visible within the trench. The bricks from the structure were orange red in colour and measured 9½x4½x2 ¾". The wall was 0.6m (1' 11¼") wide and the length forming one side of the octagon was around 4m (13' 1½") in length. The date of the bricks is the early to mid-19th century and matches the date of the construction of the cattle market in the 1830s. This brick structure was sealed by the hardcore for the present car park surface and butted by a late 20th century levelling layer, but the top was noted at only 0.12m below the existing ground surface.

An 1871 plan of the cattle market (WRO ref r496.5 BA9360/Cab17/39) shows the structure marked as a 'Business House'. There is an aerial photograph of the 1920s (EH 2014) showing the building, which was known as the 'counting house' in the 20th century, surmounted by a clock tower. This is on the historic maps up to 1940 and clearly on a photograph of 1961(Robson Glyde 2016, Plate 39 and 40), but is not on the Ordnance Survey map of 1970. It was dismantled and removed in the 1960s.

Joseph Wood timber yard and saw mill, AU 509

Extensive structural remains were recorded across Area 1 that can be related to the documented buildings of the Joseph Wood timber yard, dating from the latter half of the 19th century. A large part of the yard was covered with a range of buildings running from east to west. This range of buildings was still in existence during the 1970s. The historical maps show that the range was constructed between 1857 (WRO ref 496.5 BA9360/Cab14/15/A) and 1878 (WRO ref 496.5 BA9360/Cab 14/15/A).

Building 1, northern range CG 1020

In the central area of the site, brick walls which once formed part of the saw mill were noted, some of which still stood 1m high (Fig 85). These walls created three bays 6x4m in size, but no floor surfaces remained within this range. The walls uncovered were the foundations of structures to the east of a large semi-circular arched opening and the space of the opening itself, constructed of brick coursed in Flemish Garden Wall bond and measuring 9x4¼x3". This size of bricks is consistent with the known construction date of the range, the mid- to late 19th century.

The 1878 plan shows that this part of the site was used as stores, workshops and a 'nag stable'. On an old photograph of the buildings (Robson-Glyde 2016, Plate 24), a chimney stack can be seen at the east gable of the range. The hearth for this chimney was revealed in the excavation. The north elevation had sheds attached to it, as lean-to structures. In the photograph, immediately adjacent to the gable can be seen the windows of the nag stable, the foundations of which were also revealed. The opening through the range is marked as 'archway' on the 1878 plan. Within this archway a set of stairs is drawn, to give access to the upper floors of the buildings. The foundations of this set of stairs were seen and they adjoined to the western part of the sawmill range (CG1022) which was observed at a later time in the excavation programme.

The historic mapping shows that the full range of buildings survived throughout the 19th century and most of the 20th century. The 1970 Ordnance Survey map still includes the full sawmill range of buildings and the structures were demolished after the almshouses (AU 517) in the autumn/winter of 1976.

Postholes within Building 1, CG 1021

Within the footprint of this building were seven square postholes, measuring roughly 1.5m square and 0.30m deep. These postholes appeared to relate to the brick structure in that they were on linear alignments alongside the brick walls, and probably formed either roof supports, or supported internal machinery.

Building 2, northern range, CG 1022

To the west of the brick footings mentioned above (CG 1020) was a second range of brick walls, combined with brick and concrete floors. These structures would have once formed part of the northern range of buildings for the saw mill, connected to the building to the east via an archway, as mentioned above, and the footings for this arch could be seen as brick buttresses attached to the outer walls of the associated buildings. The walls and surfaces were overlain by a layer of demolition material. This part of the range is shown on the 1878 plan as having the functions of cutting out mill, stores, machine room and workshops.

Saw pit, CG 1023

Close to The Butts boundary wall at the south of the site, a rectangular brick-lined pit had been backfilled with building rubble. This was the remaining part of a possible ‘saw pit’ associated with the Joseph Wood timber yard (Fig 86, 87). The structure was 1.3m (4’ 3¼”) wide and 7.4m (24’ 3”) long and constructed of bricks measuring 8¾x4¾x 3”. This size of brick dates to the early 19th century. At the base of this feature were three long timber planks running lengthways that were well preserved but worn, themselves supported on a number of crossway timbers. This would have allowed the operators below the timbers being sawn to be out of any standing water.

The sawpit can be identified on the historic documents of the 19th century. The 1846 Netherton House Estate lease plan (WRO ref 496.5 BA9360/Cab14/5) shows a central range of buildings, running north to south, over the area of the sawpit and details the plot, plot 14, as *‘Stable, Work shops, Sawpit, Sheds, Offices and Yard’.* The slightly later 1854 leasehold plan (WRO ref 496.5 BA9360/Cab14/15/A) also shows this range over the site of the sawpit labelled as *‘stable, sawpits and lofts over’.* This suggests that the sawpit uncovered during the excavation was probably part of this early phase of the timber yard, before it was taken over by the Joseph Wood firm.

Workshop and shed, CG 1024

To the immediate west of the sawpit, the remains of a brick structure was uncovered which can be identified as a shed and workshop marked on the 1854 leasehold document. All that remained of this was an east to west and north to south aligned brick wall with two associated postholes. This is shown on the 1846 Netherton House plan and is therefore also part of the early phase of the timber yard.

Shed, CG 1026

A series of five postholes ran north to south across the middle of the timber yard. These consisted of roughly square holes measuring around 0.50 metres in width with a square lias slab post-pad at the base. The fill of the postholes contained artefacts that were 19th century in date. Visible in the sections of a number of the postholes were the post pipes from the posts that previously stood on the post-pads. The pads defined the footings for a building at least 9m by 7.5m in size. It is possible that many more pads with associated postholes had been removed during the levelling of the site for its present usage, as the visible slabs were located only just below the concrete and tarmac surface.

The postholes were the foundations of a post-built structure that appears to relate to a large shed built across almost the entire central area of the timber yard. This structure appears on the 1904 Ordnance Survey map with dashed sides, indicating that it was open rather than walled in. The structure is not shown on the 1886 map and therefore must have been constructed at the end of the 19th century. The building could have provided shelter for the machines and saws that were powered by the prop running through the prop shaft structure (CG 1027) leading from the engine house to the west.

Possible shed, CG 1025

A similar structure may have also been present to the north-east of Area 1, where an alignment of deep postholes running north-west to south-east suggested a further timber building, although this was not investigated in detail.

Prop structure, CG 1027

A brick structure with a blue lias stone slab top was located to the south-western side of the site; this had originally been exposed during the 2006 evaluation (Trench 5). The structure extended north-east from the western range of sawmill buildings was built of brick coursed in English Bond and measuring 9½x4½x3⅜". It consisted of a single channel to hold a propshaft, with four wider square openings which may have contained pulleys for belt drives leading upwards to power machinery associated with the timber yard (Fig 88). On the western end of the structure was a re-used grinding stone, with three holes for attachments. The bricks of the prop structure were of late 19th century date. At least one of them was stamped with the maker's mark of 'BARKER' in the frog. D W Barker's Patent Brick Works was based at Gregory's Bank, Worcester from the early 1870s.

The machinery running the propshaft was located in the sawmill building. Attached to the exterior of the east wall of the building from around 1850 onwards were three, possibly four, small buildings, shown first on the enfranchisement plan of 1857 (WRO ref 496.5 BA9360/ Cab14/ 15/A). These buildings are visible in more detail on an 1878 conveyance plan (WRO ref 496.5 BA9360/Cab14/15/A) on which they are identified as an engine and boilers. The foundations of these structures and of the chimney to their immediate north were revealed during the excavation, but not subject to detailed investigation. The engine and boiler houses are both around 30 years earlier than the construction of the prop structure. They were built between 1854 and 1857, whilst the prop structure was probably built in the 1890s at around the same time as the post-built shed shown on the 1904 map, whose foundation postholes are discussed above (CG 1026).

Brick structure, CG 1028

A small 3.60x1.30m structure, 0.25m high and built with bricks and a concrete floor was located on the terrace slope, within the footprint of the 'shed' (CG 1026). It was truncated and covered with later building rubble making it unclear as to its original purpose, but this could have been a base for another saw pit, or even a much later vehicle inspection pit.

Other features associated with the saw mill, CG 1029

Across the terrace a number of features were observed that could not be identified as providing any direct function, but did all appear to relate to use of the timber yard. These were identified through stratigraphic relationships and/or artefact recovery. The majority of these were isolated features, such as pits, postholes, gullies and layers, or foundation cuts for the features discussed above. In addition, the footing and base of a wrought iron gas lamp was noted, adjacent to the brick building in the north-east corner of the site (CG 1020). Also located on the terrace slope was a brick-built well. Due to on-site practicalities caused by the presence of asbestos, this well remained unexcavated, although the size of the bricks suggested a 19th century date.

Almshouses, AU 517

In the 1660s John Nash, Alderman and Mayor of Worcester City, left a will detailing that land and money were to be used for the benefit of the poor. Almshouses were built in his name in New Street and later, in the 1830s, a further set of nine cottages were built on land off The Butts on the alley that became known as Croft Walk. 1830s maps of the area do not show the almshouses but the 1845 railway plan has them in place and it is believed they were built in 1838.

The remains of Nash's Almshouses were recorded in the north-west part of Area 1. Two brick walls running north-east to south-west represented the external walls with a series of internal north-west to south-east walls marking room divisions. Between the internal walls were brick and tile floor surfaces set onto foundation layers of sand and clay. It was clear that the houses themselves consisted of one room on both the ground and first floors. No construction trenches were visible for the walls and this may be due to their placement within disturbed tillage soil, with the trenches backfilled with the same deposit and thus obfuscating the edges.

Photographs (Robson-Glyde 2016, 186–88) show that the almshouses were small brick structures with a front door and single window on both the ground and first floors. There was a chimney between each of the houses. The bricks were coursed in Flemish bond and the windows and doors had flat head arches of gauged brickwork. The windows themselves were multi-light sash windows set in frames flush with the face of the building. This style of construction is more typical of the mid to late 18th century.

The almshouses were separated from the timber yard by a brick wall and yard area to the front. This can be seen on the 1878 conveyance plan (WRO ref 496.5 BA9360/Cab 14/15/A) and was also revealed during the excavation, where to the south of the main Almshouse building was an open area containing a dark 'garden soil' which was bounded by a single wall. This was possibly used as a garden space and within this there was a single brick lined well that may have been contemporary with the Almshouse. The 1878 conveyance plan also showed a small structure at the east end of the row of houses. This small brick-built extension was attached to the gable of the last of the almshouses and during the excavation it was revealed to be the almshouses cesspit. A number of modern ceramic waste pipes led away from this structure.

A rubble rich deposit overlay the remains of the Almshouse and included substantial building material, such as the terracotta mouldings, relating to the demolition and infill of the building. Worcester City planning documents, regarding a proposal in 1974 to convert the almshouses into offices, storage and light engineering workshops for a fire prevention sprinkler manufacturing company, included a plan of the row of buildings and a partial elevation of the frontage of the houses. At this time the almshouses had been empty for a number of years. The proposals were turned down and the houses were eventually demolished in late summer/ autumn 1976.

19th century activity between The Butts and the city wall, AU 515

Culvert in city ditch, CG 1038

A culvert ran down the northern edge of the city ditch. This culvert, constructed of brick, consisted of a flat base, with vertical sides and a domed roof. The culvert was not functioning as a drain at the time of the excavation as the cellars and other services above (CG 1039) had truncated this to both the east and west of the investigation area.

Modern features truncating the city ditch, CG 1039

Other features in Area 2 and above the city ditch dated to the late 19th and 20th century, such as drains and services. These were mainly associated with the council depot that existed on the site at the time of the excavation and were not of any archaeological significance.

Undated

A number of features across the site remain undated and could not be allocated to a specific site period due to a lack of either artefactual or stratigraphic evidence, or both. This included around fifteen pits or unidentified features, many of which were shallow and ephemeral or only observed during removal of modern structures with the machine. Eleven features recorded as postholes were also undated.

Further features with no secure dating but that were seen to be comparable with, or in association with, the archaeology of Roman date have been allocated to the broad Period 3–6 range above (Unphased Roman features (Periods 3–6)).

Artefacts

Prehistoric lithics

Hugo Anderson-Whymark

Excavations at The Hive yielded eleven struck flints, comprising seven flakes, two blade-like flakes, a blade and a scraper/notch multi-tool. A single fragment of burnt unworked flint was also recovered. The lithics were residual finds in later contexts, but it is noteworthy that several artefacts were in reasonably fresh condition as this potentially indicates that they have not moved far from their original places of deposition.

The lithic assemblage is dominated by thin, unretouched flakes including two of narrow blade-like proportions. Several of these flakes were small and fragmentary, rendering them undiagnostic, but the overall technology is consistent with a Neolithic to early Bronze Age date. The blade, although burnt and fragmentary, exhibits parallel sides and the scars of earlier blade removals on its dorsal surface, indicating it was struck from a single platform blade core. This reduction strategy is more refined than the flake production techniques and is characteristic of Mesolithic and early Neolithic industries. Without a larger assemblage, however, it is not possible to further refine the dating.

The scraper/notch multi-tool was manufactured on a squat side trimming flake. The scraping edges on the proximal end and right hand side exhibit semi-abrupt retouch, and a small 8.5mm wide by 3.5mm deep notch is present on the distal edge. This tool is not intrinsically datable, but parallels are commonly found in Neolithic to early Bronze Age assemblages, indicating this tool may be broadly contemporary with the flakes.

The flintwork from The Hive provides some evidence for an early prehistoric presence in the local landscape, but the limited assemblage provides little insight into the character of this.

Catalogue of lithics

1. Blade-like flake in exceptionally fresh condition. Neolithic? Area 1, U/S, small find 306

2. Burnt unworked flint. Area 1, (6052)

3. Small flake in reasonably fresh condition. Area 1, (6543), sample 268

4. Small broken flake in reasonably fresh condition. Area 1, (6745), sample 326

5. Hard hammer flake of gravel flint with extensive edge damage. Area 1, (6952), small find 313

6. Proximal/side scraper and notch multi-tool manufactured on a flake of grey flint with a thick chalky cortex. Slight edge damage. Neolithic–early Bronze Age? Area 1, (8512), small find 213

7. Burnt and broken distal fragment of a parallel sided blade exhibiting dorsal blade scars. Extensive edge-damage. Mesolithic–early Neolithic. Area 1, (8512), small find 212

8. Small flake in flake in reasonably fresh condition. Area 3, Trench 15, (15050)

9. Burnt and broken flake. Area 3, Trench 15, (15051)

10. Blade-like side trimming flake of gravel-flint exhibiting platform edge abrasion. Moderate edge-damage. Neolithic? Area 3, Trench 15, (15087)

11. Flake of gravel flint with use damage on one edge in reasonably fresh condition. Area 3, Trench 15, (15088)

12. Thin broken flake with extensive edge-damage. Area 3, Trench 15, (15124)

Roman pottery

C Jane Evans

Excavation at The Hive produced *c* 36,800 sherds (919.04kg) of Roman pottery. This represents the largest excavated assemblage from Worcester; the Deansway excavations produced 26,464 sherds of Iron Age and Roman pottery (Bryant and Evans 2004, 240), the Sidbury excavations 22,530 sherds (Darlington and Evans 1992), and excavations at the Magistrates' Court site 29,106 sherds, of which 27,383 came from stratified Roman contexts (Jerry Evans, pers comm). The neighbouring City Campus site, in contrast, produced only 9,732 sherds (Evans *et al* 2014), and adjacent excavations at 14–24 The Butts only 3,770 sherds (Evans 2011).

The size of the assemblage provided a challenge as well as an opportunity, in terms of maximising potential in an efficient and cost-effective way. A focussed methodology was adopted (HEAS 2011c, 149–150). This reflected the mitigation strategy, whereby earlier Roman deposits were less affected by the development and so fewer were excavated, and the potential of the resulting phased assemblages to address the project aims. A total of 24,859 sherds weighing 555.52kg was recorded in detail, representing 67% of the Roman pottery assemblage by sherd count. This included all of the samian (1119 sherds, 17.44kg), which provided some of the best dating evidence for earlier Roman activity in the area. Selected groups of coarse ware were recorded in detail, with the aim of characterising the material culture of Roman Worcester during the periods represented. The sample included all the pottery from features that, at the time of the assessment, could be securely attributed to Periods 3, 4 and 5, and a selection of the coarse ware from the Period 6 assemblage (HEAS 2011c, Table 45). Following detailed analysis of the pottery and other well-dated finds the site phasing was revised. Small quantities of the pottery selected for detailed analysis are now assigned to less clearly defined or post-Roman phases (Table 5). However, with the exception of a few unusual forms, only the pottery from Periods 3, 4, 5, 6 and 6–7 is discussed in detail below. Nearly 80% of the pottery came from Period 5 and 6 deposits (Fig 89).

Table 5

Period	AU no	CG/ AU name	Count	% count	Weight (g)	% weight	Average weight	Rim EVE	% rim EVE
2–3	500	CG1001 Palaeo-channels	1	0	10	0	10	0.00	0
3		Layers	38	0	319	0	8	0.11	0
3	501	CG1004 Early east–west ditch	192	1	8,371	2	44	4.40	1
3	505	CG1013 Open ground	7	0	53	0	8	0	0
3–4		layers	4	0	84	0	21	0.05	0
3–4	529	CG1112 Pits on floodplain, Trench 15	8	0	115	0	14	0.13	0
3–6		Posthole	4	0	103	0	26	0.00	0
4		Various features	805	3	15,812	3	20	9.57	3
4	502	CG1006 Re-cut east–west ditch	1,608	6	37,618	7	23	22.01	6
4	503	CG1007/ 1008 Strip building 2A	110	0	2,399	0	22	1.45	0
4	504	CG1009–11, 1055 Strip building 2B	200	1	5,937	1	30	2.93	1
4	506	CG1014 Well construction	322	1	7,859	1	24	4.02	1
4	521	CG1074 Strip building 3	15	0	169	0	11	0.08	0
4	525	CG1042 Surface features	9	0	135	0	15	0.00	0
4	529	CG1112 Pits on flood plain Trench 15	27	0	735	0	27	0.75	0
4	530	CG1109, 1111 Possible earlier building with oven	164	1	2,913	1	18	1.00	0
4–5		CG1050 Various pits (mainly 8905), posthole and layers	77	0	1,890	0	25	0.00	0

Period	AU no	CG/ AU name	Count	% count	Weight (g)	% weight	Average weight	Rim EVE	% rim EVE
4–5	529	CG1113 Pits on flood plain Trench 15	6	0	13	0	2	0.00	0
4–6		Various features	5	0	206	0	41	1.42	0
5		Various features	960	4	24,831	4	26	11.74	3
5	506	CG1014 Well construction	21	0	350	0	17	0.19	0
5	518	CG1061–3, 1065 Strip building 2C	90	0	2,645	0	29	1.11	0
5	519	CG1066–70 Strip building 2D	356	1	3,924	1	11	2.24	1
5	520	CG1071 Later intrusions into AU 519	100	0	1,633	0	16	0.42	0
5	521	Oven	20	0	684	0	34	0.04	0
5	521	CG1044, 1075–79 Strip building 3	538	2	6,167	1	11	4.38	1
5	523	CG1046, 1086-7 Features cutting cobbled surface	1,033	4	35,709	6	35	20.66	6
5	525	CG1041–2 Surface and features (east of site)	2,557	10	40,008	7	16	23.99	7
5	526	CG1043, 1098 Deposits sealing cobbled surface	5,213	21	94,328	17	18	55.75	16
5	527	CG1093, 1095 Pits at rear of strip buildings, Area 1	165	1	3,187	1	19	3.04	1
5	529	CG1113 Pits on flood plain Trench 15	25	0	591	0	24	0.66	0
5–6		Layer	51	0	3,012	1	59	0.93	0

Period	AU no	CG/ AU name	Count	% count	Weight (g)	% weight	Average weight	Rim EVE	% rim EVE
5–6	524	CG1088 Timber well pit	129	1	2,596	0	20	2.42	1
6		Various features	764	3	14,825	3	19	6.55	2
6	507	CG1015 Well robbing	1,054	4	18,207	3	17	11.88	3
6	508	CG1040 Aisled building structural components	46	0	625	0	14	0.27	0
6	510	CG1057, 1108 Quarry pit	6,191	25	175,694	32	28	132.88	38
6	520	CG1072 Later intrusions into SB 2D 3rd–4th C	209	1	3,141	1	15	2.74	1
6	523	Features cutting cobbled surface	49	0	1,172	0	24	0.45	0
6–7		CG1090							
Pit 8701	10	0	63	0	6	0	0		
6–7	508	CG1017 Aisled building structural components	47	0	812	0	17	0.59	0
6–7	522	Post-Roman? features	18	0	960	0	53	0.60	0
6–7	524	CG1089 Timber well pit	1,217	5	26,619	5	22	17.44	5
6–8	508	CG1019 Aisled building structural components	47	0	2,050	0	44	0.29	0
6–12		Post-Roman features	226	1	5,601	1	25	2.63	1
Unphased			121	0	1,345	0	11	0.93	0
Total			***24,859***	***100***	***555,520***	***100***	***22***	***352.74***	***100***

Table 5: summary of the Roman pottery studied by period, activity unit (AU) and context group (CG)

The remainder of the coarse ware assemblage was scanned, with a focus on refining dating, and thus the site phasing, and identifying any unusual pieces for publication. Included in this group was the pottery from construction features associated with the aisled building, predominantly residual material disturbed from earlier deposits, and Roman pottery from post-Roman deposits. The largest Period 6 group, from the double quarry pit, was sampled, and all the pottery from quarry pit (CG 1108) was recorded in detail. This pit appeared to have been filled in rapidly, so the pottery from fills up to 7055 was thought to represent a single phase of dumping. The pottery from the lower fills of pit (CG 1057) was very similar in character, but the stratigraphic evidence suggested a more complex pattern of tipping into the pit, suggesting this may have come from a variety of sources. This material (2372 sherds weighing 117.12kg) was scanned and not recorded. The diagnostically 4th century, upper fills (contexts 6491, 6520), which produced a significant proportion of the coins and other small finds, were recorded in detail. The latter, along with the upper fill of pit (CG 1108; context 6745), characterise some of the latest Roman activity on the site.

Most of the pottery studied was in fairly good condition, with low levels of abrasion and relatively high average sherd weight. The exception to this, with average sherd weights of 8g or less, was the pottery from Period 3 layers and open ground, and Period 6–7 pit (CG 1090). In general, the pottery from Period 6 deposits was less fragmentary than the pottery from Period 5, with a higher average sherd weight (26g compared to 19g) and a higher rim EVE (Fig 90). More than half of the pottery recorded, by weight and rim EVE, came from pits (Table 6), with significant quantities also coming from layers and surfaces.

Details of the full methodology can be found in Post-fieldwork analysis . The following text includes discussions of the assemblage by fabric and then by period, followed by a discussion of the functional composition and chronological trends. Illustration is focussed on the large assemblage analysed from the Period 6 quarry pit (CG 1108), within which forms are illustrated by fabric. Only a selection of other vessels, considered to be of particular interest, is illustrated. Of the pottery recorded during the assessment stage, 289 sherds have subsequently been re-classified as oven material.

A total of 88 fabrics were identified, discussed separately below, with the range identified set out in Table 7. All the Roman pottery recorded is quantified by fabric in Table 8. The pottery from the main periods studied (3, 4, 5, 6, 6–7) is quantified by period (Table 9). Detailed information on the range of fabrics by site period is presented in the period discussions below, and the relationship between fabric and form type is presented in Table 10.

Table 6

Feature type	count	% count	weight(g)	% weight	rim EVE	% rim EVE
Beam slot	9	0	131.0	0	0.00	0
Construction Cut	93	0	1542.0	0	0.81	0
Curvilinear	8	0	116.0	0	0.06	0
Ditch	1795	7	47570.0	9	23.58	7
Drain	4	0	8.0	0	0.00	0
Finds Ref	1136	5	26486.0	5	14.48	4
Floor	244	1	5248.0	1	2.01	1
Layer	4667	19	81707.0	15	44.87	13
Linear	101	0	1272.0	0	1.28	0
Malting oven	83	0	2312.0	0	1.54	0
Oven	419	2	7815.0	1	3.60	1
Palaeochannel	1	0	10.0	0	0.00	0
Pipe Trench	2	0	16.0	0	0.05	0
Post Hole	155	1	2080.0	0	1.71	0
Post pad	16	0	479.0	0	0.04	0
Pit	4755	19	114321.5	21	70.84	20
Quarry Pit	6191	25	175694.0	32	132.88	38
Robber pit	1054	4	18207.0	3	11.88	3
Stakehole	5	0	22.0	0	0.00	0
Surface	3175	13	53819.0	10	33.45	9
Trackway	434	2	5828.0	1	2.86	1
Tree bowl	22	0	169.0	0	0.24	0
Well	379	2	9060.0	2	5.27	1
Unknown/ arbitrary	111	0	1608.0	0	1.29	0
Total	***24859***	***100***	***555520.5***	***100***	***352.74***	***100***

Table 6: Summary of the Roman pottery studied by feature type

Table 7

WHEAS fabric code	Site specific fabric code	Fabric common name	NRFRC code (Tomber and Dore 1998)	Other published reference	Magistrates Court (Evans forthcoming)
3		Malvernian ware	MAL RE A	Hurst and Rees 1992	G44
12		Severn Valley ware	SVW OX 2?	Hurst and Rees 1992	O20
12.1		Reduced Severn Valley ware		Hurst and Rees 1992	
	12.15	With common sand			
	12.16	With common soft white inclusions			
12.2		Oxidised organic tempered Severn Valley ware		Hurst and Rees 1992	O21
	12.21	With grog			
	12.23	With sand			
	12.24	Fine variant			
	12.25	With common white inclusions			
12.3		Reduced organic tempered Severn Valley ware		Hurst and Rees 1992	R32
	12.34	Fine organic			
	12.35	With sand			
12.4		Oxidised Severn Valley ware variant, shelly limestone		Bryant and Evans 2004, 255	
12.5		Oxidised Severn Valley ware variant, sandy and micaceous		Bryant and Evans 2004, 256	O29? O291? O23? O231? 024
	12.51	Common sand and white inclusions			O53
12.6		Oxidised Severn Valley ware, common soft white inclusions		Bryant and Evans 2004, 256–7	O27
	12.61	With Malvernian rock			
	12.7	Oxidised Severn Valley ware, grog			
	12.8	Oxidised Severn Valley ware, vesicular			O36?
13		Sandy oxidized ware		Hurst and Rees 1992	
	13.1	Very fine sandy oxidised ware			

WHEAS fabric code	Site specific fabric code	Fabric common name	NRFRC code (Tomber and Dore 1998)	Other published reference	Magistrates Court (Evans forthcoming)
14		Fine sandy grey ware		Hurst and Rees 1992	
	14.1	Fine, micaceous sandy grey ware			
	14.24	With fine organics			
	14.3	With distinctive firing (grey core, brown margins, blackened surfaces)			
15		Coarse sandy grey ware		Hurst and Rees 1992	R01/11
	15.1	With black organics (blackened surface, grey core, brown margins)		Beckford fabrics 32/33	
16		Grog tempered ware		Beckford fabrics 30/31	
16.1		Savernake ware	SAV GT		
17		Pink grog tempered ware	PNK GT	Booth and Green 1989	G11
19		Wheelthrown Malvernian ware		Hurst and Rees 1992	G46, G47?
20		White slipped ware		Hurst and Rees 1992	Q12-14, Q27, Q151
	20.4	With common soft white inclusions cf 12.6			
	20.5	Coarse grog inclusions			
	20.6	fine sandy fabric with distinctive red grog inclusions			
21.3		Early micaceous ware with dark surface		Griffin 2002, 120	
	21.4	Early micaceous ware with dark surfaces, pale reduced fabric with silty sand and fine organics			
22		Black-burnished ware, type 1 (Dorset BB1)	DOR BB 1		B01
	22.1	South-West BB1	SOW BB1		
23		Shell gritted ware	ROB SH		
28		Nene Valley ware, white/pale buff	LNV CC		F53
	28.1	Nene Valley ware, red	LNV CC		F51?
29		Oxfordshire red/brown colour coated ware	OXF RS		F51
	29.1	Oxfordshire oxidised ware	OXF RS		
30		Oxfordshire white colour coated ware	OXF WS		

WHEAS fabric code	Site specific fabric code	Fabric common name	NRFRC code (Tomber and Dore 1998)	Other published reference	Magistrates Court (Evans forthcoming)
31	31.1	Pale brown colour coated ware			
	31.2	Fine sandy brown colour coated ware			
	31.3	Sandy brown colour coated ware		Gloucester Fabric 207?	
32		Mancetter/Hartshill mortaria	MAH WH		M22
33.1		Oxfordshire white mortaria	OXF WH		M23
33.3		Oxfordshire red mortaria with red-brown slip	OXF RS		
34		West Midlands mortaria: Wroxeter white ware	WRX WH		
	34.1	West Midlands mortaria: Worcester/ Worcestershire workshop, red			
	34.2	West Midlands mortaria: Wroxeter red-slipped ware	WRX RS		
	34.3	West Midlands mortaria: Worcester/ Worcestershire workshop, cream			
35		Brockley Hill/Verulamium mortaria	VER WH		
37.3		Severn Valley/South-west England mortaria: S. W. white-slipped ware	SOW WS	Hurst and Rees 1992	
	37.5	Severn Valley/South-west England mortaria: Worcestershire ?ASILA			
38		Oxfordshire white ware	OXF WH		
	38.1	Mancetter/Hartshill white ware			
39		Oxfordshire burnt white ware	OXF WH		
40		Oxfordshire parchment ware	OXF PA		
41		Unprovenanced white ware			
42		Amphorae			
42.1		Dressel 20 type	BAT AM 2?		A21
42.3		Pelichet 47 type (Gauloise 4 type)	GAL AM 1		A22

<table>
<tr><th>WHEAS fabric code</th><th>Site specific fabric code</th><th>Fabric common name</th><th>NRFRC code (Tomber and Dore 1998)</th><th>Other published reference</th><th>Magistrates Court (Evans forthcoming)</th></tr>
<tr><td rowspan="8">43
43.1
43.2
43.3</td><td></td><td>Samian (unspecified)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Southern Gaulish samian</td><td></td><td></td><td>S10</td></tr>
<tr><td></td><td>Central Gaulish (Lezoux) samian</td><td>LEZ SA 2</td><td></td><td>S20</td></tr>
<tr><td></td><td>Eastern Gaulish (Rheinzabern) samian</td><td>RHZ SA</td><td></td><td>S30</td></tr>
<tr><td>43.4</td><td>Eastern Gaulish (Trier) samian</td><td>TRI SA</td><td></td><td>S30</td></tr>
<tr><td>43.5</td><td>Eastern Gaulish samian</td><td></td><td></td><td>S30</td></tr>
<tr><td>43.6</td><td>Central Gaulish (Les Martres-de-Veyre) samian</td><td>LMV SA</td><td></td><td>S21</td></tr>
<tr><td>43.7</td><td>East Gaulish (Argonne) samian</td><td>ARG SA</td><td></td><td></td></tr>
<tr><td rowspan="2">44</td><td></td><td>Moselkeramik Black-slipped ware check bags as fab no changed</td><td>MOS BS</td><td></td><td>F32</td></tr>
<tr><td>44.1</td><td>Cologne Colour-coated ware</td><td>KOL CC</td><td></td><td></td></tr>
<tr><td>45</td><td>45.4</td><td>Central Gaulish Black-slipped ware</td><td>CNG BS</td><td></td><td></td></tr>
<tr><td rowspan="6">98</td><td></td><td>Miscellaneous Roman wares</td><td></td><td></td><td></td></tr>
<tr><td>98.01</td><td>Partially oxidised sandy ware</td><td></td><td></td><td></td></tr>
<tr><td>98.09</td><td>Oxidised black-slipped ware</td><td></td><td></td><td></td></tr>
<tr><td>98.10</td><td>Oxidised black-surfaced ware</td><td></td><td></td><td></td></tr>
<tr><td>98.12</td><td>Micaceous oxidised ware (face pot)</td><td></td><td></td><td></td></tr>
<tr><td>98.13</td><td>Grooved fine ware</td><td></td><td></td><td></td></tr>
<tr><td>103</td><td></td><td>Wroxeter Raetian mortaria</td><td>WRX RS</td><td></td><td></td></tr>
<tr><td>115</td><td></td><td>New Forest ware</td><td>NFO CC?</td><td></td><td></td></tr>
<tr><td>149</td><td></td><td>Worcestershire imitation Black-burnished ware</td><td></td><td></td><td></td></tr>
<tr><td>151.2</td><td></td><td>South-west white-slipped ware</td><td>SOW [OX]</td><td>Beckford fabric 66</td><td></td></tr>
<tr><td>156</td><td></td><td>Glazed ware</td><td></td><td></td><td></td></tr>
</table>

Table 7: Roman fabrics represented in the assemblage

Table 8

Fabric common name	Fabric code	Count	% count	Weight (g)	% weight	Average sherd weight (g)	Rim EVE	% rim EVE
Malvernian ware	3	1,110	4.5	33,154	6.0	30	1,476	4.2
Severn Valley ware	12	11,554	46.5	240,801	43.3	21	10,367	29.4
Reduced Severn Valley wares	12.1	540	2.2	9,974	1.8	18	992	2.8
	12.15	25	0.1	396	0.1	16	39	0.1
	12.16	58	0.2	1,498	0.3	26	96	0.3
Oxidised organically tempered Severn	12.2	525	2.1	15,219	2.7	29	335	0.9
Valley wares	12.21	1	0.0	15	0.0	15	8	0.0
	12.23	5	0.0	86	0.0	17	0	0.0
	12.24	440	1.8	14,143	2.5	32	1,676	4.8
	12.25	6	0.0	305	0.1	51	3	0.0
Reduced organically tempered Severn	12.3	73	0.3	2,164	0.4	30	123	0.3
Valley wares	12.34	93	0.4	2,358	0.4	25	278	0.8
	12.35	4	0.0	112	0.0	28	27	0.1
Severn Valley ware, shelly	12.4	1	0.0	33	0.0	33	4	0.0
Severn Valley ware, sandy micaceous	12.5	283	1.1	9,155	1.6	32	2,024	5.7
	12.51	3	0.0	61	0.0	20	16	0.0
Severn Valley ware variant, soft white inclusions	12.6	4,728	19.0	99,656	17.9	21	6,491	18.4
With Malvernian rock	12.61	1	0.0	36	0.0	36	50	0.1
Severn Valley ware variant, grog	12.7	19	0.1	539	0.1	28	67	0.2
Severn Valley ware variant, vesicular	12.8	31	0.1	724	0.1	23	250	0.7
Sandy oxidized ware	13	146	0.6	2,303	0.4	16	245	0.7
Very fine sandy oxidized ware	13.1	1	0.0	7	0.0	7	0	0.0
Fine sandy grey wares	14	125	0.5	3,648	0.7	29	189	0.5
	14.1	1	0.0	10	0.0	10	0	0.0
	14.24	18	0.1	895	0.2	50	0	0.0
	14.3	4	0.0	37	0.0	9	0	0.0
Coarse sandy grey wares	15	55	0.2	867	0.2	16	152	0.4
	15.1	4	0.0	98	0.0	25	4	0.0
Grog tempered ware (BD32/33)	16	7	0.0	698	0.1	100	48	0.1
Savernake ware (BD30/31)	16.1	1	0.0	26	0.0	26	0	0.0

Fabric common name	Fabric code	Count	% count	Weight (g)	% weight	Average sherd weight (g)	Rim EVE	% rim EVE
Grog tempered ware	16.3	1	0.0	188	0.0	188	21	0.1
Pink grog tempered ware	17	11	0.0	1,232	0.2	112	0	0.0
Wheelthrown Malvernian ware	19	995	4.0	28,947	5.2	29	2,800	7.9
White slipped wares	20	79	0.3	1,033	0.2	13	77	0.2
	20.4	4	0.0	89	0.0	22	0	0.0
	20.5	2	0.0	56	0.0	28	29	0.1
	20.6	21	0.1	423	0.1	20	11	0.0
Early micaceous wares	21.3	45	0.2	1,179	0.2	26	201	0.6
	21.4	1	0.0	8	0.0	8		0.0
Black-burnished ware, type 1 (BB1)	22	1,944	7.8	27,528	5.0	14	3,946	11.2
South West BB1	22.1	2	0.0	36	0.0	18	13	0.0
Shell gritted ware	23	12	0.0	280	0.1	23	27	0.1
Nene Valley ware, white/ pale buff	28	15	0.1	192	0.0	13	8	0.0
Nene Valley ware, red	28.1	43	0.2	371	0.1	9	36	0.1
Oxfordshire red/brown cc ware	29	158	0.6	2,637	0.5	17	186	0.5
Oxfordshire oxidised ware	29.1	6	0.0	147	0.0	25	0	0.0
Oxfordshire white colour coated ware	30	2	0.0	34	0.0	17	0	0.0
Brown colour-coated ware	31.1	12	0.0	172	0.0	14	57	0.2
Brown colour-coated ware	31.2	4	0.0	160	0.0	40	0	0.0
Brown colour-coated ware	31.3	3	0.0	5	0.0	2	0	0.0
Mancetter/Hartshill mortaria	32	81	0.3	3,880	0.7	48	274	0.8
Oxfordshire white mortaria	33.1	60	0.2	3,924	0.7	65	230	0.7
Oxfordshire red cc mortaria	33.3	14	0.1	437	0.1	31	22	0.1
Wroxeter white mortaria	34	1	0.0	40	0.0	40	0	0.0
West Midlands mortaria	34.1	4	0.0	218	0.0	55	16	0.0
	34.2	1	0.0	57	0.0	57	0	0.0
	34.3	1	0.0	51	0.0	51	0	0.0
Brockley Hill/Verulamium mortaria	35	1	0.0	82	0.0	82	10	0.0

Fabric common name	Fabric code	Count	% count	Weight (g)	% weight	Average sherd weight (g)	Rim EVE	% rim EVE
South-west England mortaria	37.3	1	0.0	139	0.0	139	15	0.0
Severn Valley mortaria	37.5	4	0.0	221	0.0	55	0	0.0
Oxfordshire white ware	38	23	0.1	218	0.0	11	57	0.2
Mancetter/Hartshill white ware	38.1	42	0.2	507	0.1	12	37	0.1
Oxfordshire burnt white ware	39	3	0.0	40	0.0	13	18	0.1
Oxfordshire parchment ware	40	8	0.0	200	0.0	25	0	0.0
Unprovenanced white ware	41	3	0.0	24	0.0	8	0	0.0
Amphorae	42	1	0.0	96	0.0	96	0	0.0
Dressel 20 type	42.1	234	0.9	23,759	4.3	102	100	0.3
Pelichet 47 type (Galoise 4 type)	42.3	1	0.0	42	0.0	42	0	0.0
Samian ware	43	3	0.0	3	0.0	1	0	0.0
Southern Gaulish samian	43.1	10	0.0	57	0.0	6	6	0.0
Central Gaulish (Lezoux)	43.2	920	3.7	12,678	2.3	14	1550	4.4
Eastern Gaulish (Rheinzabern)	43.3	139	0.6	3,975	0.7	29	416	1.2
Eastern Gaulish (Trier)	43.4	12	0.0	272	0.0	23	57	0.2
Eastern Gaulish	43.5	12	0.0	129	0.0	11	10	0.0
Central Gaulish (Les Martres-de-Veyre)	43.6	22	0.1	272	0.0	12	23	0.1
East Gaulish (Argonne)	43.7	1	0.0	50	0.0	50	21	0.1
Moselkeramik Black-slipped ware	44	3	0.0	7	0.0	2	0	0.0
Cologne Colour-coated ware	44.1	1	0.0	25	0.0	25	0	0.0
Central Gaulish Black-slipped ware	45.4	10	0.0	67	0.0	7	15	0.0
Miscellaneous Roman wares	98							
Partially oxidised sandy ware	98.01	1	0.0	10	0.0	10	5	0.0
Oxidised black-slipped ware	98.09	1	0.0	1	0.0	1	0	0.0
Oxidised black-surfaced ware	98.10	3	0.0	16	0.0	5	0	0.0
Micaceous oxidised ware (face pot)	98.12	1	0.0	4	0.0	4	0	0.0

Fabric common name	Fabric code	Count	% count	Weight (g)	% weight	Average sherd weight (g)	Rim EVE	% rim EVE
	98.13	1	0.0	14	0.0	14	0	0.0
Wroxeter Raetian mortaria	103	1	0.0	121	0.0	121	5	0.0
New Forest ware	115	1	0.0	15	0.0	15	0	0.0
Worcestershire imitation BB1	149	7	0.0	258	0.0	37	29	0.1
South-west white slipped ware	151.2	4	0.0	22	0.0	6	0	0.0
Glazed ware	156	2	0.0	22	0.0	11	7	0.0
Total		***24,859***		***555,500***		***22***	***35,274***	

Table 8: Roman pottery assemblage by fabric, all pottery recorded (NB all samian recorded, only pottery from key assemblages recorded for other fabrics)

Table 9

Fabric code	**Count Period 3**	**Weight (g)**	**Rim %**	**Count Period 4**	**Weight (g)**	**Rim %**	**Count Period 5**	**Weight (g)**	**Rim %**	**Count Period 6**	**Weight (g)**	**Rim %**	**Count period 6–7**	**Weight (g)**	**Rim %**
3	30	711	63	288	5,595	311	541	18,138	567	174	6,015	414	45	1,835	67
12	75	1,914	72	1,226	26,917	1,086	5,534	95,592	3,716	4,010	100,459	4,850	486	10,861	485
12.1	28	824	50	219	3,461	468	188	3,705	314	66	1,208	154	21	603	6
12.15				7	130	0	5	40	0	9	159	24	2	40	15
12.16	9	338	51	11	109	17	27	736	16	5	247	4	6	68	8
12.2	33	2,098	25	159	5,051	110	205	4,416	103	94	2,951	82	26	496	15
12.21										1	15	8			
12.23							1	12	0	2	28	0	2	46	0
12.24	1	50	0	78	2,787	149	189	5,238	677	142	5,149	761	27	753	67
12.25	1	208	0	2	28	0	2	58	0				1	11	3
12.3	7	192	0	41	1,473	86	13	291	14	2	33	0	9	159	23
12.34	9	335	49	53	1,229	114	10	146	23	19	513	84	1	23	8
12.35				1	18	11	2	72	11	1	22	5			
12.4										1	33	4			
12.5	1	11	5	32	607	150	94	2,379	580	130	5,379	1,141	24	710	132
12.51				1	8	3	1	30	3	1	23	10			
12.6	24	1,826	83	548	13,254	505	2,449	41,828	2,932	1,220	33,221	2,316	427	8,184	553
12.61							1	36	50						
12.7				5	63	17	3	21	2	11	455	48			
12.8				7	196	31	14	202	136	9	301	76	1	25	7
13				11	158	25	69	1,055	77	62	1,059	131	4	31	12
13.1										1	7	0			0
14	1	9	0	34	1,026	85	31	544	29	50	1,943	72	7	99	3
14.1							1	10	0						
14.24				5	143	0	4	202	0	9	550	0			
14.3				4	37	0									
15	2	36	0	8	148	18	36	502	85	4	111	23	3	57	26

Fabric code	**Count Period 3**	**Weight (g)**	**Rim %**	**Count Period 4**	**Weight (g)**	**Rim %**	**Count Period 5**	**Weight (g)**	**Rim %**	**Count Period 6**	**Weight (g)**	**Rim %**	**Count period 6–7**	**Weight (g)**	**Rim %**
15.1				3	45	4	1	53	0						
16										6	510	27			
16.1				1	26	0									
16.3										1	188	21			
17							1	38	0	10	1,194	0			0
19				42	879	133	306	9,392	762	583	16,785	1,625	42	1,297	132
20	3	5	0	40	620	69	30	344	0	3	43	8	2	17	11
20.4										2	17	0	2	72	0
20.5							1	32	29				1	24	0
20.6	2	51	0	4	69	0	13	269	0	1	5	0	1	29	0
21.3				20	744	150	11	240	34	7	116	0	5	72	15
21.4							1	8	0						
22	4	80	23	205	2,304	389	727	9,014	1,262	914	14,907	2,129	58	901	103
23							1	7	0	10	256	19	1	17	8
28							1	2	0	14	190	8			
28.1				3	12	0	7	38	23	32	318	13			
29				1	10	0	22	215	25	123	2,312	151	2	30	5
29.1	1	3	0							5	144	0			
30							2	34	0						
31.1				7	73	36	3	29	21	1	8	0			
31.2										2	90	0	1	29	0
32				2	61	5	47	2,600	157	25	678	67	5	362	36
33.1							15	1,191	47	40	2,603	156	4	120	20
33.3										14	258	29	1	189	0
34										1	40	0			
34.1				3	185	16									
34.2										1	57	0			
34.3				1	51	0									

Fabric code	**Count Period 3**	**Weight (g)**	**Rim %**	**Count Period 4**	**Weight (g)**	**Rim %**	**Count Period 5**	**Weight (g)**	**Rim %**	**Count Period 6**	**Weight (g)**	**Rim %**	**Count period 6–7**	**Weight (g)**	**Rim %**
35										1	82	10			
37.3										1	139	15			
37.5							2	82	0				1	73	0
38				1	7	0	19	130	39	2	75	18	1	6	0
38.1				13	97	0	16	282	2	9	75	22	4	53	13
39										3	40	18			
40				1	24	0	1	3	0	6	173	0			
41							3	24	0						
42				1	96	0									
42.1				58	4,444	0	105	10,852	100	36	3,591	0	3	337	0
42.3							1	42	0						
43							1	1	0						
43.1	1	1	0	4	42	6	1	2	0	1	1	0	1	7	0
43.2	5	51	30	90	991	158	303	3,499	491	293	5,589	569	56	748	85
43.3							5	91	24	101	2,681	295	6	55	0
43.4							5	178	42	6	69	15			
43.5				1	10	0				8	94	0	1	5	0
43.6				14	190	17	2	25	0	1	6	6			
43.7							1	50	21						
44										3	7	0			
44.1							1	25	0						
45.4										9	67	15	1	1	0
98.1													1	10	5
98.09							1	1	0						
98.10	0	0	0	1	2	0				2	14	0			
98.12										1	41	0			
98.13				1	14	0									
103				1	121	5									

Fabric code	**Count Period 3**	**Weight (g)**	**Rim %**	**Count Period 4**	**Weight (g)**	**Rim %**	**Count Period 5**	**Weight (g)**	**Rim %**	**Count Period 6**	**Weight (g)**	**Rim %**	**Count period 6–7**	**Weight (g)**	**Rim %**
115										1	15	0			
149										7	258	29			
151.2							1	3	0	3	19	0			
153							1	8	8	1	28	5			
156				2	22	7									
Total	***237***	***8,743***	***451***	***3,260***	***73,577***	***4,181***	***11,078***	***214,057***	***12,422***	***8,313***	***213,664***	***15,477***	***1,292***	***28,454.5***	***1,863***

Table 9: Roman pottery by period and fabric, main Roman periods only

Table 10

Fabric code	**Flagon**	**Amphora**	**Tankard**	**Beaker**	**Cup**	**Tettina**	**Beaker/jar**	**Jar**	**Jar cook pot**	**Jar honey pot**	**Jar large storage**	**Jar medium mouthed**	**Jar narrow mouthed**	**Jar wide mouthed**	**Bowl/jar**	**Bowl**	**Collander**	**Bowl/dish**	**Dish**	**Platter/dish**	**Mortarium**	**Lid**	**Uncertain**
3								13	755		62								39			607	
12	211		1,618	81			10	126			303	77	2,592	3,064	107	2,005	42		20			78	33
12.1			14	39			2	39	118			333	29	168	7	211						21	11
12.15														8		31							
12.16	8											25		63									
12.2	8		58					8			20	13	62	116	9	39						2	
12.21																8							
12.24			284					47			84		242	443	14	494	12		30			26	
12.25																3							
12.3												13	10	6		8		7	17			6	56
12.34				7			12	7	12				51	14		104			63			8	
12.35								11						5		11							
12.4																4							

Fabric code	Flagon	Amphora	Tankard	Beaker	Cup	Tettina	Beaker/jar	Jar	Jar cook pot	Jar honey pot	Jar large storage	Jar medium mouthed	Jar narrow mouthed	Jar wide mouthed	Bowl/jar	Bowl	Collander	Bowl/dish	Dish	Platter/dish	Mortarium	Lid	Uncertain
12.5	18		454	65				25			29		520	491		380			14			28	
12.51								3						10		3							
12.6	94		1,253	29			8	101		12	185	29	1,454	1,867	67	1,336				9		41	6
12.61	50																						
12.7			29										8	12		18							
12.8	59		3					4					98	44		38						4	
13				28				7	29				27	77	3	52						22	
14									52			48		8	4	34			40			3	
15									122							30							
15.1																						4	
16									14							13							
16.2													21										
19			12					7	2,215		43			10		107		27	197			182	
20	69															8							
20.5	29																						
20.6						11																	
21.3									7				20	10		164							
22				50					1,777							1,063		19	1,004			25	8
23									8		19												
28				8																			
28.1				23														6	7				
29	40			25												121							
31.1				57																			
32																					274		
33.1																					223		
33.3																					29		
34																							

Fabric code	Flagon	Amphora	Tankard	Beaker	Cup	Tettina	Beaker/jar	Jar	Jar cook pot	Jar honey pot	Jar large storage	Jar medium mouthed	Jar narrow mouthed	Jar wide mouthed	Bowl/jar	Bowl	Collander	Bowl/dish	Dish	Platter/dish	Mortarium	Lid	Uncertain
34.1																					16		
35																					10		
37.3																					15		
38	53															4							
38.1	35															2							
39												18											
42.1		100																					
43.1																			6				
43.2					266											200		6	838	45	195		
43.3					22											14			380				
43.4					15																42		
43.5																			10				
43.6					12														11				
43.7																21							
45.4				15																			
98.01																5							
103																					5		
149																			29				
153									8													5	
156				7																			

Table 10: Roman pottery by fabric and form type, excluding amphorae (% rim extant)

Romano-British coarse and fine wares

C Jane Evans

Handmade Malvernian ware, Fabric 3

Handmade Malvernian ware was present throughout the sequence, with proportions by period varying from 8% to 3% by weight and 14% to 3% by rim EVE (Table 9). It first occurred in Period 3, when it was also proportionately most common when quantified by count and rim EVE (Table 9; Fig 91). Cooking pots were the most common vessel type represented (Table 10; Fig 92), followed by lids and, in much smaller quantities, large storage jars and dishes. This is a very different profile to the neighbouring City Campus assemblage, which was dominated by lids (Evans *et al* 2014, fig 24). The jars mainly comprised 1st to 2nd century 'tubby cooking pots', with in-turned and upright rims (15% and 13% by rim EVE respectively) similar to types found on other Worcester sites (Evans *et al* 2014, fig 25.1, Darlington and Evans 1992, fig 24.1, 2; Bryant and Evans 2004, fig 153.6, 7). Other forms included jars with simple everted rims (*cf* Darlington and Evans 1992, fig 24.3) and copies of BB1 forms, similar to those illustrated for Fabric 19 below (Fig 104.1, 2). The dishes, not illustrated, also copied BB1 types (Evans *et al* 2014, fig 25.2, 3). Lids had convex or concave profiles and plain or beaded rims, but convex lids with plain rims were the most common type (34% by rim EVE; Fig 104.3). The large storage jars had angular, tooled, rims (Fig 110.159–161). While these are typically early-Roman types, found in 1st century deposits elsewhere in Worcester (Evans 2014a, fig 13.11–13), they were found here in Period 5 deposits and have been found in later Roman deposits elsewhere (Evans *et al* 2000, 47–8, fig 36, JLS2–3). Some may be residual, but the largest example (Fig 110.161) had a consistent, reduced firing that is quite unlike the typical patchy firing of the early Roman examples, so may be a later continuation of the form. A more unusual form was represented by a pedestal base, presumably from a jar (Fig 110.162).

Sooting (15 sherds), internally and externally; limescale (14), sometimes with sooting (4); burnt residues (17) and smoke fuming (75) were noted on jars and lids, confirming that these were used for cooking. There was some evidence for the lids having been used with the jars, as at the neighbouring City Campus site (Evans *et al* 2014); one BB1 copy jar had a distinctive sooting pattern, finishing neatly in a line around the inside of the rim, and a lid had a similar sooting pattern.

Severn Valley ware, Fabric 12 and variants

Severn Valley ware dominated the assemblage, as typical for Roman sites in this region (Tables 8, 9). The fabric description published by Webster (1976, 18) is quite general, though he notes the presence of a range of minor variations. The National Roman Fabric Reference Collection defines two fabrics; a Malvernian Severn Valley ware (Tomber and Dore 1998, 148: SVW OX 1) and an un-sourced group of diverse fabrics (Tomber and Dore 1998, 149: SVW OX 2). As at the neighbouring City Campus site (Evans *et al* 2014), a range of fabrics was recorded from the Hive. Some of these fabrics are already incorporated in the County series and have been published elsewhere (fabrics 12, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6; Hurst and Rees 1992; Bryant and Evans 2004). Other variants are not so well defined, though some have parallels in other assemblages, for example from Worcester Magistrates' Court (J Evans in prep). These variants were allocated site specific fabric codes and their defining characteristics are noted in Table 7. Some fabrics that were initially separated out during analysis were subsequently merged with others (eg 12.11–12.14, 12.22, 12.31–12.33) so are not included in the tables or discussed below.

157 sherds were recorded as misfired; these were mainly overfired but a small number was recorded as warped or with bloating. While this indicates a fairly local source for some of the pottery, there was no evidence for specific periods of production. Misfired sherds were noted in a range of Severn Valley variants (12, 12.1, 12.16, 12.24, 12.34, 12.5 and 12.6) and occurred throughout the sequence, from Period 3 on. The three sherds in fabric 12.6 that were recorded as warped, rather than just overfired, all from Period 6 or 6–7 deposits (quarry pit CG 1108, fill 6745; robbing of stone well CG 1015, fill 6823; well pit CG 1088, fill 8657), might hint at later, local production in this fabric. 142 sherds were recorded as having a characteristic soft brown firing. A similar firing was noted on sherds of charcoal-tempered ware at the Newland Hopfields kiln site in Malvern, where it was thought to reflect a more iron-rich source for the clay rather than just a variation in firing (fabric 05, Evans *et al* 2000, 26, 70). This also occurred throughout the sequence and in a range of fabrics (12, 12.2, 12.24, 12.25, 12.5, 12.6, 12.8), with no clear pattern. It was slightly more common in organic fabric 12.24 and fabric 12.5 (7% and 6% of the fabrics respectively).

Three vessels were recorded with perforated bases, typically a characteristic of late Iron Age and earlier Roman vessels. One, from the Period 3, early east-west ditch CG 1003 (fill 6340), was in Severn Valley ware fabric 12.6. This had one large hole in the base. The two other examples both came from the Period 4 re-cut of this ditch (CG 1005, fills 6006 and 6278). The base of a jar in fabric 12.2 had at least 3 large holes, and the base of a tankard in fabric 12.24 had a single perforation.

The largest group of Severn Valley ware by far comprised the standard oxidised Severn Valley ware (Tables 8, 9: Fabric 12), a fairly fine fabric. This dominated all period assemblages but was proportionately more common in Periods 5 and 6 (Table 9; Fig 93). Wide-mouthed jars were the most common vessel class, followed by narrow-mouthed jars, bowls, and tankards (Table 10; Fig 94). Most of the wide-mouthed jars were broadly 2nd to 3rd century types, mainly with overhanging rims (Fig 105.33, 35; Webster 1976, fig 5: type C23-5) or thickened rims (Fig 105.31). A small proportion had the shorter necks characteristic of later types (Fig 105.38–42). The narrow-mouthed jars followed a similar pattern; longer necked jars with overhanging, out-curving, thickened or pulley rims (Fig 104.12, 13, 15, 16, 18, and *cf* 14), and a smaller quantity with shorter necks and overhanging or pulley rims (Fig 104.22–4, and *cf* 21; Evans *et al* 2014, fig 5.18, 6, 7). The large storage jars all had overhanging rims (Fig 104.27). Bowls were predominantly the medium-to-large, flanged types, with plain or reeded rims. While a narrow range of forms was noted in the plain, flanged bowls (Fig 106.61, 62, 65. and *cf* 66, 67), a great deal of variation was noted in the reeded forms. Many of those illustrated in Figures 106 and 107 (nos 68–88) were types made in Fabric 12, though only some in this fabric are illustrated (Fig 106.71,76, 77; Fig 107.79, 82, 87, 88). Smaller bead or everted-rimmed bowls were also present (Fig 105.45 and *cf* 46), along with samian copies and segmental bowls (Fig 105.54–56). The base of one bowl (Fig 107.94) had a pattern of impressed rings internally; presumably a crude copy of the ring of rouletting and potter's stamp found inside the base of samian bowls and dishes. Amongst the tankards, the 2nd to 3rd century type, with moderately splayed walls (Fig 104.5) and the increasingly splayed 4th century type (Fig 104.8 and *cf* 9) were most common (7% and 6% of the fabric by rim EVE respectively), though earlier types were also present (Webster 1976, fig 7.38–41). Other forms included: a range of flagons (Fig 104.4 and *cf* Evans *et al* 2000, fig 19, F1, F11); globular beakers with cornice rims (*cf* Evans *et al* 2014, fig 27.6) and necked beakers (not illustrated); a colander (Fig 111.170), a dish (Fig 107.90) and lids. Lids had bead, plain or up-turned rims (none illustrated). Diameters ranged mainly between 10 and 21cm, suggesting they may have been used with narrow-mouthed jars, though one example with a diameter of 32cm may have been intended for use with a wide-mouthed jar. More unusual forms included a *tettina* rim and spout (Fig 107.95, 96) and a base, possibly from a candle stick (Fig 107.93).

One sherd was perforated for repair, the rim of a 2nd–3rd century, wide-mouthed jar in Fabric 12, found in one of the Period 6 quarry pits (CG 1057; fill 6520 Rec 1611).

As at the City Campus site (Evans *et al* 2014, table 8) and Deansway (Bryant and Evans 2004, 257), the most common of the fabric variants was Fabric 12.6, distinguished by its more abundant, soft, white inclusions. An unpublished study, using neutron activation analysis, suggested that this fabric came from a Malvern source (Evans 1991; Bryant and Evans 2004, 257). Similar inclusions were noted in the Malvernian Severn Valley ware described in the National Roman Fabric Reference Collection (Tomber and Dore 1998, 148, SVW OX 1), thought to be decayed feldspar. However they are also present, to varying degrees, in the un-sourced ware (Tomber and Dore 1998, 149, SVW OX 2). A single sherd from a flagon, recorded as fabric 12.61 (not illustrated), had Malvernian rock inclusions. Fabric 12.6 was common throughout the sequence, but had a rather erratic chronological distribution (Fig 93). It was proportionately most common in Periods 6–7 and 5 (Table 9). The range and proportion of vessel classes and types was similar to Fabric 12 (Table 10; Fig 95). Narrow-mouthed jars mainly had overhanging rims (10% the fabric by rim EVE; Fig 104.14 and *cf* 18), though jars with thickened rims, pulley rims and out-turned rims were also represented (*cf* Fig 104.12, 13, 15, 16; Fig 110.165). Wide-mouthed jars also mainly had overhanging rims (*cf* Fig 110.32, 33, 35, 39), followed by thickened rims (Fig 110.36 and *cf* 31). As with fabric 12, a relatively small proportion had the characteristically later short necks. These included a more unusual spouted jar, the base of which had been perforated after firing (Fig 111.166). Associated with this was another base, of similar diameter, that had been reworked to form a lid (Fig 122.23). It is speculated that the jar might have been inverted and used with this lid as a removable cover for the hole, perhaps as a bee hive. The large storage jars nearly all had overhanging rims, and relatively few had short necks (Fig 104.26 and *cf* 27). Bowls were predominantly the medium-to-large, flanged types, with plain or reeded rims (Fig 106.59, 60, 64, 68, 69 and *cf* 62, 65, 66, 67, 74; Fig 107.80 and *cf* 79), again with wider variation in the reeded forms. Smaller bead or everted-rimmed bowls were also present (Fig 105.46, 47 and *cf* 45, *cf* Evans *et al* 2000, fig 29, BT50–54), along with samian copies and segmental bowls (*cf* Fig 105.55). Few early tankard types were represented in this fabric; the 4th splayed forms were most common, followed by the broadly 3rd to 4th century, moderately-splayed types types (Fig 104.7,10 and *cf* 8, 9, 10% and 8% of the fabric by rim EVE respectively). This supports the evidence from City Campus, which indicated a later date for the fabric than was proposed at Deansway (Bryant and Evans 2004, 257). Other forms included a few fragmentary beakers, flagons and lids (not illustrated).

A single, over-fired sherd was distinguished by the presence of a macroscopically visible Malvernian rock inclusion in the break (Fabric 12.61). This was from the rim of a wide-mouthed flagon found in a period 5 pit (CG 1042; pit 6601, fill 6600).

The next most common group of fabrics was characterised by the presence of coarse organic inclusions; finer organic tempered ware Fabric 12.24 is discussed separately below. Coarsely organic tempered ware, with macroscopically visible, black, organic inclusions, was present in relatively small quantities, mainly oxidised (Fabric 12.2 and variants) rather than reduced (Fabric 12.3 and variants). Given the coarseness of the inclusions, it seems that these were deliberate. Both of these typically 1st–2nd century fabrics were, as expected, most common in Period 3, declining markedly afterwards (Fig 96). A slight increase in Period 6 suggests that more residual material is incorporated in this assemblage. Wide-mouthed jars were by far the most common vessel class in the oxidised fabric (Fig 97), occurring in a range of broadly 2nd to 3rd century types (out-curving rims 10%, *cf* Evans *et al* 2000, fig 23.JWM6, 8; slightly overhanging rims 7%, *cf* Fig 105.32, 33; thickened rims 6%, *cf* Fig 105.31; and hooked rims 11%, *cf* Webster 1976, fig 5, C23–5). The narrow-mouthed jars had gently overhanging rims or, in one example, a pulley rim (*cf* Fig 104.19, 9% and *cf* 15, 4%). Unsurprisingly, none of the later, short-necked jars were represented in this fabric. Other forms included tankards, mainly with only slightly splayed walls (*cf* Webster 1976, fig 7.E40, 41, 13%; Webster 1976, fig 7. E38, 39, 3%) and bowls (not illustrated). The latter were notably less common than in fabrics 12 and 12.6 and mainly comprised medium-to-large, flanged types, with plain or reeded rims (6% and 3% of the fabric respectively; *cf* Fig 106.66, 69, 75, and Webster 1976, fig 9.G54). A fragmentary lid was also noted (not illustrated). Forms in the reduced organic ware were generally earlier Roman types. Of particular interest was an unusual, elongated, handled jar in Fabric 12.23 (Fig 110.163). Other early Roman forms included an everted rim, possibly from a rusticated jar (*cf* Evans *et al* 2014, fig 27.19) and a carinated bowl (Webster 1976, type H). Later Roman forms comprised dishes; a copy of late 3rd–4th century BB1 dish (*cf* Seager Smith and Davies 1995, fig 123, WA type 20; Gillam 1976, fig 5: 80–84) and another more typical Severn Valley form (Webster 1976, fig 10.K72).

The reduced, organic-tempered ware (Fabrics 12.3, 12.34, 12.35) represented less than 1% of the assemblage and were most common in period 3 (Table 9, Fig 96). Forms included a carinated bowl (Webster 1976 type H), a couple of bead-rimmed or plain-rimmed dishes (*cf* Fig 107. 91, 104), a medium-mouthed jar rim and nine body sherds with rusticated decoration, a narrow-mouthed jar (*cf* Fig 104.13), a wide-mouthed jar (*cf* Evans *et al* 2000, fig 23.JWM6, 8), and a lid. The most unusual form, however, was a rilled beaker, from a Period 4 ditch (Fig 110.164). Other decoration included a grey/black slip (7 sherds) and combed, wavy decoration, reminiscent of grey wares from the south-west and south Wales (11 sherds).

The finer organic tempered ware (Fabric 12.24) was far more common than the coarsely tempered ware. The black organics in this fabric are not necessarily visible macroscopically, and may be natural inclusions, perhaps left behind when the coarser organic component was removed during clay preparation. This may be more similar to fabrics identified at the Newland Hopfields kiln site, which included carbonised wood (Evans *et al* 2000, 17, fabrics O1, O2 and O5). At the Hive, this variant is proportionately most common in Period 4 by weight (Table 9) and Periods 5 and 6 by rim EVE (Fig 93). The evidence from the Newland Hopfields site suggests that this finer organic fabric is associated with 2nd to 3rd century products (Evans *et al* 2000, 17, 26). The main products were bowls, then wide-mouthed jars, tankards and narrow-mouthed jars (Fig 98). Amongst the bowls, reeded-flange bowls were more common than the plain flanged bowls (12% and 10% by rim EVE respectively), a contrast to Fabrics 12 and 12.6 discussed above. This variation was also noted at the neighbouring City Campus site (Evans *et al* 2014). A variety of rim types are represented in both of these vessel classes (Fig 106.72, 76 and *cf* 61, 63–5, 71, 73, 75; Fig 107.84, 86 and *cf* 79, 82, 83; *cf* Fig 111.169). Other bowls included smaller, everted–rim types (*cf* Fig 105.45, 47; Webster 1976, fig 7.D36), a 3rd–4th century, necked bowl (Fig 105.49; Rees 1992 form 69.1), a hemispherical bowl with a grooved, elongated rim (not illustrated) and a 2nd–3rd century, flanged, segmental bowl (Webster 1976, fig 10, J65; Evans *et al* 2000, fig 28, BT43). The wide-mouthed and narrow-mouthed jars were mainly 2nd to 3rd century types (in order of frequency, *cf* Fig 105.31, 7%; 32, 33, 8%; Fig 110.165, 3%; Fig 104.12, 2%), but included later types (*cf* Fig 105.35, 2%; *cf* Webster 1976, fig 5.C27–9, 4%; Webster 1976, fig 3, A9, 1%). Some of the later, short-necked jars were also present in both categories, but in smaller quantities (*cf* Fig 105.40, 3% and *cf* Fig 105.41, Fig 104.22, 23), as well as a more unusual cordoned form (Evans *et al* 2014, fig 27.13). Large storage jars were also recorded. Tankards were predominantly 4th century types (*cf* Fig 104.6–8, 8%; Webster 1976, fig 7, E44) or late 2nd to 3rd century types (*cf* Fig 104.5; Webster 1976, fig 7, E42–3), although earlier upright and near-upright forms were also present. Other forms comprised lids, a BB1-type dish (*cf* Fig 107.104) and a colander (Fig 107.92).

The other oxidised organic fabrics occurred in much smaller quantities. They first appeared in Period 3, with a couple of sherds present throughout the sequence. Variants included wares with abundant soft white inclusions (Fabric 12.25), sand (Fabric 12.23) and grog (Fabric 12.21). Two forms were noted: a small bead-rim bowl in fabric 12.25 and a necked bowl in fabric 12.21 (*cf* Fig 105.45 and 49 respectively). A grooved base in fabric 12.25 had been re-used as a lid (Fig 122.23). Grog-tempered fabrics, including Fabric 12.7, are typically 1st century wares. Similar fabrics were noted, for example, in a mid-1st century assemblage from Worcester, St Johns (Evans 2010, 18). Fabric 12.7 was first present on this site in Period 4 and was present in small quantities up to Period 6. Forms included tankards (*cf* Fig 104.9), bead-rimmed and reeded-flange bowls (*cf* Fig 106.72; Evans *et al* 2000, fig 29, BT60; Webster 1976, fig 9.G55), wide-mouthed jars with everted or hooked rims (Evans *et al* 2000, fig 23.JWM6, 8; Webster 1976, fig 5.C27–9) and a narrow-mouthed jar (Evans *et al* 2014, fig 27.10). Two of these, the tankard and hooked-rim, wide-mouthed jar, are later Roman types suggesting this is not just an early fabric variant.

The sandy, micaceous variant (Fabric 12.5) was never common, representing 2% of the assemblage by weight (Table 8), but was present throughout the sequence, particularly in periods 6 and 6–7 (Table 9). The vessel profile differed from Fabrics 12 and 12.6; narrow-mouthed jars were the most common type, followed by wide-mouthed jars, tankards and bowls (Fig 99). This is similar to Sidbury fabric 12.4 (Darlington and Evans1992, 45) itself similar to Gloucester fabric TF23, and was thought to be an early fabric at Deansway (Bryant and Evans 2004, 256). However, as at the neighbouring City Campus site (Evans *et al* 2014), later tankard types were most common (Fig 104.6, 9, 13%) than earlier types (Evans *et al* 2014, 39–43, 8%). Jars were broadly 2nd to 3rd century types with thickened or slightly overhanging rims (*cf* Fig 104.12–14; Fig 105.32, and *cf* 31, 33; Fig 110.165; Evans *et al* 2000, fig 23, JWM6, 8) though later, hooked rim or pulley rim and short-necked forms were also present (Fig 104 21, 25 and *cf* 15, 16, 18, 20, 24; Fig 105.34; Webster 1976, fig 5.C27–9). Medium-to-large flanged bowls were common, those with plain rims (Fig 106.63, 66, 67 and *cf* 60, 61, 64, 65) more so than those with reeded rims (Fig 106.70, 73 and *cf* 68, 69, 76; Fig 107.85 and *cf* 79, 80). Other bowls included small everted-rim types (*cf* Fig 105.45, 46), necked bowls (Fig 105.53 and *cf* 48, 50), samian copy bowls (*cf* Fig 105.56, 57), and various flanged, segmental bowls (Fig 107.89 and *cf* Fig 106.60). Less common were beakers with devolved cornice rims, (not illustrated), flagons (Evans *et al* 2000, fig 19, F11), large storage jars (*cf* Fig 104.26) and lids (not illustrated). At Deansway, a Malvern source was suggested (Bryant and Evans 2004), and a sandier variant was noted from the Newland Hopfields kiln (Evans *et al* 2000, 26, fabric 08), but other sources are possible (Evans *et al* 2014).

Three sherds were separated out and recorded as fabric 12.51. Two rim sherds from jars (*cf* Fig 105.42) were distinguished by the presence of siltstone inclusions, similar to Magistrates court fabric O24. Another rim sherd, from a bowl (*cf* Fig 107.79), was distinguished by the presence of Malvernian inclusions. It is uncertain whether these are variations within the fabric range, or indicative of a different source.

Another Severn Valley ware variant was distinguished by its very vesicular appearance (Fabric 12.8). These vesicles could result from burnt or leached out inclusions. Some of the Newland Hopfields fabrics were described as vesicular (Evans *et al* 2000, 26, fabrics 01, 02, 05, 09). Examination with a binocular microscope showed fragments of carbonised material to be present in the vesicles of some fabrics, and chaff or grass in others. Another cause might be poor wedging, as with the Malvernian Severn Valley ware described in the National Roman Fabric Reference Collection (Tomber and Dore 1998, 148, SVW OX 1). The fabric was present in very small quantities from Period 4 on (Table 9). Narrow-mouthed jars were the main type occurring, with a range of thickened and slightly overhanging rims (*cf* Fig 104.12–14; *cf* Fig 110.165) and a pulley rim (Fig 104.16). The wide-mouthed jars were mainly later types with hooked rims and sometimes short necks (*cf* Fig 105.41). Other forms included two flanged bowls (*cf* pot3.64, 65) and a hemispherical bowl (*cf* Fig 105.56), a flagon, a lid, and a fragmentary tankard (not illustrated).

Reduced Severn Valley ware was poorly represented. The organic fabric (Fabric 12.3) has been discussed above. Fabric 12.1 was most common in Period 3, with proportions then steadily declining (Table 9, Fig 96). The form profile is quite distinct from the other Severn Valley wares, with an emphasis on medium-mouthed jars, bowls, wide-mouthed jars and cooking pot forms (Fig 100). The medium-mouthed jars had everted rims (Evans 2011, fig 5.18, 12; Evans *et al* 2014, fig 27.19), some slightly cupped or with collared rims (not illustrated). These are likely to be from rusticated jars; nine body sherds were noted with rusticated 'knobs' and two with linear rustication. The bowls included characteristically early Roman types: necked bowls (Bryant and Evans 2004, fig 158.12), including one with combed decoration not typical of Severn Valley ware; carinated bowls (Webster 1976 type H); and a hemispherical bowl (*cf* Fig 105.56). There were no medium-to-large, flanged bowls, usually the most common type in the Severn Valley fabrics. The wide-mouthed jars were also predominantly earlier types, with out-curving (*cf* Evans *et al* 2000, fig 23.JWM6, 8, 10% and Fig 105.29, 10%) or thickened rims (*cf* Fig 105.31, 1%), although a couple had characteristically later hooked rims (*cf* Fig 105.35; Webster 1976, fig 5.C27–9). The only narrow-mouthed jar was also an earlier type (*cf* Fig 110.165). The cooking pots copied BB1 types, mainly with near upright rims indicating a 2nd century date (8%), but including some later types (*cf* Fig 107.105, 4%). A 2nd century date is supported by the presence of acute cross-hatch burnish (11 sherds), though single sherds with right-angle and obtuse pattern burnish were recorded, the latter dating from the mid-3rd century. The only tankard was a 2nd century type (Webster 1976, fig 7.E40, 41). Beakers included a copy of a BB1 form (Seager Smith and Davies 1993 WA type 10; Gillam 1976 fig 2.20–22), a small beaker with a cupped rim and a globular beaker (not illustrated). In addition to the decoration described above, some sherds had a black or dark grey slip (34 sherds).

Some variation was noted within fabric 12.1, and sherds were recorded separately in case they indicated different sources. Some sherds (fabric 12.15) had common sand inclusions (fabric 12.15), similar to oxidised fabric 12.5. Others (fabric 12.16) had more common soft white inclusions, similar to oxidised fabric 12.6. Fabric 12.15 was represented by jars and bowls (*cf* Fig 106.70; Evans 2000, fig 23.JWM6, 8; Bryant and Evans 2004, fig 162.8), and fabric 12.16 by jars and a flagon (*cf* Fig 105.31, 42; Evans *et al* 2014, fig 27.19; Evans *et al* 2000, fig 19.F11). Both variants include bases with turned grooves.

The only other Severn Valley fabric was a shelly ware (Fabric 12.4), represented by a single rim from a flanged bowl (*cf* Fig 106.65), found in a Period 6 context, and body sherds from a carinated bowl with wavy, combed decoration from the Period 4 ditch.

Evidence for manufacture, use and re-use was sought for all the Severn Valley variants. A distinctive soft, brown firing was noted on sherds in most oxidised variants. It was most common on Fabrics 12.24 and 12.5 (29 sherds, 6.6% of the fabric and 16 sherds, 5.6% of the fabric respectively), and was noted on flanged bowls, tankards of different dates, wide-mouthed and narrow-mouthed jars. A similar firing was noted in one of the charcoal tempered fabrics from the Newland Hopfields kiln, where it was thought by Vivien Swan to indicate a more iron-rich clay source (Evans *et al* 2000, 26 and 70, fabric 05). Overfired or warped sherds, suggesting relatively local production, were recorded in various fabrics: Fabric 12 (148 sherds, 1.3% of the fabric), 12.1 and variants (27, 4.3%), 12.24 (3, 0.7%), 12.34 (2, 1.2%), 12.5 (5, 1.7%), and 12.6 (2.2%). The only evidence for use came from sherds with limescale or sooting. Fifty-three body sherds with limescale were recorded in fabric 12, one from a tankard base and one from a jar, the others undiagnostic. Only a handful of examples were recorded in other fabrics.

Sandy oxidised ware, Fabric 13

Sherds classified as sandy oxidised ware, possibly representing a range of sources, made up roughly 1% of the assemblage (Table 8). They first appeared in Period 4 (Table 9) and were then present in small quantities throughout the sequence. Forms included wide- and narrow-mouthed jars and cooking pot forms, bowls, beakers, lids and a tettina spout (Table 10). The most unusual form was the tettina spout, found in Period 6 quarry pit CG 1057 (Fig 107.96). Beakers were 2nd to 3rd century types, including a bag shaped beaker with a devolved, cornice rim (Fig 111.171), a globular beaker (Fig 107.97) and a copy of a BB1 type (*cf* Fig 108.117). The wide- and narrow-mouthed jars were Severn Valley ware types, with thickened (*cf* Fig 104.12, 13; *cf* Fig 105.31) and overhanging rims (Fig 105.32, 33, 35; Webster 1976, fig 5.C27–9). The cooking pot was a 3rd century, BB1 copy and possibly misfired (Fig 107.98). Bowls included mid-3rd to 4th century necked forms (Fig 107.99; Rees 1992, fig 29.5, 6) and broadly 2nd to 3rd century, and flanged types (*cf* Fig 106.61, 68; Webster 1976, fig 9, G57; Evans *et al* 2000, fig 28, BT32, 34, 35). Two sherds were recorded as over-fired but there were no real wasters.

Very fine sandy oxidised ware, Fabric 13.1

One more distinctive body sherd was separated out. This was in a pale, oxidised fabric (Munsell 7.5YR 7/6) and had a slightly ‘soapy’ feel. Inclusions comprised common, silt-sized white sand and sparse red grog pellets. It was found in Period 6 quarry pit CG 1108 (fill 6745).

Sandy reduced ware, Fabrics 14 and 15 and variants

Small quantities of fine (Fabric 14 and variants) and coarse (Fabric 15, 15.1) reduced sandy ware were present throughout the sequence (Tables 8, 9). The finer fabrics (Fabric 14 and variants) were present in small quantities. Fabric 14 was associated primarily with copies of BB1 cooking pots with a range of dates (Fig 107.100; Seager Smith and Davies 1993, 231, WA types 1 and 2), and late 1st to early 2nd century medium-mouthed jars (Bryant and Evans 2004, fig 163.1). A short-necked, wide-mouthed jar is more typical of late 3rd–4th century Severn Valley forms (Fig 107.101). The broad date range is also reflected in the bowls, which included a late 1st to early 2nd century necked type (Bryant and Evans 2004, fig 162.8), a Severn Valley ware flanged type (Fig 107.102) and a copy of a late 3rd to 4th century drop-flange bowl (*cf* Fig 108.124, 125). Other late forms included copies of BB1 dishes, with characteristically local, decorated rims (Fig 107.103) and with plain rims (Fig 107.104). Decoration included occasional body sherds with acute burnished lattice (4) and various types of rustication (5).

A small number of fine, reduced sandy sherds were recorded separately. One, Fabric 14.1, was a micaceous fabric with very fine black inclusions. This was decorated with lines of rouletting reminiscent of late 1st to early 2nd century London-type wares, but was residual in a Period 5 pit (CG 1085, fill 6951). Eighteen sherds with fine organic inclusions were recorded as fabric 14.24. Nine of these, from the Period 6 quarry pit CG 1108 (fill 6745), were from a copy of a BB1 bowl or dish. Another sherd had limescale, indicating use in cooking. Four sherds, recorded as fabric 14.3, had a distinctive firing, with a dark grey core, brown margins and blackened surfaces. These came from the re-cut of the Period 4, east–west ditch (CG 1005, fill 7263). Finally, two sherds, from a jar and a lid in a coarse sandy ware with black organic inclusions, were recorded as Fabric 15.1. No diagnostic rims were recorded in any of these variants.

The coarser reduced sandy ware, fabric 15, was less common but present in all periods. All forms copied BB1 types, dating from the 2nd to late 3rd or 4th centuries; primarily cooking pots (*cf* Fig 107.100, *cf* Fig 107.106) but also bowls (*cf* Fig 108.123–5). Four sherds from one of the cooking pots were badly warped, hinting at production somewhere in the vicinity. These came from the floor of Building 2C (CG 1062; layers 6981, 6984), attributed to Period 5.

Wheel-made grog-tempered ware, Fabric 16

Six sherds, from a jar and a bowl (not illustrated, *cf* Figs 106.66 and 107.106), were recorded as fabric 16. This fabric is broadly dated to the late 2nd–3rd centuries (Bryant and Evans 2004, 34). All were found in Period 6 quarry pit CG 1108 (fill 6745).

Savernake ware, Fabric 16.1

A single body sherd of Savernake ware was recorded, from a jar decorated with an incised wavy line, from a Period 4 deposit.

Hand-made grog-tempered ware, Fabric 16.2

A single rim, from a narrow mouthed jar with a slightly overhanging rim, was recorded in a hand-made, grog-tempered ware (not illustrated). This is an early Roman fabric but was found in the Period 6 quarry pit (CG 1108, fill 6745).

Pink grog-tempered ware, Fabric 17

Eleven sherds of pink grog-tempered ware were recovered, one from Period 5, from the primary fill of a pit cutting the cobbled surface CG 1045 (CG 1087; fill 6475), and ten from Period 6. Apart from a base (*cf* Booth and Green 1989, fig 1.1), these were all body sherds from large storage jars, three of which were decorated with incised wavy lines (not illustrated).

Wheelmade Malvernian ware, Fabric 19

Wheelmade Malvernian ware was one of the more common fabrics, after Severn Valley ware (Table 8); not surprisingly given the fairly local source. It first appeared in Period 4, but was most common in Period 6 (Table 9, Fig 91). As at the neighbouring City Campus site (Evans *et al* 2014), cooking pots, copying BB1 types, were by far the most common form (Table 10, Fig 101), in particular jars with plain everted rims (Fig 107.106, 50% rim EVE; 105, 20%; and 108, 1%). There was some correlation between rim diameters of these jars and the handmade Malvernian lids (Fig 102); a much higher proportion of lids had a diameter of 15cm (2.14 rim

EVE) but these could have been used with slightly larger jars. Limescale, sooting and burnt residues were noted on the jars, sometimes together, indicating use for cooking. In a number of cases the sooting finished in a neat line inside the rim, presumably where a lid had been placed during use. Lids were also produced in the wheelmade Malvernian ware, mainly with plain rims (Fig 111.175) but also with up-turned or tooled rims (not illustrated). A number of these were recorded as ‘smoke fumed’, with the fuming also occasionally ending in a clearly defined line. Other forms included BB1 copy bowls and dishes (Fig 108.109–111, 114, 115; Fig 111.174), some with BB1 style burnished decoration, some with wiped surfaces, and some with impressed or pinched decoration around the rim (Fig 108.112, 113). These also occasionally had sooting on the rim or ‘smoke fuming’. Least common were large storage jars and wide-mouthed jars, the latter representing less than 1% by rim EVE (Fig 108.107).

Ten sherds were recorded as overfired, one with spalling, and one warped. The spalled sherd came from a cooking pot with burnished lattice, found in a Period 4 pit (CG 1092; fill 7010 rec 3133), while the warped sherd, from a BB1-type cooking pot, was deposited in a Period 5 layer (CG 1098; 7165).

White-slipped wares, Fabrics 20, 20.4, 20.5 and 20.6

In addition to the four sherds of South-west white-slipped ware described below (Fabric 151.2), a range of white-slipped ware fabric variants was noted. An attempt was made to split these, but it was not clear that the variations noted were consistent or significant. Variations included the frequency and coarseness of sand inclusions, and the firing of vessels, with some sherds oxidised throughout, some reduced internally and oxidised externally, and some having reduced cores. Most sherds fell within the broad definition of Worcestershire Fabric 20, some having no macroscopically visible inclusions and a slightly soapy feel, but others having variable amounts of quartz. A similar range of white slipped wares was noted at the Magistrates’ Court site (fabrics Q12–14, Q27, Q151). Some sherds were more distinctive and are described separately below; with fine grog (Fabric 20.6) and coarser grog inclusions (fabric 20.5), or common white inclusions (Fabric 20.4). The source or sources of these wares is uncertain, and a more detailed study of the fabrics would be justified, particularly on a site with significant earlier Roman deposits. These white-slipped wares were most common in Period 4, particularly associated with the re-cut east west ditch CG 1005, where they represented 2% by count and weight and 5% by rim EVE (Table 9). They were predominantly associated with flagons, although a possible *tazza* rim and a very fine strap handle, possibly from a beaker, were also recorded. Forms in Fabric 20, included a ring-necked flagon (*cf* Gillam 1970, fig 2.5 dated *c*110–150), a cup-mouthed flagon (not illustrated) and a necked bowl (Fig 108.116).

The white-slipped ware with fine grog inclusions (Fabric 20.6) was fairly common. It was present throughout the sequence but was most common in Period 5 (Table 9). The firing of this fabric was variable; some sherds were oxidised throughout, some had a reduced core and oxidised margins, and others were oxidised externally and reduced internally. Forms included flagons, but also the fragmentary rim from a *tazza* (not illustrated), found in the Period 6–7 timber well pit (CG 1088; fill 8662).

The other white-slipped fabrics were present in very small quantities. Two sherds were in a coarser grog-tempered fabric (Fabric 20.5), possibly just a variant of Fabric 20.6. One, from a cupped-mouth flagon (not illustrated), was found in a Period 5 layer (CG 1043; 6782). The other sherd came from the Period 6–7 timber well pit (CG1088; fill 8659).

The fabric with abundant white inclusions (20.4) was similar to Severn Valley ware fabric 12.6, and is likely to be from the same source. Sherds had a thick colour coat, and were fired with a red outer surface and margins and a pink inner surface and margins. Only four sherds were recorded, all from later periods; two came from the Period 6 quarry pit (CG 1108, fill 6908) and two from the Period 6–7 timber well pit (CG 1088, fills 8658, 8662).

Early micaceous wares, Fabrics 21.3, 21.4

A number of sherds were classified as reduced micaceous ware. Most were thought to be the early fabric (Fabric 21.3) recorded at the City Campus site, and found previously on sites to the north side of Castle Street (Griffin 2002, 120; Evans forthcoming). An early date is supported by the range of forms present: carinated bowls (Fig 111.176; Webster 1976, fig 9, H59, 60) and waisted bowls, the latter paralleled at the New Police Station and Sidbury sites (Griffin 2002, fig 10: 9; Darlington and Evans 1992, fig 22: 7); and narrow- and wide-mouthed jars with simple everted rims. A couple of rims copied BB1 jar types, suggesting a slightly later, 2nd century date. Most sherds had blackened surfaces, though firing varied; some vessels had pale grey cores, others grey cores and brown margins. Decoration included rouletting and pattern burnish. This fabric first occurred, and was most common, in Period 4, and was then present in decreasing quantities throughout the sequence. One sherd, from a Period 5 pit (CG 1093, fill 6949), was recorded as 21.4. This was from a sharply carinated form, in a pale reduced fabric with silty sand and fine organic inclusions, and a good black slip.

South-east Dorset Black-burnished ware, Fabric 22

Dorset Black-burnished ware was the second most common fabric (Table 8). Only 4 sherds were recorded from Period 3, but it was present in significant quantities in all other periods. It was most abundant in Period 6 (Table 9). Cooking pots dominated the assemblage (Table 10; Fig 103; Fig 108.117–120). Most common amongst these were jars typical of the late 2nd to mid-to-late 3rd century (25% rim EVE; Gillam 1976, fig 1.7–10), followed by later 3rd to 4th century types (8% rim EVE; Gillam 1976, fig 2.11–14). Second-century jars (Gillam 1976, fig 1.1–6; Seager Smith and Davies 1993, fig 122, WA type 1) were present in much smaller quantities (4% rim EVE). An emphasis on 3rd century forms is reflected in the pattern-burnish recorded: most decorated body sherds (173) had obtuse cross-hatch, which first appears at Vindolanda *c* AD 223–5 (Holbrook and Bidwell 1991, 96). Only 34 sherds had acute lattice, typical of the 2nd century, five had wavy lines on the neck, a mid-to-late 2nd century characteristic, and 15 had right-angle lattice, typical of the late 2nd to early 3rd. Flanged bowls were particularly common (25% by rim EVE) and reflected similar chronological biases as the jars. Most common were late 3rd to 4th century drop-flange bowls (Fig 108.124–125; Gillam 1976, fig 4.45–49; 12% by rim EVE) followed by types dating from the late 2nd to mid-3rd century (Fig 108.122; Gillam 1976 fig 3.42–43, 4%) and mid to late 3rd century (Fig 108.123; Gillam 1976, fig 3.44, 5%). Flat-flanged bowls were least common, and most of these had splayed walled characteristic of the mid-to-late 2nd century rather than earlier (Gillam 1976, fig 3.38–41; Fig 108.121, 2%). The only other bowl was a mid-to-late 2nd century, bead-rimmed type (not illustrated; Gillam 1976, fig 4.52; 2%) found in Period 4 and 5 deposits. Dishes were only slightly less common than bowls (Fig 108.126–130). Most of the plain-rimmed dishes were late 2nd to early 3rd century types, with near-upright walls (Gillam 1976, fig 5.76–9; 13%), although later, increasingly splayed types were also well represented (Gillam 1976, fig 5.80–81, fig 6.82–84, 7%). As typical of this form, most were decorated with intersecting arcs (423 sherds) rather than lattice (126 sherds). Other dishes comprised: bead-rimmed types, predominantly 3rd century forms (Gillam 1976, fig 5.73–74; Fig 108.126, 1%); an unusual, round-handled dish, decorated with burnished lattice, found in a Period 4 ditch fill (Fig 111.177; Gillam 1976, fig 6.86); and four sherds from late 3rd to 4th century, oval fish dishes (Fig 108.130; Gillam 1976, fig 6.85). Twenty eight rims had roughly wiped surfaces. These were mainly from plain rimmed dishes, with a couple from drop-flanged bowls. This is a characteristic of 4th century BB1. Other forms were far less common, including mid-to-late 2nd century beakers (Gillam 1976, fig 2.20–22) and lids (not illustrated).

Two sherds were perforated for repair, one from a cooking pot decorated with obtuse cross hatch and a scored line, found in a Period 5 pit; the other from a bowl decorated with intersecting arcs, found in one of the Period 6 quarry pits. This is consistent with evidence elsewhere that repair is more common on later Roman vessels. Limescale and sooting were recorded, both evidence for use in cooking. Limescale was noted on 37 sherds from cooking pots, three of which also had internal burnt sooting. Sooting and burnt residues (29 sherds and 10 sherds respectively) were recorded on cooking pots. Twenty-eight sherds from bowls and 14 sherds from dishes had sooting. The sooting on bowls was often on or under the flange, and on dishes near the rim, sometimes in a line under the rim.

Two sherds of possible South-west BB1 were also recorded (see fabric 153 below).

Late Roman shell-tempered ware, Fabric 23

Twelve sherds of this diagnostically later Roman fabric were recovered. This first appeared in Period 5, from the floor of Building 2D (CG 1066). It was most common in Period 6 (Table 8), particularly in the upper fills of quarry pit CG 1057, with individual sherds associated with pit CG 1072 and the upper backfill of well pit CG 1089. The only forms represented were jars (Fig 108.131–133). The presence of shell-tempered ware is traditionally taken to indicate a very late Roman date in this area; it is associated with late 4th century features at Bays Meadow villa, Droitwich (Barfield 2006a), at Alcester (Evans 1994, 146) and Gloucester (Hassall and Rhodes 1975, 85–6). Its absence from many Worcester sites has previously been used to suggest that areas of the Roman town were abandoned sometime between the late 3rd or early 4th century (Darlington and Evans 1992, 32; Bryant and Evans 2004, 280; Dalwood *et al* 1994, 97; Griffin 2002, 129). The forms at The Hive are similar to vessels produced at Harrold, Bedfordshire from the late 2nd century (Brown 1994, fig 26: 78), to the later 3rd (Brown 1994, fig 29: 164–173) or early 4th century (Brown 1994, fig 34: 239–41, 243–5), rather than later types. The fabric represents less than 1% of the period assemblages in which it occurs and is found in rather mixed deposits. There is, however, later Roman activity in the vicinity. Diagnostically later forms were recorded at the neighbouring site at 14–24 the Butts, where the fabric represented 2% of the phased deposit (Evans 2011, fig 5.20, 61; table 5.10), and more significant quantities, including a late form, were recovered from the late Roman well at 1 The Butts (Evans 2011, fig 3.6, 11; table 3.2). The latter is thought to have been in filled between *c* AD 370 and 390 (Napthan 2011, 31). Elsewhere, on Castle Street, it was noted in the late Roman assemblage from the County Education Offices (Dalwood *et al* 1997). Only three sherds were recovered from the City Campus excavations (Evans *et al* 2014, 76), and only three from Deansway, where coin evidence indicated activity continued until *c* AD 364–78 (Bryant and Evans 2004, 280). All of the sherds at The Hive were from contexts dating to the early 4th century or later, but these earlier forms might indicate that this ware was reaching Worcester in small quantities slightly earlier than previously thought.

Nene Valley ware, Fabric 28 and Fabric 28.1

Small quantities of Nene Valley colour-coated ware were recorded, first appearing in Period 4 but most common in Period 6 (Tables 8, 9). The white/pale buff fabric (28) was less common than the pink/red fabric (28.1), the former having brown or red slip and the latter mainly brown, but also grey/black and orange/red slip. The latter fabric and slips are typical of later Nene Valley wares (Howe *et al* 1980, 9). A couple of body sherds from a pentice-moulded beaker were very hard fired, another late characteristic. Forms included: a 4th century, pentice-moulded beaker in a buff fabric (Fig 109.134); and a fragment from a late 2nd–early 3rd century hunt cup (not illustrated), and a 4th century dish (Fig 109.135; Howe *et al* 1980, fig 3.26) in the pink/red fabric. Two body sherds were decorated with barbotine under slip, indicative of a late 2nd to mid-3rd century date, and eight with barbotine over slip, the characteristically later technique.

Oxfordshire tablewares, Fabrics 29, 29.1, 30, 38, 39 and 40

Fabric 29

None of the Oxfordshire wares represented more than 1% of the assemblage (Table 8). The most common fabric, apart from the mortaria discussed separately below, was red colour-coated ware (Fabric 29). A single sherd of this fabric from the upper structure of a Period 4 well (CG 1014, fill 6824) is probably intrusive from a later pit. Excluding this, the fabric first appears in Period 5, and is most common in Period 6 (Table 9). Bowls were the most common vessel class (Table 10), including forms dated broadly to *c* AD 240–400+ (Young 2000, fig 59, C51), *c* AD 270–350/400+ (Young 2000, fig 57, C44; fig 58, C45, 47) and diagnostically 4th century types dated from c 325 or later (Young 2000, fig 60, C61, 63, 75.2). Other forms comprised a flange-necked flagon, dating to *c* AD 240–400+ (Young 2000, fig 53, C8) and necked beakers dated *c* AD 270–400+ (Young 2000, fig 55, C25–27). Only the forms found in the quarry pit are illustrated (Fig 109.136–141).

Fabric 29.1

Six sherds were tentatively identified as Oxfordshire oxidised ware. Four sherds, from thin-walled vessels, were decorated with white barbotine lines, a type of decoration used on this ware only in the 2nd century (Young 2000, 188). One of these was from the Period 3 east–west ditch CG 1003 (fill 6340), and the other three from the Period 6 quarry pit CG 1057 (fills 6491, 6520). Two further sherds, from a jar or bowl decorated with lattice burnish, were found in Period 6 quarry pit CG 1108 (fill 6745). These could be later, perhaps dating to the latter part of the 3rd century when this fabric was most common (Young 2000, 189). Fabric 98.01 described below may be a misfired variant.

Fabric 38

A small quantity of Oxfordshire white ware was recorded, first represented by a single sherd in Period 4, but most common in Period 5. Forms included a bowl dated *c* AD 100–300 (Fig 112.191; Young 2000, fig 32, W54) and a flagon dated *c* AD 240–400+ (Fig 109.142; Young 2000, fig 54, W15). Other sherds of white ware are described below, identified as possible Mancetter-Hartshill products (Fabric 30.1) or of unknown source (Fabric 41).

Fabric 39

The assemblage also produced three sherds of burnt white ware (Fabric 39), including a 4th century jar (Fig 109.143; Young 2000, fig 35, GW2) and two body sherds of Parchment ware (Fabric 40).

Fabric 40

Eight sherds of parchment ware were recorded. Forms, where identifiable, were Oxfordshire bowls dating to *c* AD 240–400+ or more specifically to the 4th century (Young 2000, fig 27, P24 and P25). Most sherds were associated with Period 6 deposits, such as quarry pit CG 1057 (fills 6520, 6491, Fig 109.144) and the robbing of well CG 1015 (fill 6823). One sherd from the Period 4 construction of the well (fill 6824) must be intrusive from later robbing.

Miscellaneous white wares, Fabric 38.1; Unsourced, Fabric 41

A range of other white ware fabrics was also identified. The majority of diagnostic handles, re-tooled bases and rims were from flagons.

Mancetter-Hartshill, Fabric 38.1

Forty-two sherds, in a fine, white fabric with soft red inclusions, were thought to be Mancetter-Hartshill products. This fabric first appeared in Period 4 deposits and was then present in small quantities throughout the sequence. Forms included a flange from a segmental bowl, a pulley-rim flagon and a cupped-mouth flagon. The flange, decorated with red paint, was separated out from the Mancetter-Hartshill mortaria during analysis by Kay Hartley. The form could not be dated, but it was noted that small segmental bowls were produced at Mancetter-Hartshill in the same fabric as the mortaria, and that these sometimes had red-brown motifs on the rim.

Unsourced, Fabric 41

Three sherds, all from period 5 deposits, were of uncertain source. Forms comprised a grooved rim from a flagon (not illustrated) and a very small strap handle, from a beaker or small flagon.

Brown colour-coated wares, Fabrics 31.1, 31.2, 31.3

Three brown colour-coated fabrics were identified, though it is uncertain whether these reflect different sources or variation within the products of one production site. A similar fabric is described from the nearby Magistrates' Court site (J Evans in prep, fabric F42), represented by later 1st to 2nd century beakers. This was thought to have a fairly local source.

Sandy oxidised, roughcast, pale brown colour-coated ware, Fabric 31.1

Twelve sherds of oxidised sandy ware were distinguished by the presence of a thin, pale brown colour coat (Munsell 7.5YR 5/4). Ten sherds were from bag-shaped beakers with clay pellet, roughcast decoration. Four of these, spread across three Period 4 pits (CG 1042, fill 6892; CG 1009, fill 6868, and CG 1008, fill 6876) were thought to be from the same vessel. A devolved, cornice rim was found in a Period 4 ditch (CG 1094, fill 6997; Fig 112.189), and other sherds came from a Period 4 layer (CG 1055; 6980), and Period 5 features (contexts 6587, 6922 and 6758). A base, possibly from a rough-cast beaker, that had been reused as a counter (Fig 122.17) was found in a modern layer (Period 12, 6317).

Fine sandy, brown colour-coated ware, Fabric 31.2

Of particular interest were four sherds from a face pot (Fig 112.190), in a dark brown colour-coated ware (5YR 4/1 dark grey). Sherds of this were found in a Period 6–7 pit (6841, fill 6840) and the Period 6 robbing of a well (CG 1015, fill 6823). The vessel was in a fairly hard-fired fabric with fine sand inclusions, reduced internally and with an oxidised external margin.

Sandy oxidised, roughcast, dark brown colour-coated ware, Fabric 31.3

Another brown colour-coated ware was represented by the base and two body sherds from a beaker decorated with clay pellet roughcast. The clay pellets went right down to the base, and some were even found underneath it. The oxidised fabric contained abundant sand inclusions. Sherds had good slip, dark brown externally (Munsell 5YR 3/1, very dark grey), with a paler slip internally (5YR 4/3 reddish brown) and under the base (5YR 5/6 yellowish red). The source of this fabric is certain; it may be related to Gloucester fabric 207. The sherds were found in a modern drain (Period 12, CG 1099, fill 6292).

New Forest ware, Fabric 115

A single body sherd, from a funnel-necked beaker in a very hard-fired fabric, was identified as New Forest ware. Worcester is at the northern fringe of the distribution of this ware, but it has been recorded in small quantities elsewhere in Worcester (Bryant and Evans 2004, 272). The identification is not certain; some late Nene Valley ware can also be very highly fired. The sherd came from one of the Period 6 quarry pits (CG 1108, fill 6745).

Worcestershire imitation Black-burnished ware, Fabric 149

Seven sherds in this fabric were recorded, from the Period 6 quarry pits (CG 1057, fills 6520, 6491; CG 1108, fill 6745). All were from BB1-type, plain-rimmed dishes (Fig 109.145). Some had wiped external surfaces, but none had the heavily scratched surface present of the type sherd in the County fabric series.

South-west white-slipped ware, Fabric 151.2

Four body sherds were identified as south-west oxidised ware (Tomber and Dore 1998, 192), from Periods 5 and 6. The fabric dates broadly to the later 2nd to 3rd centuries. It is thought to come from south-east Gloucestershire or north Wiltshire, and has been noted on other sites in the County (Timby 2004a, 20).

South West Dorset Black-burnished ware, Fabric 153

Two sherds of Black-burnished ware were thought to be south west BB1, one from a late 3rd century jar (JCM7.21; Gillam 1976, fig 2.10) found in a Period 5 pit, the other from a lid (LAB16.01), found in the Period 6 quarry pit. The sherds were distinguished by their firing, with the core being sandwiched between well-defined, paler margins, and the presence of what appeared to be a black slip. This is not a common find in Worcestershire, but three sherds were identified at the neighbouring City Campus site (Evans *et al* 2014, table 7, recorded as fabric 22.1) and one sherd from the villa at Childswickham, in south Worcestershire (Timby 2004a, 20).

Glazed ware, Fabric 156

Two sherds of glazed ware were recorded, both from the Period 4, re-cut ditch CG 1006 (fills 6006 and 7252). One fragmentary rim (not illustrated) came from a beaker. This was in a sandy orange fabric, reminiscent of Holt products (Arthur 1978). The other sherd, a footring base re-used as a counter (Fig 122.5) was in a hard, reduced fabric with an olive green glaze. The fabric had sparse silt-sized sand, mica and black/brown grits, and sparse, rounded quartz <0.5mm. The source of this fabric is uncertain. It is unlike the South-east English glazed ware (Fiona Seeley pers comm) but could be from a range of other sources, such as Derby, Holt or Caerleon, Wiltshire/Wanborough, Mancetter-Hartshill, or Oxfordshire. Roman glazed wares, typically dating to the late 1st to 2nd century, are rare in Worcestershire, though sherds from at least two glazed ware vessels were recorded at the nearby Magistrates' Court site. These were identified as Derby products, dating to the early 2nd century (Trajanic), and were interpreted as possible indicators of a military link (Jerry Evans pers comm).

Miscellaneous Roman wares, Fabric 98

During analysis, a small number of distinctive sherds could not be matched with the fabric series so were separated out. These were re-assessed during report completion and some were integrated above. The others are described below.

Partially oxidised sandy ware with barbotine decoration, Fabric 98.01

This was represented by a single rim from Period 6–7 timber well pit CG 1088 (8662). The sherd, from a small bowl imitating samian form Drag 37, is in a hard grey fabric, with common, rounded, white quartz and sparse red clay pellets. The burnished external surface is red, a surface treatment that continues to *c* 5mm below the rim internally. The inner surface below this is reduced with patchy oxidisation. The bowl is decorated with a band of rouletting below the rim, and trailed barbotine lines (Fig 112.192). The form and decoration are similar to early 2nd century London ware forms (Marsh 1978, fig 6.18, form 42) and 2nd Oxfordshire oxidised ware forms (Young 2000, fig 73, form O45.2). This is an unusual sherd; the effect is of a colour-coated vessel, but the burnishing and the fact that the inside of the bowl is largely reduced suggests that the red colour is a result of differential firing. It may be related to Oxfordshire Fabric 29.1 described above.

Oxidised, black slipped ware, Fabric 98.9

One small, distinctive sherd was in an oxidised fabric (Munsell 2.5YR 5/8, red) with a thick, black slip on the external surface (10YR 5/1). The fabric had soft white inclusions, similar to fabric 12.6 described above, and a rounded ironstone inclusion *c* 1mm. The sherd was from a thin-walled vessel and was found in a Period 5 pit (7081, fill 7079).

Oxidised, black surfaced ware, Fabric 98.10

Three sherds were noted with an oxidised core (Munsell 5YR 5/8, yellowish red) and blackened, micaceous surfaces (5YR 2.5/2, dark reddish brown). Inclusions comprised moderate to abundant coarse sand, with occasional grog and black inclusions. Two sherds were from a thin-walled vessel, blackened internally and externally. The third was from a thicker walled vessel with a blackened and burnished external surface. One sherd came from a Period 4 pit (CG 1008, fill 6876) and the other two from Period 6 quarry pits (CG 1057, fill 6491; CG 1108, fill 6745).

Micaceous oxidised ware, Fabric 98.12

One face pot has been described above (Fabric 31.2). A single sherd from another face pot (Fig 109.146) was found in Period 6 quarry pit CG 1057 (fill 6491). This was in a fine, micaceous, oxidised fabric, with sparse inclusions of silty sand, and occasional red and black inclusions. This may be a Gloucester product.

Fabric 98.13

The last of these fabrics was represented by a distinctive body sherd from a carinated bowl, decorated with very highly burnished surfaces and multiple incised grooves/rilling. This is a late 1st to early 2nd century fine ware form similar, for example, to types produced elsewhere in mica-dusted ware (Marsh 1978 fig 6.20 44.13). It was found on the Period 4 cobbled yard surface (CG 1045; 7225).

Mortaria

C Jane Evans, with identification and dating by Kay Hartley

Eight coarseware mortaria fabrics were identified, from Mancetter-Hartshill (Fabric 32), Oxfordshire (Fabrics 33.1, 33.2), the west midlands/Wroxeter (Fabrics 34, 34.1), Brockley Hill/Verulamium (Fabric 35) and the South-west (Fabric 37.3, 37.5). Mancetter-Hartshill and Oxfordshire white mortaria (Fabric 33.1) were the most common types, though none represented more than 1% of the assemblage (Table 8). The presence of the later Roman Oxfordshire white ware form M22 and the red-slipped Oxfordshire fabric contrasts with the neighbouring City Campus site, supporting the suggestion that activity ceased earlier there (Evans *et al* 2014, 33). The samian mortaria are discussed separately below (hyperlink section 6.2.3).

Mancetter-Hartshill mortaria, Fabric 32

Mancetter-Hartshill mortaria was the most common type by count and rim EVE. This first appeared in Period 4 (two sherds), but was more common in Periods 5 and 6. The earlier bead and flange forms were more common than the hammerhead types, produced from *c* AD 160 onwards (57% and 43% of the fabric by rim EVE respectively). The earliest bead and flange form was dated to *c* AD 130–160 (not illustrated). This was found in the Period 4 well (CG 1014, fill 6972). Most dated to between *c* AD 140 and 170, with one stamped vessel dated more closely to *c* AD140–165 and another to *c* AD 145–170 (Fig 111.178 and 179 respectively). Another was given a slightly later date of *c* AD 150–170, based on the spout (Fig 111.180). The latest in this class, with red-painted decoration on the flange, was dated to *c* AD 180–230 (Fig 109.147). The hammerhead mortaria had date ranges from *c* AD 200–250 (Fig 109.148), 230–300 (Fig 111.181) and 250–350 (not illustrated). One thin walled example was dated to the 4th century (Fig 111.182). Multi-reeded rims (Fig 109.148, 149) were more common than plain (28% and 15% respectively).

Oxfordshire white mortaria, Fabric 33.1

The white Oxfordshire fabric was more common than the red-slipped ware (Table 8). This first appeared in Period 5 but was most common in Period 6 (Table 9). The only form represented in Period 5 was Young type M18, dated to *c* AD 240–300 (Young 2000, fig 21). A wider range of forms were represented in Period 6 and 6–7; Young type M17, M18 (Young 2000, fig 21;

Fig 109.150, 151) and M19 (Young 2000, fig 22), all with a similar date, and the standard late Roman mortarium form, M22 (Fig 109.152, 153), dated *c* AD 240–400+ (Young 2000, fig 23).

Oxfordshire red mortaria with red-brown slip, Fabric 33.3

Only fourteen sherds of red-slipped mortaria were recovered, first appearing and most common in Period 6. The walled type, dated *c* AD 240–400+ (Fig 110.154; Young 2000, fig 67, C97), was the only form identified.

West Midlands mortaria (Wroxeter and other sources), Fabrics 34, 34.1, 34.2, 34.3

The assemblage included two vessels thought to be from Wroxeter, residual in Period 6, and a handful of sherds in three other, probably more local fabrics found in Period 4. The two Wroxeter sherds were a flanged rim, dated to the first half of the 2nd century (not illustrated), in a cream fabric (Fabric 34; Tomber and Dore 1998, 179–180, WRX WH), and a stamped rim in an orange-brown fabric with a reddish slip, dated to the mid-2nd century (Fabric 34.2 Fig 110.155). The source of the other west midlands fabrics is less certain; though they are likely to be from small, fairly local workshops. One was a hard, orange-brown fabric (Fabric 34.1, Fig 112.183). The other, a flange in a hard, cream, orange-brown sandwich fabric (Fabric 34.3, not illustrated) was dated to *c* AD 100–160.

Brockley Hill/Verulamium mortaria, Fabric 35

Only one, heavily worn sherd of this mortarium type was recovered, a rim dated to *c* AD70–130 (not illustrated), residual in Period 6.

Severn Valley/Southwest mortaria, Fabrics 37.3, 37.5

One, very heavily worn sherd of South-west England mortaria (Fabric 37.3; Tomber and Dore 1998, 192), was recovered from a Period 6 deposit. A close parallel for this wall-sided form is noted at Wanborough, Wiltshire (Anderson *et al* 2001, fig 77, type 19). This specific vessel, which has a bent-back or everted bead, is dated to the 3rd century (Fig 110.156), probably before the end of the 3rd century by which time Oxfordshire potteries had probably taken over the market of this industry. This fabric has been noted elsewhere in Worcester, for example at the Sidbury site (Darlington and Evans 1992, 39, fig 36.4).

Of particular interest were four sherds in what is thought to be a local fabric (Fabric 37.5), including two stamped sherds of ASILA, possibly from the same vessel (Fig 111.184–186). The distribution of stamps for this potter points increasingly to a source in the vicinity of Worcester and/or Droitwich. The fabric is virtually identical to that of mortaria stamped by Crispi(nus?), a stamp which has only so far been recorded in Worcester (Hartley 2014), and there is a strong possibility that both potters worked in the same workshop. All the profiles are 2nd century, perhaps on the early side of mid-2nd century; more precise dating will only come from good contextual dating. Unfortunately this was not available here as the sherds were residual in Period 5 or later contexts, or from a poorly dated context.

Wroxeter Raetian mortaria, Fabric 103

A single rim from a Raetian mortarium was recovered from a Period 4 pit (Fig 112.187).

Imported colour-coated wares, Fabrics 44, 44.1, 45.4

A small number of imported fine wares were identified (Table 8), in addition to the samian discussed below. Most common (10 sherds) was Central Gaulish black-slipped ware (fabric 45.4), dating from *c* AD 150 until the early 3rd century (Tyers 1996, 138). This first appeared and was most common in Period 6 (Table 9). The group included rims from two funnel-necked beakers (Fig 110.157), and one body sherd was decorated with trailed barbotine, under slip. One base had been re-used as a counter (Fig 122.9). Three sherds of 'Moselkeramik' Rhenish ware (Fabric 44) were found, also in Period 6. This ware, from Trier, was exported from the late 2nd to mid-3rd century (Tyers 1996, 138). The three body sherds were all from a folded beaker; one was decorated with rouletting. Finally, a single sherd of Cologne colour-coated ware (Fabric 44.1), broadly dating to the 1st to mid-3rd century (Tyers 1996, 148), was recovered from Period 5.

Amphorae

David Williams with C Jane Evans

Amphorae were uncommon in the assemblage, representing less than 1% by count and rim EVE, and 4% by weight. This is similar to the proportions noted at the nearby City Campus (Evans *et al* 2014, table 8) and Magistrates' Court sites (J Evans in prep), and is within the range expected for a Roman small town (J Evans 2001a).

All of the amphora sherds bar one are from the commonly found Baetican olive oil amphora Dressel 20 (Fabric 42.1; Williams and Peacock, 1983; Peacock and Williams, 1986, Class 25). The exception is a thickish body sherd from the lower section of a flat-bottomed French amphora, most probably Gauloise 4 (Fabric 42.3; Williams and Peacock, 1983; Peacock and Williams, 1986*,* class 27), as this seems to have been the most common of the Gauloise types imported into Roman Britain (Laubenheimer, 1985 and in Williams and Keay, 2006). The majority of the Dressel 20 material is made up of plain bodysherds, though there is also a complete rim and two handles, one of them stamped (Fig 110.158). The form of the rim and other handles (not illustrated), together with the date of the use of the stamp, suggests a 3rd century context for the group as a whole. This would seem to be corroborated by the fact that the fabric of many of the Dressel 20 body sherds point to a production date late in the series (Rodriguez-Almeida, 1989). One body sherd has a handle stub which looks as if the handle has been sawn off in antiquity producing a flat surface in which the saw marks are still visible. Presumably this was done so that the neck could also be sawn to produce a wider opening in the vessel to make it a better receptacle for storage once the original contents of olive oil had been used up. Like Dressel 20, Gauloise 4 was produced over a long time-span, which ended sometime in the 3rd century AD (Laubenheimer, 1985 and in Williams and Keay, 2006). The Dressel 20 amphorae first appear in Period 4, and are present in similar proportions in Periods 4 and 5 (Table 9). The Gauloise 4 sherd was from a Period 5 deposit.

Face pots

C Jane Evans

Two face pots were recovered, both illustrated and described in detail in the catalogue below (Fig 109.146, Fig 112.190). These were in very different styles and fabrics; the former in a fine, micaceous fabric (Fabric 98.12) and the latter in a colour coated ware (Fabric 31.2). They were both found in late Roman pits, Periods 6 and 6–7 respectively, but could be residual. Late 3rd to 4th century face pots have been found in the west midlands, including Worcester;

an amorphous group of vessels associated with the late Roman Severn Valley ware industry (Braithwaite 2007, 279, fig J9). They are not common however, so it is unusual to recover two face pots from one site. An association has been noted elsewhere between face pots and 3rd to 4th century sites associated with iron working (Braithwaite 2007, 279). Although the evidence for extensive metal working on this site is limited, a great deal of debris from metal working was being deposited that indicates the presence of larger-scale industry in the vicinity.

The illustrated pottery

Figure 104: pottery from the Period 6 quarry pit; Fabric 3, 1–3; Severn Valley wares (Fabric 12 etc), 4–27

Figure 105: pottery from the Period 6 quarry pit; Severn Valley wares (Fabric 12 etc)

Figure 106: pottery from the Period 6 quarry pit; Severn Valley wares (Fabric 12 etc)

Figure 107: pottery from the Period 6 quarry pit; Severn Valley wares (Fabric 12 etc), 79–95, Fabric 13, 96–99; Fabric 14, 100–104; Fabric 19, 105–107

Figure 108: pottery from the Period 6 quarry pit; Fabric 19, 108–115; Fabric 20, 116; Fabric 22, 117–130; fabric 23, 131–133

Figure 109: pottery from the Period 6 quarry pit; Fabric 28/28.1, 134–5; Fabric 29, 136–141; Fabric 38, 142; fabric 39, 143; Fabric 40.1, Fabric 144; Fabric 149, 145; Fabric 98.12, 146; Fabric 32, 147–149; Fabric 33.1, 150–153

Figure 110: pottery from other deposits; Fabric 3, 159–162; Fabric 12.23, 163; Fabric 12.34, 164; Fabric 12, 165

Figure 111: pottery from other deposits; Severn Valley wares (Fabric 12 etc), 166–170; Fabric 13, 171; Fabric 14, 172–3; Fabric 19, 174–5; Fabric 21.3, 176; Fabric 22, 177; Fabric 32, 178–182; Fabric 34.1, 183; Fabric 37.5, 184–4

Figure 112: pottery from other deposits; Fabric 37.5, 186; Fabric 103, 187; Fabric 29, 188; Fabric 31.1, 189; Fabric 31.2, 190; Fabric 38, 191; Fabric 98.01, 192

Illustrated pottery from the Period 6 quarry pit (Figures 104 to 109)

Handmade Malvernian ware (Fabric 3; Fig 104.1–3)

1. Cooking pot with an everted rim, copying a BB1 type. Diam. 19cm (11%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 940. JCM7.02

2. Jar with a gently splayed rim. Diam. 28cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 943. JCM7.20

3. Lid. Diam. 15cm (10%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 136. LAB16.01

Severn Valley ware (Fabrics 12, 12.14, 12.23, 12.24, 12.34, 12.5, 12.6; Fig 104.4–

107.95)

Flagons

4. Fabric 12. Collared flagon, with a grooved collar. A similar vessel is illustrated from a mid-3rd to late 4th century context at Old Bowling Green, Droitwich (Rees 1992, fig 27.5). Diam. 8cm (70%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 992. FC4.02

Tankards

5. Fabric 12. Tankard with increasingly splayed walls and a bead rim; dated to the late 2nd to 3rd century (Webster 1976, fig 7, E42–3). Diam. 14cm (15%). Period 6, quarry pit CG 1108, fill 7055. Database Rec 414. TC1.01

6. Fabric 12.5. Diam. 16cm (21%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 278. TD1.01

7. Fabric 12.6. Diam. 18cm (50%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1037. TD1.01

8. Fabric 12. Tankard with markedly splayed walls and an elongated, bead rim; dated by Webster to the 4th century (Webster 1976, fig 7, E44). Diam. 17cm (21%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 259. TD1.10

9. Fabric 12.5. Tankard with markedly splayed walls and a grooved rim; dated by Webster to the 4th century (Webster 1976, fig 7, E44). Diam. 14cm (12%). Period 6, quarry pit CG 1057, fill 6492. Database Rec 1951. TD1.02

10. Fabric 12.6. Tankard with markedly splayed walls and a plain rim; dated by Webster to the 4th century (Webster 1976, fig 7, E44).Diam. 16cm (100%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 202. TD16.01

Narrow mouthed jars

11. Fabric 12.6. Narrow mouthed jar with a simple out-curving rim, broadly dated from the 2nd to 4th centuries (Webster 1976, fig 1, type A2). Diam. 9cm (18%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 244. JNA1.01

12. Fabric 12. Narrow mouthed jar with a thickened, near-triangular rim; a 2nd to 4th century type (Webster 1976, fig 1, type A4). Diam. 8cm (10%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1689. JNA19.11

13. Fabric 12. Narrow mouthed jar with a thickened, near-triangular rim most likely dating to the 2nd to 3rd century (Evans *et al* 2014, fig 27.11,

Period 6). Diam. 12cm (26%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 214. JNA19.15

14. Fabric 12.6. Narrow mouthed jar with gently overhanging rim; mainly a 2nd to 3rd century type (Webster 1976, fig 1, type A3, A5; fig 2, A7). Diam. 11cm (23%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 243. JNA20.01

15. Fabric 12. Narrow mouthed jar with a 'pulley' rim, near-equal beads. A 3rd to 4th century type (Webster 1976, fig 3, type A9; Evans *et al* 2000, fig 21, JNM12; Evans *et al* 2014, fig 27.15, Period 6). Diam. 13cm (24%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1001. JNA2.01

16. Fabric 12. Narrow mouthed jar with a 'pulley' rim, lower bead more pronounced; a 3rd to 4th century type (Webster 1976, fig 3, type A10, A11; Evans *et al* 2000, fig 21, JNM14). Diam. 14cm (19%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 390. JNA2.02

17. Fabric 12.24. Narrow mouthed jar with a 'pulley' rim, upper bead more pronounced. A 3rd to 4th century type. Diam. 15cm (14%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 403. JNA2.03

18. Fabric 12. Necked jar with overhanging or hooked rim, dated by Webster to the 2nd–3rd century (Webster 1976, fig 1, A6) and present in the mid-to-late 2nd to 3rd century assemblage from the Newland Hopfields kiln site (Evans *et al* 2000, fig 21, JNM9–11; Evans *et al* 2014, fig 27.14 Period 6). Diam. 17cm (33%). Period 6, quarry pit CG 1108, fill 7055. Database Rec 423. JNA20.03

19. Fabric 12.24. Jar with a hooked rim. Diam.12 cm (38%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 16. JNA20.02

20. Fabric 12. Jar with hooked rim and internal cup. Diam. 17cm (60%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 279. JNA 20.06

21. Fabric 12.5. Short necked jar with a slightly overhanging rim; a 3rd to 4th century type (Webster 1976, fig 3, type A8). Diam. 6cm (30%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 276. JNB20.02

22. Fabric 12. Short necked jar with a thickened, triangular rim. Diam. 11cm (18%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1650. JNB19.11

23. Fabric 12. Short necked jar with an overhanging rim. Diam. 9cm (26%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1040. JNB20.03

24. Fabric 12. Short necked jar with a hooked rim, a 3rd to 4th century type (Webster 1976, fig 3, type A8). Diam. 17cm (16%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1002. JNB20.02

25. Fabric 12.5. Short necked jar with a hooked, ‘pulley’ rim. Diam. 14cm (18%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1680. JNB20.04

26. Fabric 12.6. Large, short necked storage jar with an overhanging rim. Diam. 20cm (35%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 275. JLB20.02

27. Fabric 12. Large, short necked storage jar with an overhanging rim. Diam. 20cm (30%). Period 6, quarry pit CG 1108, fill 6908. Database Rec 1265. JLB20.01

Medium mouthed jars

28. Fabric 12.6. Medium mouthed jar with an everted, grooved rim. Diam. 17cm (5%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1681. JMB7.26

Wide mouthed jars

29. Fabric 12. Wide mouthed jar with an out-curving, flange rim; a broadly mid–late 2nd to late 3rd century type (Evans *et al* 2000, fig 23, JWM6; Webster 1976, fig 5 type C23). Diam. 24cm (6%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1085. JWA7.03

30. Fabric 12.24. Wide mouthed jar with a near-triangular rim. Diam. 26cm (26%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 26. JWA1.12

31. Fabric 12. Wide mouthed jar with a triangular rim, a mid–late 2nd century type (Webster 1976, fig 4, type C22; Evans *et al* 2000, fig 23, JWM5, JWM7). Diam. 25cm (25%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1095. JWA19.11

32. Fabric 12.5. Wide mouthed jar with a gently overhanging rim; a 2nd to 3rd century type (Webster 1976, fig 5, type C22). Diam. 19cm (20%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 448. JWA20.01

33. Fabric 12. Wide mouthed jar with a gently overhanging rim, a late 2nd to late 3rd century type (Webster 1976, fig 5, type C24). Diam. 23cm (18%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 213. JWA20.01

34. Fabric 12. Wide mouthed jar with a hooked rim. Diam. 24cm 21(%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 233. JWA20.06

35. Fabric 12. Large, wide mouthed jar with a hooked rim, a late 3rd to 4th century type (Webster 1976, fig 5, C29). Diam. 36cm (15%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 404. JWA20.02

36. Fabric 12.6. Wide-mouthed jar with everted rim, only broadly dated by Webster to the 2nd–4th centuries (Webster 1976, fig 4, type B16). Diam.

20cm (13%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 358. JWB19.14

37. Fabric 12. Wide-mouthed jar with an out-curving, everted rim; probably a similar date to the vessel above. Diam. 21cm (15%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 359. JWB7.01

38. Fabric 12. Wide-mouthed jar with an angular, everted rim; probably a similar date to the vessel above. Diam. 17cm (28%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 360. JWB7.10

39. Fabric 12.Short-necked, wide mouthed jar with a hooked rim; a 4th century type (Webster 1976, fig 6, C31). Diam. 17cm (13%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 351. JWB20.02

40. Fabric 12. Short-necked, wide mouthed jar with an overhanging rim; a 4th century type. Diam. 26cm (9%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 327. JWB20.01

41. Fabric 12. Short-necked, wide mouthed jar with an overhanging rim; a 4th century type. Diam. 33cm (6%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1652. JWB20.03

42. Fabric 12. Short-necked, wide mouthed jar with a triangular rim; dated to the mid-3rd to 4th century (Rees 1992, fig 28, 14). Diam. 31cm (12%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 217. JWB19.11

43. Fabric 12. Wide mouthed jar or bowl with up-turned, reeded, flange rim. Diam. 19cm (10%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 297. BGB17.35

Carinated bowls

44. Fabric 12.6. Carinated bowl with straight walls and a grooved rim, decorated with burnished, oblique lines. A 1st to 2nd century type (Webster 1976, type H). Diam. 18cm (20%). Period 6, quarry pit CG 1108, fill 6908. Database Rec 1267. BHA1.23

Curving sided bowls

45. Fabric 12. Curving sided bowl with an elongated bead rim, a broadly 2nd to 4th century type, but similar to vessels produced at the 2nd to 3rd century Newland Hopfields kiln (Evans *et al* 2000, fig 29, BT58). Diam. 13cm (12%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 286. BDA1.06

46. Fabric 12.6. Curving sided bowl; similar date to the vessel above. Diam. 14cm (20%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 382. BDA7.02

47. Fabric 12.6. Curving sided bowl with an out-curving rim; a mid-3rd to 4th century form (Evans 2011, fig 5.22, 32). Diam. 11cm (17%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1111. BDC7.03

Necked bowls

48. Fabric 12. Bowl with a short neck and out-curving rim; a mid-3rd to 4th century type (Rees 1992, fig 29.5, 6). Diam. 12cm (13%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 292. BEB7.04

49. Fabric 12. Bowl with a short neck and everted rim; similar date to the vessel above. Diam. 13cm (9%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1653. BEB7.01

50. Fabric 12. Bowl with a short neck and out-curving rim; similar date to the vessel above. Diam. 12cm (18%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 963. BEB7.04

51. Fabric 12. Bowl with a short neck and a 'pulley' rim. Diam. 13cm (20%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 961. BEB2.01

52. Fabric 12.6. Bowl with a short neck and a flanged rim. Diam. 17cm (13%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1651. BEB8.27

53. Fabric 12.5. Short necked bowl with an everted rim. Diam. 14cm (5%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 464. BEC7.01

Hemispherical bowls

54. Fabric 12. Hemispherical bowl with a gently out-curving rim. Diam. 11cm (18%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 399. BIC7.11

55. Fabric 12. Hemispherical bowl with a plain rim. Diam. 14cm (21%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 18. BIC16.01

56. Fabric 12. Hemispherical bowl with a bead rim, a broadly 2nd to 4th century type (Webster 1976, type I). Diam. 22cm (6%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 352. BIC1.01

Samian copy, flanged bowl

57. Fabric 12.6. A broadly 2nd to 4th century type (Webster 1976, type I). Diam. 22cm (7%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 432. BIA1.01

Medium-to-large flanged bowls

58. Fabric 12. Flanged bowl with curving walls and internal lip; flange slightly up-turned. A broadly 2nd to 3rd century type (Webster 1976, fig

8, type F47, F48; Evans *et al* 2000, fig 26, BT6). Diam. 24cm (32%). Period 6, quarry pit CG 1108, fill 7055. Database Rec 410. BFA21.03

59. Fabric 12.6. Flanged bowl with curving walls and internal lip; flange slightly up-turned. Diam. 26cm (7%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 394. BFA21.04

60. Fabric 12.6. Flanged bowl with curving walls, no internal lip; near horizontal flange. Diam. 25cm (12%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 471. BJA8.15

61. Fabric 12. Flanged bowl with curving walls, no internal lip; near horizontal flange. Diam. 26cm (15%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 15. BFB8.15

62. Fabric 12. Flanged bowl with curving walls, no internal lip. Diam. 22cm (18%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 967. BFA21.13

63. Fabric 12.5. Flanged bowl with curving walls and internal lip. Diam. 33cm (7%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1010. BFA21.15

64. Fabric 12.6. Flanged bowl with curving walls and internal lip and thin, flat flange. Diam. 24cm (12%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1015. BFA21.16

65. Fabric 12. Flanged bowl with curving walls and internal lip, slightly downturned flange; a 2nd to 3rd century type (Webster 1976, type F; Evans *et al* 2000, fig 26, BT7–8; Rees 1992, fig 30.3–4). Diam. 23cm (22%). Period 6, quarry pit CG 1108, fill 6986. Database Rec 377. BFA21.08

66. Fabric 12.5. Flanged bowl with curving walls and internal lip; a 2nd to 3rd century type (Webster 1976, fig 9, type F51; Evans *et al* 2000, fig 26, BT9–10). Diam. 23cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1007. BFA21.06

67. Fabric 12.5. Flanged bowl with curving walls and internal lip and slightly upturned flange. A 2nd to 3rd century type (Webster 1976, fig 8, type F47, F48; Evans *et al* 2000, fig 26, BT6) Diam. 29cm (16%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 450. BFA21.03

Medium-to-large reeded, flanged bowls

68. Fabric 12.6. Bowl with a grooved flange, a mid-to-late 2nd to 3rd century type (Webster 1976, fig 9, type G57; Evans *et al* 2000, fig 28, BT32, 34, 35). Diam. 27cm (18%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 43. BGA17.08

69. Fabric 12.6. Bowl with a grooved flange. Diam. 25cm (5%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 391. BGA17.30

70. Fabric 12.5. Segmental bowl with a stubby, grooved flange; broadly 2nd to 4th. Diam. 23cm (10%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 462. BJA17.10

71. Fabric 12. Bowl with curving walls and a grooved rim, heavy flange lower than the internal lip. A mid-to-late 2nd to 3rd century type (Webster 1976, type G; Evans *et al* 2000, fig 28, BT37, 38, 41). Diam. 29cm (7%). Period 6, quarry pit CG 1108, fill 6986. Database Rec 371. BGA17.10

72. Fabric 12.24. Bowl with curving walls and a grooved, horizontal rim (Webster 1976, type G). Diam. 22cm (13%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 383. BGA17.26

73. Fabric 12.5. Bowl with curving walls and a grooved, slightly down-turned flange rim (Webster 1976, type G). Diam. 22cm (17%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1104. BGA17.10

74. Fabric 12.24. Bowl with curving walls, a flat, multiple grooved, flange rim, and a pronounced inner lip; a mid-to-late 2nd to 3rd century type (Webster 1976, fig 9, type G56; Evans *et al* 2000, fig 27, BT13–15). Diam. 23cm (10%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 203. BGA17.05

75. Fabric 12.24. Bowl with curving walls, a flat, multiple grooved, flange rim, and a slight inner lip; a mid-to-late 2nd to 3rd century type (Webster 1976, fig 9, type G56; Evans *et al* 2000, fig 27, BT13–15). Diam. 31cm (4%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 468. BGB17.18

76. Fabric 12. Bowl with curving walls, a flat, multiple grooved, flange rim, and a slight inner lip Diam. 34cm (4%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2066. BGB17.05

77. Fabric 12. Bowl with curving walls, a multiple grooved, flange rim, and an inner lip. Diam. 33cm (9%). Period 6, quarry pit CG 1108, fill 6908. Database Rec 1271. BGA17.36

78. Fabric 12.6. . Bowl with curving walls, a multiple grooved, flange rim, and an inner lip. Diam. 24cm (23%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 46. BGA17.36

79. Fabric 12. Bowl with curving walls, a multiple grooved, flange rim, and an inner lip; with a very pronounced central ridge. A late 3rd to 4th century type (Webster 1976, fig 9, type F53). Diam. 25cm (12%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 266. BGA17.01

80. Fabric 12.6. Bowl with curving walls, a multiple grooved, flange rim, and a slight inner lip; with a very pronounced central ridge. Similar date

to the vessel above. Diam. 22cm (13%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 273. BGB2.10

81. Fabric 12.6. Bowl with ?curving walls and a grooved, 'pulley' rim; no internal lip. Diam. 25cm (6%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 23. BGB2.08

82. Fabric 12. Bowl with curving walls, a multiple-grooved, 'pulley, 'flange rim and a pronounced internal lip. Diam. 22cm (10%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 272. BGA2.09

83. Fabric 12.6. Bowl with curving walls, a multiple-grooved, 'pulley', flange rim and a pronounced internal lip. Diam. 22cm (13%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2065. BGA2.09

84. Fabric 12.24. Bowl with curving walls, a multiple-grooved, flange rim with finger pinched decoration and a pronounced internal lip. Diam. 24cm (12%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1675. BGA17.43

85. Fabric 12.5. Bowl with curving walls, a multiple-grooved, flange rim and an internal lip. Diam. 23cm (7%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 40. BGA17.37

86. Fabric 12.24. Bowl with curving walls, a multiple-grooved, up-turned, 'pulley, flange rim with finger pinched decoration, and an internal lip. Diam. 22cm (18%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 270. BGA17.34

87. Fabric 12. Bowl with curving walls, a grooved, flange rim, cupped internally. Diam. 23cm (16%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 271. BGB17.31

88. Fabric 12. Bowl with curving walls, an angular flange rim and an elongated internal lip. Diam. 21cm (9%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 267. BGA17.32

Segmental bowls

89. Fabric 12.5. Flanged, segmental bowl. Diam. 20cm (13%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1711. BJA2.13

Dishes

90. Fabric 12. Dish with gently splayed walls and grooved, bead rim (Webster 1976, type K). Diam. 16cm (20%). Period 6, quarry pit CG 1108, fill 6986. Database Rec 370. DBB1.02

91. Fabric 12.5. Dish with curving walls and bead rim (Webster 1976, type K). Diam. 21cm (9%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1667. DBC1.03

Miscellaneous forms

92. Fabric 12.24. Colander, with a flat, flange rim. Diam. 18cm (12%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 33. MICo8.23

93. Fabric 12. Base of a candlestick? Diam. 11cm (11%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 1435.

94. Fabric 12. Base of bowl, decorated internally with crude, impressed rings, perhaps imitating a samian stamp. Diam. 9cm (70%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 2256.

95. Fabric 12. Rim, possibly from a tettina. Diam. 3cm (27%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1687.

Regional Sandy wares, oxidised (Fabric 13; Fig 107.96–99)

96. Tettina spout. Period 6, quarry pit CG 1057, fill 6491. Database Rec 2195. MITe

97. Fabric 13. Beaker with devolved, cornice rim, a broadly 2nd to 3rd century type. Diam. 11cm (8%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2215. BKG5.03

98. Jar with a moderately splayed rim. Diam. 17cm (5%). Period 6, quarry pit CG 1108, fill 7055. Database Rec 418. JCB7.21

99. Bowl with a short upright neck and an everted rim, dated to the 3rd to 4th century elsewhere (Rees 1992 form 69.1). Diam. 17cm (14%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 955. BEB7.01

Regional Sandy wares, reduced (Fabric 14; Fig 107.100–104)

100. BB1-type jar with a splayed rim; a mid-to-late 3rd to 4th century type (Peacock 1967, fig 3.20–1, 28). Diam. 20cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 860. JCM7.24

101. Short-necked, wide mouthed jar with a triangular rim; dated to the mid-3rd to 4th century (Rees 1992, fig 28, 14). Diam. 33cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 854. JWB19.11

102. Grooved rim bowl with internal lip, a mid-to-late 2nd to 3rd century type (Webster 1976, type G; Evans *et al* 2000, fig 28, BT37, 38, 41). Diam. 28cm (6%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1543. BGA17.10

103. BB1-type dropped-flange bowl. The stubby flange has pinched, 'pie-crust' decoration at the tip and there is internal burnished decoration. A 4th century type, known to have been produced at a late-Roman kiln in Malvern (Peacock 1967, fig 4.69–70). Diam. 27cm (6%). Period 6, quarry pit CG 1108, fill .6745. Database Rec 858. DAB8.041

104. BB1-type plain rimmed dish with splayed walls, a broadly late-3rd-to 4th-century, type. Diam. 20cm (5%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 951. DBA16.03

Wheelmade Malvernian ware (Fabric 19; Fig 107.105–107, Fig 108.108–115)

105. Splayed rim jar copying BB1 forms, a mid-to-late 3rd to 4th century type (Peacock 1967, fig 3.20–1, 28). Diam. 20cm (31%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 115. JCM7.24

106. Jar with moderately splayed rim, copying BB1 forms, a 2nd to late 3rd century type (Peacock 1967, fig 1.13, 14, fig 3.20–24). With sooting internally up to a horizontal line below the rim, suggesting the jar was used for cooking with a lid. Diam. 22cm (72%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 189. JCM7.21

107. Large, necked jar with an everted rim; with a blackened surface. Diam. 25cm (10%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 942. JLA7.09

108. Bowl or jar with a short neck and out-curving rim, a mid-3rd to 4th century type (*cf* Rees 1992, fig 29.5, 6, form 69.1). Diam. 24cm (16%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 853. BEB7.04

109. BB1 type flat-rimmed bowl, a 2nd century type (Seager Smith and Davies 1995, fig 123, WA type 22; Gillam 1976, fig 4.53–64. Diam. 19cm (4%). Period 6, quarry pit CG 1108, fill 6986. Database Rec 365. DAA8.01

110. Similar bowl with burnished lattice decoration internally. Diam. 22cm (14%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 947. BBA8.013

111. Similar bowl, with burnished decoration internally. Diam. 21cm (8%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1493. DAA8.25

112. BB1-type dish with a stubby, triangular flange; with finger impressed decoration on top of the rim and internal pattern burnish. Diam. 23cm (10%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1494. DAA8.26

113. BB1 type dish with pinched decoration at the end of the flange rim and burnished lattice decoration internally. Diam. 22cm (7%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 1983 DAA8.251

114. BB1-type conical bowl with a drop-flange rim, copying a later 3rd to early 4th century type (Gillam 1976, fig 4.45). Diam. 23cm (11%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 861. BBA8.04

115. BB1-type plain rimmed dish. Diam. 14cm (12%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 866. DBB16.03

White slipped ware (Fabric 20; Fig 108.116)

116. Bowl with short upright neck and outcurving rim, a 3rd to 4th century type (Rees 1992 fig 29 5, 6 form 69.1). Diam. 12cm (8%). Period 6, quarry pit CG 1108, fill 7055. Database Rec 420. BEB7.04

BB1 (Fabric 22; DOR BB 1; Fig 108.117–130)

117. Small jar or beaker dating to the mid-late 2nd century (Seager Smith and Davies 1993, WA type 10; Gillam 1976 fig 2.21). Diam. 10cm (20%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 81. BKH1.13

118. Jar with a near upright rim, dating to the late 2nd to mid-3rd century (Gillam 1976, fig 1.8; Seager Smith and Davies 1993 fig 122 WA type 2). Diam. 11cm (18%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 66. JCB7.20

119. Jar with moderately splayed rim and obtuse cross-hatch burnish, a late 3rd century type (Gillam 1976, fig 2.10; Seager Smith and Davies 1993 fig 122 WA type 2). Diam. 11cm (16%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 57. JCB7.21

120. Jar with markedly splayed rim, early–mid 4th (Gillam 1976, fig 2.13; Seager Smith and Davies 1993 fig 122 WA type 3). Diam. 22cm (5%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 54. JCB7.22

121. Conical bowl with flat flanged rim, late 2nd century (Gillam 1976, fig 3.41; Seager Smith and Davies 1993, fig 123 WA type 22 & 23). Diam. 23cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 108. BBA8.013

122. Conical bowl with a grooved rim, early to mid-3rd century (Gillam 1976, fig 3.43). Diam. 20cm (30%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 200. BBA8.02

123. Conical bowl with dropped, flange rim. The flange is quite high suggesting a late 3rd century, rather than 4th century date (Gillam 1976, fig 3.44, fig 4.45). Diam. 16cm (10%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 4. BBA8.03

124. Conical bowl with dropped, flange rim. The flange is quite high suggesting a late 3rd century, rather than 4th century date (Gillam 1976, fig 3.44, fig 4.45). Diam. 15cm (15%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 100. BBA8.04

125. Conical bowl with markedly dropped, flange rim, early–mid 4th century date (Gillam 1976, fig 4.47–9). Diam. 16cm (19%). Period 6, quarry pit CG 1057, fill 6492. Database Rec 1952. BBA8.04

126. Dish with grooved/bead rim and near upright walls, an early 3rd century form (Gillam 1976 fig 5.73; Seager Smith and Davies 1993 fig 123 WA

type 20). Diam. 19cm (8%). Period 6, quarry pit CG 1108, fill 7050. Database Rec. 9. DBB1.02

127. Dish with grooved/bead rim Diam. 22cm (7%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 156. DBB16.03

128. Dish with slight grooved rim, early 3rd century (Gillam 1976, fig 5.73). Diam. 26cm (13%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 154. DBB16.03

129. Dish with plain rim and splayed walls, mid-4th century (Gillam 1976, fig 6.83). Diam. 20cm (8%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1527. DBA16.03

130. Oval 'fish-dish', with wiped external surface, a late 3rd to, predominantly, 4th century type (Gillam 1976, fig 6, 85; Seager Smith and Davies 1993 fig 123 WA type 21). Diam. not applicable. Period 6, quarry pit CG 1108, fill 6745. Database Rec 153. DBF16.03

Shell-tempered ware (Fabric 23; ROB SH; Fig 108.131–133)

131. Jar with simple out-turned rim. At one known production site, Harrold in Bedfordshire, this form is one of the commonest types associated with later 3rd century, phase 4 kilns (Brown 1994, 62, fig 29.172). Diam. 18cm (8%). Period 6–7, upper backfill of timber well pit CG 1089, fill 8662. Database Rec 1728. JCS7.07

132. Similar to above but with a slightly thickened rim. At Harrold, this form is common in the later 3rd century and early 4th century kilns, but less common in the later 4th century kilns (Brown 1994 fig 26.73; 3; fig 29.173; fig 34.244). Diam. 22cm (10%). Period 6, quarry pit CG 1057, fill 6520. Database Rec.1479. JCS7.01

133. Large storage jar with bead rim, similar date to those above (Brown 1994 fig 34.240; Diam. 28cm (9%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1478. JCS7.01

Nene Valley ware (Fabric 28/28.1; LNV CC; Fig 109.134–135)

134. Fabric 28 Funnel-necked beaker with an everted rim, brown slipped with a slightly metallic sheen, 4th century (Howe *et al* 1980 fig 5.54–57). Diam. 8cm (8%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2192. BKF1.26

135. Fabric 28 Plain rimmed dish, 4th century (Howe *et al* 1980 fig 7.87). Diam. 27cm (7%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1698. DBB16.03

Oxfordshire wares: red colour coated ware (Fabric 29: OXF RS; Fig 109.136–141)

136. Flagon with tall neck and flange half way down neck, grooved below the rim. Dated 240–400+ (Young 2000, fig 53, C8). Diam. 2cm (40%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 2205. FFC1.27

137. Beaker with sloping, near-vertical neck and bulbous, globular body, dated AD 270–400+ but usually found in 4th century contexts (Young 2000, fig 55, C26). Brown slipped. Diam. 4cm (18%). Period 6, quarry pit CG 1057, fill 6520. Database Rec .2183. BKF1.01

138. Flanged bowl copying samian form 38, dated 240–400+ (Young 2000, fig 59, C51). Diam. 15cm (5%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2209. BIOC51

139. Hemispherical bowl with flanged rim, dated c AD 340–400+ (Young 2000, fig 60, C63). Diam. 19cm (17%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1147. BDOC63

140. Shallow bowl copying samian form 31, dated c AD 270–350 (Young 2000, fig 57, C44) Diam. 24cm (10%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 1146. BDOC44

141. Shallow bowl with flanged rim, a type found in late 3rd and 4th century contexts (Young 2000, fig 58, C47). Diam. 32cm (5%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2208. BJA8.28

Oxfordshire wares: white ware (Fabric 38: OXF WH; Fig 109.142)

142. Flagon with a moulded rim, possibly Young form 17, dated *c* AD 240–300 (Young 2000, fig 31). Diam. 8cm (18%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1939. FB2.01

Oxfordshire burnt white ware (Fabric 39; OXF WH; Fig 109.143)

143. Wide-mouthed, necked jar, the only common burnt-white Oxfordshire type and dated *c* AD 240–400+ (Young 2000, fig 35, BW2. Diam. 10cm (18%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1938. JMO1.12

Oxfordshire wares: parchment ware (Fabric 40; OXF PA; Fig 109.144)

144. Base from a bowl with red, painted decoration internally, probably from a wall-sided form such as P24–7, dated *c* AD 240–400+ (Young 2000, fig 27). Diam. 11cm (65%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2182.

Worcestershire imitation Black-burnished ware (Fabric 149; Fig 109.145)

145. BB1 type dish with splayed walls, late 3rd to 4th century. With a wiped external surface. Diam. 20cm (5%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1539. DBA16.03

Micaceous oxidised ware (Fabric 98.12) face pot (Fig 109.146)

146. Shoulder fragment from a globular face pot, in a fine micaceous fabric, possibly from Gloucestershire. The sherd has a circular eye below a sinuous eyebrow. The eye is applied; it is unclear whether the ring delineating the eyeball was impressed, or whether the eyeball was applied separately. The sherd is broken at the left end of the eyebrow, but this appears to curve up and round into a scroll. The Period 6, quarry pit CG 1057, fill 6491. Database Rec 2180.

Mortaria: Mancetter-Hartshill (Fabric 32: MAH WH; Fig 109.147–149)

147. Bead and flange mortarium, dated AD 180–230. Diam. 34cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 430. MHH8.19

148. Reeded, hammerhead mortarium dated c AD 200–250. Diam. 25cm (13%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 12. MHC4.123

149. Reeded, hammerhead mortarium with slightly concave rim. Diam. 18cm (6%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 425. MHC4.122

Mortaria: Oxfordshire white mortaria (Fabric 33.1: OXF WH; Fig 109.150–153)

150. Oxfordshire type M17, dated *c* 240–300 (Young 2000, fig 21). Diam. 27cm (34%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 431. MOM17

151. Oxfordshire type M18, dated *c* 240–300 (Young 2000, fig 21). Diam. 44 cm (11%). Period 6, quarry pit CG 1108, fill 7050. Database Rec 201. MOM18

152. Oxfordshire type M22, dated *c* 240–400+ (Young 2000, fig 23). Diam. 29cm (35%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1553

153. Oxfordshire type M22, dated *c* 240–400+ (Young 2000, fig 23). Diam. 33cm (29%). Period 6, quarry pit CG 1057, fill 6520. Database Rec 1547–9. MOM22

Mortaria: Oxfordshire red colour-coated mortaria (Fabric 33.3: OXF RS; Fig 110.154)

154. Oxfordshire wall-sided mortarium, type C97, dated c 240–400+ (Young 2000, fig 67). Diam. 16cm (6%). Period 6, quarry pit CG 1057, fill 6491. Database Rec 2202. MOC97

Mortaria: West Midlands/Wroxeter (Fabrics 34.2; Fig 110.155)

155. Flange; with a diagonal cut across marking the left-facing cut, preparatory to forming the spout; the broken stamp is thus the left-facing stamp. Part of one border and very small parts of perhaps two to three letters survive. It cannot be identified with certainty. It could perhaps be from the most commonly used die of Decanius, one of the major potters who supplied mortaria to Wroxeter (Hartley 2000, p303, fig4.99, no.9 and at Gloucester (Rawes 1972, p47, fig8, M11). Kay Hartley notes that Decanius is known to have produced a small number of mortaria in a red brown fabric, so that Wroxeter is a possible source, but not certain. Fabric 34.2. Period 6, quarry pit CG 1108, fill 7050. Database Rec 4230.

Mortaria: South-west white slipped mortaria (Fabric 37.3; Fig 110.156)

156. Wall-sided mortarium with a bent-back or everted bead, similar to a vessel published from Wanborough, Wiltshire (Anderson *et al* 2001, fig 77, type 19) and dated to the 3rd century. Diam. 23cm (15%). Period 6, quarry pit CG 1108, fill 6745. Database Rec 4233.

Imported Colour-coated wares (Fabrics 45.4; Fig 110.157)

157. Funnel-necked beaker. Diam. 8cm (8%). Period 6, quarry pit CG 1108, fill 6745. Database Rec. 4616. BKF1.19

Amphorae (Fabric 42.1; Fig 110.158)

158. The top half of a Dressel 20 handle containing a faint but complete impressed two-lined stamp enclosed in a cartouche. The reading is somewhat difficult due to the faintness of some of the letters, especially the top line which is all but impossible to read. However, the initial letters of the bottom line can just about be read and would appear to be E L I S S I. If this reading is correct, it means that the stamp belongs to the important form of L. Iunius Melissus or the two Iuni Melissi. The workshops for this stamp were situated at La Delicias, just to the north of Astigi, and situated on the eastern bank of the River Genil, the main tributary of the River Guadalquivir (Berni Millet, 1998, 426–432). The main period of production seems to have been during the late 2nd century AD and the first half of the 3rd century AD (Callender, 1965, no. 879; Martin-Kilcher, 1987, no. ST 69; Remesal, 1997, no. 190). These stamps appear in a variety of combinations and have a wide distribution, including a number of sites in Britain (Callender, 1965, 879; Funari, 1996, nos. 136 and 137; Carreras and Funari, 1998, no. 271;

Sheehan-Finn, 2012]. Fabric 42.1. Period 6, quarry pit CG 1057, fill 6491. Database Rec. 4207

Illustrated pottery from other deposits (Fig 110.159–192)

Handmade Malvernian ware (Fabric 3; Fig 110.159–162)

159. Fabric 3. Large storage jar with faceted rim (Evans 2014, fig 13.11–2). Blackened, smoke fumed surface. Diam. 50cm (7%). Period 5, upper cobbled surface CG 1098, layer 6158. Database Rec 4759. JLD1.21

160. Fabric 3. Large storage jar with faceted rim. Smoke fumed. Diam. uncertain, c 5%. Period 5, upper cobbled surface CG 1098, layer 6158. Database Rec 4758. JLD1.29

161. Fabric 3 Substantial rim fragment from a large storage jar or ‘dolium’ with a faceted bead rim. The form is reminiscent of vessels produced in a handmade, Malvernian fabric in the late Iron Age and early Roman period (eg Evans 2014, fig 13.11–2), but the hard, grey firing is more typically Romanised than these early examples. Diam. 58cm (35%). Period 5, pit 7132, primary fill 7129. Database Rec 1366. JLD1.22

162. Fabric 3. Ring footed base with a central perforation. Diam. 11cm (46%). Period 5, CG 1087, pit 6808, fill 6807. Database Rec 3549.

Severn Valley ware (Fabrics 12, 12.3, 12.34, 12.6; Fig 110.163–165, Fig 111.166–170)

163. Fabric 12.3. Unusual elongated jar, with rod handle. Decorated with a band of burnishing below the handle, bordered top and bottom by two grooves. Diam. 15cm (56%). Period 4, re-cut east–west ditch CG 1005, fill 6278. Database Rec 3967–9.

164. Fabric 12.34. Beaker with a multiple-grooved neck and a plain rim. Diam. 12cm (12%). Period 4, AU 502, re-cut east–west ditch CG 1005, fill 7263. Database Rec 3693. JH5.05

165. Fabric 12. Narrow mouthed jar with a simple, out-curving rim, broadly dated to the 1st to 4th centuries (Webster 1976, fig 1, type A1). Diam. 11.5cm (70%). Period 4, pit CG 1010, fill 6634. Database Rec 1164–5. JNA16.02

166. Fabric 12.6. Spouted wide-mouthed jar, with a thickened, near-triangular rim. Diam. 25cm (43%). Period 3, early east–west ditch CG 1003, fill 6340. Database Rec 3298–9. JWS19.11

167. Fabric 12. Small bowl with a complex, grooved and ‘frilled’ rim. Diam. 14cm (19%). Period 6, quarry pit CG 1057, fill 6915.

168. Fabric 12.34. Necked bowl. Similar forms are dated to the late 1st to early 2nd century at Worcester, Sidbury (Darlington and Evans 1992, fig 22.7) and Deansway (Bryant and Evans 2004, fig 158. 12, fig 162.8).

Diam. 16cm (18%). Period 4, re-cut east–west ditch CG 1005, fill 6278. Database Rec 3888–90. BEA7.01

169. Fabric 12. Medium–large, reeded-rim bowl with 'scribbled' burnished decoration internally. Diam. 37cm (21%). Period 6, quarry pit CG 1057, fill 7001. From scanned group, not recorded. BGA17.08

170. Fabric 12. Colander with an out-curving rim. Diam. 19cm (42%). Period 4, CG 1112, pit 15067, fill 15066. Database Rec 3852. MICo7.01

Other coarsewares (Fabrics 13, 14??, 19, 21.3, 22; Fig 111.171–177)

171. Fabric 13. Diam. 9cm (12%). Period 6–7, Area 7, AU 524, timber well pit, upper backfill CG 1089, fill 8662. Database Rec 1856.BKC5.02

172. Fabric 14. Jar with linear rustication, a late 1st to early 2nd century type. The form is more similar to vessels illustrated from Alcester than from other Worcester sites, indicating that it may be a Warwickshire product. Diam. 18cm (72%). Period 11–12, cleaning layer 6005.

173. Fabric 14. Tooled base of a small, sharply carinated form, with a fumed external surface. The upper part of the vessel is missing making identification difficult. Period 6–11, tillage soil CG 1056, layer 6004.

174. Fabric 19. BB1 type conical bowl with a grooved rim. Diam. 22cm (10%). Period 6, pit CG 1015, fill 6823. Database Rec 2040. BBA8.03

175. Fabric 19. Lid, with blackened, smoke fumed surface. Diam. 27cm (31%). Period 5, CG 1086, pit 7033, fill 7025. Database Rec 2728. LAB16.01

176. Fabric 21.3. Carinated bowl with a blackened, smoke-fumed surface and burnished lattice decoration.. Diam. 18, 27cm (%). Period 4, re-cut of east–west ditch, CG 1005, fill 7263. Database Rec 3694. BHD6.01

177. Fabric 22. Round, handled dish with lattice decoration and burnt residues internally. A 2nd century type (Gillam 1976, fig 6.86). Diam. 17cm (28%). Period 4, east–west ditch CG 1059, fill 6278. Database Rec 3781. DBH16.03

Mortaria (Fabrics 32, 34.1, 37.5, 103; Fig 111.178–184, Fig 112.186–7)

178. Fabric 32. Flanged mortarium with an incomplete, retrograde potter's stamp reading BRVS[…], from right to left reading outwards from the bead. The potter's name is Bruscius. Seven die-types are known for him and this stamp may be from an eighth one since it differs in letter and space size from all other known stamps. There are also tiny parallel, horizontal lines in the background, throughout the impression which means that, although the letters are well-made, the die was poorly finished off; it was probably this rather than the die being dragged across the rim because the letters are not stretched. A kiln possibly shared

by Bruscius and Iunius was excavated in a quarry face at Hartshill in 1963 (unpublished), while forty stamps of Bruscius found at Mancetter (Manduessedum) attest his activity there also. The Hartshill kiln (above) contained stamps from two dies of Bruscius and three dies of Iunius 2. His work and distribution are typical for an Antonine potter working in these potteries in the early to mid-Antonine period. His mortaria have previously been recorded from the following sites (excluding his workshop sites), in England (23–24): Aldborough, Yorks (2); Alcester; Chesterton, near Peterborough; Clapham, Beds; Coleshill; Corbridge (3); Fisherwick, Staffs; Frampton, near Boston; Gloucester; High Cross; Hibaldstow; Newark (A46 Newark to Widmerpool); Newcastle (Snape and Bidwell 2002, p.149); Old Sleaford; Verulamium (Frere 1972, p374, no.14); Welton, Humberside; Wildsworth, Lincs; Whitemoor Haye, Alrewas, Staffs (Hewson 2006); Winterton; Wroxeter (1–2); and provenance unknown (Yorkshire Museum); and, in Scotland (7–8): Birrens; Cramond; Duntocher; Mumrills (3–4); and Newstead. There is reason to place the Hartshill kiln in the latter part of the activity of Bruscius, partly because his associate there, Iunius, was a marginally later potter, but also because some rim-profiles associated with the two Bruscius dies represented at this kiln, are of a near wall-sided type likely to belong to the latter part of his activity and more common in the work of potters like Iunius. A date of AD140–165 should cover his activity. Fabric 32. Diam. 28cm (10%). Period 5 CG 1098, layer 6158. Database Rec 3047. MHH8.19

179. Fabric 32. Three flange fragments, two joining. The fragmentary stamp is retrograde and preserves most of [.]VN[…] with superfluous central strokes in both parts of the N. It is from, at least, 23 dies attributed to this potter. Iunius worked in the Mancetter-Hartshill potteries (Tomber and Dore 1998, 189). Many of his stamps were found along with those of Bruscius in a kiln at Hartshill (H63 kiln 34) and with Sarrius in a kiln in the workshop in the parish of Mancetter, just outside Manduessedum (M64 Kiln 1); both unpublished. The evidence suggests that he could have been using these two kilns in common with the above potters. Up to 130 mortaria of his have been recorded excluding those found at the potteries. His mortaria also appear in those Pennine forts like Bainbridge and Brough-on-Noe, which are believed to have been unoccupied AD120–160. He belongs to the latest generation of potters at these potteries to stamp their mortaria and he is the only one of these to have any stamps recorded from the Antonine occupation of Scotland (Castlecary and Duntocher). His work, however, also overlapped with that of Sarrius and Bruscius who are both commonly recorded in Scotland. Since he was one of the most prolific of the potters stamping mortaria in the Mancetter-Hartshill potteries, these facts suggest that his activity began too late for him to be more than marginally involved with the supply of Mancetter-Hartshill mortaria to Scotland. He was also one of the small number of potters who were introducing the new, near hammerhead rim-profiles, which became more popular after the practice of stamping ceased in these potteries. The rim-profiles he sometimes

produced would also fit with the possibility that he continued producing mortaria after the practice of stamping had ceased. The evidence as a whole points to activity *c* AD145–175, with optimum importance c AD150–170+. Fabric 32. Period 5 CG 1043, layer 6782. Database Rec 2318. MHH8.19

180. Fabric 32. Flanged mortarium, dated to *c* 150–170, based on the spout. Fabric 32. Diam. 33cm (12%). Period 5 CG 1043, layer 6782 sealing the cobbled surface. Database Rec .2317 MHH8.19

181. Fabric 32. Rim from a hammerhead mortarium with a very fine, barely functional, thumb spout. Dated by Kay Hartley to c AD 230–300. Fabric 32. Diam. 25cm (12%). Period 5, Building 2D floor CG 1066, layer 6573. Database Rec 2868. MHC4.12

182. Fabric 32. Smooth, wall-sided mortarium with red painted decoration and thin walls, dated to the 4th century by Kay Hartley. Diam. 16cm (13%). Period 6–7, pit 6841, fill 6840. Database Rec. 4756 MHC4.14

183. Fabric 34.1. Mortarium rim with a hooked flange, flange higher than the bead. Diam. 28cm (16%). Period 4, posthole 6554, fill 6552. Database Rec 4234. MWW8.20

184. Fabric 37.5 Flange fragment with a broken stamp impressed at right angles to the rim. While not a perfect join this sherd could be part of no. 185 below REC 4229 context (8662), in which case the stamp would probably be the right-facing stamp. No complete examples of the stamp have been found, but stamps from the same die are known from elsewhere in Worcester, at Sidbury (Hartley 1992, 65, 34.6, and fig 34, no. 6, published vertically instead of horizontally) and St Johns (Hartley 2014, fig 26.1). Stamps from the same die have also been recorded from Caerwent (unpublished); Bays Meadow villa, Droitwich (Barfield 2006a, 157, no. 2 and fig 104: 2 and p157, the first line is in error and refers to another sherd); Hanbury Street, Droitwich (Lentowicz 2006, fig 39, no.24 and CD 17–18, no.171) and Winfrith Heath, Dorset (Fowler 1963, 130, Appendix II and fig 6). The reading of the stamp remains uncertain, but ASILA retrograde is a possibility. This example is too fragmentary to permit an exact reading, but there is enough to make the attribution certain. Period 5, linear feature 8719, fill 8718. Database Rec 4715.

185. Fabric 37.5. Spout, possibly from the same vessel as the stamped flange described above (REC 4715). Period 6–7, timber well pit CG 1089, fill 8662. Database Rec 4229.

186. Fabric 37.5. Spout from a mid-2nd century, white-slipped mortarium, as ASILA. Period 3–6, posthole 6494, fill 6493. Database Rec 4231.

187. Fabric 103. Rim from a Type A Raetian mortarium, attributed to a workshop at Wroxeter. An example with a very similar profile is dated

Hadrianic, ie *c* AD 117–138 (Hartley 2012, fig 8, no.12). Fabric 103, Period 4, pit CG 1092, fill 7013. Database Rec 3063

Fine wares (Fabrics 29, 31.1, 31.2, 38; Fig 112.188–192)

188. Fabric 29. Fragmentary, out-turned rim from a necked bowl, dated c AD 325–400+ (Young 2000, fig 62, C75). Diam. 16cm (5%). Period 5–6, timber well pit CG 1088, fill 8663. Database Rec 2254. BEOC75.2

189. Fabric 31.1. Bag-shaped beaker with a devolved cornice rim, with clay-pellet, roughcast decoration and a thin brown slip. Diam. 8cm (8%). Period 4 CG 1094, fill 6997. Database Rec 4731. BKC5.03

190. Fabric 31.2 Fragments from a face beaker in a dark brown colour coated ware. One sherd has a circle of square impressions presumably forming an eye, with part of another eye at the edge of the sherd. Above this is a heavy, applied, hatched eyebrow. The eyebrow curves down sharply to the right of the eye, and ends with two impressed dots, suggestive of eyes. This may represent a snake, in which case this vessel may be associated with cult activities (Braithwaite 2007, 482). The other sherd has only a fragment of the hatched eyebrow and another eye surviving, presumably from a second face, and shows the position of this on the vessel; on the shoulder of a beaker which is broken at the base of the neck, demarcated by a groove. Period 6, pit CG 1015, fill 6823 and Period 6–7 pit 6841, fill 6840. Database Rec 2150 and 4428.

191. Fabric 38. Bowl copying samian form Drag 37, dated *c* AD 100–300 (Young 2000, fig 32, W54). Diam. 15cm (4%). Period 5, upper cobbled surface CG 1098, layer 6158. Database Rec 1933. BIOW54

192. Fabric 98.01 Bowl copying samian form 37; decorated with a band of rouletting below the rim, and vertical, trailed barbotine lines below this. Diam. 19cm (5%). Period 6–7 timber well pit CG 1089, fill 8662. Database Rec 4697. BIC1.01

Samian

J M Mills

Abbreviations: Form types
Drag – *Dragendorff*; Wa – *Walters*; Déch – *Déchelette*; Lud – *Ludowici*

The samian assemblage, comprising 1119 sherds (17,436g), is in many ways typical of Worcester excavations, including vessels from the main factories of the three production centres (Wild 2010; Mills 2014). There is, however, very little 1st century samian, and vessels from the first half of the 2nd century, from either Les Martres-de-Veyre or Lezoux, form only a small portion of the assemblage. The bulk of the samian dates from the mid-2nd to early 3rd centuries AD and is from the kilns of Lezoux in Central Gaul, and Rheinzabern in East Gaul. A few East Gaulish vessels from Trier were also identified which are a later type, dating to the mid-3rd century. These are some of the latest samian to reach Britain; samian imports having ceased around AD260. A single sherd of late Argonne ware of late 3rd or early 4th century date was also identified. The vessel function profile for the assemblage has an unusually high proportion of plain bowls and mortaria and a correspondingly small quantity of cups and decorated bowls.

The assemblage is summarized by fabric (Table 11) and by stratigraphic period (Table 12). Table 13 presents the maximum vessel numbers (MVN) by form and fabric. This method of quantification is distinct from the quantification by Estimated Vessel Equivalent (EVE), which is derived from measuring the percentage of rims extant. MVN estimates the maximum number of vessels possible from the sherd count after taking sherd joins, decoration, and finish into consideration. This is only possible because of the standardization in samian production, but inevitably overestimates quantities, especially of common plain forms, as it is not possible to find all the cross-joining sherds in an assemblage.

Condition and wear

In general the sherds are un-abraded or only slightly abraded, although there are a few exceptions. There is also a low level of post-depositional burning (c.30 sherds). The lack of abrasion may simply be a result of the well-fired nature of the vessels. It was noted that the majority of the material from Rheinzabern was well-fired and in good condition; softer fired vessels from East Gaul can often look quite worn, but there are few here. Not a great many vessels exhibit signs of prolonged use, other than several foot-rings with the slip worn away through use. About six were so well-used that little internal slip remains.

Table 11:

Fabric	Count	% of total no	Weight (g)	% of total weight	Rim EVE	% of total EVE	Mean sherd weight (g)
SG	10	1	57	0	0.06	0	6
Les M	22	2	272	2	0.23	1	12
Lezoux	920	82	12,678	73	15.59	74	14
Rheinzabern	139	13	3,975	23	4.16	20	28
Trier	12	1	272	1	0.57	3	25
EG (unspec)	12	1	129	1	0.10	1	12
SAM	3	0	3	0			1
Late ARG	1	0	50	0	0.21	1	50
Totals	***1,119***	***100***	***17,436***	***100***	***20.92***	***100***	

Table 11: Summary of the samian by fabric (production area)

Table 12

Fabric code	Period 3			Period 4			Period 5			Period 5–6			Period 6		
	no	**wt**	**EVE**	**no**	**wt**	**EVE**	**no**	**wt**	**EVE**	**no**	**wt**	**EVE**	**no**	**wt**	**EVE**
43							2	2		1	1				
43.1	1	1		4	42	0.06	1	2		1	2		1	1	
43.2	5	51	0.3	83	913	1.37	254	3,006	4.33	93	1,675	1.77	293	5,589	5.69
43.3							5	91	0.24				101	2,681	2.95
43.4							6	178	0.42				6	69	0.15
43.5				1	10	0.00							8	94	0.06
43.6				14	190	0.17	2	25	0.00					6	
43.7							1	50	0.21						
Total	***6***	***52***	***0.3***	***102***	***1,155***	***1.6***	***271***	***3,354***	***5.2***	***95***	***1,678***	***1.77***	***409***	***8,440***	***8.85***

Fabric code	Period 6–7			Period 6–11			Roman			Post-Roman		
	no	**wt**	**EVE**	**no**	**wt**	**EVE**	**no**	**wt**	**EVE**	**no**	**wt**	**EVE**
43												
43.1	1	7										
43.2	56	748	0.85	40	493	0.89	7	76	0.00	111	1,102	1.28
43.3	6	55	0.00	4	154	0.08	2	10	0.00	5	75	0.00
43.4												
43.5	1	5	0.00	1	12	0.10				1	8	0.00
43.6										1	12	0.00
43.7												
Total	***64***	***815***	***0.85***	***45***	***659***	***1.07***	***9***	***86***	***0***	***118***	***1,197***	***1.28***

Table 12: Summary of the samian by fabric (production area) and Period groups

Period groups: 'Roman' comprises Period groups 2–3, 3–6, 4–5, 4–6.
'Post-Roman' comprises Period groups 6–10, 7–10, 10, 10–11, 10–12, 11, 11–12, 12, 13. EVE measurements are Rim EVEs only. All weights (wt) are in grammes.
The 43.5 sherd in Period 4 is a tentative identification – the sherd could easily be from Central Gaul.

Table 13:

Vessel type	Form	Fabric code							
		43	43.1	43.2	43.3	43.4	43.5	43.6	43.7
Dish	15/17							1	
	18		1						
	18/31		1	25				4	
	18/31R			5				1	
	18/31 or 18/31R			1					
	18/31 or 31			12			1		
	31			72					
	31 or 31R			1	1				
	31R			46					
	18/31R or 31R			38					
	18/31 ser			5					
	Lud Sa				1		1		
	Lud Sb				21	3	2		
	Wa 79			13					
	Wa 79R			7					
	Wa79 or 79R			1					
	32				6				
	36			13	7	1	1		
	35/36			1					
	32 or 36			1	4				
	Curle 23			6					
	Curle 15 or 23			1					
	Lud Tb				2				
	Lud Td?			1	1				
	Lud Tg?				1				
	Dish			46	7	1	2	1	
	Dish/bowl			8	1				
Dec	29		1	0					
	30			8				2	
	30 or 37		1	8					
	37		1	66	2	1		1	
	Dec bowl		1	13					
Cup	27			4				2	
	33			41	1	1			
	33 or 46			2					
	35			1					
	Wa 80			2					
	42/42H							1	
	Wa 81 var			1					
	Lud Tx				1				
	Cup			7					

Vessel type	Form	Fabric code							
		43	43.1	43.2	43.3	43.4	43.5	43.6	43.7
Bowl	Curle 11			1					
	38			5					
	Flanged bowl			10	1				
	38/Lub Sd				3				
	44			1					
	Chenet 326								1
	Bowl			26					
Mortaria									
	45			12	0	1			
	Gritted martaria			8					
Closed	Dech 72			1					
	Closed			2					
	Cup/closed				1				
No id	No form count	3	3	245	20	2	5	2	
	No form wt (g)	3	5	1,159	129	13	21	5	
	Av wt (g) of chips	1	1.7	4.7	6.5	6.5	4.2	2.5	

Table 13: Fabric and form of samian assemblage

Repair and graffiti

Evidence for repair in the form of drilled holes or X-shaped cut/filed slots occurs on 14 Central Gaulish vessels but was not recorded on vessels from any other fabric group (Table 14); the drilled hole type of repair is most common. A variety of forms have been repaired and no obvious chronological difference can be seen between the two methods. The quantity of repaired vessels is not remarkable representing less than 3% of all the Central Gaulish vessels. This would appear to be a 'normal' repair rate (Willis 2004, 11.5). Although the presence of repaired vessels is often taken to infer that access to samian was restricted in some way this is often not the case. Usually most repaired vessels occur at the period of peak samian consumption, as in this assemblage where all of the repaired samian vessels are from Lezoux. Only one vessel had a graffito, the base of a Drag 31 dish. This is reported on by Roger Tomlin below (Fig 121.1).

Fabrics, source and date

The few South Gaulish sherds date broadly to the second half of the 1st century. The sherds are small (mean sherd weight *c* 6g) and are clearly residual. Although few in number, sherds from the kilns of Les Martres-de-Veyre, which date to the first quarter of the 2nd century AD, survive better (mean sherd weight *c* 12g). The range of forms, however, is limited, with dish form Drag 18/31 the most frequent (Table 13). Decorated bowls include a Drag 30 attributed to potter X-13 and a Drag 37 attributed to X-2. Conjoining sherds from at least three vessels (Drag 30, Drag 42, Drag 15/17) were found scattered across the site and show how early deposits have been dispersed by later earth moving or middening and then partial clearance. These vessels, as well as the Hadrianic vessels produced at Lezoux, are probably also residual.

Table 14:

Period	Fabric code	Vessel form (Dr)	Repair type
3	43.2	36	Drilled hole
4	43.2	18/31	Drilled hole + Pb
5	43.2	18/31	Drilled hole
5	43.2	18/31R or 31R	Cut slot + Pb
6	43.2	31R	Drilled hole
6	43.2	31R	Cut slot
6	43.2	30 or 37	Drilled hole
10	43.2	37	Cut slot
6	43.2	45	Cut slot
6	43.2	45	Cut slot
6–11	43.2	Walters 79R	Drilled hole
6	43.2	dish	Drilled hole
13	43.2	dish	Drilled hole
5	43.2	bowl	Drilled hole + Pb

Table 14: Summary of sherds prepared for repair

The quantity of definite Hadrianic Lezoux vessels is small, with a maximum of a dozen vessels including: a cup-sized variant of form Walters 81 (Fig 119.1), a single Curle 11, a form 18/31R dish stamped by Littera i (Stamp Cat 8) and decorated Drag 37's attributed to Potter X-9 and Geminus, as well as one from an X-13 mould. Other Drag 18/31 dishes, a form which ceased in production around AD160, may also belong to this early period, but as a maximum of only 25 of this common form were recovered it is clear that activity during the first half of the 2nd century was limited. Form Drag 27 cups also belong to this period but are uncommon on the site (only 5 in total), again indicating little activity during the first half of the 2nd century AD.

Figure 113 plots the mean sherd weight by fabric against the Brokenness Index. The great difference between the figures for the South Gaulish and to a lesser degree the Les Martres sherds illustrates how the earliest material has been fragmented, presumably by re-deposition and re-working of deposits over time.

The assemblage is dominated by vessels from Lezoux (>70%, Table 11); the bulk of which are mid–late 2nd century. The predominant forms are those characteristic of late Antonine assemblages: dishes Drag 31 (1.91 EVEs), Drag 31R (0.46 EVEs) and Wa79/79R (0.45EVEs), cup Drag 33 (2.39EVEs), and mortaria Drag 45 (1.95EVEs). The mean sherd weight is almost 14g and more than 100 sherds weigh 30g or more. The total rim EVE count is 15.6. Especially in the later features, notably the Period 6 quarry pits, large sections of vessels survive. These late groups are characterised by large, fresh-looking sherds; although finally deposited in the 3rd and 4th centuries they are often not as battered or abraded as would be expected from continuously re-worked deposits. It is not possible to tell if the vessels had remained in use for a long period as the ceramic assemblages are so mixed, however, the low level of wear to slipped surfaces, which would be indicative of prolonged use, probably suggests these are not especially long-lived vessels.

Samian from East Gaul arrived in Britain around AD160; the same time as the late vessel forms discussed above were introduced into the repertoire at Lezoux. Here, as was observed at City Campus (Mills 2014) most of the East Gaulish samian came from Rheinzabern. Trier products were not imported into Britain in great quantities, and were traded less extensively than Rheinzabern products; both are more common in eastern Britain. In general, Rheinzabern products account for *c* 70% of the East Gaulish samian found on British sites (Bird 1993, 2); here it is closer to 90%. The mean sherd size for these fabrics is significantly greater than for the earlier samian (Table 11); the convergence of the plot for mean sherd weight and the Brokenness Index indicates that the Trier and Rheinzabern wares are less broken than the other samian vessels (Fig 113). This suggests that, as would be expected, the later pottery was subjected to less post-depositional disturbance. Some sherds of East Gaulish ware, however, were too fragmentary to be assigned to a specific factory and were recorded separately (Fabric 43.5, Fig 113, EG). The Brokenness Index for this group is consequently anomalously high. However, if the data for all of the East Gaul vessels is amalgamated the results are smoothed out and the mean sherd weight and the Brokenness Index still converge. The two Trier vessels of mid-3rd century date, a Drag 45 (Fig 119.6) and a Drag 37 (Fig 120.2) are probably contemporary with the contexts they were deposited in, as is the case for the late Argonne vessel (Fig 119.7). The latter is a large rim sherd (50g), its mean sherd weight exceeding the brokenness index (Table 11).

Inter-site comparisons often compare the varying ratios of vessels by function (see Willis 2004). The make-up of the Hive samian assemblage by vessel class is in many ways unusual. There are, however, issues with the methods of both quantification and classification that need to be considered before this is discussed.

The first issue to be considered is the classification of forms. Where identifiable these were recorded as belonging to one of seven vessel categories: inkwell (no examples), closed vessel (beakers and jars), decorated bowl, plain bowl (including flanged bowls), cup, dish, or mortarium. The identification of some sherds, however, can be uncertain; for example, bowl and dish rims are difficult to classify if little height of the vessel survives, and the classification of one form in particular (Drag 31R or Lud Sb if from East Gaul) is contentious, being viewed as either a dish or a bowl by different specialists. In this report Drag 31R/Lud Sb is classified as a 'bowl,' allowing direct comparison with Willis' data. However, the number of vessels of this form present in the quarry pits (discussed further below) is exceptionally high. To assess the impact of this, the quantification by vessel class (Fig 114) shows separate percentages for when form 31R/ Lud Sb is classified as a dish and as a bowl. It is perhaps also worth stating that the use of the terms dish, bowl etc does not infer how the vessels were used, but merely describes classes of vessels in a manner that allows comparison across and between sites.

The choice of quantification method can also be an issue. In his study, Willis (2004) used maximum vessel number (MVN) rather than rim EVE, as these were the data most readily available. Maximum vessel number (MVN) is therefore used here. The main difference between the two methods is that MVN consistently gives a greater proportion of decorated vessels. This is because decorated vessels can be confidently identified from very small sherds. In contrast, the values for cups and mortaria are depressed, reflecting various factors; the ability to recognise a form against sherd strength and rim survival.

Interestingly, the MVN results still show that cups are relatively infrequent in this assemblage whilst mortaria remain more frequent, but not as dominant as the EVEs data suggests. The Rheinzabern everted rim classified above as cup/closed form is here classified as a closed form (which is probably the case) in order to simplify the vessel categories and align them with those used by Willis. There are no inkwells from the Hive or the earlier City Campus excavation and so that class is omitted. Dish/bowl is used to describe those vessels, usually within the 18/31 series which cannot be confidently assigned to a specific form with the series.

A comparison with the MVN data from the City Campus excavation shows some of the main differences of the Hive assemblage (Fig 115). The number of cups from the Hive is very low and decorated bowls are also infrequent. Plain bowls, influenced by the large number of Drag 31R/Lud Sb in the Period 6 quarry pits, are relatively high, as are dishes and mortaria. These trends are also present in the rim EVEs data.

The City Campus assemblage compared well with Willis' Major Civil Centres, and to some degree with the profile for Small Civil Centres. There is a small variation (<5%) in the proportion of decorated bowls from these site types, but the results presented by Willis are averages from a number of sites and in some cases the parameters are wide so exact correlation is not necessary. The results from the Hive compare well with City Campus and Willis' Major Civil Centres in terms of closed, decorated bowls, and dishes; mortaria (4%) are elevated, although probably at the high end of the range; however, the results for plain bowls (20%) and cups (12%) are markedly different, not only from the average profile for Major Civil Centres, but Small Civil Centres and Rural Sites as well (Fig 116). There is no clear explanation for these values and it might be specious to force comparison in this way. The fact remains that there are very few cups from the Hive and rather a lot of plain bowls. The fills of the quarry pits yielded most of the plain bowls and mortaria, and like the rest of the site yielded very few cups, suggesting that these deposits are markedly different in Samian terms from the rest of the site.

Summary of Samian by site period

Period 3: Late 1st century to early/mid-2nd century (AD69–c AD140)

A very few sherds of samian were recovered from contexts assigned to this period (Table 12). None of these scraps of South Gaulish and Lezoux samian are particularly closely-dated; however, the three sherds from the fill of the roadside ditch (CG1004), two from Drag 18/31 dishes and one Drag 37, probably date between AD120 and 160.

Sherds manufactured during this period and found residual in later levels include all of the South Gaulish samian (Fabric 43.1) and that from Les-Martres-de-Veyre (Fabric 43.6). The exact proportion of the Lezoux wares (Fabric 43.2) which are solely Hadrianic in date is difficult to assess, but likely to be only a small portion of the assemblage. A single stamped Drag 18/31R (Stamp Cat 8) perhaps belongs here along with five or six of the decorated vessels (Decorated Cat nos 6–11), including sherds from an over-fired bowl attributed to Geminus found in Periods 4 and 06–07 and site cleaning in the north-west of Area 1.

Period 4: Mid-2nd century to early 3rd century (c AD140–c AD225)

Period 4 encompasses the main exporting period of the Central Gaulish kilns of Lezoux (up to *c* AD 200) and much of the period of production and export of the East Gaulish centres, the latter probably ceased production around AD 260. Consequently most of the samian from the excavations derives from this phase – the construction and use of the Buildings, associated surfaces and features.

The fills of the re-cut roadside ditch (CG1006) yielded a small collection of samian (26 sherds, 316g), all from Central Gaul (Fabrics 43.2 and 43.6) except for two small South Gaulish sherds (Fabric 43.1) weighing 5g. Like the pottery from the Period 3 infilling of this ditch, none of the samian has to be dated any later than about AD160. Closely-dated sherds include decorated vessels attributed to potters X-2, X-9 and Geminus. Of the vessels from this feature that could be identified to a specific form, a relatively high proportion are decorated. This is unusual for an assemblage which generally displays a paucity of decorated wares.

No large groups of samian came from the other contexts assigned to Period 4. The stone-lined well (CG 1014) produced 16 sherds weighing 355g. With the exception of a single scrap from South Gaul, the samian is Central Gaulish and includes: Dragendorff vessel forms 27, 18/31 (3), 33, 38, 31R and two decorated bowls, one dating to *c* AD160–80 (Dec Cat 26). This group of samian compares well with the rest of the Period 4 assemblage. A single sherd had been burnt.

There is little of note in the samian from the remaining features and layers; the only stamp (Aurelius, Stamp Cat 1) is dated to the second half of the 2nd century; of the two decorated bowl rims only one is attributed (Decorated Cat 8). Although some characteristically late 2nd century forms are present (Wa79 and Drag 31R) there are no sherds from vessels produced in East Gaul. A few sherds show signs of prolonged use and one Drag 18/31 has been drilled for repair, some lead from the repair remaining *in situ*.

Sherds from the same Wa79R platter/dish were noted in one of the Period 4 pits on the flood plain (CG 1112, fill 15119) and a Period 11 pit (15121), and another possible join was noted between sherds in the re-cut roadside ditch (CG1005) and one of the Period 5 features cutting the cobbled surface (CG 1087).

Period 5: Early/mid-3rd century to early 4th century (c AD225–c AD320)

The floors and ovens associated with Phases 2C and 2D of Building 2 (AU518 and AU519) produced a scatter of 2nd century plain wares; and a similar scatter of 2nd century material was associated with Building 3 (AU521). Three sherds from decorated bowls were recovered, although none was large enough to describe or date. Evidence of use/re-use includes occasional burnt sherds, some showing signs of prolonged use, a single sherd drilled for repair, and one sherd possibly trimmed down for use after breakage. Sherds from AU521 seemed slightly abraded compared with others, and the mean sherd weight was low (*c* 4g), indicating residuality and much soil movement/disturbance. The samian was all from Lezoux, with the exception of a single East Gaulish rim sherd (9g) from oven CG1083.

Relatively large collections of samian came from contexts associated with the cobbled surfaces and cut features to the east of the Buildings (AU525 and AU526). The lower cobbled surface (AU525, CG1041) and the pits cutting into this (AU525, CG1042) produced 43 sherds (381g, 0.45EVEs) and 29 sherds (519g, 0.79EVEs) respectively. The deposits sealing this (AU526, CG1043 and CG1098) produced 90 sherds (1026g, 1.34EVEs) and 54 sherds (556g, 0.88EVEs) respectively. All of this samian was from Lezoux (Fabric 43.2). There is little to distinguish the lower cobbling from the upper in samian terms; both AU525 and 526 contain samian dating from AD120–180/200, and some later forms such as Walters 79 and Drag 31R, although not in great quantities. There are relatively large numbers of sherds from decorated forms, although no more than the average for the site. AU526 seems to have more cups than the site as a whole, but the sample is so small that this is perhaps not reliable data. It is interesting that again there are no vessels from Eastern Gaul, suggesting that the phase of occupation that these sherds derived from may have ended in the last decades of the 2nd century.

Amongst the features post-dating the cobbling (AU523), pits CG1046 and CG1087 produced comparatively large groups of samian. Pit CG1046 produced some mid- to late Antonine

Lezoux ware (8 sherds, 18g), and a tiny sherd (1g) from a Rheinzabern closed ware vessel which is not datable, along with three sherds (129g) from a mortarium with a 'bat-faced' spout typical of late Trier manufacture (Fig 119.6). The mortarium is markedly worn/abraded. Although this might indicate long use, it should be noted that this vessel probably wasn't as well-fired as the Lezoux and Rheinzabern vessels from the site and would thus have become abraded more easily than them. Another Trier sherd, from a dish base (24g), also came from this feature. Samian from the other large rubbish pit (CG1087) included: a sherd from a Drag 15/17 dish from Les Martres (21g), another sherd of which was recovered from the layers sealing this pit (CG1047); 29 sherds from Lezoux (428g), and a large rim sherd (50 grams) of late Argonne ware. The latter vessel, a Chenet (1941) form 326 flanged bowl, is of late 3rd to early 4th century date (Fig 119.7). The 2nd century (Lezoux) samian from this pit includes sherds from Hadrianic plain and decorated vessels, as well as late 2nd century vessels, the latest of which is a single mortarium sherd.

Although most of the samian from Period 5 is clearly residual, the Trier mortaria and the Chenet 326 bowl are not. It is perhaps of note that the stratigraphically earliest substantial East Gaulish vessel is from this period, along with the first Central Gaulish mortarium.

Pit CG1095, located to the rear of the buildings (AU527), produced another 3rd century vessel, a Trier Drag 37 attributed to Dubitatus and dated AD225–45 (Fig 120.2). Associated with this were three sherds of Lezoux samian (109g) and a large sherd from a Drag 31R from Rheinzabern and dating to the late 2nd or early–mid 3rd century. The sherd size of this group is particularly large at *c* 35g, suggesting little redeposition/re-working of deposits.

Period 5–6: CG1047 Demolition debris above cobbled surface

Samian from the demolition layers (CG1047) included two sherds of Les Martres ware. One, a Trajanic Drag 15/17, joins a sherd found in pit CG1087. Other finds included 13 fairly unremarkable Lezoux sherds (116g) and 11 Rheinzabern sherds (367g), nine of which (337g, 0.36EVEs) are from a single vessel. This stamped Drag 31R bowl (Stamp Cat No 10) joins sherds from the upper levels of one of the quarry pits (CG 1108) and is dated AD220–255. Again it is noteworthy that a substantial portion of a 3rd century East Gaulish vessel is related to the closing period of use of the Buildings and associated features.

Period 6: Early – late 4th century (c AD320–400)

The samian from the features associated with the construction of the aisled building and the central oven (AU 508) are probably derived from the underlying deposits. With the exception of a sherd from an East Gaulish Lud Sb dish (48g) from an unidentified production site, all the samian is from Lezoux, comprising mostly plain wares of Antonine date. The only noteworthy vessel is a Drag 31R stamped by Mascellio i, dated AD165–200 (520g, 0.47EVEs). Sherds of this vessel were recovered from a foundation trench for the aisled building (CG1017) and a pit (CG1015) which cut the Period 4 well (CG 1014). The slip was worn off the foot of this vessel, presumably during prolonged use, and a letter had been cut across the foot-ring, presumably a mark of ownership. This graffito is reported on below (Fig 121.1).

By far the largest group of samian came from the infilling of the two conjoined quarry pits (AU510; 366 sherds, 7796g, 8.42EVEs). This amounts to about 45% of the assemblage by weight (40% by EVEs, but only 32% by count due to large sherd size).

The initial visual assessment of the material from the two pits suggested that there was little difference between the two groups. Both produced large fresh looking sherds with only a few showing signs of post-depositional abrasion. Some, although not a high proportion, showed signs of heavy use and a few sherds from each pit had been burnt. One vessel, a form Drag 45 mortaria, had not only been well-used, but had also been repaired (Fig 119.3). Cut slots, all noticeably blacked which may be evidence for the use of (birch tar) glue, were noted around the lower part of the body, but none actually retained lead from the repair. Sherds from two Drag 45s, one the repaired vessel discussed, were found in both pits, and sherds from one vessel in the upper fill of pit CG1108 joined another from a context in the demolition debris CG1047. There may be other cross-joins which were not identified. Some differences between the two pit assemblages became evident during more detailed quantification. Although pit CG1057 yielded considerably more samian (223 sherds, 4108g) than pit CG1108 (143 sherds, 3692g) the mean sherd weight of the samian in CG1108 was greater (25.8g vs 18g) as was the rim EVEs quantification (4.33 vs 4.09 EVEs).

The samian from both pits was dominated by plain wares, less than 3% of the sherds were from decorated vessels (less than 1% when measured in EVEs). Especially evident was the number of very large sherds from Drag 31R and Lud Sb bowls, other plain bowl forms, and mortaria. The mean sherd weight for the 31R /Lud Sb and mortaria was *c* 30g across the two pits. Approximately 79% (by rim EVEs) of all the Drag 45 and 56% of Drag 31R/Lud Sb came from these quarry pits. These forms were noticeably more common in the quarry pits than in the assemblage as a whole (Fig 117), while decorated vessels and cups were less common. These variations from the site profile may in part be explained by the late date for this group; in some assemblages cups and decorated wares do seem to decline from the end of the 2nd century. The forms which dominate these pits, Drag 31R/Lud Sb and mortaria, were not introduced into the samian repertoire until at least AD160/165, if not a little later.

When the data for pit CG1057 is shown separately from pit CG1108 it becomes clear that pit CG1057 has far more of the Drag 31R/Lud Sb bowls, whilst the majority of the mortaria sherds were deposited in pit CG1108 (Fig 118).

The dating of the samian of from the quarry pits relies mainly on the stamped vessels and date ranges for the different vessel forms as there is very little decorated material. There are early 2nd century vessels both from Les Martres-de-Veyre and Lezoux. These include: a bowl from a mould made at Les Martres, apparently by Potter X-13, but manufactured at Lezoux, providing evidence of a trade in moulds and/or the movement of potters from Les Martres to Lezoux; a sherd from a Curle 11 bowl, a form which ceased to be produced by about AD140; and one stamped dish (*c* AD135–65). The majority of the samian, however, dates from the second half of the 2nd century through to the mid-3rd. Sherds of vessels from Lezoux (Fabric 43.2) outnumber those from East Gaul, predominantly from Rheinzabern (Fabric 43.3), by about 2:1. The proportion of Rheinzabern wares is significantly higher than for the site as a whole, where Lezoux outnumbers East Gaulish samian by 3:1. This elevated proportion of samian from Rheinzabern, at around 30–35% of the samian from these features, is very high indeed and indicates that this group is late in samian terms, also reflected in the presence of several solely 3rd century vessels. The accepted average for East Gaulish samian from a ‘normal’ site within Britain is around 10% of the total.

The quarry pits yielded eight of the 14 identified potters’ stamps from the excavation (Stamp Cat nos, 2, 3, 5, 6, and 10–13); of the five Lezoux potters one, Divicatus, is on an early Antonine dish (no 5), but the remainder post-date AD160: Carussa i, Geamillus ii (Giamillio), and Quintus v on form 31R bowls, and Sacerus ii on an identified bowl base. The three

Rheinzabern potters' stamps, Datius, Marcellus vi, and Urbicus ii, are on form Lud Sb bowls. Marcellus vi has a 3rd century date, the other two date to the late 2nd to mid-3rd century. All of the Rheinzabern bowls were finely potted and in a well-fired, fine orangey-red fabric with a good even slip. This made it difficult to separate the 3rd century bowls from earlier examples without stamps, to refine the dating, so it could be that many more of the Rheinzabern vessels were 3rd century in date rather than late 2nd to mid-3rd century.

Other late forms within the pits, ie those introduced after *c* AD160/170, are the shallow dishes Walters 79 and 79R (0.15EVEs); mortaria, here all Drag 45 from Central Gaul (2.37 EVE); and East Gaulish (Fabric 43.3) dishes Lud Tg, Lud Tb, Drag 32 (0.5 EVEs) and flanged bowl Lud Sd (0.11EVE). Mortaria form an unusually large part of the group (Table 13 and Fig 114); substantial amounts of at least 4 different vessels were identified including the repaired one mentioned above.

The samian from the malting oven (CG1049, context 8802, included seven sherds from Lezoux (37g) and three from Rheinzabern (45g). Sherds from a Drag 37 bowl from Rheinzabern, dating to the period AD160–220, join a sherd from an underlying pit (CG1050). The sherds are mostly small; vessel forms, including Drag forms 33, 30 or 37 and 31 in Central Gaulish fabrics; and Lud Sb and Drag 37 from Rheinzabern.

Period 6–7

The samian from the lower fill of the timber well pit (CG1088, fill 8663) comprises only 5 sherds (46g), including a Drag 18/31 probably from Les Martres-de-Veyre (Trajanic?), two sherds from Lezoux, and a large sherd (25g) from a 3rd century Lud Sb dish/bowl.

The upper backfill (CG1089) produced a late group of samian from Lezoux (32 sherds 150g) and Rheinzabern (6 sherds 55g), including Walters 79, a late Drag 36, and a Drag 45 mortaria rim. The decorated vessels include a sherd from the over-fired Geminus vessel described above (Period 4, CG1006) and two sherds from at least one Cinnamus-style Drag 30. A few sherds in Lezoux fabrics may be from Drag 31Rs, but none are large enough to be certain that they don't derive from the earlier Drag 18/31R dish. There is also a scrap from a Lud Sb bowl.

There is little to base a comparison with the fills of the two quarry pits on. The presence of a Central Gaulish mortarium is perhaps the best; almost 90% of these sherds came from the quarry pits.

A small group of sherds was recovered from pit 6841 (AU522), which cut the top of the Period 6 well; 9 sherds (164g) including a single 1st century, Drag 37 sherd (Dec Cat 2.), along with sherds from Lezoux that include two mortaria sherds, two decorated sherds (one contemporary with the mortaria), and three sherds from flanged bowls.

Period 6–11 Tillage Soils (CG1056)

The samian from the tillage soils includes 40 sherds (493g, 0.89 EVEs) from Lezoux, 4 sherds (154g, 0.08EVEs) from Rheinzabern, and a single sherd (12g, 0.1EVEs) from a vessel made in East Gaul for which the kiln site was not identified. The range of forms is predominantly late 2nd – early/mid-3rd century. As such it compares with the material from the quarry pits, except that no mortaria were recovered from the tillage soils. Wear caused by prolonged use was noted on only three sherds, two of which has been drilled for repair. There are two stamped bases, the only identifiable one (Stamp Cat 4) joins sherds of the same vessel (Lud Sb) from a layer assigned to Period 5–6. This vessel is similar to the Drag 31R/Lud Sb bowls from the quarry pits. The mean sherd weights of 12g for Lezoux wares and over 30g for the sherds from East Gaul shows the sherd size has not been reduced much by the working of the soils. Only three of the sherds had been burnt, although these were recorded as heavily burnt. The proportion of Rheinzabern samian, 23% of the Period 6–11 samian, is similar to the proportion for the assemblage as a whole.

The samian from the Post-Roman deposits (Periods 6–12) represents about 7% of the total (10% by sherd count due to the relatively low mean sherd size of *c* 10g). Most is from Central Gaul reflecting the composition of the underlying deposits. In terms of vessel form there is no observable difference between the samian from Post-Roman deposits and the earlier layers. There is therefore no reason to suggest the material was derived from anywhere other than the under-lying deposits.

Illustrated samian vessels including unusual plain forms (Fig 119.1-7)

Lezoux

1. A body sherd with a cordon from a cup sized version of form Walters 81 which is more usually a bowl. It may be compared with one of similar size from Les Martres-de-Veyre (Romeuf, 1986, p148 fig 7, centre top). The vessel is labelled there as Drag 38 but is really more akin to a Wa81 with a flange-like cordon. Based on fabric and finish Brenda Dickinson has suggested that this looks like a Hadrianic product of the Lezoux kilns. Period 12, pit 6620, fill 6619. SAM 302

2. Rim from a small flanged bowl or large cup. The fabric is medium fired, micaceous with occasional small chalk inclusions and small voids. The vessel is poorly finished and the slip thin with an orange cast. The flange is short and straight, and the rim is upright and plain with no bead. The form is a variant which lies on the spectrum between form Drag 38 and Drag 44. Form 38 is a bowl with a hooked flange (Oswald and Pryce 1920, pl. LXXII); Central Gaulish versions tend to have a bead rim which is absent in later East Gaulish versions. Drag 44 is a bowl with a cordon rather than a flange (Oswald and Pryce 1920, pl LXI). A small Drag 44 from Pudding Pan Rock has an almost pointed flange like this example, but a beaded rim (Oswald and Pryce 1920, no 5). This vessel was heavily used; the internal slip below the height of the flange is absent. The slip from the rim top and for a few mm down the inside has also gone. The overall impression is of a late product from the Lezoux kilns, certainly of very late 2nd century date and possibly extending to the 3rd. Period 10–12, ditch CG 1059, fill 6251. SAM075

3. Repaired mortarium Drag 45. In standard Lezoux fabric, this vessel has been repaired, or a repair had been attempted using the cut slot/dovetail method. Of particular interest is the blackening around the cuts. There is no sign of lead in the cut slots but the blackening in places looks like (birch sap) glue which has been observed as a black tar-like substance on samian and coarseware vessels elsewhere in Britain (Brown and Seager-Smith 2012); one vessel from Cambourne (Brown and Seager-Smith 2012, fig 1 B) has been mended with both lead ‘rivets’ and glue,

and it is possible that this is another example of the two methods used in tandem. Period 6, quarry pit CG 1108, fill 7050, with joining sherds from fill 7055 and pit CG 1057, fill 6520. SAM693

East Gaul

4. Dish with a flat, everted rim and a slight bead below the rim. This is a less common Rheinzabern form, similar to Lud Tb (Bird 1993, fig 3). This example is in the same well-fired fabric as some of the Lud Sb bowls. Late 2nd to early 3rd century. Period 6, quarry pit CG 1108, fill 6986. SAM 642.

5. Similar form to no. 4 above, but smaller, with a smaller flat rim and only a slight bead below the rim; also with a darker slip. Late 2nd –mid 3rd century. Period 6, quarry pit CG 1108, fill 6745. SAM 395

6. Drag 45 mortarium with a bat-faced spout. The fabric is pale pink with frequent small chalky inclusions, the slip thin and orangey brown in colour. The spout is quite battered but has large round ears and a prominent brow; wiping marks from where the moulded head was applied obliterate any finer hair-like details that are present on a similar example from New Fresh Wharf, London which is dated to the first half of the 3rd century (Bird 1986, 2.215). Period 5, CG1046, pit fill 6529. SAM 229

Another sherd (not illustrated) came from a very small, everted rim with a diameter of c 100mm; in a standard Rheinzabern fabric. Listed as cup/closed form because little of the height of the vessel survives, this is most probably the rim from a jar, although the precise form is impossible to identify. Late 2nd–mid 3rd century. Period 5, CG1046, pit fill 6529. SAM235

Late Argonne Ware

7. Rim, with thin orange slip over a pale orange body, from a Chenet (1941) form 326, the late version of the Drag 38 flanged bowl (Joanna Bird pers. comm.). This form it is also known from the Marlowe sites in Canterbury, Kent (Bird 1995, 775). Probably late 3rd to early 4th century. Period 5, CG 1087 pit 6476, fill 6475. SAM 146

Potters' Stamps (including Fig 119.8–9)

1. Aurelius, 1a, CG (Lezoux), Drag 18/31R or 31R. ΛVRIIⱩIM AD150–200. Period 4, CG 1102 layer 7078. SAM 710 (not illustrated)

2. Carussa i, 3a, CG (Lezoux), Drag 31R. C:·A·RV̇SSA[=] The '= 'at the end of the stamp is not visible on this example, nor is there room for it, it could be that the die was broken. AD165–200. Period 6, quarry pit CG 1108, fill 6745. SAM 354 (not illustrated)

3. Datius, 2a, Rheinzabern, Lud Sb (Drag 31R). DATIVSFEC AD 165–240. Period 6, quarry pit CG 1057, fill 6592. SAM 281 (not illustrated)

4. Datius, 2a, Rheinzabern, Lud Sb (Drag 31R). DATIVSFEC AD 165–240, though this bowl is probably late 2nd or very early 3rd century in date. Period 6–11, layer 6004 and Period 5–6, layer 7137. SAM 719 (Fig 119.8)

5. Divicatus, 3b, CG (Lezoux), Drag 18/31 or Drag 31. [D]IVICATVS AD135–165. Period 6, quarry pit CG 1108, fill 6908. SAM 562 (not illustrated)

6. Geamillus ii (Giamillio), 1a, CG (Lezoux), Drag 31R. GIIΛMILLIOF It is not clear if this is a blind A or if there is, as in the published example (Hartley and Dickinson 2009, 150) a dot instead of a bar. 165–200. Period 6, quarry pit CG 1108, fill 7050. SAM 688 (not illustrated)

7. Habilis, 5c?, CG (Lezoux), bowl. HA[BILISF] Very deeply impressed stamp AD150–180. Period 3–6, posthole fill 6494. SAM 186 (not illustrated)

8. Littera i, 1c, CG (Lezoux), Drag 18/31R. [LIT]TERΛF AD120–50. Period 5, CG 1043 layer 6782. SAM 442 (not illustrated)

9. Mascellio i, 4b, CG (Lezoux), Drag 31R. M[ASCIIL]LIO Foot-ring is well worn and has a very deeply and clearly cut? (*cf* graffiti report below) across it. AD165–200. Period 6, pit CG 1015, fill 6839, and Period 6–7, foundations of Aisled building, CG 1017. SAM 528 (not illustrated)

10. Marcellus vi, 3a, Rheinzabern, Lud Sb (Drag 31R). MΛRCIIKVS AD220–255? Period 6, quarry pit CG 1108, fill 6745 and Period 5–6, CG 1047 layer 6517. SAM 204 (Fig 119.9)

11. Quintus v, 5b, CG (Lezoux), Drag 31R. QVIN[T·I·]M The beginning of this stamp has not registered well, the V appearing squashed into the Q. AD165–200. Period 6, quarry pit CG 1057, fill 7044. SAM 678 (not illustrated)

12. Sacerus ii, Ψ1, CG (Lezoux), bowl. SACERI[K]I No examples of this stamp are very clear around the letter which here is in brackets (Hartley and Dickinson 2011, 46–47) . This bowl base is broken exactly across this letter. The base seems to have been trimmed and re-used, inverted; there is some wear in the centre of the underside of the base and also around the bottom of the foot-ring. AD160–200. Period 6, quarry pit CG 1108, fill 6745. SAM 374 (not illustrated)

13. Urbicus ii, 1a, Rheinzabern, Lud Sb (Drag31R). VRBI-CVS AD165–260. Period 6, quarry pit CG 1057, fill 6592. SAM 278 (not illustrated)

Incomplete Stamps

14.]TΛKIS Rheinzabern, platter/dish with a circle in the base around the stamp. Could be one of two or three potters, but no exact match has been found. Augustalis ii, Vitalis viii, and Vestalis are all candidates although the latter used a reverse S. Late 2nd–early 3rd century. Period 6–7, pit CG 1088, CG 1089 fill 8655. SAM 797 (not illustrated)

15.]M, CG (Les Martres-de-Veyre), Drag 27. AD100–125. Period 4, ditch 6007, fill 6278. SAM 088 (not illustrated)

16. IꞀVS , CG (Lezoux), Drag 31. A short stamp, placed off centre. Possibly as read; could be anepigraphic. c AD140–200. Period 6, quarry pit CG 1057, fill 7001. SAM 649 (not illustrated)

Decorated samian (Including Fig 120.1–2)

All vessels are Dragendorff 37 unless stated otherwise

Abbreviations:

O: figure type in Oswald 1936–7;

Rogers: motif in Rogers 1974;

Ricken-Fischer: figures/motifs in Ricken and Fischer 1963;

Gard: figures/motifs in Gard 1937

The 7-digit Serial Numbers (Ser No) are taken from *Samian Research.*

South Gaul: La Graufesenque

1. — Scrap from cordon of Drag 29, the size of the beads and the hint of the design, a cogged medallion and a rosette suggest a date c AD50–70. Period 5–6, layer 7137. SAM717. (not illustrated)

2. — Scrap of a leafy wreath. Probably Flavian. Burnt. Period 6–7, pit 6841, fill 6840. SAM529. (not illustrated)

Central Gaul: Les Martres-de-Veyre

3. X-2 Body sherd from a bowl in X-2 style with his distinctive ovolo (Rogers B28), wavy borders, and pillar (Rogers P85 without an additional capital). The panels include (from the left of the sherd) warrior (O.174) reaching towards the pillar, and to the right of the pillar the large crouching leopardess O.1562 in a panel above repeated impressions of the large tulip bud Rogers G136. The column, wavy borders and buds placed horizontally are on a bowl from Les Martres (Terrise 1968, pl. XXIV, 529); the panther with different small warriors in a panel above and different horizontally-placed leaves is on a bowl from London (Stanfield and Simpson 1990, pl.5, 45). *c* AD100–120. Period 4, ditch CG 1005, fill 6278. SAM090 (not illustrated)

4. X-13 Sherds from three contexts from the same Drag 30 bowl, although not necessarily joining. The main design below an unidentified ovolo and a border of very small beads is a tree or trees comprised of 'branches' made from motif Rogers U281 and buds similar to those used by the Rosette potter (Rogers G273, Stanfield and Simpson 1990 pl.23, 290). Below is a figure, or figures, which are very badly moulded and unidentifiable. The panel borders are of very fine beads with rosettes (?Rogers C229) at the junctions; one panel is of leaf tips/ arrowheads. A similar ovolo, but a much clearer impression which shows a cabled tongue also with fine beads occurs on a bowl attributed to Potter X-13 from Regis House, London (1932.196 FS-V 8872) *c* AD100–120. Period 4, ditch CG 1005, fills 6006, 6278, SAM036 and SAM089, and fill 7263, SAM773 (not illustrated)

Central Gaul: Lezoux

5. — Scrap with leaf spring Rogers L19 below twigs Rogers U281 or similar. The fabric is Central Gaulish, probably Lezoux. The motifs were used by Potter X-13 who worked at Les Martres-de-Veyre, so this bowl may have been from a traded mould. c AD120–140. Period 6, quarry pit CG 1057, fill 6491. SAM163. (not illustrated)

6. X9 ? Rim from a small bowl with ovolo Rogers B233? and irregular wavy borders with large astragali at the junctions. Only a small double-bordered medallion containing an unidentified motif or figure remains. Both potters X-6D and X-9 used this ovolo with a wavy border. The style seems more akin to that of potter X-9. This sherd is in a Lezoux fabric indicating a Hadrianic date. Period 4, ditch CG 1005, fill 6278. SAM081. (not illustrated)

7. Geminus Body sherds from three contexts from an over-fired bowl in Geminus style; the ovolo (Rogers B76), wavy borders, and wheel-like rosette (Rogers C297) are all characteristic of his work. The figures within the surviving panels are crouching panther O.1521, and gladiator O. 1027. c AD120–140. Period 4, ditch 6007, fill 6278, SAM082; Period 6–7, CG 1089, fill 8659, SAM806; Undated, layer 6154, SAM040. (not illustrated)

8. Attianus Rim sherd with scrap of an ovolo with a rosette terminal to the tongue and neat beads above. Possibly ovolo Rogers B7 as used by Attianus. *c* AD120–145. Period 4, pit 6404, fill 6403. SAM121. (not illustrated)

9. Acaunissa Rim sherd with ovolo B22, beaded dividers and rosette Rogers C249 at the panel junctions; one panel contains a saltire design comprising trident leaf Rogers G75, beads and rosettes; the other panel contains palm fronds Rogers J121. The ovolo was used exclusively by Acaunissa, and the delicate design is characteristic of his work; the beads, trident and frond are all on a signed bowl in Kettering Museum

(www.rgzm.de/samian/home/frames.htm ser. no. 0010104). *c* AD125–145. Period 5, CG 1098 layer 7165. SAM725. (not illustrated)

10. Quintilianus group Scrap with ?double bead row and leaf/bud motif Rogers G18. This motif was used by several potters associated with the Quintilianus group of potters. *c* AD120–150. Period 5, CG 1070 layer 6756. SAM422. (not illustrated)

11. Criciro Sherd from lower part of body from a free-style bowl with a broad line at the bottom of the decorated zone. A snake and rock motif O.2155 in the field and bear O.1588 are identifiable. The other figure may be a horse. Both figure types were often used by Criciro on free-style bowls. *c* AD135–165. Period 10–12, ditch CG 1059, fill 6396. SAM115a. (not illustrated)

12. Criciro Scrap from the lower part of a Drag 30. The rosettes at the panel junctions are characteristic of bowls stamped by Criciro. *c* AD135–165. Period 11, posthole 6801, fill 6800. SAM503. (not illustrated)

13. Criciro Three sherds from two layers of a bowl with freestyle decoration of animals running or facing to the left, including hind O.1743, a bear probably O.1616, and a dog O.1979; with the tips of acanthus leaf Rogers K2? in the field. Similar acanthus tips were used by Attianus, and Sacer, and Criciro. The ovolo, above a wavy border, has a beaded tongue and a pair of beads at the terminal; it is not illustrated by Rogers. Brenda Dickinson has kindly drawn my attention to a similar bowl with the same ovolo with wavy border below from Verulamium (Dickinson 1984, fig 76, 80) which she now believes was made by Criciro. A small sherd from Wroxeter in Criciro's style with beaded rings at the panel junctions also appears to have this ovolo (B. Dickinson pers. comm.) and may indicate the ovolo was his. *c* AD135–165. Period 5, CG 1098 layer 6158 and CG 1041, 6701. SAM 054 & SAM323. (Fig 120.1)

14. Criciro *et al* Sherd with scrap of ovolo Rogers B12 which was used by several potters: Attianus ii, Cinnnamus ii, Criciro, Divixtus, and Sacer. Hadrianic or Antonine. Period 5, CG 1098 layer 6158. SAM055. (not illustrated)

15. Criciro or Divixtus Hercules O.783 (Déch 464) with two snakes is a figure type used first by Potter X-13 (Stanfield and Simpson 1990 pl 46,534), and later, at Lezoux by Immunus (Stanfield and Simpson 1990 pl. 173,6). The poinçon seems then to have passed to Criciro and Divixtus, by this time the snake in the left hand (the viewer's right) was broken. Period 5, curvilinear feature 15061, fill 15060. SAM875. (not illustrated)

16. Divixtus Rim sherd with ovolo Rogers B12, beaded borders and the ring of beads characteristic of Divixtus' work. *c* AD135–165. Period 5, CG 1043 layer 6782. SAM460. (not illustrated)

17. Cerialis ii /Cinnamus ii-style The small gladiator or warrior O.1059 was used by a few potters, but perhaps most commonly by Cerialis ii /Cinnamus ii *c* AD 135–70. Period 4, ditch CG 1005, fill 6006. SAM033. (not illustrated)

18. Cinnamus ii Scrap from a Drag 30 with edge of medallion Rogers E5 which was used exclusively by the Cinnamus workshop, contains Venus with a square column O.322. *c* AD145–75. Period 6–7, CG 1089, fill 8660. SAM809. (not illustrated)

19. Cinnamus ii style Drag 30 body sherd with vertical panels containing basket motif Rogers Q58; Vulcan O.66 *c* AD150–80. Period 6–7, CG 1089, fill 8658. SAM800. (not illustrated)

20. Cinnamus ii style Body sherd with large hare O.2115 below a festoon with vase Rogers T3 surmount by acanthus Rogers K12 in the panel to the right. *c* AD150–80. Period 12, CG 1053 layer 6362. SAM103. (not illustrated)

21. Cinnamus ii style Scrap of ovolo Rogers B143/144. Period 5, CG 1042, pit 6672, fill 6785. SAM493. (not illustrated)

22. ?Cinnamus ii style Scrap bearing small Victory O.819A which was used by Cinnamus and also by Secundus who shared two of the ovolos used by Cinnamus *c* AD 145–80. Period 4, CG 1011 floor 6665. SAM313. (not illustrated)

23. Cinnamus ii *et al* Scrap with ovolo Rogers B39 (or B231) used by potters X-7 and X-9, Sacer ii, Paternus III, Pugnus and Cinnamus ii. Hadrianic or Antonine. Period 6, pit CG 1015, fill 7268. SAM780. (not illustrated)

24. Advocisus style A body sherd with lion O.1404 below a double-bordered medallion or festoon with a plain ring as space filler. The lion occurs in a similar position on a bowl with Advocisus' mould stamp from Margidunum (www.rgzm.de/samian/home/frames.htm ser. no. 0010044) *c* AD 160–180. Period 4, beam slot CG 1111, 7096. SAM712. (not illustrated)

25. Mercator II Drag 30 Panels with fragment of medallion Rogers E14 and panel below containing opposing birds with trailing wings O.2250A and O.2295A, and an unidentified robed figure. The heavy cabled dividers and large rosette terminals (C171) are characteristic of Mercator's work. The birds and the cable are on a stamped Drag 30 from London (Stanfield and Simpson 1990 pl. 145, 9) *c* AD 160–180. Period 4, well CG 1014, fill 6824. SAM524. (not illustrated)

26. Mercator II Drag 30 body sherd with split-tongued ovolo Rogers B258 with cabled border below. There are two figures within a double-bordered medallion; the figure on the left may be Pudicitia O.926A, but the figure on the right is indistinct. There are large plain rings either side of the medallion. The ovolo, border, medallion and rings are all on a bowl attributed to Mercator from Glanum, Province (Rogers 1999, pl. 74, 15). *c* AD160–80. Period 6, pit CG 1015, fill 6965. SAM626. (not illustrated)

27. Paternus II Sherd with part of erotic scene O.X used by Butrio, Laxtucissa and Paternus II, the fabric and finish of this piece suggest the work of Paternus II. The figure type is on a scrolled bowl stamped by Paternus from Brest (www.rgzm.de/samian/home/frames.htm ser nos 0012232a/b/c). *c* AD160–190. Period 6–11, CG 1056 layer 6004. SAM016. (not illustrated)

28. Paternus II Scrap from the base of the decoration with stand Rogers Q16 and trifid sprig Rogers G56 separated by vertical beaded dividers with slightly larger beads at the terminal. *c* AD160–190. Period 5, CG 1041 layer 6752. SAM407. (not illustrated)

29. Casurius? Body sherd from just below the ovolo. Below the large beads is the only surviving figure lion O.1424. Several potters used this figures, but those who used beads below the ovolo include only Criciro, Drusus II and Casurius. Given the size of the beads Casurius is the most likely potter for this vessel therefore a late Antonine date is suggested. Period 6, quarry pit CG 1057, fill 6520. SAM211. (not illustrated)

30. Casurius Sherd with a narrow panel with mask O. 1270A above leaf Rogers J40. The panel borders are large, squat beads. *c* AD160–90. Period 5, CG 1043 layer 6782. SAM 461. (not illustrated)

Not assigned/identified to a specific potter

31. — Rim sherd with ovolo Rogers B114 and a wavy line below. This ovolo was used by several potters. Hadrianic or early Antonine. Period 4, pit 6404, fill 6403. SAM122. (not illustrated)

32. — Scrap of ovolo Rogers B24. Hadrianic or early Antonine. Period 5, CG 1087 pit 6953, fill 6952. SAM617. (not illustrated)

33. — Sherd with scrap of ovolo Rogers B28, beads below it and a fragment of a festoon with an astragalus terminal. Abraded. Might be same vessel as SAM616 (6952) but no joins. Probably Antonine. Period 4, ditch CG 1005, fill 6278. SAM083. (not illustrated)

34. — Rim sherd with scrap of ovolo Rogers B28, beads below it; chipped. Nothing else survives. Might be same vessel as SAM083 but no joins. Probably Antonine. Period 5, CG 1087 pit 6953, fill 6952. SAM616. (not illustrated)

35. — Rim sherd with scrap of ovolo Rogers B105 with a fine bead row below. The ovolo was used with beads by several potters including Albucius, and Paternus II. Antonine. Period 5, CG 1042 pit 6672, fill 6785. SAM492. (not illustrated)

36. — Drag 30 body sherd with free-style animal scene including a ?lion, a ?bear and a ?crouching panther (possibly O.1518) and the edge of a leaf impressed in the background to look like grass. The leaf is similar to that used by Albucius, but is not the same leaf as usual. None of the figures are complete hampering identification. Antonine. Period 3–6, posthole 6494, fill 6493. SAM185. (not illustrated)

37. — Seated Apollo O.94A, used by several mid–late Antonine potters. Period 5, CG 1041 layer 7192. SAM737. (not illustrated)

38. — Body sherd with scrap of figure-type O.926 (Pudicitia) used by many potters. Hadrianic or Antonine. Period 5, CG 1098 layer 7165. SAM726. (not illustrated)

39. — Sherd with a small, narrow-cored ovolo, with bead row below and vertical beads as panel dividers. The only remaining decoration is a stag (O.1732) within a double-bordered festoon with a large astragalus terminal. Hadrianic or Antonine. Undated cleaning layer 7265. SAM775. (not illustrated)

40. — Body sherd with fragment of lower part of a panelled design with crane O.2197 in a small panel below one containing a festoon; to the right is a large panel with a large double-bordered medallion. This crane was used by several Lezoux potters including Pugnus, Casurius and Doeccus. Probably Antonine. Period 5, CG 1043 layer 6754. SAM414. (not illustrated)

41. — Scrap of a female figure; probably Minerva. Slightly over-fired. Probably Antonine. Period 6–7, CG 1089, 8662. SAM813. (not illustrated)

42. — Body sherd with part of Victory O.809 which was used by many potters. Hadrianic or Antonine. Period 6–11, CG 1056 layer 6004. SAM015. (not illustrated)

East Gaul: Rheinzabern

43. Julius I or Lupus Three joining sherds from three layers comprising the rim and top of the decoration of a bowl with ovolo Ricken-Fischer E42 and part of a medallion (Ricken-Fischer K20). Both ovolo and medallion were used by Julius I and Lupus. Late 2nd to early 3rd century AD. Period 4–5, CG 1050 pit 8905, fill 8902 SAM862; Period 6, CG 1049 layer 8802, SAM844 and layer 8822 SAM845. (not illustrated)

East Gaul: Trier

44. Dubitatus Very small, poorly moulded bowl apparently with one panel repeated around it below a tongue-less ovolo, probably Gard R18. The panels are divided by stout cabled verticals (Gard V73, but not full length) within each is a bust (Gard M6). The ovolo and bust were used by both Afer and Dubitatus, the use of a vertical divider is, however, more in the style of Dubitatus who used the devise quite frequently (cf Gard 1937, figs 19 and 20). The bust and a short divider occur together, but with a different ovolo on Gard 1937 fig 20, 2. The internal surface of this sherd is heavily worn across the base and up the wall with the slip removed and surface very smooth. c AD225–245. Period 5, CG 1095, fill 6917. SAM600. (Fig 120.2)

Graffiti

Roger Tomlin with C Jane Evans

Four sherds with graffiti were identified (Fig 121.1–4). Two represented personal names (Fig G1.2–3), and two less well-defined marks of identification (Fig 121.1, 4). The latter two were both found in the Period 6 pit cutting the well (CG 1015). The vessels, however, are of very different dates. The samian Drag 31 dish (Fig 121.1) is dated *c* AD 165–200 (Roman Pottery, Samian), and joining sherds were found in the Period 6–7 construction cut of the aisled building (CG 1017, fill 6647; Mills SAM 310). Much of the pottery from these construction cuts seemed to be material from earlier deposits, disturbed by this construction. The Severn Valley ware jar (Fig 121.4) is a type dating to the late 3rd to 4th centuries (Webster 1976, fig 5, C28–9). The two sherds with personal names also came from later Roman deposits. The body sherd from a BB1 jar (Fig 121.3) was decorated with obtuse cross-hatch burnish, indicating a broadly mid-3rd to 4th century date. This was found in a Period 5 layer. The other sherd (Fig 121.2) is less closely datable. This came from an upper fill of one of the Period 6 pit quarry pits which also included notable quantities of earlier material.

A few graffiti were recorded on pottery from each of the neighbouring sites. Graffiti were recorded on two diagnostically late Roman vessels at 14–24 The Butts (Tomlin 2011, 108, 1 and 2; fig 5.20, 58). Both indicated names; one, on an Oxfordshire red colour-coated bowl, was made by the potter before firing, while the other, on a BB1 dish, was made at some point after firing. The third graffito was not identifiable and on an undated sherd. The City Campus excavations produced four vessels with graffiti. Two were made before firing, one on an amphora handle and one on a later Roman, Mancetter-Hartshill mortarium (Tomlin and Williams 2014, 44–45, 1 and 3). The other two, both made after firing, were on 2nd century vessels; another samian Drag 31 dish and a white colour-coated flagon. Graffiti are illustrated from the Deansway excavations (Bryant and Evans 2004, fig 157.20, 21; fig 160.15), though they are not catalogued in the published report, and Neronian–Claudian graffiti are illustrated from St Johns (Tomlin 2014, fig 25).

All the examples from the Hive were made after firing. They presumably relate to the period of use of the vessel, though this is not necessarily the case; a sherd of Roman samian found at the Deansway excavations was subsequently inscribed with an Anglo-Saxon, runic graffito (Page 2004, 461–2). It would be an interesting research exercise to collate information on all graffiti found in Worcester, to assess patterns of literacy through time. This will be facilitated by publishing details of pottery forms, dating and context along with the catalogue of graffiti, as has been attempted here.

Catalogue of the graffiti (Figure 121)

1. Two conjoining sherds comprising the base of a stamped, Drag 31R dish. The foot-ring has been neatly incised after firing with four diagonal strokes, the instrument used being more like a file than a knife. Assuming they were made from left to right, the sequence of strokes suggests they should be read looking inwards as VV, not (inverted) as M. Marks like this on the foot-ring of samian vessels have not been systematically collected and published, so their purpose is obscure. Fabric 43.2. Period 6, pit CG 1015, fill 6839. SAM 528

2. Wall sherd in pale grey fabric with fine black surface, scratched after firing below the rim:
   [...]MI

   The continuation-scratches, especially of the second letter, and the position of the graffito below the rim, show that it should be read this way up. M was made with four diagonal scratches, of which only the third and fourth are preserved complete. However, the letter is not A or X because the very end of the second scratch can also be seen. This is the end of a masculine personal name in -mus, in the genitive case: [...]mi, '(Property) of [...]us.' There are many possible names, Maximus and Primus being two of the most common. Period 6, quarry pit CG 1057, fill 6492.

3. Wall sherd from a BB1 jar, incised after firing:
   N
   There is a little more space to the right of the letter than to its left, but the sherd is too small to be sure that the graffito is complete. It might be a single letter, the initial letter of the owner's name; but quite likely it is his name abbreviated to three letters or so, for example [CA]N for Candidus. Fabric 22. Period 5, CG 1043, layer 7169 sealing cobbled surface. Database Rec 3612.

4. Rim from a Severn Valley ware jar, the lip incised vertically three times, after firing. These scored grooves are not a letter, nor even a numeral, but probably a mark of identification. Fabric 12. Period 6, pit CG 1015, fill 6823. Database Rec 4137.

Re-use and repair – counters, lids and tools

C Jane Evans

Fifty-five counters/lids made from Roman pottery were recovered. Forty-three came from Roman contexts, Periods 3–6 (Table 15). The great majority had been deposited in the Period 6 quarry pits, with 20 recorded while scanning the pottery from pit CG 1057, and two recorded during analysis of the pottery from pit CG 1108. This seems an exceptionally high number of counters, even taking into consideration the element of subjectivity in classifying some of the more crudely rounded examples.

A selection of counters/lids is illustrated, to show the range of sizes, fabrics and finishes (Fig 122; Table 16). Some were very neatly finished, with smooth, rounded edges, while others were more roughly 'pecked' into shape. Most counters were made in Severn Valley ware (Table 17), though sherds in various other fabrics were also used. Twenty-six counters (55%) were in oxidised fabrics, twenty in reduced wares (43%) and one sherd in a white ware (Fabric 38). All were in coarse ware fabrics apart from the latter, two sherds in Oxfordshire red-slipped ware (Fabrics 29 and 33.3), one in Central Gaulish black-slipped ware (Fabric 45.4), and three possible counters in samian. The latter three were all in Lezoux, Central Gaulish samian (Fabric 43.2; SAM 327, 328, 760).They were all bases from dishes recorded as being possibly trimmed around the edge, but described as quite chipped all over, and not therefore identified as counters or lids. These could be similar to the pecked examples in other fabrics so are included, though no diameters are available.

Table 15:

Period	Feature type	Count	% count
3	Ditch	1	2
4	Ditch	2	4
4	Pit	2	4
4	Well	1	2
5	Pit	3	5
5	Surface	5	9
5–6	Layer	1	2
6	Pit	2	4
6	Quarry pit	23	42
6	Robber pit	3	5
6–11	Layer	3	5
10–12	Pit	1	2
11–12	Finds ref	3	5
12	Construction cut	1	2
12	Unknown	3	5
13	Finds ref	1	2
Total		***55***	***100***

Table 15: Roman pottery counters/lids by period

A range of sizes was represented (Figs 122 and 123). The two counters made from, grooved, fine ware bases had diameters of 4cm (glazed fabric 156) and 5cm (black colour-coated fabric 54.4) respectively. The higher average sherd weights in Table 17 reflect the presence of larger discs, made from thick bases or body sherds, with diameters between 7cm and 12.5cm. These are perhaps more likely to have been used as lids.

The examples from pit CG 1057 were found throughout the sequence, from lower fill 7053 to upper fill 6491. The largest groups, however, came from fills 6592 (9) and 7001 (4). These groups were studied in more detail given the possibility that, having been deposited together, they could represent part of a gaming set. All of those from fill 6592 ranged in size between 5 and 6cm. Most were made from body sherds, and one base, in oxidised Severn Valley ware (Fabrics 12, 12.24, 12.6; 5) or sandy ware (Fabric 13; 1). Two counters were made from BB1 bases, one decorated with burnished lattice and one with burnished 'scribble.' The last was made from a base in Central Gaulish black-slipped ware (Fabric 45.4). The four examples from 7001 were all in oxidised Severn Valley ware (Fabrics 12, 12.5) with diameters ranging from 6.5 to 8.5 cm.

Table 16:

Figure no	Diameter (cm)	Fabric code	Period	AU no	CG no	Context	Database record
1	2.0	12	5	526	1098	6158	1928
2	3.0	14	6	507	1015	6823	2052
3	3.0	15	11–12			6005	4175
4	3.0	29	11–12			6005	4176
5	4.0	156	4	502	1006	7252	4751
6	4.0	22	5–6		1047	6517	4167
7	4.0	12.5	5	527	1093	6556	3785
8	4.5	12	5	526	1098	6158	1927
9	5.0	45.4	6	510	1057	6592	4194
10	5.0	12.24	6	510	1057	6592	4186
11	5.0	22	6	510	1057	6592	4191
12	6.0	12.5	6	510	1057	6520	1460
13	6.5	12.24	6	510	1057	7044	4162
14	7.0	12	12			6317	4163
15	7.0	12	6	507	1015	6942	4177
16	7.0	38	6	510	1057	6520	1937
17	7.5	31.1	12			6317	4165
18	8.0	33.3	6	507	1015	6942	4183
19	8.5	12	6	510	1057	7001	4182
20	10.0	22	6	510	1057	6491	1423
21	10.0	12	4	502	1006	6278	3960
22	10.0	12	6–11		1056	8801	4169
23	11.0	12.25	3	501	1004	6340	3297
24	12.0	12.6	4	506	1014	6824	2157

Table 16: catalogue of illustrated counters/lids

Other examples of re-use included a spindle whorl and three possible rubbers/polishers (Fig 124, 1–4). The spindle whorl was made from a body sherd of Fabric 12, found in a Period 5 pit in Building 2D (CG 1068, fill 6796; Fig 124.1). This had a diameter of 3.5cm. The rubbers/polishers (Fig 124.2, 3) were irregularly-shaped sherds with pecked and/or much smoothed edges, all in Severn Valley ware. One was perforated (Fig 124.3). One sherd had smoothed edges forming an oval hollow (Fig 124.4). The function of this is uncertain; it could perhaps have been used for mixing ointments or as a cosmetic palette.

Two sherds in BB1, and one in Severn Valley ware Fabric 12 were perforated for repair. These are discussed above. Most evidence of repair, however, came from the samian. Twenty-eight sherds, representing 14 vessels, in Lezoux, Central Gaulish samian had perforations or repair slots, two with lead rivets still in place. These are discussed in detail above. Examples came from Periods 4, 5, 6, 6–7 and post-Roman contexts. The largest number came from the Period 6 quarry pits (19 sherds, representing 6.5% of the Lezoux ware from this period), perhaps suggesting that the samian vessels deposited here had been kept in use for longer.

Table 17:

Fabric code	Count	% count	Weight (g)	Average weight (g)
12	15	27	892	59
12.15	1	2	12	12
12.2	2	4	47	24
12.24	4	7	159	40
12.25	1	2	208	208
12.34	2	4	191	96
12.5	4	7	141	35
12.6	6	11	426	71
13	1	2	24	24
14	1	2	17	17
15	1	2	7	7
19	2	4	160	80
22	6	11	259	43
29	1	2	20	20
31.1	1	2	62	62
33.3	1	2	114	114
38	1	2	54	54
43.2	3	5	55	18
45.4	1	2	36	36
156	1	2	21	21
Total	***55***	***100***	***2,905***	***53***

Table 17: Roman pottery counters/lids by fabric

Summary of pottery by period

C Jane Evans

Pottery provided the bulk of the dating for the site. This is mentioned within the pottery analysis but the pottery evidence is more thoroughly integrated into a summary of all dating, presented below in the discussion section (Discussion). This section, therefore, focusses on characterising the period assemblages; considering the range of fabrics and vessel classes present and, where possible, relating this to activity on the site.

Period 3: Late 1st century to early/mid-2nd century (AD69–c AD140)

The smallest assemblage came from the handful of features attributed to Period 3 (Table 5, Figs 89 and 90). The majority of sherds came from the early roadside ditch (CG 1004; 97% by weight and rim EVE). These had a high average sherd weight (37g), indicating a low level of post-depositional disturbance. A range of diagnostically early fabrics was represented. Organic tempered Severn Valley ware Fabric 12.2 was particularly common (Table 9; Fig 125, 24% by weight), along with other organic and reduced Severn Valley wares. Handmade

Malvernian ware was well represented; it was more common in this period than in later periods when quantified by count and rim EVE (13% and 14% respectively). In contrast, BB1 which is typically associated with contexts post-dating *c* AD 120, was least common in Period 3 (Fig 91). The assemblage also included a couple of sherds of white slipped ware (Fabrics 20.1, 20.6), a sherd of Oxfordshire self-coloured ware (Fabric 29.1), and a few sherds in sandy, reduced ware (Fabrics 14, 15) one of which had typically late-1st–early 2nd century rusticated decoration.

Wide-mouthed storage jars were by far the most common vessel class deposited, making up nearly half of the assemblage, followed by a range of other domestic vessels: bowls, cooking pots, narrow-mouthed jars, tankards and dishes (Fig 126). The form-types are consistent with the dating. The wide-mouthed jars mainly had triangular rims (*cf* Fig 105.31, 24% by rim EVE), gently out-curving rims (*cf* Evans *et al* 2000, fig 23.JWM6, 8, 19%) or slightly overhanging rims (*cf* Fig 105.32, 33, 3%), and similar rims were noted on the narrow-mouthed jars. Bowls, the second most common class, included small bead-rimmed bowls (*cf* Evans *et al* 2000, fig 29.BT50–52, 6%), a typically early-Roman carinated bowl (Webster 1976, fig 9.H59, 60, 2%), and a medium–large flanged bowl (*cf* Fig 106.61, 1%). The tankards were broadly 2nd century types (Webster 1976, fig 7.E40, 41, 4%, Webster 1976, fig 7.E42, 43, 2%), though some forms may be intrusive given the presence of a ditch re-cut and overlying later deposits. The cooking pots were mainly in handmade Malvernian ware (*cf* Bryant and Evans 2004, fig 153.2, 6–8, 13%). The small quantity of BB1 included an early 2nd century dish (*cf* Gillam 1976, fig 4.57), but also some later forms which, again, are thought to be intrusive for the same reasons (*cf* Fig 108 119, 124–5).

Period 4: Mid-2nd century to early 3rd century (c AD140–c AD225)

A much larger assemblage was recovered from Period 4 deposits, roughly half of which came from the re-cut east–west ditch (AU 502, 51% by weight). The rest of the pottery came from: Buildings 2A (AU503), 2B (AU 504) and 3 (AU521); a possible earlier building associated with an oven (AU 530); a well, and a range of other features (Table 5). Overall sherds had a fairly high average weight (24g), although this varied depending on the character of the deposits; the pottery from Building 2B, which included a near-complete Severn Valley ware jar from pit CG 1010 (fill 6634) had the highest average weight (30g) and the pottery associated with the oven in Building 3, redeposited and used in the make-up, the lowest (13g).

The larger assemblage size is reflected in the wider range of fabrics recorded (Table 5, Figs 89 and 90, Fig 127). Some variations were noted in the composition of the assemblage, compared to that from Period 3, which may reflect chronological changes in production or supply. The typically early Roman, organic tempered and reduced Severn Valley wares were notably less common in Period 4. The assemblage was dominated by the standard Severn Valley ware fabric (12), though significant quantities of Fabric 12.6, with soft white inclusions, were also recorded. The pattern for handmade Malvernian ware is less clear; the proportion by % weight was the same as for Period 3, though the proportion by count and rim EVE declined (9% and 7% respectively), the latter in particular suggesting there were fewer vessels. The proportion of BB1, in contrast, increased. A number of significant fabrics first appeared in this period: wheelmade Malvernian ware (Fabric 19), Nene Valley ware (fabric 28.1), and the early micaceous ware (Fabric 21.3). The latter, and a range of other characteristically earlier Roman wares were present in small quantities, including white-slipped wares (Fabric 20), brown colour-coated, roughcast ware (Fabric 31.1), typically late-1st to early 2nd century glazed ware (Fabric 156) and other black-surfaced wares (Fabrics 98.10, 98.13). The mortaria came from a variety of regional sources, including Mancetter-Hartshill (Fabric 32), Wroxeter (Fabric 103) and other, less well defined west midlands producers (Fabric 34.1, 34.3). Amphorae sherds, all Dressel 20 (Fabric 42.1), were well represented. They came from a range of contexts, usually occurring as individual finds though a few contexts produced larger quantities. Seventeen sherds (862g), including a 3rd century handle (Williams and Evans above), were incorporated in the hearth/oven in Building 2A (CG 1007, fill 6862), and 16 sherds (726g) were found in an earlier building associated with an oven (AU 530, fill 6932), presumably used as packing in the oven floor. Five substantial sherds (1082g) were incorporated in the floor surface of Building 2B (AU 504, layer 6730), and 12 further sherds came from associated pits (CGs 1009 and 1011; 12 sherds, 656g). Many more sherds of samian were from Period 4 deposits, compared to Period 3, though the overall proportion did not increase significantly. Most were Central Gaulish samian from Lezoux. Sherds of Oxfordshire red colour-coated ware (Fabric 29) and parchment ware (Fabric 40) associated with the construction of the well (CG 1014, fill 6824) are assumed to be intrusive from the possible robber pit.

A wider range of vessel classes was also noted in the Period 4 assemblage (Fig 128), probably also reflecting the larger assemblage size. This included beakers, colanders, cups and flagons amongst the more common forms. Bowls, cooking pots, narrow- and wide-mouthed jars were all fairly common, followed by tankards, medium-mouthed jars and dishes. The remaining vessel classes each represented less than 5% of the assemblage. The most common forms are described below, with a view to characterising the period assemblage.

The most common bowls were late-1st to early 2nd century necked types, similar to vessels illustrated from Worcester found at Deansway and Sidbury (Bryant and Evans 2004, fig 158.12, fig 162.2, 8; Darlington and Evans 1992, fig 22.7). Other forms included early-Roman carinated bowls (Webster 1976, fig 9, H59–60, 2%), small bead- or everted-rim bowls broadly dated to the 2nd–3rd centuries(Fig 105.45; Evans *et al* 2000, fig 29, BT50–52; Webster 1976, fig 7, D34, D36; 2%), and medium–large flanged bowls (*cf* Fig 106.58, 62, 63, 65, 66, 2%; Webster 1976, fig 8, F45, F47–48; Evans *et al* 2000, fig 26, BT7–10; Evans *et al* 2014, fig 28.43). Medium to large bowls with a variety of reeded or grooved rims were present in smaller quantities (*cf* Fig 106.68, 74; Webster 1976, fig 9.G57, 17.30, 17.41, 17.18, Evans *et al* 2000, fig 27, BT24, 17.45; 1% or less by rim EVE; Webster 1976, fig 9, G57). BB1 bowls included forms dating from the early–mid to late 2nd century (Gillam 1976, fig 3, 34–41, fig 4.52). Samian bowls included forms DR37 and 38.

Most cooking pots were in Malvernian ware, but, while a number of tubby cooking pots were still present (*cf* Bryant and Evans 2004, fig 153.2, 6–8), so were copies of BB1 jars, a number in wheelmade Fabric 19 (Fig 107.105, 106; Evans *et al* 2014, fig 38.66). BB1 cooking pots included a range of 2nd century types (Gillam 1976, fig 1, 1–8).

Narrow- and wide-mouthed jars occurred with a range of rim forms. Simple, out-curving rims were particularly common (*cf* Webster 1976, fig 1.A1; Evans *et al* 2000, fig 23.JWM6, 8, 7%). Otherwise forms with near-triangular rims or slightly overhanging rims were common in both classes (*cf* Fig 104.12, 14; Fig 105.31–33), together making up 14% of the period assemblage. Medium-mouthed jars with a variety of everted rims, sometimes cupped, were most common in this period assemblage. These are likely to be from rusticated jars; 29 body sherds with a variety of rusticated decoration were also noted.

The tankards included a couple of upright-walled forms, assumed to be residual (Webster 1976, fig 7, E38–39, 3%), as well as moderately splayed types (Webster 1976, fig 7, E40–41, 5%) and increasingly splayed types (Webster 1976, fig 7, E42–43, 4%). A later Roman tankard with much splayed walls (Webster 1976, fig 7, E44, 1%), found in the upper fill of the east–west ditch (AU 502) is thought to be intrusive.

Roughly half of the dishes were cooking wares in BB1 (51% of dishes by rim EVE) and over a third (35%) tablewares in samian. The rest comprised BB1 copies in reduced, organic Severn Valley ware (Fabrics 12.34) and handmade Malvernian ware (*cf* Fig 108.126; Evans *et al* 2014, fig 25.2). The BB1 dishes dated to the early–mid and mid–late 2nd century, and the early 3rd century. They included flanged dishes (Gillam 1976, fig 4, 57–64) as well as plain-rimmed types (Gillam 1976, fig 5, 75, 76, 79. A later 3rd century dish (Gillam 1976, fig 5, 81) came from the oven/hearth in Building 2A (CG 1007, fill 6862). More unusual was a round-handled dish (Gillam 1976, fig 6.86), a type not often found in Worcester.

The mortaria included a Mancetter-Hartshill, bead-and-flange-rimmed vessel dated to *c* AD 130–60 (MHH8.19) and a Raetian mortarium dated AD 117–38 (Fig 112.187). Flagons included a collared type found at the Newland Hopfields kiln in Malvern (Evans *et al* 2000, fig 19, F1), and in white-slipped ware (Fabric 20), a ring-necked flagon (*cf* Rees 1992, fig 27.1) and a fragmentary cupped-mouth flagon (not illustrated).

The pits in Building phase 2A and 2B were thought to relate to occupation of the buildings. The pottery data for these groups was therefore analysed in a little more detail, in an attempt to characterise activity.

Building 2A produced 41 sherds from the pit (CG 1008), with a further 69 sherds coming from the cobbled surface and oven/hearth (CG 1007). The pit produced higher proportions of BB1 (12%), brown-slipped ware (Fabric 31.1, 3%), samian (Fabric 43.2, 5%) and reduced Severn Valley ware (Fabric 12.1, 11%) than in the period assemblage as a whole, and a lower proportion of handmade Malvernian ware (Fabric 3, 2%). Forms included the brown-slipped, roughcast beaker, 1st to 2nd century tankards (Webster 1976, fig 7.E38–41) and a carinated bowl (Webster 1976, fig 9.H59, 60), a jar and a bowl in BB1 (Seager Smith and Davies 1993, WA type 8; Gillam 1976 fig 4.52) and a Drag 18/31 bowl in Central Gaulish samian. The pottery from the pit had a fairly high average sherd weight (21g). This was a marked contrast to the pottery from the cobbled surface, where the pottery was, as might be expected, much more fragmentary (average weight 6g), and the pottery from the oven/hearth which was dominated by amphorae and therefore had a very high average sherd weight (33g).

Two pits were excavated in Building 2B (AU 504). The main pit (CG 1009) produced 23 sherds (658g). The high average sherd weight for this assemblage (29g) also reflects the presence of nine sherds of heavy amphorae (456g). The other pottery included Severn Valley ware tankards (Webster 1976, fig 7. E40–43), a bowl (*cf* Fig 105.45), and part of a narrow-mouthed jar, all in Fabric 12; a fragment from a brown colour-coated, roughcast beaker (Fabric 31.1), a sherd of white colour-coated ware (Fabric 20) and a single sherd of samian from an unidentified, closed form (fill 6872). The smaller pit (CG1010) produced seven sherds (931g), but this included three joining sherds from a near-complete Severn Valley ware jar with an out-curving rim (874g, *cf* Webster 1976, fig 1.A1; Fig 21), hence the very high average sherd weight (133g).

Another large pit in the south-west of Area 1, only partially excavated, was also thought to relate to the buildings (CG 1092). The three fills produced 66 sherds, weighing 1291g, with an average sherd weight of 20g. Fabric 12.6 was more common in this pit assemblage than Fabric 12 (36% and 24% of the assemblage by weight). Forms included 2nd and early 3rd century types; an early to mid-2nd century BB1 bowl (Gillam 1976, fig 6.34), and an early to mid-3rd century jar (Gillam 1976, fig 1.7); the 2nd century Raetian mortarium (Fig 112.187); a Malvernian tubby cooking pot (*cf* Bryant and Evans 2004, fig 153.8) and a late 2nd–3rd-century tankard (*cf* Fig 104.5; Webster 1976, fig 7.E42–3).

Period 5: Early/mid-3rd century to early 4th century (c AD225 – c AD320)

The largest assemblage of pottery recorded came from Period 5. While, overall, this assemblage had a lower average sherd weight (19g), there was considerable variation across the site, reflecting depositional patterns and biases. Nearly half of the assemblage (44% by weight; Table 5) came from deposits sealing, and features cut into the cobbled surface (AU 526, CG1043 and 1098; AU 523, particularly CG 1086 and 1087) and from surfaces and features cut into the east part of the site (AU 525, CG 1041, 1042). The pottery from deposits sealing the cobbled surface was more fragmentary than from features cutting into it (18g compared to 53g, 33g and 30g). The particularly high average sherd weight of 53g reflects the presence of 20 body sherds from Dressel 20 amphorae (4360g) dumped in the ditch (CG 1086, fill 6376). The presence of heavy amphora sherds also biased the average sherd weights in other features, such as floor CG 1061 in Building 2C, and post pad CG 1065, where 5 sherds (392g) had presumably been used as packing. More amphorae, 21 sherds (966g), was found on the lower cobbled surface (CG 1041), though this made less impression on the average sherd weight which, at 13g, was lower than for pits cutting into this surface (CG 1042, average weight 23g).

As in Period 4, plain Severn Valley ware (Fabric 12) was the most common fabric, followed by Fabric 12.6 (Fig 129). The proportions of early Roman fabrics, such as organic-tempered and reduced Severn Valley ware, declined while there was a slight increase in the proportion of wheelmade Malvernian ware (Fabric 19) and BB1 (Fabric 22). The proportion of handmade Malvernian ware (Fabric 3) remained level when quantified by weight, but the proportion by rim EVE, reflecting the number of vessels represented, dropped (Table 9; Fig 91). A wide range of other fabrics were present in small quantities. The majority of the mortaria came from Mancetter-Hartshill. Bead-and-flange mortaria dating to *c* AD 140–170 were most common, including two rims stamped IVNIVS and BRVS[….] (Fig 111.178–180). Other forms had more hooked flanges, with a similar date, or hammerhead rims, dated *c* AD 230–300 and 250–350 (Fig 111.181 and *cf*182). Oxfordshire white mortaria were also being used; two forms dated to *c* AD 240–300 (Young 2000, fig 21, M18 and fig 22, M21). Of particular interest were the products of a local potter, ASILA, working sometime in the mid-2nd century, represented by a stamped flange and a base.

It was not always easy to identify the source of other white wares with confidence, but both Mancetter-Hartshill (Fabric 158) and Oxfordshire products (Fabrics 38, 40) were present, along with sherds of uncertain source (Fabric 41). Very small amounts of Oxfordshire parchment ware (Fabric 40) and white-slipped ware (Fabric 30) were also recorded. White-ware forms included a flagon and bowls. The only precisely identifiable form was an Oxfordshire bowl dating to *c* AD 100–130 (Young 2000, fig 32, W54). Oxfordshire red colour-coated ware (Fabric 29) was present in more significant quantities than in Period 4, represented again by bowls. These had date ranges of *c* AD 240–400+ (Young 2000, fig 59, C51) and *c* AD 270–350 or 400+ (Young 2000, fig 57. C44 and fig 58. C45). Two other characteristically later Roman wares were represented by individual sherds; shell-tempered ware (Fabric 23), from the floor of Building 2D (CG 1066; 6573), and pink grog-tempered ware (Fabric 17) from the primary fill of a pit cutting the cobbled surface (CG 1087; 6475). Cologne colour-coated ware (Fabric 44.1) and South-west white-slipped ware (Fabric 151.02) also appeared in Period 5. A handful of East Gaulish samian was identified, but Central Gaulish samian dominated the assemblage, particularly products from Lezoux (Fabric 43.2; Mills above). The amphorae were all Dressel 20, for olive oil, apart from a single sherd from a Gauloise 4 wine amphora (Fabric 42.3).

The profile of the assemblage by vessel class (Fig 130) was broadly similar to that for Period 4, though some variations may have functional significance. Bowls were still the most common class deposited, but cooking pots were less common in this assemblage than wide- and narrow-mouthed jars, and tankards. The proportion of medium-mouthed jars, the late 1st to early 2nd century jars described for Period 4, dropped (from 6% to 1%), as did the proportion of beakers (3% to 1%).

Changes were evident in the bowl types. The most common forms were medium-to-large flanged bowls with plain or reeded rims, made in a range of Severn Valley fabrics. These were more common than in Period 4, representing 6% and 5% of the assemblage respectively (% rim EVE). These utilitarian bowls are, arguably, more suited to food preparation than cooking or tableware. The majority in each class (4% of the 6% and 5%) had rims with internal lips, perhaps intended to stop liquids spilling. Greater variation was noted within both groups than was evident in Period 4. A number of the forms are paralleled at the Newland Hopfield, Severn Valley ware kiln in Malvern (Evans *et al* 2000) or are illustrated in the Webster corpus. Variations within the plain-flanged forms were mainly based on the angle and heaviness of the rim. It is by no means certain that these variations have chronological or functional significance, but they were recorded to see if any patterns emerged. The most common types, with an internal lip, had a horizontal flange (*cf* Fig 106.64, 66; Evans *et al* 2000, fig 26, BT9– 10), while others had slightly up-turned (*cf* Fig 106.67; Webster 1976, fig 8, F47–8) or down-turned flanges (Fig 106.65; Evans *et al* 2000, fig 26, BT7–8). One had a concave rim (Evans *et al* 2000, fig 26, BT11), while others had a horizontal flange but a less pronounced internal lip (Fig 106.61).

There was even more variation amongst the reeded-rim bowls, with some increasingly complex rim types being produced, sometimes with pinched decoration. Most of these also had internal lips (*cf* Fig 106.68, 71, 72, 74; Fig 107.79, 82, 83, 85; Webster 1976, fig 9, F53, 557; Evans *et al* 2000, fig 27, BT13–15, fig 28, BT32, 34–5, 37–8, 41, 47, fig 29.50) Some did not have internal lips more complex rim (*cf* Fig 106.75, Fig 107.80; Evans *et al* 2000, fig 27, BT24).

Nearly all the cooking bowls were in BB1. Forms included residual, flat-flanged, 2nd century types (Gillam 1976, fig 3, 35–41); bowls with grooved rims or slightly dropped flanges (Gillam 1976, fig 3, 42, 44), dating to the late-2nd to 3rd and mid–late 3rd century; and drop-flanged bowls, dating from the late 3rd to early–mid 4th century (Gillam 1976, fig 4, 45–48). Bead-rimmed bowls, dating to the mid–late-2nd century, were also represented (Gillam 1976, fig 4, 52). All of these types occurred in similar proportions. Only two cooking bowls were recorded in other fabrics; a copy of a BB1, grooved-flange BB1 bowl in reduced sandy ware (Fabric 15, *cf* Gillam 1976, fig 3, 44) and a BB1-type bowl with a more pronounced drop flange in wheelmade Malvernian ware (Fabric 19).

The other bowls were mainly tablewares, though some might have also been used in food preparation. These included small–medium bowls in Severn Valley ware, with bead rims (Evans *et al* 2000, fig 29, BT50–54) or elongated bead rims (Webster 1976, fig 7, D34–35), amongst which those similar to Webster D34 were most common. Other Severn Valley forms comprised copies of samian form Drag 37 (*cf* Fig 105.56), and flanged, segmental bowls (Webster 1976, fig 10, J65; *cf* Evans 2011, fig 37.6). More unusual was a necked bowl in a reduced fabric (Fabric 12.1, BED1.01) which had combed decoration, more reminiscent of vessels produced in South Wales and Somerset. The earlier Roman, necked bowls and carinated bowls more common in Period 4 were no longer a significant component of the assemblage. As noted above, a range of Oxfordshire red colour-coated and white ware bowls were also reaching the site.

Narrow- and wide-mouthed jars had a range of rim forms. Slightly overhanging rims (*cf* Fig 104.14, 4% of the period assemblage by rim EVE, Fig 105.32, 33, 5%) and near-triangular rims (*cf* Fig 104.12, 3%, Fig 105.31, 4%) were common in both classes. Simple, out-curving rims were common on narrow-mouthed jars (Webster 1976, fig 1, A1, 4%) but less so on wide-mouthed jars. Both classes had an increasing number of hooked rims (*cf* Fig 104.18, 19, 1% each; Fig 105.JWA 20.02, 20.03, 1% and 3%), perhaps indicating a chronological trend.

Tankards made up a higher proportion of the assemblage than in Period 4, and forms demonstrate a clear chronological trend. Those with increasingly splayed walls were most common (Webster 1976, fig 7.E42–3, 6%) but the most splayed types also formed a significant proportion of the assemblage (Webster 1976, fig 7.E44, 5%). The former are dated by Webster to the 2nd–3rdcenturies and the latter to the 4th century.

Cooking pots, unlike the cooking bowls, were predominantly in Malvernian ware rather than BB1 (8% and 4% of the period assemblage respectively). The Malvernian wares included both handmade (Fabric 3) and wheelmade jars, though the latter were more common (3% and 4% of the period assemblage respectively). The handmade wares included some residual tubby cooking pots (*cf* Bryant and Evans 2004, fig 153.7, 8; Darlington and Evans 1992, fig 24.1) as well as copies of BB1 jars (*cf* Fig 104.2, Fig 107.106) and everted rim jars (*cf* Darlington and Evans 1992, fig 24.3). The latter two forms, more likely to be contemporary, were most common (each *c* 1% of the assemblage). The wheelmade jars copied BB1 forms, mostly with splayed rims (*cf* Fig 107.106 and *cf* Evans *et al* 2014, fig 38.66, *c* 3% respectively). The BB1 jars included some residual 2nd century types (Seager Smith and Davies 1993, fig 122.WA type 1), but were mainly 3rd century types (*cf* Fig 108.119; Gillam 1976, fig 1.7–9, fig 2.10, 2.6%), with a only couple of later types (*cf* Fig 108.120 Seager Smith and Davies fig 122, WA type 3). A few cooking pots in other fabrics were also recorded (Fabrics 14, 15, 153), again copying BB1 types.

The dishes divide into cooking wares and samian forms, the latter making up 2.3% of the period assemblage and including forms Drag 18/31, 18/31R, Drag 31 and Curle 23 (Mills above). The coarse ware dishes, like the bowls, were mainly in BB1 (2.5% of the assemblage). These were mostly plain-rimmed dishes dating to the 2nd–3rd centuries (Gillam 1976, fig 75–79, c 2%), though a few later examples of this form were also noted (Gillam 1976, fig 80, 81, <1%). Other forms included mid–late 2nd century flanged bowls (Gillam 1976, fig 4.59–66, <1%) and bead-rimmed dishes (*cf* Fig 108.126, Gillam 1976, fig 5.73 <1%). The handmade and wheelmade Malvernian dishes, both representing <1% of the assemblage, were copies of these forms (Fabric 3, *cf* Evans *et al* 2014, fig 25.2, 3; fabric 19, fig 38.67, 68, 69). Only a couple of dishes were recorded in other fabrics; a flanged dish in organic-tempered Severn Valley ware (Fabric 12.34), probably residual, and a dish in reduced, sandy ware (Fabric 14, *cf* Peacock 1967, fig 4.69–70).

A number of features potentially related directly to activity in the buildings (Table 18). As with Period 4, the pottery data from these were analysed in more detail to assess the character of these groups.

Table 18:

AU no	CG no	Fill of pit	Count	Weight (g)	Average weight (g)
Building 2D (AU 519)	1068	6797	113	1,166	10
		6795	19	121	6
		6727	6	23	4
		6799	10	40	4
	1071	6369	100	1,633	16
Building 3 (AU 521)	1076		139	1,482	11
	1077		52	401	8
Features post-dating cobbled surface (AU 523)	1046	6526	57	1,866	33
	1085/1087	6928	120	4,400	37
	1087	6476	358	9,788	27
	1087	6808	27	913	34
	1087	6953	241	7,515	31
Later activity to rear of buildings 1 & 2 (AU 527)	1093	6555	143	2,600	18
	1095	6895	22	587	27

Table 18: Pottery from Period 5 deposits related to buildings

A couple of pits and postholes were associated with Building 2D (AU519, CG1068). A shallow pit produced 113 sherds of fragmentary pottery, all from one fill (6796). A fairly narrow range of fabrics was represented: Severn Valley wares (mainly Fabric 12), and cooking wares (Fabrics 3, 19 and 22). The Severn Valley ware included reduced and organic fabrics (12.1, 12.34) which are probably residual, along with sherds of Central Gaulish samian (fabric 43.2). More unusual fabrics comprised South-west colour-coated ware (Fabric 151.2) and, in Oxfordshire red colour-coated ware (Fabric 29), the base of a rouletted beaker probably dating from the late 3rd–4th century. The only other diagnostic form was a tankard, dating to the late 2nd–3rd century (Webster 1976, fig 7, E42–3). Less diagnostic forms included fragmentary cooking pots, in BB1 and wheelmade Malvernian ware (Fabrics 22 and 19) and a narrow-mouthed jar (Webster 1976, fig 1, A1). A partially excavated pit (CG 1071) produced 100 sherds of slightly less fragmentary pottery, from six fills. This included similar tankards and Severn Valley ware jars; an early–mid 3rd century, BB1 cooking pot and an early 3rd century dish (Gillam 1976, fig 1.7, fig 5.79). Another pit (6795) and associated postholes (6727, 6799) each produced only small quantities of very fragmentary pottery.

Building 3 (AU 521) produced pottery from the internal floor layer (CG1076) and a layer of occupation debris (CG1077). The pottery was fragmentary, as would be expected from deposits that would have been subjected to trampling, with low average sherd weights. Severn Valley Fabrics 12 and 12.6 were common in both assemblages, though proportions varied (CG1076, 86% by weight; CG1077, 48%), and a couple of sherds of reduced Severn Valley ware (Fabric 12.1) were present in both. Vessel classes from the floor layer included, in order of frequency: wide-mouthed jars, bowls, narrow-mouthed jars, dishes, large storage jars, cooking pots and tankards. Diagnostic forms included a late 3rd century BB1 cooking pot and 3rd century bowls (Gillam 1976, fig 2.10, fig 3.43, 44), and a 4th century tankard (Webster 1976, fig 7, E44). The occupation debris produced fewer forms, but included similar tankards and

BB1 bowls, along with a Severn Valley ware bowl and wide-mouthed jar (*cf* Fig 105.31; Evans *et al* 2000, fig 27.BT24).

Another group of features post-dated the cobbled surface at the rear of the Buildings (AU 523). A number of these pits produced pottery, all noticeably less fragmentary than from the features discussed above (Table 18). Data from the largest of these assemblages was analysed. The biggest group came from rubbish pit 6476, and, even excluding one very heavy sherd of Dressel 20 amphora, this group had an average weight of 26g. A wide range of fabrics was represented, amongst which Severn Valley Fabrics 12 and 12.6 (36% and 16% by weight) and cooking wares (Fabric 22, 14%, Fabric 19, 12%, Fabric 3, 7%) were common. Some residual fabrics were also present (Fabrics 12.2 and 12.3, 2%; 43.2, 2%) and some characteristically later Roman wares: a sherd of pink grog tempered ware (Fabric 17) and nine sherds of Oxfordshire red-colour-coated ware (Fabric 29), including a bowl dated *c* AD 270–400+ (Young 2000, fig 58, C45). The samian included a more unusual, Chenet 326 bowl in Argonne, East Gaulish samian (Fabric 43.7; Mills above). The vessel profile differed from that for the period as a whole. While bowls were still the most common type (38% by rim EVE), the main class was cooking bowls (16%). Cooking pots were the other common class (23%). Wide-mouthed jars, tankards and narrow-mouthed jars were also fairly common (13%, 6% and 5% respectively). If this is rubbish from the nearby building then this could be providing an indication of vessel use in that structure. A wide range of form types was recorded but only the chronologically diagnostic forms are summarised here. The most common bowl was the BB1, drop-flange type, dating from the mid–late 3rd to early 4th century (12%; Gillam 1976, fig 4.44, fig 4, 47). Cooking pots were mainly in Malvernian ware (Fabric 19, 14% by rim EVE; *cf* Fig 107.106, 105) rather than BB1 (5%). The only identifiable BB1 jar dated to the early–mid 3rd century (Gillam 1976, fig 1.7). Tankards were mainly the very splayed type dated by Webster to the 4th century (5%; Webster 1976, fig 7, E44), though 3rd century tankards were present.

The pottery from pit 6953 also had a high average sherd weight. The proportions of fabrics were broadly similar, the exceptions being that BB1 was far more common than Malvernian Fabric 19 (8% and 3% by weight respectively), and reduced Severn Valley ware (Fabrics 12.1) was more common than expected for this period (7%). The latter probably reflects the presence of earlier material in the assemblage, also evinced by sherds of Central Gaulish samian dating from the late 2nd to early/mid-3rd century and BB1 dating to the 2nd/late 2nd century (Gillam 1976, fig 4, 65–66; fig 5.75). There were also diagnostically later forms present, such as an Oxfordshire C44 bowl (Young 2000, fig 57), and Mancetter-Hartshill mortaria dated to *c* AD 250–350 . Amongst the cooking wares, bowls and dishes were far more common than jars in BB1 (13% and 2% by rim EVE respectively), while only jars were recovered in Fabric 19. The only form in Malvernian Fabric 3 was a lid. The overall vessel profile differed from that for the period, in that narrow-mouthed jars were the most common class (32% by rim EVE), and dishes were also well represented (6%). Tankards, wide-mouthed jars and cooking pots were all poorly represented (1%, 8% and 6%).

The pottery from pit CG1093, to the rear of the Buildings (AU 507) was more fragmentary. The proportions of Fabrics 12 and 12.6 were similar to the period as a whole. BB1 was slightly more common than Malvernian Fabric 19 (6% and 5%). Unusually, only dishes and bowls were present in these fabrics. These reflected a wide date range, with one BB1 bowl dated to the mid–late 2nd century (Gillam 1976, fig 3.38–41) and another to the late 3rd/4th century (Gillam 1976, fig 4.45–49). Other early fabrics included reduced and organic-tempered Severn Valley ware (Fabrics 12.1, 12.15, 12.2), while other diagnostically late pottery included a sherd of Oxfordshire red colour-coated ware and a typically late tankard (Webster 1976, fig 7.E44). A fairly limited range of vessel classes was represented. Wide-mouthed jars were most common (36%) followed by flagons, bowls, tankards and narrow-mouthed jars (19%, 16%, 15% and 9% respectively).

Period 6: Early 4th century late 4th century (c AD320 – c AD400)

The second largest assemblage analysed came from Period 6, though it should be remembered that not all of the pottery recovered was included in the study. The conjoined quarry pit (AU 510) was excavated in full and, therefore, produced significant quantities of pottery. Given the constraints of funding, a pragmatic approach to analysis had to be decided. Only the pottery from one quarry pit (CG 1108, 6746) was recorded in detail. Stratigraphic evidence indicated that this pit had been filled in fairly rapidly, so pottery from all fills up to fill 7055 was thought to represent a single phase of dumping. This material also had two associated C14 dates, AD70–250 and AD 220–350. The pattern of deposition in the other pit (CG 1057) indicated a more complex pattern of tipping, and it was thought the pottery might, therefore, have come from a variety of sources. This material (2372 sherds weighing 117.12kg) was scanned but not recorded. The upper fills of both pits (CG 1057, fills 6520, 6491; CG 1108, fill 6745) were distinctly different in character, producing a significant proportion of coins, small finds and other finds. These diagnostically 4th century fills were all recorded in detail. These groups made up roughly a third of the entire assemblage studied (Table 5). The other significant group of pottery came from robbing of the timber well pit (Table 5, AU 507), with smaller quantities coming from the timber well pit (AU 524) and various other features. Average sherd weights varied between these different deposits, but the overall average weight (26g) was higher than for Periods 4 and 5. Although fewer sherds were analysed from Period 6 deposits, the assemblage included a higher proportion of vessels, when quantified by % rim EVE (Fig 90).

The period assemblage was again dominated by Severn Valley ware, particularly fabric 12 (Table 9; Fig 131). The proportion of Fabric 12.6 dropped (Fig 93), for reasons that are unclear. There was a slight increase in organic-tempered Fabrics 12.2 and 12.3, reflecting increased re-deposition of residual material. Both and BB1 (Fabric 22) and wheelmade Malvernian ware (Fabric 19) were proportionally most common in this period; the latter roughly twice as common as in Period 5. The BB1 included cooking pots, bowls and dishes (44%, 28% and 24% of the fabric respectively), while the wheelmade Malvernian ware occurred predominantly as cooking pots (77% of forms in this fabric). Handmade Malvernian ware (Fabric 3) was less common than in Period 5, and lids were by far the most common form (89% of the forms in this fabric), possibly intended for use with the wheelmade cooking pots as suggested elsewhere (Evans *et al* 2014, 21). Other forms included copies of BB1 jars (JCM7.02, 7.07, 7.20) and residual tubby cooking pots. There were no copies of BB1 dishes in Malvernian wares, although another fabric copying BB1 (Fabric 149) first appeared in this period, with forms copying BB1, plain-rimmed dishes (Fig 109.145).

Most mortaria came from the Oxfordshire kilns, mainly white ware (Fabric 33.1, 40 sherds), but also red colour-coated ware (Fabric 33.3, 14 sherds). Forms included: Young M22, a common form after *c* AD300, but produced from *c* AD 240; Young type M17 and M18, both dated AD 240–300, (Young 2000, fig 21, fig 23), and Young C97, dated AD 240–400+ (Young 2000, fig 67). Mancetter-Hartshill mortaria (Fabric 32) were represented by 14 sherds. These were mainly hammerhead types; some reeded (MHC4.12), dated to *c* AD 230–300 or 250–350, some smooth (MHC4.14), dated to AD 250–350, and a residual bead-and-flange form

(MHH8.19), dated to AD 180–230. The rest of the mortaria were residual, including samian, Drag 45 (Mills above), and mortaria from Wroxeter (Fabric 34, 34.2), Verulamium (Fabric 35) and South West England (Fabric 37.3), the latter three represented by individual sherds.

Oxfordshire red colour-coated ware (Fabric 29) was most common in this period, represented by a range of forms: Young C8 (FFC1.27), dated AD 240–400+; C25 and C26 (BKF1.01) both dated AD 270–400+; C51, dated 240–400+; C44, dated AD 270–350; C45, dated AD 270–400; C61, dated AD 350–400+; C63, dated AD 340–400 (Young 2000, figs. 53, 55, 57–60). Oxfordshire products also included a handful of parchment ware (Fabric 40) and burnt white ware (Fabric 39). Nene Valley ware (Fabrics 28, 28.1) was also more common in this period, the only forms being a pentice-moulded beaker and a dish (Fig 109.134, 135, Howe *et al* 1980, fig 5.55–57, fig 7.87).

Ten sherds of shell-tempered ware (Fabric 23) were recorded. This is a small but significant quantity; more than found in any other period on the site, and more than found at the neighbouring City Campus site (Evans *et al* 2014, 31) or, for example, at Deansway (Bryant and Evans 2004, 280). It is less, however, and represents a lower proportion of the assemblage, than in 4th century deposits at the neighbouring, 14–24 The Butts site (Evans 2011, table 5.10) or the late Roman well excavated at 1 The Butts (Evans 2011, table 3.2). While typically thought to be an indicator of later 4th century activity, as discussed elsewhere (Evans 2011, 89–94; Evans *et al* 2014, 50), the forms (Fig 108.131–3) are types produced at Harrold, Bedfordshire in the late 2nd, the later 3rd and 4th centuries (Brown 1994, fig 26.95, fig 29.173, fig 34.241, fig 37.311). Ten sherds of Pink grog-tempered ware (Fabric 17), another characteristically late fabric, were also recovered: body sherds and a base (*cf* Booth and Green 1989, fig 1.1) from large storage jars.

Lexoux, Central Gaulish samian (Fabric 43.2), was roughly as common as in Periods 4 and 5, reflecting the presence of residual pottery in the assemblage. East Gaulish, Rheinzabern samian (Fabric 43.3), was most common in this period, though this must also be residual. A range of other fabrics were present in small quantities (Table 9).

The profile of the assemblage by vessel class (Fig 132) differed again. Wide-mouthed jars were slightly more common than bowls, these being the two most common classes deposited. Cooking pots formed a more significant proportion of the assemblage than in Period 5, as did dishes, while tankards were less common. The proportion of medium-mouthed jars and beakers remained level (1%).

Wide-mouthed jars occurred in a range of rim forms. Amongst these, the proportion of jars with shorter necks increased, though jars with longer necks were still more common (5% and 11% of the period assemblage respectively). This may reflect a chronological trend. Slightly overhanging rims (Fig 105.32, 33, 6%) and near-triangular rims (Fig 105.31, 3%, Fig 105.42, 2%) were common in both classes, but more hooked rims were also common (Fig 105.35, 5%; 39, 1%). Narrow-mouthed jars were less common. Like the wide-mouthed forms, they had a variety of rims. Longer-necked jars were again most common (11%) but the proportion of short-necked jars increased (2%). Slightly overhanging rims and simple, out-curving rims were most common (Fig 104.14, 3%, Fig 104.13, 3%; Webster 1976, fig 1, A1), followed by pulley rims (Fig 104.15–7, 2%), hooked rims (Fig 104.18–20, 2%) and triangular rims (Fig 104.12, 1%).

The most common bowls were still Severn Valley, medium-to-large flanged bowls with plain (5%) or reeded (4%) rims, but cooking bowls were more common than in Period 5 (5%

compared to 1%). The majority of the Severn Valley ware bowls, in each class, had rims with internal lips and there was again great variation within both groups (BFA/BFB forms, BGA/BGB forms). There was even more variation in the reeded-rim bowls (Fig 106.68–78. Fig 107.79–88), each representing <1% of the period assemblage. These included a number of increasingly complex rim types.

Nearly all the cooking bowls were in BB1. Bowls with pronounced, drop flanges, dating from the late 3rd–early mid-4th century (Fig 108.124, 125; Gillam 1976, fig 4, 45–48) were most common (2%), followed by bowls with only slightly dropped flanges (Fig 108.123; Gillam 1976, fig 4, 42, 44), dating to the mid–late 3rd century. Earlier, residual forms were also present (Fig 108. 122). A few cooking bowls were also recorded in other wares (Fabrics 19, 14 and 15), copying a similar range of forms.

The other bowls were mainly tablewares, though some might have also been used in food preparation. These included small–medium bowls in Severn Valley ware, mainly with elongated-bead rims (Fig 105.45–7; Webster 1976, fig 7, D34–36), rather than bead rims (Evans *et al* 2000, fig 29, BT50–54). There were also short-necked bowls in Severn Valley ware, most commonly with an out-curving rim (Fig 105.49–50; Rees 1992, fig 29.6) but with a range of other rim forms (Fig 105.52; Evans *et al* 2014, fig 28.35), copies of samian form Drag 37 (Fig 105.55; Evans *et al* 2014, fig 28.30; Webster 1976, fig 9, I61), and, in smaller quantities, segmental bowls (BJA). As noted above, a range of Oxfordshire red colour-coated bowls were also reaching this area, and a number of samian bowls were also recovered, presumably residual (Mills above).

As in Period 5, cooking pots, unlike for the cooking bowls, were predominantly in Malvernian wares rather than BB1 (9% and 6% of the period assemblage respectively). All but a handful of the latter were in the wheelmade ware (Fabric 19). The handmade ware (Fabric 3) included some residual tubby cooking pots (*cf* Bryant and Evans 2004 153.8; Darlington and Evans 1992, fig 24.1) as well as a few copies of BB1 jars (Fig 104.1, 2). The wheelmade jars copied BB1 forms, mostly with splayed rims (Fig 108.105, 106, 5% and 2% respectively). The BB1 jars were mainly 3rd century types (Fig 108.119; Gillam 1976, fig 1.7–9, fig 2.10, 3%), or later (Fig 108.120; Gillam 1976, fig 2.11–13, 2%), but included residual 2nd century types (Fig 108.118 and Gillam 1976, fig 1.4, <1%). A few cooking pots in other fabrics were also recorded (Fabrics 12.1, 12.34, 14 and 15), again copying BB1 types.

The dishes were mainly cooking wares. Most of the plain-rimmed dishes were in BB1 (3% of the assemblage), though examples in a range of other wares were also recorded (Fabrics 12.34, 14, 19, 149). Amongst all these, forms dating to the 2nd–mid-3rd centuries (Fig 108.115; DBB16.03, Gillam 1976, fig 5.75–79) occurred in similar proportions to later 3rd–4th century types (Gillam 1976, fig 5.80–83, both 2%). Very few BB1 bead-rimmed dishes were noted (Fig 108.126, <1%) and there were no flat-flanged dishes in BB1. A variety of new, flanged forms appeared in the wheelmade Malvernian ware, including dishes with flat flanges and distinctive internal pattern burnish (Fig 108.109–111), and dishes with impressed or frilled decoration on the flange (Fig 108.112, 113). A few, pattern-burnish decorated dishes were also noted in reduced Severn Valley fabric 12.34. A couple of tableware dishes were noted in Severn Valley ware (Fig 107.91), and one in Nene Valley ware, described above (Fig 109.135). Otherwise the only other dishes were in samian ware, presumed to be, though not necessarily residual by this period.

Tankards with very splayed walls, dating to the 4th century, were most common (6%; Fig 104.6-7; Webster 1976, fig 7, E44), followed by broadly 2nd–3rd century types (3%; Fig 104.5; Webster

1976, fig 7, E42–3). It is also worth noting that lids, while never common, were more common in this period assemblage.

Quarry pit CG1108 and the upper fills of CG1057

As noted above, the finds from the main fills of quarry pit CG1108 were different in quantity and character to the finds from the upper fills of the pits. It therefore appears that these upper fills represent a separate phase of infilling, perhaps when the earlier fills of the pit had settled, or a dump of material from a different source. One aim of pottery analysis, therefore, was to assess whether differences were apparent in the pottery from these two groups. All fills were assigned to the same stratigraphic period. For the purpose of examining the pottery data, the upper fills of the two quarry pits (6745, 6491, 6520) have, therefore, been classified here as 'AU 510a', to separate them from the main fills of CG1108, classified here as AU510 (Table 19; Figs 133, 134). Roughly 75% of the pottery came from the three upper fills, the largest group coming from fill 6745 (Table 19). The pottery from the upper fills was more fragmentary than the other fills of CG1108, based on average sherd weight. The exception to this was the very small, anomalous assemblage from fill 7051.

Table 19:

AU no	CG no	Context	Count	Weight (g)	Average weight (g)	Rim EVE
510a	1057	6491	852	13,130	15	9.91
	1057	6520	1,589	32,618	21	23.77
	1108	6745	2,595	82,347	32	63.99
total AU 510a			***5,036***	***128,095***	***25***	***97.67***
510	1108	6908	396	16,153	41	9.91
		6986	130	5,624	43	3.04
		7050	338	16,197	48	14.88
		7051	12	103	9	0.00
		7055	66	3,739	57	3.43
total AU 510			***942***	***41,816***	***44***	***31.26***

Table 19: Pottery from Period 6 quarry pit AU 510

A much wider range of fabrics was present in the upper fills. In addition to the fabrics illustrated and listed in Figure 133, a variety of other wares were represented in very small quantities (Fabrics 16, 16.3, 44, 45.4, 98, 98.04, 98.10, 115, 149). While proportions of the main fabrics were broadly similar, some differences may have functional or chronological significance. Malvernian and BB1 cooking wares were proportionately more common in the upper fills. Severn Valley Fabric 12.6 and samian, Central Gaulish and East Gaulish, was more common in the main fills of CG1108.

Differences could also be seen in the vessel profiles of the two assemblages. The upper fills (Fig 134 510a) show a similar pattern to the overall period assemblage, of which they form a significant part. Wide-mouthed jars are most common, followed by bowls and cooking pots in equal proportions. The profile for the other fills (Fig 134 510) is quite distinct, dominated by bowls, then wide-mouthed jars, with dishes and tankards more common than in the overall period assemblage, and cooking pots less common. The most common bowls were Severn Valley ware, medium–large flanged and reeded types (Fig 135 510; BFA/B BGA/B). This contrasts with the upper fills, in which BB1 cooking bowls were more common (Fig 135 510a; BBA), particularly the late 3^{rd}–4^{th} century, drop-flange form (Gillam 1976, fig 4.45–49), which comprised 4% of the assemblage. Although proportionately less common, there was still a wide range of flanged and, in particular, reeded-rim bowls in the upper fills. These included a number of bowls with more complex rims, that seem to be later types and were poorly represented in the lower fills (Fig 107.80, 82–84, 87, 88).

In both the upper and lower fills, 4^{th} century tankards (Fig 135 TD; Webster 1976, fig 7, E44), were more common than the broadly 2^{nd}–3^{rd} century types (Fig 135 TC; Webster 1976, fig 7, E42–3). However, a wider range of characteristically later forms were present in the upper fills. BB1 drop-flange bowls have already been mentioned above. In Severn Valley ware, characteristically later jars with short necks were proportionately more common in these upper fills (Fig 135 JNB, JWB), as were short-necked bowls (Fig 135 BEB), including a form dated elsewhere to the mid-3^{rd}–4^{th} century (Fig 105.48–50; Rees 1992, fig 29.6). A number of Oxfordshire red colour-coated forms were recorded from the upper fills: Young C8 (FFC1.27), dated AD 240–400+; C25 and C26 (BKF1.01) both dated AD 270–400+; C51, dated 240–400+; C44, dated AD 270–350; C45, dated AD 270–400; C63, dated AD 340–400+, and C97 mortaria, dated AD 240–400+ (Young 2000, figs. 53, 55, 57–60, 67). The only Oxfordshire forms from the lower fills were C45 and a white-ware mortarium dated *c* AD 240–300 (Young 2000, fig 21, M18). There were also 4^{th} century, Nene Valley ware forms in the upper fills; a pentice-moulded beaker and a dish (Fig 109.134, 135, Howe *et al* 1980, fig 5.55–57, fig 7.87). It is also significant that 4^{th} century, BB1 cooking pots (Gillam 1976, fig 2.11–13) occurred in similar proportions (*c* 3% each by rim EVE) to the 3^{rd} century types (Gillam 1976, fig 1.7–9, fig 2.10). There were no diagnostically 4^{th} century cooking pots in the lower fills, where 3^{rd} century forms represented 5% (JCB7.21). Another significant variation between the groups is that Malvernian cooking pots greatly outnumbered BB1 forms in the upper fills, but were less common than BB1 in the lower fills (Fig 135 JCB, JCM).

Residual pottery was present in both groups. A very crude estimate of this, based on quantifying some diagnostically earlier fabrics (organic tempered Severn Valley ware, samian, white slipped ware, micaceous wares and Fabric 34 mortaria) suggests that at least 4% of the pottery from the upper fills was residual, but at least 17% of the pottery from the lower fills. However, the real picture is more complicated than this. The upper fills produced a number of earlier forms; Severn Valley ware carinated bowls (Fig 135 BHA; Webster 1976, fig 9, H59–60), and in BB1, flat-flanged and grooved-flange bowls (Fig 135 DAA; Fig 108.121, 122; Gillam 1976, fig 3.41, 42). BB1 plain-rimmed dishes dating to the 2^{nd}–early 3^{rd} century (Fig 135 DBB; Gillam 1976, fig 5.75–79) were more common than late 3^{rd}–mid 4^{th} century types (Fig 135 DBA; Gillam 1976 fig 6.80–83) in the upper fills, and occurred in roughly the same proportion as the later type in the lower fills.

Robbing of the timber well (CG 1015)

The contexts associated with the Period 6 robbing of the timber well produced 1054 sherds (Table 5). The pottery data from these deposits was compared to the patterns noted for the Period as a whole. The assemblage differed in a number of ways and was dominated by Severn Valley Fabric 12 (47% by weight), though the proportion of Fabric 12.6 was relatively higher than average for the period (21%). These relative proportions are more similar to those for Period 5 and the main fills of the quarry pit (Fig 135, 510). There was a surprisingly high proportion of BB1 in this group (8%) compared to Malvernian Fabric 19 (3%). This is not characteristic of the period as a whole or either of the quarry pit groups, and might reflect some more localised activity. Cooking pots were the most common BB1 vessel class represented (10% by rim EVE), with bowls representing 4% and dishes 3% of the CG 1015 assemblage. Malvernian cooking pots were uncommon (2%), and less common than bowls and dishes in these fabrics (3%). The overall proportion of vessel classes differed in that the assemblage was dominated by narrow-mouthed jars (26%), followed by bowls (18%) and wide-mouthed jars (15%). Amongst the bowls, Severn Valley ware flanged and reeded-rim bowls occurred in similar proportions to cooking bowls (each 5%), which is consistent with the pattern for the period as a whole. Tankards made up 12% of the assemblage, and dishes and lids 3% each. Some late fabrics, such as Pink grog-tempered ware (Fabric 17) and Oxfordshire red colour-coated ware (Fabric 29) were present, but there was no late Roman shell-tempered ware (Fabric 23).

Period 6–7

Period 6–7 produced one of the smaller pottery assemblages (Fig 90). The pottery was studied to see if it was possible to characterise the latest Roman pottery use on the site, though from the stratigraphic evidence it was unclear whether features were Roman, Period 6, or post-Roman, Period 7. The largest group came from the timber well pit (AU 524), with much smaller assemblages from the structural components of the aisled building (AU 508) and various other features (Table 5). The overall average sherd weight was fairly high (22g), though lower than for Period 6, and notably lower than the main fills of the Period 6 quarry pit. Average sherd weights also varied between features. One pit (8701) produced only 10 sherds of very fragmentary pottery (average weight 6g). In contrast, features in (AU 522) had an average sherd weight of 53g. The latter mainly came from the fill of a pit cutting the robbed well (cut 6841, fill 6840), which included a mix of 4th century and residual material. The more substantial sherds included two fragments of Dressel 20 amphorae (324g); bases of an Oxfordshire mortarium (Fabric 33.3, 189g), broadly dated *c* AD 240–400+, and a Lezoux samian mortarium (Fabric 43.2, 51g), broadly dated *c* AD 170–200; and the rim from a Mancetter-Hartshill flanged mortarium (155g), dated *c* AD 130–160. The assemblage included further sherds of 2nd century samian (Mills above), as well as other diagnostically 4th century forms, for example a painted, hammerhead mortarium from Mancetter-Hartshill. This assemblage also produced one of the face pot fragments (Fig 112.190). The small assemblage associated with construction of the aisled building (AU 508) included samian and BB1 dating to the 2nd century. This was more useful for dating the disturbed deposits underlying the building than for dating the construction of the building itself.

The fabric proportions for the period (Fig 136) are similar to those for the timber well pit (AU524), as this provided the majority of the pottery studied. Severn Valley wares were again the most common fabrics. The proportion of Fabric 12.6 increased; it was proportionately more common in this period than any other. Amongst the cooking wares, Malvernian Fabric 19 was still more common than BB1, but both represented a lower proportion of the assemblage than in Period 6. Only one sherd of late Roman shell-tempered ware (Fabric 23) was recorded, and three sherds of Oxfordshire red colour-coated ware (Fabrics 29 and 33.3). As noted above, the continuing presence of residual material was indicated by earlier Roman fabrics, such as Lezoux, Central Gaulish samian (Fabric 43.2) and organic-tempered Severn Valley ware (Fabric 12.2).

The profile of the assemblage by vessel class (Fig 137) differed from Period 6, and in some respects was more similar to Period 5. The proportion of wide-mouthed jars increased again. However, while these jars included some later 3rd–4th century types (Webster 1976, fig 5,.C27–

29), forms characteristic of the 2nd–3rd centuries were more common (Webster 1976, fig 4. C22, fig 5, C23–25). The proportion of all cooking vessels decreased; dishes, cooking pots, cooking bowls and lids. This is particularly evident when the data for all periods is plotted together (Fig 138). However, plotting data by period for a range of forms indicated that this assemblage was anomalous and probably unreliable, with earlier forms becoming more common and later forms less common. Plotting the occurrence of Severn Valley tankards provides an example of this. The proportion of tankards was much higher in this period than in Period 6, but this included an increase in earlier forms (Fig 139, Webster 1976 E40–43) as well as later Roman types (Fig 139, Webster 1976 E44). So while this assemblage does include some late Roman material, as a group it cannot be considered representative of late Roman activity.

Functional composition and chronological trends

C Jane Evans

Excavation at the Hive produced the largest assemblage of Roman pottery recovered to date from Worcester, of which 68% by count, 60% by weight was studied for this report. Pottery provided the bulk of the dating evidence for the excavated deposits; even where contexts were not selected for analysis, the pottery was scanned and spot dated to refine the phasing. The dating evidence is detailed in the period discussions above, and summarised along with the evidence from other finds below. There was a clearer stratigraphic sequence on this site than at the neighbouring City Campus site (Evans *et al* 2014, 45), though during excavation there was an emphasis on the later deposits threatened by the development. The presence of two conjoined quarry pits, associated with Period 6 and both fully excavated, significantly increased the quantity of later Roman material. The pottery from only one of these has been included in this study, but this alone makes up 25% of the assemblage by count, 38% by rim EVE. This large group therefore was prioritised for illustration (Figs 104–110.158). The mitigation strategy resulted in minimal threat to the earlier Roman deposits, which explains why relatively few early Roman features were recorded, and partly why the Period 3 and 4 pottery assemblages are significantly smaller than those for Periods 5 and 6. There were, however, some good, earlier Roman pottery groups, for example from the Period 4, east–west roadside ditch. A selection of this pottery has been illustrated (Fig 110.163–5; Fig 111.168, 170, 176, 177, 183; Fig 112.187, 189) to give a flavour of this group.

A tiered recording system was used for recording pottery forms, which allowed them to be classified and quantified by vessel class (eg bowl, dish, jar), by vessel groups (eg medium–large flanged bowl, small–medium bead rimmed bowl, cooking bowl), and specific form type. This, combined with the stratigraphic sequence, allowed for detailed analysis of functional composition and chronological trends.

In previous studies, data from urban and rural sites has been plotted to compare broad functional patterns (J Evans 2001a). The proportion of jars and bowls/dishes in the Hive assemblage (52% and 27% by rim EVE respectively) places it at the edge of what would be considered as an urban site as presented by Evans (2001a, fig 6). This is perhaps to be expected given that the site is in the area thought to be part of the northern suburbs of the Roman town. Evans also compared data for jars and drinking vessels, mainly tankards, on rural and urban sites in the Severn Valley. The assemblage from The Hive, in which tankards and beakers combined make up 12%, sits well within Evans' rural group (2001a, fig 7). While such studies provide useful models for understanding and comparing assemblages, in reality the picture is a lot more complex than broad data sets might suggest. As the analysis above has shown, there are variations in the functional composition within and between period assemblages. Broad classes such as ‘bowl’ and ‘jar’ encompass a range of vessels with distinct characteristics that must have related to function. Bowls, for example, include cooking wares made in coarsely tempered fabrics, often associated with sooting; Severn Valley, medium–large bowls with flanged and reeded rims (Webster 1976, type F) are thought to have been used in food preparation, probably involving liquids (Greene 1993, 38–9, fig 6 type 22; Rawes 1982, 37, 45); fine ware bowls, and perhaps the smaller Severn Valley ware bowls, are more likely to be tablewares. Jars also include cooking wares, along with storage jars with both open (wide-mouthed) and constricted (narrow-mouthed) mouths, the latter arguably better suited for storing and transporting liquids. The recording system has allowed more nuanced trends to be assessed. Data for Periods 3 and 6–7 are not considered reliable; the Period 3 assemblage is too small and, therefore, biased by the presence of individual forms, while the Period 6–7 assemblage is chronologically mixed. Some of the patterns revealed by this analysis clearly relate to chronological trends, while others may reflect functional changes in the assemblage.

Cooking bowls, dishes and lids (mainly in Malvernian fabrics) increase from Periods 4 to 6 (Fig 138), as do mortaria. These data include residual forms as well as contemporary vessels in each period. For example, analysing the data for BB1 bowls in more detail (Fig 140), mid-2nd century bowls (Gillam 1976 34, 35–7) decline from Period 4, mid–late 2nd century bowls (Gillam 1976 38–41) are most common in Period 5, while mid–late 3rd century and late 3rd–4th century types (Gillam 1976 44, Gillam 1976 45–49) are most common in Period 6. The changing proportions of cooking pots appear, on initial inspection, more erratic (Fig 141). These data include three fabrics with different chronological patterns (Fig 91): tubby cooking pot in Malvernian Fabric 3 is a 1st–2nd century type which then goes out of use; cooking pots in Malvernian Fabric 19 become increasingly common through time; BB1 cooking pots are well dated so more complex chronological patterns can be seen. They were most common in Period 4. The proportion of 2nd century types (Gillam 1976 1–5) drops off sharply after this, rising again slightly in Period 6–7, when early material was being redeposited. Both 3rd century and late 3rd–4th century types (Gillam 1976 7–10, 11–12) were most common in Period 6. In general, the Malvern potters seem to have been a more important source for cooking jars, and the Dorset BB1 potters for bowls and dishes.

Returning to bowls, the broad category of ‘other bowls’ was more common in Period 4, with roughly similar, lower proportions in Periods 5 and 6, and a slight increase in Period 6–7 (Fig 138). Once again, there are more complex patterns within the data. The characteristically early forms are, as expected, most common in Period 4 (Fig 142). This is particularly evident with the necked bowls (BEA) and carinated bowls (Webster 1976, fig 9.H59–60), both 1st–early 2nd-century types. The samian bowls decline steadily though time. These date mainly to the second half of the 2nd century (Mills above), but the latest examples were produced in the 3rd century and may have continued in use for some time after this. The slight decrease in the Webster type D small bead-rim bowls is less expected, and should be reviewed as more well-stratified assemblages are quantified and published. The increase in necked bowls in Period 6 reflects the presence of new, later Roman types in this category (BEB) as well as the diagnostically early Roman types.

Medium–large flanged and reeded bowls form a significant element of the assemblage. These show a marked increase in Period 5 but are slightly less common in Period 6 (Fig 143). It is not clear whether this decrease indicates a real chronological trend, or whether the proportions are simply depressed by the high quantity of cooking bowls in the Period 6 assemblage. Amongst the tablewares, copies of samian forms in Severn Valley ware increase from Period 4 to 5, then also dip down. The dominance of cooking bowls in this late assemblage must again be a factor, but this may also reflect the increasing supply of Oxfordshire products, red colour-coated and parchment ware bowls, in Period 6.

Jars were classified as narrow-mouthed, medium-mouthed, and wide-mouthed jars. Medium-mouthed jars show a clear chronological trend, with proportions of these typically late 1st–early 2nd-century forms dropping from Period 4. The proportions of narrow-mouthed jars remain fairly level, dipping a little in Period 6 (Fig 144).

Some types most common in Period 5 include narrow-mouthed jars, tankards, flagons and large storage jars. Arguably, these are a mainstay of the Roman repertoire, with a basic function of storing liquids. This group also comprises a range of forms, revealing different chronological trends (Fig 145). Wide-mouthed jars show a different pattern, becoming more common through time, a pattern which actually continues into period 6–7). These also include a variety of forms, but the chronological trends for these were less pronounced and are not, therefore, presented here.

Amongst the vessels most closely associated with drinking, tankards and flagons, were most common in Period 5 (Fig 144). A more detailed breakdown of tankard forms, which are well dated, has already been presented as part of the Period 6–7 discussion (Fig 139). Beakers, in contrast, were most common in Period 4, after which proportions decline. Time constraints has prevented any review of the dates of individual beakers or flagons by period, to assess whether these proportions reflect real chronological trends or are clouded by the presence of residual vessels. This is something that could be done in a future study. Large storage jars show a very similar pattern to flagons.

This is the most detailed analysis undertaken of both fabrics and forms from a Roman assemblage in Worcester in relation to a defined stratigraphic sequence. It is, however, an urban site containing elements of primary and secondary deposition and disturbed and truncated ground; therefore it was not always possible to conclusively identify residual material. Some of the well dated types have informed the phasing of the site, so will inevitably show clear chronological trends, but these are supported by analysis of other datable fabrics and forms. A lot more detailed analysis could be done on the data recorded, as part of a research-based project. Many more forms were identified and classified than could be illustrated within the constraints of a developer-funded project. These could be used as the basis of a Roman pottery form-type series for Worcester, along with forms from other published assemblages, which would be a valuable reference resource, improving consistency of recording and thus improving comparability between assemblages, and this could also be used for assemblages from the wider region. It has not been possible to make physical comparison with the fabrics defined by Jerry Evans for the Magistrates' Court site, or to visit other fabric-type series to compare some of the more unusual fabrics. Further work in the city, and wider region, would be greatly enhanced by the creation of a regional fabric-type series. Future archaeological work in the city could aim to focus on well-dated groups that should be analysed and published in full. The focus here, and at the neighbouring 14–24 The Butts, has been on the later Roman pottery, but both sites also produced some good 2nd century groups that could not be fully published within the financial constraints of the projects. The evidence for rubbish disposal and household activities is discussed in the concluding synthetic section of the report, integrating data from all finds (Discussion).

Roman coins

Cathy King and C Jane Evans, with Sam Moorhead

88 Roman coins were recovered from The Hive excavations, of which 66 could be closely enough identified to be assigned to specific chronological periods (Table 20). These ranged in date from the 1st century to the late 4th century. Many of the coins were encrusted or had bronze disease, so it was not possible to assess patterns of wear in any detail.

This is the largest assemblage of coins excavated to date from Worcester (Table 21). Far more coins were found at The Hive than from other excavations in this area of the city, though it should be noted that the nine coins from 1 The Butts all came from a single feature. No coins were found at the nearby New Police Station site on Castle Street (Edwards *et al* 2002). Excavations at The Hive also produced the latest coin from the sites listed in the table.

Sixty four coins came from stratified Roman deposits; the remainder being residual finds from post-medieval and modern deposits, or unstratified finds. The great majority of coins (58%) were associated with Period 6 (Table 22); nearly half the assemblage coming from the quarry pits (43 coins).

Most of these came from two upper fills of quarry pit (CG 1057; fill 6491, 21 coins; fill 6520, 12 coins; Table 23). These upper fills were different in character to the lower fills of the quarry pits, with higher quantities of finds in a range of categories, suggesting a different, and probably later, source for the material dumped in them. One explanation for this concentration might be that it simply reflects the character of later Roman activity in this area, with more conspicuous economic activity taking place. However, another possibility considered was that the group represented a disturbed hoard.

The coin data was therefore sent to Sam Moorhead, principal investigator on a British Museum/Leicester University project researching hoards and hoarding in Roman Britain. Analysis of the data (Sam Moorhead pers comm) suggested that the coins from fill (6491) were unlikely to be a dispersed hoard, the chronological spread being too wide (*c* AD 260–*c* 360). The date range of the coins from the fill below this (6520) was much tighter, *c* AD 260–85 if the coin of *c* AD 310–17 is interpreted as intrusive, so may well represent a small radiate hoard. Any further interpretation is hindered by the fact that the assemblage has been redeposited; it is uncertain for example whether this would have been a small group of coins kept for economic reasons, coins kept along with some of the associated metal finds as scrap metal, or part of a ritual offering. The possibility of a hoard was considered, but ruled out, for the coins from the late Roman well at nearby 1 The Butts (Napthan 2011a, 31). The density and distribution of coins there, coming from a number of fills, was thought to be more indicative of 'accidental losses in a public area where money regularly changed hands'. The coins there were deposited in the 370s or 380s, and probably towards the end of that period given that a number of them showed significant wear. This interpretation may be correct, but it is worth noting that the late Roman infilling of wells, and the associated deposition of coins, has been attributed more ritual significance elsewhere, for example at Silbury and *Cunetio* (Moorhead 2013; Moorhead 1997). This evidence is perhaps something that could be considered should the opportunity arise for more detailed research on Roman coins from Worcester.

The assemblage was quantified by Reece coin loss period (Table 24; Reece 1991), and compared with the significant body of data available through The Portable Antiquities Scheme, provided by Sam Moorhead (Table 24; Figs 146–147). Most coins from The Hive date to the later Roman period, reflecting wider patterns of coin use and loss. However, the proportion of Reece Period 13 (AD 260–75), Period 14 (AD 275–96) and Period 15 (AD 296–317) coins is higher at The Hive than in the PAS data for Worcestershire (Fig 146) and the national data (Fig 147). The particularly strong Period 13 peak may support the suggestion that a hoard could be included amongst the coins dating to this period, though the main occupation on site appears to have been from the later 2nd to early 4th century which would correlate well with the coin dates. Cathy King notes that coins dating to between AD 260–286 also dominate the assemblage from Deansway (King 2004, 454), but the proportion is noticeably higher at The Hive (32% of the assemblage here, 20.4% at Deansway). This may reflect the peak period of activity both in the wider settlement and on site at The Hive. It is relatively unusual on British sites to have a higher percentage of 4th century coins from the years before AD 330, most having much larger numbers of coins from the years between AD 330 and 364. This is clearly illustrated in the coin loss plots. As well as having the higher proportion of Reece Period 15 (AD 296–317) coins noted above, The Hive assemblage also lacks the significant Period 17 (AD 330–348) peak apparent in the wider data sets, and includes no Period 19 (AD 364–378) coins. This potentially supports the other evidence for the absence of occupation on the site from the early 4th century, prior to redevelopment in a different form during the latter half of the 4th century. The Hive assemblage has a higher percentage of imitative coins (*c.* 43%) for the period between AD 330 and AD 348 than Deansway, which has only one imitative coin identifiable amongst its 4th century coins.

The evidence from the Hive hints at economic trends and reveals varying patterns of deposition, including a possible hoard. This data needs to be reviewed in detail alongside coin evidence from other sites in the Roman settlement, to investigate broader patterns of coin use and loss, and thus perhaps fluctuations in the economy of this Roman small town. This is beyond the scope of this project but would be a valuable subject for future research, particularly given the quantity of comparative data from surrounding rural sites now available from PAS.

Table 20

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Comments	Imitation	Reference	SF no	Context	CG no	AU no	Period
[ ]CAES[ ]	Vesp/Titus	Illeg, S C	Sest	Rome	69	79	As/Dp	AE								
[ ]VESPASIAN[ ]	Vespasian	S C, figure standing left		Rome	69	79	As/Dp	AE				117	6340	1004	501	3
IMP CAES DOMIT AVG[ ]	Domitian	VIRTVS AVGVSTI S C, Virtus standing right		Rome	81	96	As/Dp	AE				181	unstrat			
[ ]MIT[ ] PF[ ]	Domitian?	Illeg		Rome	81	96	As/Dp	AE				36	6577			13
Head, right	Illeg	Illeg	Illeg		96	388		AE	broken			327	8623	1023	509	12
Illeg	Illeg	Seated figure, l			*c* 98	192	AE core of pl denarius	AE	broken	imitation?		07	6005			11–12
Illeg	?Hadrian	Two figures standing facing each other			*c* 117	138	AE core of pl den	AE		imitation		08	6181			13
[HAD]RIANVS [ ] CAES [ ]	Hadrian	Aeternitas standing right, S C		Rome	117	138	As/Dp	AE			BMC Had, pl 79, 14	175	6951	1087	523	5
[ ]ONINVS[ ]	A Pius?	Illeg		Rome	138	161	As/Dp,	AE			cf RIC, 2, 1, pl 4, 65	192	7045	1057	510	6
[ ]COMMODVS [ ]	Commodus	Figure standing left		Rome	180	192	Sestertius	AE				29	6010	1099		12
Diademed head, r?	Illeg	Illeg		Illeg	193	388		AE				01	6005			11–12
[ ]SEV ALE[ ]	Sev Alex	Illeg			222	235	Den, plated	AE		imitation		109	6853	1069	519	5
Radiate head, r	Illeg	Illeg			*c* 260	286	Ant	AE		imitation		324	2556	1036	513	10
Radiate head, r	Illeg	Standing figure, left	[ ] NST	Arles	*c* 260	286	Ant	AE		imitation	cf LRBC238a image	12	6156	1059	516	10–12

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Comments	Imitation	Reference	SF no	Context	CG no	AU no	Period
Head, radiate r	Illeg	?Spes, walking left			260	286	Ant	AE				05	6160	0		
Radiate head, r	Illeg	Figure standing left			*c* 260	286	Ant	AE	over-struck?	imitation		108	6491	1057	510	6
Illeg	Illeg	Sol, walking left, raising r hand			*c* 260	317		AE				58	6491	1057	510	6
Radiate head, r?	Illeg	Illeg			*c* 260	286	Ant	AE		imitation		92	6491	1057	510	6
Radiate head, r	Illeg	Illeg			260	286	Ant	AE				158	6520	1057	510	6
Radiate head, r	Illeg	Illeg			260	286	Ant	AE				101	6520	1057	510	6
Radiate head, r	Illeg	Illeg	Illeg		260	286	Ant	AE				128	6520	1057	510	6
[ ]LLIE[ ]	Gallienus	PAX [ ] stg l			260	268	Ant	AE				103	6520	1057	510	6
Radiate head, r.	Illeg	Female figure standing left			260	274	Ant	AE				105	6520	1057	510	6
Radiate head, r	Illeg	Female figure standing left			*c* 260	286	Ant	AE		imitation		104	6520	1057	510	6
Radiate head, r	Illeg	Illeg			260	286	Ant	AE				153	6520	1057	510	6
Radiate head, r	Illeg	Illeg			*c* 260	286	Ant	AE		imitation		143	6520	1057	510	6
Radiate head, r	Illeg	[ ] AVG, illeg			*c* 260	286	Ant	AE		imitation		78	6745	1108	510	6
IMP C VICTORINVS [ ]	Victorinus	Illeg			*c* 268	286	Ant	AE	chipped	imitation		111	6520	1057	510	6
[ ]ORINVS P F AVG	Victorinus	[ ]NTIA AVG		Gallic	268	270	Ant	AE				43	6597	1018	508	6–7
[ ]VDI[ ]	Claudius II	[CONSECR] A[TI]O, eagle, head left			*c* 270	286	Ant	AE		imitation		139	unstrat			
[ ]ETRIC[ ] P F AVG	Tet I	Illeg		Gallic	270	274	Ant	AE				44	6491	1057	510	6

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Comments	Imitation	Reference	SF no	Context	CG no	AU no	Period
[ ]TETRICVS[ ]	Tetricus I	LAETIT[IA]		Gallic	270	274	Ant	AE				94	6491	1057	510	6
DIVO [CLAVDIO]	Claudius II	[CO] NSECRA[TIO], eagle, head r.		Rome	*c* 270	274	Ant	AE			Ric 5, 267a	83	6520	1057	510	6
[ ]CVS PIVS	Tetricus I	[ ] AVGG, Laetitia ?, holding wreath			270	274	Ant	AE				149	6745	1108	510	6
C PIV ESV [TETRI] CVS CAES	Tet II	[ ] AVGG		Gallic	270	274	Ant	AE		imitation?		61	6745	1108	510	6
Illeg	Tetricus II?	Female figure walking left			*c* 270	286	Ant	AE		imitation		144	6745	1108	510	6
DIVO [CLAV]DIO	Claudius II	[CONSE] CRATIO, eagle, head left			270	274	Ant	AE				113	6745	1108	510	6
[ ]VS CAES	Tetricus II?	Standing figure			*c* 270	286	Ant	AE		imitation		160	6925	1087	523	5
[ ]CARAVSIV[ ]	Carausius	Illeg		British	*c* 286	293	Ant	AE		imitation		98	6491	1057	510	6
[ ]C CARAVS[ ]	Carausius?	Illeg		British	286	293	Ant	AE				90	6491	1057	510	6
[IM]P CARAVSIVS P F AVG	Carausius	[LA]ETIT}, Laetitia standing left		British	286	293	Ant	AE				60	6745	1108	510	6
[AL]LECTVS PF [AVG]	Allectus	[V]IRTVS AVG, ship left	QC	Colchester	293	296	Ant	AE				156	6840		522	6–7
MAXIMIANVS NOBIL CAES	Galerius	GENIO POPVLI ROMANI	TR	Trier	295	305	Nummus	AE				30	6013	1099		12
Head, right	Illeg	Illeg	SF, field r		295	302	Nummus	AE				13	6156	1059	516	10–12

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Comments	Imitation	Reference	SF no	Context	CG no	AU no	Period
Head, left	Illeg	Illeg			*c* 295	388?		AE		imitation		23	6529	1046	523	5
[ ]ON P F AVG	Illeg	[ ] AVG	Illeg		*c* 295	388	Nummus	AE				159	6839	1015	507	6
[ ]CONST[ ]	Cs I	Illeg	Illeg		295	305	Follis	AE				288	7266	1075	521	5
CONSTANTINVS AVG	C I	SOLI INVICTO	PTR	Trier	309	310	Fraction	AE			RIC 6, 899	40	6417			12
[ ]AVG	Illeg	[ ]GENIO [ ], Sol standing left, holding globe	Illeg		*c* 310	317	Nummus	AE		imitation		115	6520	1057	510	6
[ ]NSTA[ ]	Illeg	[SOLI] INVICTO COMITI	Illeg		310	317	Nummus	AE				290	7267	1015	507	6
IMP CONSTANTINVS PF AVG	C I	[SOLI IN] VICTO COMITI	C/S//	?Lugdunum	310	317	Nummus	AE				279	8802	1049		6
Head, r	Illeg	[SOLI INVICTO CO] MITI, Sol standing l.	S/F// PLN	London	312	316	Nummus	AE				80	6491	1057	510	6
DN CRISPO NOB CAES	Crispus	BEAT TRANQ[ ], altar	PLG	Lugdunum	320	325	Nummus	AE				35	6567	1057	510	6
Illeg	C I	[BEAT TRANQ]LITAS, altar	SR/ PLG	Lugdunum	320	325	Nummus	AE				38	6588	1086	523	5
CONSTANTINVS AVG	C I	DN CONSTANTINI MAX [AVG] VOT XX	{ } TR[ ]	Trier	325	330	Nummus	AE				27	6452			1

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Comments	Imitation	Reference	SF no	Context	CG no	AU no	Period
CONSTANTINVS IVN NOB C	C II	CAESARVM NOSTRORVM VOT X	STR, dot in cresc	Trier	325	330	Nummus	AE			LRBC 31	67	6491	1057	510	6
[C]ONS{TINOPOLIS]	C I	Victory on Prow	Illeg		*c* 330	348	Nummus	AE		imitation		26	6491	1057	510	6
CONSTANTINOPOLIS	C I	Victory on Prow	wr// TRS	Trier	330	335	Nummus	AE			LRBC 77	20	6527	0	0	0
[CONSTAN] TINOPOLIS	CI	Victory on Prow	Illeg		330	337	Nummus	AE				42	6624			12
[ ]NTIN[ ]	Illeg	Illeg, standing figure	Illeg		330	378		AE				247	8657	1089	524	6–7
[ ]CONSTANTIVS NOB C	Cs II	GLORIA EXERCITVS, 1 stan	Illeg		335	337	Nummus	AE				19	6491	1057	510	6
Head, r	Illeg	[VICTORIAE DD AVGG Q NN], two Victs	Illeg		341	348	Nummus	AE				96	6491	1057	510	6
Head, r	Illeg	[FEL TEMP REPARATIO, fh	Illeg		*c* 348	360		AE		imitation		65	6491	1057	510	6
DN CONST[A]NS P F AVG	Cn	FEL TEMP REPARATIO, phoenix on pyre, r	TRS	Trier	348	360	Nummus	AE	broken			71	6823	1015	507	6
IMP MAGNENTIVS[ ]	Magnentius	FELICITAS REIPVBLICE	PAR	Arles	350	353	AE2	AE			RIC 8, 136–7	93	6823	1015	507	6
DN VALENTINIANVS PF AVG	Val II	VOT X MVLT XX	TRP	Trier	383	388	AE4	AE				270	8802	1049		6
Illeg	Illeg	Female figure standing left			2nd	4th		AE	broken			110	unstrat			0
Illeg	Illeg	Illeg			2nd	4th		AE	frags			31	6013	1099		12

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Comments	Imitation	Reference	SF no	Context	CG no	AU no	Period
Illeg	Illeg	Illeg			2nd	4th		AE				48	6158	1098	526	5
Head, r	Illeg	Illeg			2nd	4th		AE	broken			11	6375	1029	509	10–12
Illeg	Illeg	Illeg			2nd	4th		AE	broken			91	6491	1057	510	6
Head, r	Illeg	Illeg			2nd	4th	Nummus	AE				52	6491	1057	510	6
Illeg	Illeg	Illeg			2nd	4th		AE	frags			55	6491	1057	510	6
Head, r	Illeg	Illeg			2nd	4th		AE	frags			148	6520	1057	510	6
Illeg	Illeg	Illeg			2nd	4th		AE	frags			15	6527	0	0	0
Illeg	Illeg	Illeg			2nd	4th		AE	frags			21	6529	1046	523	5
Head, r	Illeg	Figure standing left			2nd	4th		AE		imitation		79	6745	1108	510	6
Illeg	Illeg	Figure standing left			2nd	4th		AE				256	8801	1056		6–11
Illeg	Illeg	Illeg			3rd	4th		AE				95	6491	1057	510	6
Illeg	Illeg	[ ] TOR, Victory?			3rd	4th		AE				45	6745	1108	510	6
Illeg	Illeg	Illeg			3rd	4th		AE		imitation		62	6745	1108	510	6
Head, r?	Illeg	Illeg			3rd	4th	Nummus	AE				221	7160	1098	526	5
Head, r	Illeg	Illeg			3rd	4th		AE				263	8804	1049		6
Head, r	Illeg	Standing figure			3rd	4th		AE		imitation?		272	8851			12
Head, r	Illeg	Illeg			4th	4th		AE				89	6491	1057	510	6
Head, r	Illeg	Illeg	*c* 295–388		4th	4th		AE	broken			69	6491	1057	510	6
Head, right	Illeg	Wreath, vota reverse?			4th	4th	Nummus	AE				53	6491	1057	510	6
Head, r	Illeg	Illeg	Illeg		4th	4th	Nummus	AE				54	6491	1057	510	6

Table 20: Roman coin list

Table 21:

Site	No coins	Date range	Reference
The Hive	88	*c* AD 69–79 to 383–8	This report
Deansway	54	Republican to 364–78	King 2004
Sidbury	29	*c* AD 1–40 to 330–8	Darlington and Evans 1992, 69–72
14–24 The Butts	10	*c* AD 101–2 to 337–40	Nogueira 2011
1 The Butts	9	*c* AD 324–37 to 364–78	Bolton 2011
City Campus	5	*c* AD 196–211 to 286–93	King 2014
Magistrates Court	12	*c* AD 117–38 to 313–18	information from Peter Guest

Table 21: Summary of Roman coins from other Worcester sites

Table 22:

Period	AU no	Feature type	Count	% count
3	501	Ditch	1	1
5	519	Oven	1	1
5	521	Oven	1	1
5	523	Pit	5	6
5	526	Surface	2	2
6		Finds ref	2	2
6		Malting oven (group)	1	1
6	507	Robber pit	4	5
6	510	Finds ref	1	1
6	510	Quarry pit	43	49
6–7	508	Post pad	1	1
6–7	522	Pit	1	1
6–7	524	Pit	1	1
6–11		Layer	1	1
10	513	Ditch	1	1
10–12	509	Pit	1	1
10–12	516	Ditch	2	2
11–12		Finds ref	2	2
12		Drain	3	3
12		Layer	2	2
12		Pit	1	1
12	509	Pit	1	1
13		Finds ref	1	1
13		Layer	1	1
Unstratified			8	9
Total			***88***	***100***

Table 22: Summary of the coins by Period, AU no and feature type

Table 23:

Context	SF no	Start date	End date	Denom
6491	58	260	317	
	92	260	286	Ant
	108	260	286	Ant
	44	270	274	Ant
	94	270	274	Ant
	98	286	293	Ant
	90	286	293	Ant
	52	2nd	4th	Nummus
	91	2nd	4th	
	55	2nd	4th	
	80	312	316	Nummus
	67	325	330	Nummus
	26	330	348	Nummus
	19	335	337	Nummus
	96	341	348	Nummus
	65	348	360	
	95	3rd	4th	
	69	4th	4th	
	54	4th	4th	Nummus
	53	4th	4th	Nummus
	89	4th	4th	
6520	103	260	268	Ant
	153	260	286	Ant
	101	260	286	Ant
	158	260	286	Ant
	143	260	286	Ant
	128	260	286	Ant
	105	260	274	Ant
	104	260	286	Ant
	111	268	286	Ant
	83	270	274	Ant
	148	2nd	4th	
	115	310	317	Nummus
6567	35	320	325	Nummus
7045	192	138	161	As/Dp

Table 23: Coins from Period 6 quarry pit CG1057

Table 24:

Reece period	Dates	No of coins	Per Mills
1	Up to AD 41		
2	41–54		
3	54–69		
4	69–96	4	66.6
5	96-117		
6	117–38	2	33.3
7	138–61	1	16.6
8	161–80		
9	180–92	1	16.6
10	193–222		
11	222–38	1	16.6
12	238–60		
13	260–75	21	350.0
14	275–96	8	133.3
15	296–317	8	133.3
16	317–30	4	66.6
17	330–48	6	100.0
18	348–64	3	50.0
19	364–78		
20	378–88	1	16.6
21	388–402		
Total		***60***	***1000.0***

Table 24: Hive coins by Reece period

Roman small finds and glass

Hilary Cool

The small finds from the excavations at The Hive were overwhelmingly of Roman date where they could be independently dated. Table 25 summarises the identifiable objects by function excluding the timber nails and the less diagnostic fragments. Phasing has been simplified to the latest period where a context is assigned to more than one period. The original catalogue ordered types with multiple occurrences according to the site phasing, but at a late stage new phasing was provided. The text and tables have been revised to take account of this. The catalogue ordering has been left unchanged. In what follows the material is discussed by functional categories and then as a complete assemblage. The small amount of medieval and post-medieval material recovered is detailed separately in Medieval and post-medieval finds.

Table 25:

Function	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8–11	Total
Personal	1	43	80	102	13	8	247
Toilet			1			1	2
Textile		1		1		2	4
Household		1	5	12	2	3	23
Writing				1			1
Buildings			2			2	4
Tools		1	4	1			6
Fasteners		4	6	7	1	1	19
Agriculture		1		1			2
Craft material			1	5			6
Miscellaneous		4	7	4	2		17
Total	***1***	***55***	***106***	***134***	***18***	***17***	***331***

Table 25: Summary of the diagnostic Roman items from the excavation

Personal ornaments and equipment

Personal ornaments and equipment are the largest category of find and the types represented are summarised in Table 26. As may be seen the number is inflated by the number of hobnails recovered, but even without them this would still be the largest category. This is the normal pattern on most Romano-British sites.

Table 26:

Type	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8–11	Total
Brooch		1	5	4	1	5	16
Hair pin		2	7	8		1	18
Bracelet			3	9	1	2	15
Finger ring				2	1		3
Bead	1		1				2
Belt equipment				1			1
Shoe sole			1				1
Hobnail		40	63	78	10		191
Total	**1**	**43**	**80**	**102**	**13**	**8**	**247**

Table 26: Summary of the personal ornaments and equipment (the phasing is simplified as for Table 25)

Brooches (Fig 148)

A dozen complete and fragmentary bow brooches were recovered (no 1–12) together with a sprung brooch pin (no 13) which from its length almost certainly also came from a bow brooch.

Several of these show unusual features. In what follows where Hull Forms are referred to, this typology is usefully summarised in Bayley and Butcher 2004.

There were five Colchester Derivative brooches with the Polden Hill method of spring fixing which is typical of the western part of Britain (no 1–5). In this the spring is held by a bar running through the spring with the ends lodged in the ends of the spring cover, and the chord held by a lug or hook on the head. One of these (no 1) came from a small example of the light form (Hull Form 97; Mackreth 2011, 70, Type CD PD 2). This is the earliest brooch in the group as the form appears to have developed in the mid-1st century. Whilst some are found in 2nd century contexts, the early date of this example is suggested by the possible perforation in the catchplate. It is clearly residual in its Period 4 context. Where the catchplates are preserved in the other Polden Hill brooches (no 2 and 5) they are solid, indicating none need belong to the earlier part of the form's life which runs from the mid-1st to mid-2nd century. No 2 is a classic example of the plain Dolphin form and no 3 of the heavier form with moulded bosses (respectively Hull Form 98; Mackreth 2011, 72–44 type CD PH variants 4b and 4i). No 4 belongs to Mackreth's enamelled variant CD PH 8 (Mackreth 2011, 80), which has a strong regional presence a little to the south of the west midlands. The final Polden Hill brooch (no 5) has unusual projecting bosses on the narrow bow.

Brooch 6 is also unusual. The general form is often referred to as a Wroxeter brooch but the normal pin-fixing arrangement for these is either the Polden Hill system or a hinge (Mackreth 2011, 110). Here though the chord is clearly held by a rearward facing hook. The closed ends of the spring cover show no obvious perforations to hold a bar in the Polden Hill manner, though it might be suspected that one is lodged within the spring cover, if only for the fact that despite coming from a Period 12 context, the spring is still in place. The rearhook method of holding the spring was famously unsatisfactory as the spring could easily become detached. The type as a whole has dating that suggests the main floruit was the end of the 1st century and the 2nd century. Use of the rear-hook though is a mid-1st century trait and so that might suggest this brooch was made in the earlier part of the life of the form. The main focus of the distribution for the type as a whole is in the midlands, and a west midland focus for its manufacture would seem likely given both the use of the Polden Hill style of fastening and the panelled enamel on the upper bow which is often a features seen on the contemporary 'T' brooches of the lower Severn (eg Bayley and Butcher 2004, 138).

Three trumpet brooches were found, though one (no 8) can only be approximately identified because of its fragmentary and corroded state. Superficially no 7 looks like a classic example of what is sometimes called a Backworth brooch with a central knob consisting of petalloid mouldings either sides of a central button with the mouldings running all around the bow and with a loose headloop (Hull Form 158, Bayley and Butcher 2004, Group A; Mackreth 2011, 115 TR 1). In addition, however, no 8 has a very distinctive head with a beaded edge. Mackreth knew of only three other examples of this and isolated them as his type TR 1.4 (Mackreth 2011, 122). Two were from Alcester in Warwickshire and one from Wycomb, Gloucestershire. This fourth example strengthens the likelihood that this is a west midlands form. Unfortunately as it is from the tillage soil it does not help to identify the date range within the normal mid-1st to mid-2nd century period, though the evidence from Alcester indicates it must have been in existence by early in the 2nd century.

The second recognisable trumpet brooch (no 9), has a cast head loop, a double lug to hold the spring and petalloid mouldings only on the front of the bow with ribs in low relief at the back. Apart from the moulding on the back of the bow these features place it within Bayley and Butchers Group B (2004, 161), whilst the double lug places it within Mackreth's group TR

2. Generally these appear to be part of the later, second century development of the trumpet type. The detail of the ribs at the rear means that once again this is not a common type. Mackreth's corpus, for example provides no precise *comparanda*.

No 5, 6, 7 and 9 have all been noted as unusual brooches, which indeed they are, but it has to be noted that when they were being worn it is unlikely that the unusual features would have marked them out as such to the contemporary viewer. Only modern archaeologists, after all, get excited over spring fixing arrangements and the minutiae of small decorative features. Generally these brooches would have looked to be very similar to all the brooches which everyone else was wearing in the area in the later 1st to 2nd centuries. The same cannot be said of the enamelled brooch no 10. Its cast-on headloop marks it as British and the peltate ring foot is a feature seen on some of the Alcester family of brooches first studied in detail by Richardson (1960). No 10 retains fragments of its original whit metal trimmings, and this too is a feature of Alcester brooches. Mackreth places two brooches similar to no 10, though lacking the lower enamelled crescent, within a sub-type of the 2nd century Alcester group (2011, 126 Type TR 3.4), though it should be noted that these lack the trumpet head, so placing them here is something of a convenience rather than an attribution based on strict typological grounds. The headloop, the little crescent, the peltate foot and the white metal trim all point towards that family and a common origin seems likely.

The more standard Alcester brooches are occasionally found in the Worcester area. One came from the Deansway excavations (Mackreth 2004, 438, no 12, fig 246) and another from Sidbury (Mackreth 1992, 77, no 4, fig 38), but they are not a local type. Bayley and Butcher (2004, 170) have drawn attention to the fact that in general the Alcester group share an alloy composition with the standard Backworth style of trumpet brooches trumpet brooches suggesting a northern, and more specifically a north-eastern origin. Mackreth (2011, 126) based on the distribution shown by his corpus favoured an East Anglian origin, though partially that might be the result of inherent biases within it (Mackreth 2011, 3). Favouring a north-eastern origin is the recovery of an unfinished casting for an Alcester brooch in a mid-2nd century context at Castleford in West Yorkshire (Cool and Philo 1998, 49, no 81. fig 13). Wherever precisely no 10 was made one thing is clear, it is not a local west midlands type and whoever wore this relatively large and striking brooch may well have been recognisably not local.

The original wearer of the knee brooch no 11 may also have been a little different from their contemporaries. This is a relatively uncommon variant of the British series of knee brooches (Hattatt 1987, 262 Hull Type 178/9; Mackreth 2011, 191 Type KN Br 5). Knee brooches were an introduction of the mid-2nd century running on into the 3rd century. By the later 2nd century when these were in use the majority of the population in Britain were no longer wearing bow brooches, the knee brooch is more typically common on military sites than civilian ones.

In addition to the bow brooches, there are three penannular ones. No 14 is technically an example of a Fowler (1960) A3 which is the equivalent of Mackreth's (2011, 213) Type Pen K3 which has a knob terminal with moulding behind. This example though is extremely well made with a moulding at the outer edge of the almost drum-shaped terminals. The knob terminals on A3 penannulars do not normally show such detail. In general the type is of 1st to 3rd century date, but it is possible that no 14 should be regarded as contemporary with its Period 6–7 context, ie a late to post-Roman date. There was a revival of interest in using penannular brooches in the 4th to 5th centuries, and it is clear that new forms and new interpretations of old forms were developing. This piece is in very good condition, in comparison to some of the fragmentary bow brooches which are clearly residual. It also retains fine wire spirals around the hoop, possibly from the pin and it seems unlikely these would have survived in such good condition if it was a disturbed residual piece.

The second copper alloy example (no 15), by contrast is bent out of shape. It has double disc terminals (Mackreth 2011, 213–4, Type Pen k4). Dated *comparanda* are certain for the 1st and 2nd centuries, but they may also have been used in the later Roman period as well. A third penannular brooch in iron (no 16) may also be present but it has been recognised from the X-radiograph only.

1. Light Polden Hill brooch. Copper alloy. Long semi-cylindrical spring cover, closed ends with notches in either end; detached spring of six and nine turn with part of pin, bar runs through centre. Humped oval-sectioned tapering bow broken at upper part of catchplate, possibly along edge of a circular perforation. Present length 24mm, width of spring cover 23mm. Small find 230: 6870: Period 4.

2. Polden Hill brooch. Copper alloy. Short semi-cylindrical spring cover with perforated ends holding bar running through centre of spring of three and four turns with cord running through perforated lug on head; pin missing. Moulded plate either side of humped head; D-sectioned tapering bow with very small forward facing foot knob with rib above; triangular catchplate. Length 46mm, width wings 15mm. Small find 215: 8549: Period 12.

3. Polden Hill brooch lacking foot. Copper alloy. Short stumpy wings with closed semi-cylindrical spring case with ends holding central bar through spring. Ends may have been notched rather than fully perforated, but now damaged. Iron wire spring of three turns either side of missing pin. Cord of spring held by (?) rear hook, now damaged. Humped head with ridge on either side; remains of rounded lozenge shaped mouldings in zig-zag pattern down each side of oval-sectioned bow. Present length 29mm, width of wings 18mm. Small find 75: 6491: Period 6. (not illustrated)

4. Polden Hill brooch; lacking foot. Semi-cylindrical spring cover with perforated ends holding bar running through centre of much damaged spring of possibly three turns on each side of missing pin; cord held by perforated lug on head; very shallow D-sectioned bow with flange on either side; very small diamond-shaped moulding on upper head; flange notched on central part of bow which has reserved lozenges with triangular cells on either side now filled with much decayed enamel, parts of two reserved lozenges extant. Present length 22mm, width of wings 15mm. Small find 51: 6667: Period 6–7. (not illustrated)

5. Polden Hill brooch. Copper alloy. Short semi-cylindrical wings grooved at either end, with closed ends perforated for central bar; spring of three turns on either side of pin, broken at tip; cord of spring held by pierced crest on head which continues as skeuomorph of hook; front of bow has three square projecting blocks; tapering lower bow with very

slightly projecting triangular foot knob. Length 43.5mm, width of wings 15.5mm. Small find 142: 6745: Period 6.

6. Wroxeter brooch variant; complete. Copper alloy. Semi-cylindrical spring cover with closed ribbed ends; spring of five turns on each side of pin, chord held by rearhook; oval-sectioned bow tapering to rounded hemispherical foot knob; upper bow has panel of 10 cells in two rows, infilled by chequerboard of alternate coloured enamel now light and dark green; two ribs running down front of bow terminating in two expansions below the chequerboard, three pairs of knobs on sides of upper and middle part of bow; triangular catchplate with rib running up back of bow. Length 64mm, width of spring cover 26mm. Small find 166: 6834: Period 12.

7. Trumpet brooch. Copper alloy. Trumpet head with single perforated lug behind extending beyond upper edge of head as small knob; spring with two turns on either side running through perforation with cord running around the back of the underside of the head; pin broken at tip. Front of head has double beaded rib running around edge giving the appearance of twisted wire; circular-sectioned upper bow. Central moulding running all around bow, a double moulding above and below a petalloid knob; tapering lower bow; cordon and cylindrical foot knob with centrally projecting knob on underside; underside has ring cell with traces of enamel. Triangular catchplate. Length 53mm, width of head 14mm. Small find 244: 8671: Period 6–11.

8. Trumpet brooch. Very heavily corroded and fragmented. X-radiograph suggests petalloid knob with loose headloop. Head width *c* 23mm. Small find 182: 7020: Period 5. (not illustrated)

9. Trumpet brooch. Copper alloy. Trumpet head with two lugs on back holding central bar with spring of two turns on each side and stump of pin, cord of spring passes in a loop below lugs and is broken; lower part of cast headloop. Rounded triangular section upper bow tapering to central moulding - central knob which consists of three ribs on back of bow and a central rib with three petal mouldings top and bottom , this flanked above and below by concavity terminating in rib on front and back of bow with lozenge moulding on either side on front; triangular-sectioned lower bow with groove parallel to each edge; D-sectioned three-ribbed foot knob; triangular catchplate with upper edge curving up to back of central moulding. Present length 59mm, width of head 14.5mm. Evaluation: 506.

10. Peltate-footed enamelled bow brooch. Rectangular upper bow with concave long sides occupied by two cells with bright blue enamel; semi-circular plate below with down-pointing tips occupied by large cell filled by bright blue enamel; small cast-on headloop on upper edge and rectangular spring case on back with perforation for central bar on either short end; ‘D’-sectioned lower bar with peltate ring at end. Front of lower bow faceted and central band has spots of solder from white metal trim;

front of peltate foot ring has discoloured front probably indicating this was originally trimmed with white metal as well. Rectangular catch-plate with spine running up towards mid bow. Length 63mm, width of upper bow 19mm. Small find 10: 6004: Period 6–11.

11. Knee brooch. Copper alloy. Half disc head with double-lugged spring fastening on back, remnants of spring of two turns on either side of missing pin; hollow-backed arched upper bow; triangular foot; trapezoidal deep footplate. Length 43mm, width of head 21mm. Small find 46: 6158: Period 5.

12. Brooch; two fragments. Copper alloy. Fragment of fantail foot with part of catch plate. Very heavily corroded. Dimensions (largest fragment) 19 x 14mm. Small find 49: 6158: Period 5. (not illustrated)

13. Brooch pin. Copper alloy. Oval-sectioned shank tapering to point, retaining curve from start of spring. Length 53mm, section 2.5 x 2mm. Small find 179: 6492: Period 6. (not illustrated)

14. Penannular brooch. Copper alloy. Circular-sectioned hoop; flat-ended hemispherical knob terminals, rib around end of terminal and double-ribbed collar between terminal and hoop. Two loops of wire wrapped around hoop. Diameter 37 x 34mm, hoop section 4.5mm, terminal section 7.5mm. Small find 251: 8657: Period 6–7.

15. Penannular brooch bent out of shape. Copper alloy. Circular-sectioned hoop; terminals consisting of two flat ended discs. Length (straightened) *c* 100mm (equivalent to diameter of *c* 40–5mm, hoop section 3.5mm, terminal section 6.5mm. Small find 280: 8873: Period 5. (not illustrated)

16. Penannular brooch; hoop fragment. Iron. Approximately half of hoop. Rectangular-section hoop; X-radiograph appears to show end of pin wrapped around hoop, pin appears rectangular in break within crust. Hoop diameter 37mm, hoop section *c* 7.5 x 5mm. 6600: Period 5. (not illustrated)

Hair pins (Fig 149.18, 23, 24, 26, 29)

All the hair pins were made of bone or related material; it is possible that no 26 might be made of ivory. Four different types are represented. There is a single example of a plain Crummy (1983, 19–25) Type 1 pin (no 17) and five of the allied Type 2 where grooves are cut into the top of a slightly tapering, generally conical-headed shank (no 18–22). In addition to what may be termed the classic form of the Type 2 pin, there are also three examples (no 23–5) where the carving into the shank has resulted in a well-defined knob terminal with a cordon below. There are clearly similarities with Crummy type 5 hairpins, represented here by no 26–8, where the head consists of a knob and one or more cordons below and which is of greater dimensions than the maximum shank diameter. The Type 2 variants here, by contrast, have clearly been formed by shaping the shank and then cutting into the upper part to form the decoration, just as happens in the classic Type 2 examples. There are also two examples of the simple knob-headed pins of Crummy Type 3 (no 29–30) and four shank fragments that can be securely attributed to hairpins because they retain tapers to both the point and the missing heads. These shanks would have come from pins of Crummy Types 3 to 6 where the head is of larger diameter than the shank (not shown on table).

The established dating of these pins is that Type 2 are overwhelmingly a 2nd century form and it is likely that most of the plain Type 1 ones were contemporary, though simple items like this are found throughout the Roman period. Types 3 and 5 are normally considered to be late Roman forms. At the City Campus excavations in Worcester (unpublished) both Type 2 and Type 3 were found together in the Period 5–6 quarry pit rubbish which was somewhat at odds with the conventional dating and suggested at least some residuality.

Table 27 shows the distribution of the hairpins from The Hive according to the site phasing. As can be seen here the conventional dating does appear to be reflected. Interestingly, what is here described as the Type 2 variant separates out from the classic form, being represented in the double quarry pit, including two complete examples both from 4th century fills (6492 and 6592). Curiously both these pins are long, which is normally typical of 1st and 2nd century pins and may suggest that they are residual. In discussing the City Campus hairpin assemblage however, attention has already been drawn to the possibility that in this area there may have been a continuing use of long hair pins into the late Roman period. If, as seems possible, the Type 2 variants from this site are a local later Roman form, this might be another example of this phenomenon.

Table 27:

Type	Period 4	Period 5	Period 6 pits	Total
Crummy 1			1	**1**
Crummy 2	2	3		5
Crummy 2V		1	2	**3**
Crummy 3		1	1	**2**
Crummy 5		1	2	**3**
Total	***2***	***6***	***6***	***14***

Table 27: the distribution of bone hair pins according to the site period

17. Hair pin; fragment. Bone. Circular-sectioned shank flattening at one point; shallow conical head. Present length 55mm, shank section 3mm. Small find 294: 6745: Period 6. (not illustrated)

18. Hair pin. Bone. Circular-sectioned shank tapering to point; head pointed with two grooves cut into shank. Length 120m, section 3mm. Small find 229: 6877: Period 4.

19. Hair pin, in two joining pieces. Bone. Circular-sectioned shank tapering evenly to chipped point; conical terminal with four grooves below. Length 99mm, shank section 4mm. Small find 281: 7192: Period 5. (not illustrated)

20. Hair pin. Bone. Circular-sectioned shank tapering to point; conical terminal with two grooves below. Length 104mm, shank section 4mm. Small find 196: 6403: Period 4. (not illustrated)

21. Hair pin; fragment. Bone. Circular-sectioned shank; conical terminal with four grooves below; lower part missing. Present length 56mm, shank section 3.5mm. Small find 39: 6596: Period 5. (not illustrated)

22. Hair pin, fragment. Bone. Circular-sectioned tapering shank; conical terminal with five grooves; tapering evenly, lower part missing. Present length 64mm, section 3mm. Small find 50: 6758: Period 5. (not illustrated)

23. Hair pin. Bone. Oval-sectioned shank tapering to point; head cut into upper part of shank, biconical knob with straight central section and collar below. Length 118mm, shank section 4 x 3.5mm. Small find 183: 6592: Period 6.

24. Hair pin. Bone. Circular-sectioned shank tapering to point; head cut into upper part of shank, biconical knob and collar below. Length 93mm, shank section 4.5mm. Small find 168: 6592: Period 6.

25. Hair pin, fragment. Bone. Circular-sectioned tapering shank; head cut into upper part of shank, biconical knob with straight-sided middle section and collar below. Present length 47mm, shank section 5mm. Small find 24: 6529: Period 5. (not illustrated)

26. Hair pin; fragment. ?Ivory. Circular-sectioned shank tapering markedly to head, also tapering to missing point; head biconical knob with sharp collar below. Present length 52mm, shank section 4mm. Small find 134: 6520: Period 6.

27. Hair pin; head fragment. Bone. Circular-sectioned button knob head with cordon below; circular-sectioned shank. Present length 9.5mm, head section 5mm, shank section 2.5mm. Small find 216: 6911: Period 5. (not illustrated)

28. Hair pin; fragment. Bone. Circular-sectioned shank tapering markedly to head and to broken lower part; oval-sectioned button knob head with sharp cordon below. Present length 45mm, head section 5 x 4.5mm, shank section 3.5mm. Small find 116: 6520: Period 6. (not illustrated)

29. Hair pin, fragment. Bone. Spherical knob head; circular-sectioned shank tapering slightly to head, and to missing end. Present length 66mm, head section 4.5mm, shank section 3.5mm. Small find 286: 7258: Period 5.

30. Hair pin, fragment. Bone. Slightly faceted oval knob head; circular-sectioned shank tapering slightly to head. Present length 48mm, head section 5.5mm, shank section 3mm. Small find 97: 6520: Period 6. (not illustrated)

31. Hair pin; shaft fragment. Bone. Circular sectioned shank tapering to both missing head and tip. Present length 67mm, shank section 4mm. Small find 59: 6745: Period 6. (not illustrated)

32. Hair pin; head missing. Bone. Circular-sectioned shank tapering to (missing) head and bevelled point. Present length 92mm, section 4mm. Small find 189: 7001: Period 6. (not illustrated)

33. Hair pin. Bone. Shank fragment tapering in both directions to broken ends. Present length 40mm, section 4mm. Small find 365: 15050: Period 5. (not illustrated)

34. Hair pin; fragment. Bone; surfaces abraded. Circular-sectioned shank tapering to missing head and point. Present length 60mm, section 3mm. Unstratified: Small find 226. (not illustrated)

Bracelets (Fig 149, Fig 150.47)

As can be seen from Table 26 bracelets are a common find in the assemblage. This probably reflects the fact that the bulk of the material is coming from late Roman contexts when bracelet wearing became much commoner than it had been before. The possibility that some of the fragments could be residual from earlier occupation though cannot be ruled out, as many of the types are ones with relatively long lifespans. There are for, example, two plain shale bracelets (no 35–6). These were in use throughout the Roman period. Cable-twist bracelets such as no 37–43 are the commonest bracelet type in use in Roman Britain, occurring sporadically from the later 1st century and becoming very common in the 4th century (Cool 1983, Group 1). One of those found (no 37) is of a relatively uncommon variant where the wires making up the strands of the cable are of different metals, here copper alloy and iron. Cable twist bracelets made in this way are more frequently found in the early to mid-Roman period, though this example came from a 4th century fill in the double quarry pit. The earliest stratified example from this site comes from a Period 5 context (no 41), though the majority come from the later Period 6 quarry pit fills (no 37–40). The number of cable twist bracelet fragments from these fills contrasts with the absence of any examples of them from the prolific rubbish deposits in the quarry pits found in the City Campus excavations, reflecting the earlier date of the latter.

Another bracelet from a 4th century rubbish fill in the quarry pit is no 44 which is a complete expanding bracelet (Cool 1983, 130 Group III). Like cable twist bracelets these are occasionally found earlier, but were commonest in the 4th century. This is not the case for penannular bracelets such as the plain examples no 45–6 (Cool 1983, 139 Group V). In the West Country there seems to have been a fashion for wearing both plain and decorated penannular bracelets in the 2nd and 3rd centuries. The examples from The Hive came from Period 5 and Period 5–6 contexts in noticeable contrast to the cable twist bracelets which were predominantly from Period 6 ones. A penannular bracelet with grooved terminals was also recovered from the City Campus, though not from a stratified context. The presence of these in Worcester suggests that the fashion may have been prevalent in the upper Severn Valley as well as in the southern part of it.

Given this propensity to wear penannular bracelets in the region before bracelet-wearing was the common fashion it was to become, it is tempting to wonder if bracelets such as no 47 were part of this. This bracelet has a very distinctive form where the snake head resembles a leaf and is twisted back on itself. It forms part of bracelet Group XXXX (40) identified by Cool (1983, 207), five of which were so distinctive as to suggest they came from the same workshop. Two came from Cirencester and the others from Bourton-on-the-Water, Caerwent and Charterhouse. Since then two others have been found at Lechlade (Allen *et al* 1993, 144, fig 95 no 1412) and at Somerford Keynes (Miles *et al* 2007, 257 no 39, fig 93.14). Clearly this is a regional type belonging to the Severn Valley/Upper Thames area. Unfortunately nearly all the pieces are without useful dating information, including no 47 which comes from the tillage soil. The example from Lechlade came from a ditch fill which was filling in the late 3rd century or later based on a coin of Tetricus II, though there had been earlier occupation on the site. Snake-headed bracelets of various forms are known throughout the Roman period (see Cool 1979 for the main Romano-British ones), but the twisted back heads would suggest a 2nd century date might be most likely for this as that is the period when snake-headed finger-rings were showing this feature in Britain.

Given the fact that so much of the assemblage comes from later 3rd and 4th century contexts the virtual absence of the light bangles that normally feature prolifically in 4th century assemblages is curious. The only possible example is a small bent fragment (no 49) that might come from the type with a grooved upper surface (Cool 1983, 157 Group XIX) from a Phase 5 to 6 context. Another example of this family is a simple hooked wire fragment lacking one of the terminals and now bent out of shape. It could belong to Group XXXIII (Cool 1983, 194), but given its deformed and fragmentary state it could as well be a piece of hooked wire that served quite another function.

35. Bracelet; fragment. Shale. Plain, ‘D’-sectioned with convex face near to wrist. Diameter 80mm, *c* 28% of circumference; section 6.5 x 5.5mm. Small find 225: 6745: Period 6. (not illustrated)

36. Bracelet fragment. Shale. Approximately circular-sectioned hoop with inner ridge from manufacture. Approximately one third extant. Diameter 55mm, section 6 x 5.5mm. Small find 17: 6317: Period 12. (not illustrated)

37. Cable twist bracelet. Two copper alloy wires and originally an iron strand forming the third wire, now remaining only as iron corrosion products; right-hand twist. One end broken, other end has one strand forming a small eye, second strand pressed into side. Current length *c* 110mm. Small find 64: 6491: Period 6.

38. Cable twist bracelet; in three fragments bent out of shape. Three wires with right-hand twist; terminals with two strands wrapping around third in a cuff of one turn; terminal wires broken. Length *c* 200mm, section 2mm. Small find 151: 6520: Period 6. (not illustrated)

39. Cable twist bracelet; fragment. Copper alloys. Three wires, right-hand twist; one strand forms broken terminal, other strand forms cuff of one and a half turns. Present length 29mm, section 2 x 1.5mm. Small find 63: 6745: Period 6. (not illustrated)

40. Cable twist bracelet, fragment. Copper alloy. Three wires right-hand twist; one end broken, other end has one strand forming broken

terminal, other strands forming cuff of one turn. Length *c* 60mm, section 2mm. Small find 152: 6520: Period 6. (not illustrated)

41. Cable twist bracelet; fragment. Copper alloy. Three wires , right-hand twist. Length 32mm, section 2.5mm. Small find 34: 6158: Period 5. (not illustrated)

42. Cable twist bracelet; fragment. Copper alloy. Three strands, left-hand twist; slightly squared section; one end broken, other end has one strand forming part of a hook, other strands form a cuff of one turn. Length 75mm, section 2mm. Small find 157: 6840: Period 6 to 7. (not illustrated)

43. Cable twist bracelet; fragment. Copper alloy. Three wires, left-hand twist, oval section. Present length 34mm, section 5 x 4mm. Small find 102: 6823: Period 6. (not illustrated)

44. Expanding bracelet; complete. Copper alloy. Circular-sectioned hoop, expanding junction with turns of seven and nine. Diameter 82 x 80mm, hoop section 3mm. Small find 77: 6520: Period 6.

45. Penannular bracelet; three joining fragments. Copper alloy. Shallow D-sectioned, extant terminal tapers to blunt rounded end. Now bent out of shape and approximately half extant. Original diameter *c* 50–60mm, section 4 x 2mm. Small find 178: 6474: Period 5. (not illustrated)

46. Penannular bracelet; fragment. Copper alloy. Shallow ‘D’-sectioned hoop, expanding very slightly to blunt terminal. Approximately one third extant and bent out of shape. Present length *c* 60mm, section 5 x 1.5mm. Small find 136: 6517: Period 5 to 6. (not illustrated)

47. Snake-headed bracelet; approximately half extant. Copper alloy. Very shallow D-sectioned hoop; one end broken, other tapering to leaf-shaped terminal bent around and back along hoop. Length 105mm; hoop section 6 x 3mm. Small find 9: 6004: Period 6–11.

48. Wire bracelet. Copper alloy. Circular-sectioned wire, one end hooked to loop, other end broken. Current length 130mm, section 1.5mm. Small find 167: 6555: Period 5. (not illustrated)

49. Bracelet fragment. Copper alloy. Shallow D-sectioned, diagonal grooves over upper face; both ends broken, bent. Present length 15mm, section 4 x 2mm. Small find 228: 7193: Period 5–6. (not illustrated)

Finger rings (Fig 150.50-2)

The two copper alloy finger-rings are both 2nd to 3rd century forms, despite them all coming from 4th century contexts. No 50 is a slight example of the simple expanded form which was the main finger-ring type of the 1st and 2nd centuries with use continuing into the 3rd (see Cool 1983, 226 Groups IV to VII for general discussion). The bezel area is obscured but seems most likely to have had bezel decoration soldered on and it did not originally have an intaglio. This might suggest it came from the later part of the form's lifespan when finger-rings were ceasing to be exclusively a vehicle for the intaglio and were becoming decorative items of jewellery as well.

Constricted shoulder finger rings such as no 51 were a 2nd to 3rd century form (Cool 1983, 249 Group XIII) with the ones with flat enamelled bezels like this being more common in the 2nd century.

The two copper alloy rings are common forms whereas no 52 is not because of the material it is made from. This appears to be more likely to be shale rather than jet given its slightly dulled appearance. Items of shale and jet jewellery other than plain armlets like no 35–6 are predominantly a late Roman fashion. Whilst decorated bracelets, beads and hair pins are not uncommon, finger rings are much rarer. The large collection from Silchester, for example, produced only one finger ring compared to 30 decorated bracelets, 17 beads and at least seven hair pins (Lawson 1976). As a consequence dating finger-rings made of this material within the third to fourth century period is problematic. The best collection, for example, comes from York (Allason-Jones 1996, 36–7), but most of these are antiquarian finds without context and none are precisely similar to no 52. By analogy to the much commoner copper alloy rings, no 52 shows features such as the oval outline and the constricted shoulders that suggest a 3rd century date. This would place it somewhat earlier than its Phase 6 context, though it may be noted that the cultivation soils around the malting oven in which it was found also produced no 50 which would have been broadly contemporary with the suggested date. A somewhat similar jet ring, though of circular outline and less well-defined shoulder concavities, was recovered from a 3rd century context at Bays Meadow, Droitwich (Cool 2006a, 194 no 39, fig 133). The ring is very small, a feature noted on the York finger rings, and it would only have been suitable for a child or a woman, and the latter only if wearing it on the upper joint of a small finger.

50. Finger ring. Copper alloy. 'D'-sectioned hoop expanding evenly to oval-sectioned bezel, back of hoop missing; bezel area corroded and retains a ghost of an oval setting that might have been soldered on. Diameter 20mm, hoop section 1.5 x 1mm, bezel section 6.5 x 2.5mm. Small find 274: 8837: Period 6.

51. Finger ring, lacking small part of hoop and one shoulder. Copper alloy. 'D'-sectioned hoop expanding very slightly to extant constricted shoulder with cordon behind. Shallow circular box bezel probably with central circular cell. Bezel probably originally with enamel but now appears uniformly green. Hoop bent out of shape. (The piece has been through sampling and flotation). Current dimensions 14 x 12mm, bezel diameter 6.5mm, shank section 1mm. Unknown Small find? Sample 392: 8655: Period 6–7.

52. Finger ring. Shale (?) shows cracks. Oval outline, D-sectioned hoop expanding slightly to elongated oval flat bezel, chipped down one side; concave shoulders with groove behind. Diameter 21 x 16mm, hoop section 4 x 3mm, bezel section *c* 6 x 2mm. Small find 254: 8802: Period 6.

Beads

The two small disc cylindrical beads are puzzling finds. Though beads of the same shape made of glass were in use in the late Roman period, the material of no 53 is unusual. No 54 is minute and though glass beads of this size were occasionally made, the possibility that this piece is from a segment of a fossil coral should not be ruled out.

53. Bead. Stone. Cream-coloured disc cylindrical. Diameter 4mm, length 2mm, perforation diameter 1mm. Small find 217: Sample 313: 6491: Period 6. (not illustrated)

54. Bead. Stone. Cream-coloured disc cylindrical. Diameter 1.5mm, length 1mm. Small find 231: 6158: Period 5. (not illustrated)

Belt plate (Fig 150.55)

No 55 is clearly a rectangular buckle plate given the central slot for the pin, but lacks any other details that would allow it to be dated. Within a Roman context the most likely date would be in the 4th to 5th centuries (eg Booth *et al* 2010, 286). For much of the Roman period buckles and belt fittings are indicative of a military presence, but by the later 4th century the fashion seems to have spread more widely through society especially in the south-west. The presence of this piece probably reflects this.

55. Buckle plate. Copper alloy. Sheet bent in two to form square plate with two rivet holes at back, slot for buckle pin. Dimensions 25 x 20mm. Small find 99: 6823: Period 6.

Hobnails

If the numbers of hobnails in the shoe sole are included, a total of 216 hobnails were found. These are summarised in Table 28. The first column of this gives the absolute numbers quantified by heads. The second column excludes those where large numbers are corroded together and clearly relate to the disposal of a shoe (no 56 and 67). In the case of no 56 part of the outline of the sole can still be seen. This division has been done to check there is no bias due to the multiple instances, and there does not appear to be any. The pattern of recovery appears to reflect the general pattern of recovery of objects on the site, as can be seen from the 5th column where the iron building nails are quantified. Hobnailed shoes were clearly being worn from the point at which occupation is regularly seen on the site (Period 4), which was also pattern seen in the City Campus site.

What this group does show very well is the importance of a sampling regime for recovering this sort of evidence. Column 3 shows those items found by hand (excluding no 56 and 67) and those found in the samples are in Column 4. Without the sampling and sorting regime, there would have been no evidence for the wearing of hobnailed shoes prior to the mid-3rd century.

Table 28:

Phase	Total	Without 56 & 67	Hand	Sample	Nail
3–6	5	5		5	1
4	40	40		40	8
4–6					2
5	110	61	1	60	48
5-6	2	2	2		2
6	73	48	6	42	60
6–7	10	10		10	12
Total	***216***	***166***	***9***	***157***	***133***

Table 28: Hobnails and building nails from the Hive quantified by numbers of heads present (for explanation of the columns see text)

56. Hobnail. Iron. Two sections of shoe sole, each consisting of two closely packed rows of hobnails in groups of 9 and 15. Diameter of heads *c* 7–8mm. 6570: Period 5. (not illustrated)

57. Hobnail (1). Iron. Head diameter 11mm. Sample 414: 6881: Period 4. (not illustrated)

58. Hobnail. Iron. Pyramidal head. Length 8mm, head diameter 5mm. Sample 311: 6918: Period 5. (not illustrated)

59. Hobnail (1). Iron. Pyramidal head. Length 16mm, head diameter 8.5mm. Sample 358: 7155: Period 3–6. (not illustrated)

60. Hobnail (4). Iron. Length 15.5mm, head diameters 8mm, 9mm. Sample 273: 6466: Period 3–6. (not illustrated)

61. Hobnail. Iron. Two corroded together. Width head *c* 7.5mm. Sample 480: 8559: Period 4. (not illustrated)

62. Hobnails (2). Iron. Pyramidal head. Lengths 17, *c* 10mm, head diameters 10mm, 4mm. Sample 341: 7065: Period 4.

63. Hobnail (2). Iron. Flattened head – length *c* 18mm, head diameter 11mm. Sample 373: 6876: Period 4. (not illustrated)

64. Hobnail (1). Iron. Head diameter 10mm. Sample 264: 6403: Period 4. (not illustrated)

65. Hobnails (2). Iron. Length 16mm, head width 8.5mm. Sample 418: 6885: Period 4. (not illustrated)

66. Hobnails (25). Iron. Pyramidal heads where preserved. Lengths 12–20mm, head diameters 6 to 11.5mm. Sample 316: 6950: Period 4. (not illustrated)

67. Hobnails. Iron. A total of 25 consisting of seven groups corroded together (two of five, three of three, two of two) and four singletons. Head diameter 6mm. small find 271: 8802: Period 6. (not illustrated)

68. Hobnails (2). Iron. Pyramid head. Head width 7mm, length 13mm. 8882: Period 6. (not illustrated)

69. Hobnail. Iron. Pyramidal head. Length 10mm; head width 8.5mm. 7208: Period 5. (not illustrated)

70. Hobnails, (3). Iron. One complete with domed head, two others with broken shanks. Complete – length 15mm, head diameter 9mm; other head diameters 9 and 8mm. Sample 274: 6583: Period 5. Also 1 from Sample 357 from this context – head diameter 8mm. (not illustrated)

71. Hobnails. Iron. Three fragmentary, also domed concretions from heads. Lengths *c* 11mm. Sample 437: 7246: Period 5. (not illustrated)

72. Hobnails (2) Iron. Domed head – length 12.5, head diameter 9mm. Other one not measurable. Sample 305: 6902: Period 5. (not illustrated)

73. Hobnails (3). Iron. Pyramidal head – length 12.5, head width 8mm; shape of head not discernible – length 12mm. Other not measurable. Sample 297: 6845: Period 5. (not illustrated)

74. Hobnail (1). Pyramidal head. Length 18mm, head diameter 8.5mm. Sample 434: 7243: Period 5.

75. Hobnail (1). Iron . Pyramidal head. Head diameter 7mm. Also at least one other shank fragment and one possible additional head. Sample 440: 7255: Period 5. (not illustrated)

76. Hobnails (2). Iron. Larger with flattened head, smaller with pyramidal head. Length 15mm, 9mm, head diameters 6.5mm, 5mm. Sample 323: 6977: Period 5. (not illustrated)

77. Hobnail (1). Iron. Head diameter 9mm. Sample 367: 6981: Period 5. (not illustrated)

78. Hobnail (1). Iron. Length *c* 13mm. Sample 304: 6894: Period 5. (not illustrated)

79. Hobnail (1). Iron. Pyramidal head. Length 12mm, head diameter 8.5mm. Sample 393: 8718: Period 5. (not illustrated)

80. Hobnail (1). Iron. Head diameter 8.5mm. Sample 417: 8833: Period 6. (not illustrated)

81. Hobnail (1). Iron. Length 14mm. Sample 435: 7244: Period 5. (not illustrated)

82. Hobnails (3). Iron. Pyramidal head and two fragmentary. Length 13mm, head diameter 8mm. Sample 432: 8892: Period 5. (not illustrated)

83. Hobnails (5). Iron. Pyramidal head. Length 13mm, head diameters 6, 6, 6.5, 8, 8.5mm. Sample 436: 7245: Period 5. (not illustrated)

84. Hobnails (4). Iron. Two corroded together. Measurements not possible. Sample 287: 6158: Period 5. (not illustrated)

85. Hobnail (5). Iron. Two pyramidal heads – lengths *c* 16mm, head width 6.5mm; head widths of others 9 and 7mm. Sample 293: 6830: Period 5. (not illustrated)

86. Hobnail (1). Iron. Length 11mm. Sample 302: 6911: Period 5. (not illustrated)

87. Hobnails (5). Iron. Length 13mm, head diameters 6–9mm. Sample 292: 6796: Period 5. (not illustrated)

88. Hobnail (2). Iron. Pyramidal head. Length 15mm, head diameter 9mm, 8mm. Sample 278: 6600: Period 5. (not illustrated)

89. Hobnails (4). Iron. Pyramidal head. Lengths 9.5, 8.5, 7.5, 7.5mm. Head diameters 6, 4.5, 4.5mm. Sample 296: 6843: Period 5.

90. Hobnail (2 corroded together). Iron. Shallow domed heads. Length 11mm, head width 9mm. 7137: Period 5–6. (not illustrated)

91. Hobnails (3). Iron. Worn head – length 19mm, head diameter 11mm; others not measurable. Sample 451: 6943: Period 6. (not illustrated)

92. Hobnails (5). Iron. Head diameters where measurable – 8, 7.5, 6mm. Sample 352: 7096: Period 4. (not illustrated)

93. Hobnails (4). Iron. Three corroded together. Length 12mm, head diameter 7mm. 6592: Period 6. (not illustrated)

94. Hobnails (4). Iron. One complete with pyramidal head, three other fragmentary. Length 15.5, head width 9mm. Sample 392: 8655: Period 6–7. (not illustrated)

95. Hobnails (2). Iron. Two corroded together. Length 13mm, head diameter 10mm. Sample 407: 8762: Period 6. (not illustrated)

96. Hobnail (1). Iron. Pyramidal head. Length 14mm, head diameter 8mm. Sample 299: 6823: Period 6. (not illustrated)

97. Hobnail (9). Iron. Pyramidal heads where identifiable. Lengths 13–17mm, head diameter 7.5 – 10mm. Sample 313: 6491: Period 6. (not illustrated)

98. Hobnail (2). Fragmentary. Sample 391: 8706: Period 6. (not illustrated)

99. Hobnails (9). Iron. Pyramidal head. 18.5, 15.5mm, 14mm, head diameter 10, 8.5, 8 (x3), 7.5, 6.5 (X2) mm. Sample 326: 6745: Period 6. (not illustrated)

100. Hobnail (3). Iron. Heads domed or worn. Lengths 15mm, head diameter 7mm (x2), 9mm. Sample 298: 6823: Period 6. (not illustrated)

101. Hobnails (4). Iron. Head diameters – 9, 8, 7mm. Sample 384: 8700: Period 6–7. (not illustrated)

102. Hobnails (2). Iron. One with pyramidal head – length 17mm, head diameter 8mm. Other – length 15mm. Sample 326: 6986: Period 6. (not illustrated)

103. Hobnails (5). Iron. Pyramidal heads were well preserved. Lengths 12–15mm, head diameters 6–8mm. Sample 262: 6378: Period 6. (not illustrated)

104. Hobnail (5). Iron. Fragmentary. Sample 319: 6962: Period 6.

105. Hobnail (11). Iron. Pyramidal heads. Lengths 12.5 – 18mm. Head diameters 6.5–9mm. Sample 310: 6901: Period 5. (not illustrated)

106. Hobnail (2). Iron. Head diameters 11mm, 10mm. Sample 300: 6840: Period 6–7. (not illustrated)

Toilet equipment (Fig 151.108)

Two items can be assigned with some caution to this category. The fragmentary no 107 found in one of the samples seems most likely to have been part of a set of tweezers given the looped hinge preserved. The blue/green rim fragment no 108 has a form that could have come from a bottle, a jug or a bath flask. The neck opening would be very slender for a bottle and the width or the rim would be large for a jug. Both features though would be appropriate for a bath-flask (Price and Cottam 1998, 188–90). These were in use from the later 1st century into the 3rd.

107. Tweezers (?). Copper alloy strip, bent to form hinge, one side broken, other broken at top of arm; also short length of arm detached. Width of strip 4mm. Sample 285: 6561: Period 5. (not illustrated)

108. Bath flask; rim fragment. Blue/green. Rim bent out, up, in and flattened; neck broken flush with underside. Rim diameter 45mm. Weight 10.5g. Small find 357: 6417: Period 12.

Textile equipment (Fig 150.109-10)

Only one of the three bone needles came from a stratified Roman context but all are likely to be of Roman date. In general they are most common in early to mid-Roman contexts (Greep 1986, 198) with examples of Crummy Type 1 needles represented here by no 109, tending to be commoner in the earlier Roman period, whilst Crummy Type 2 with a flattened head (no 110–1) being commoner later (Crummy 1983, 65). An iron needle (no 112) may also be present. It has been identified from the X-radiograph. If it was a needle it would certainly have been used in the working of textiles or leather. The function of bone needles is more equivocal. Though they have long been considered as textile equipment, the interesting suggestion has been made that they may have been part of female hair dressing practices (Stevens 2008, 121). This seems plausible given that bone needles and hair-pins are often found together in contexts such as bath house drain deposits. At the City Campus site attention was drawn to the presence of two bone needles in the quarry pit fills alongside numerous bone hair pins. Here the only bone needle stratified in a Roman context (no 110) also came from a context that produced a bone hair-pin in the double quarry pits which, as has been shown in Table 27, were a prolific source of hair pins.

109. Needle; fragment. Circular-sectioned tapering shank with pointed conical head with oval eye. Present length 70mm, section 3.5mm. Small find 243: 8671: Period 6–11.

110. Needle. Bone. Circular-sectioned shank flattening to blunt-ended head and tapering to faceted point, possibly re-sharpened. Rectangular eye with bevelled short ends. Length 69mm, maximum shank section 4.5mm. Small find 185: 6592: Period 6.

111. Needle; fragment. Bone. Broken circular-sectioned shank becoming flat at broken head. Head retains broken lower end of a rectangular perforation. Present length 58mm, shank section 4mm. Small find 304: 6623: Period 12. (?Crummy 2). (not illustrated)

112. Needle? Iron. Rectangular-sectioned shank tapering to ?Square-sectioned; both ends broken, upper rectangular-sectioned end possibly across the base of an eye. Present length 52mm, maximum extant section 3.5 x 2mm. 6006: Period 4. (not illustrated)

Household (Fig 150.132-4, Fig 152.135, Fig 151.131)

The bulk of this category consists of vessel glass but there is also an interesting group of other utensils.

The complete vessel glass assemblage, including the less diagnostic fragments excluded from Table 25, is summarised in Table 29. As can be seen it overwhelming consists of blue/green vessel glass which is the colour predominant in the 1st to 3rd centuries. There is very little colourless glass which was used for the finer tablewares of the 2nd to 3rd centuries and no light green bubbly glass of the sort that was used in the 4th century. This is curious given the focus of the rubbish disposal on the site was from the mid-3rd century onwards. Even allowing for the fact that some of this rubbish may be derived from earlier occupation, it is still at odds with both the pottery and the coins where 4th century material is present. It is a pattern that has been seen elsewhere in Worcester, as at the Deansway sites 4th century vessel glass was absent there as well, despite there being 4th century occupation.

Identifiable forms are sparse because many of the fragments are from bases and these are less diagnostic than rims. Apart from the two colourless vessels (no 113–4), tablewares are represented by no 115–7. No 115 is from a tubular-rimmed bowl of the mid-1st to mid-

2nd century (Price and Cottam 1998, 78–80). No 116 is the sort of lower handle attachment decoration that is most commonly seen on conical jugs that were broadly contemporary with the bowls (Price and Cottam 1998, 52–7). This suite of vessels is a common one and was well represented on the Deansway sites (Cool and Jackson 2004, 441–2).

Table 29:

Phase	Colourless		Blue/green		Blue/green bottle		Total	
	C	W (g)	C	W (g)	C	W (g)	C	W (g)
4			2	2.51	1	8.85	3	11.36
5	1	0.66	11	8.15	2	28.15	14	36.96
6	1	0.34	13	30.96	8	42.02	22	73.32
6–7			1	3.94	2	6.84	3	10.48
Post Roman			5	15.45	4	10.91	9	23.36
Total	***2***	***1.00***	***32***	***60.71***	***17***	***96.77***	***51***	***158.48***

Table 29: Roman vessel glass by period

(C – fragment count; W – weight)

Containers are represented by the ubiquitous prismatic bottles of the later 1st into the 3rd centuries (no 126–31, see Price and Cottam, 1998, 194–200). Where the shape of the bottle is preserved, the fragments come from square bottles. The one base fragment comes from a small square bottle with a design of a cross inside a circle with triangular corner pellets. A bottle of the same base dimensions and a broadly similar base pattern with the circular moulding replaced by a square one was recorded from Haslingfield by Charlesworth (1966, 39, no 70). This came from the tall narrow form and no 131 may also have come from such a bottle as, where recognisable, they often have corner mouldings. Other containers include at least two small jars (no 118–9 and possibly also no 125).

The scarcity of 2nd and 3rd century tablewares is at some odds with the presence of two copper alloy spoons of that period (no 132–3), both from Period 5 contexts. Both have the bowl type variously described as fiddle or mandolin-shaped (see Strong 1966, 177; Crummy 1983, 69 Type 3). No 132 has been coated with white metal and clearly had an off-set handle. The junction with this is very angular and the upper part of the offset is uneven and possibly coated with solder, and so the handle might have been separately made. Folding spoons with bowls like these are known (Sherlock 1976, 250 Type B) and it is possible that no 133 might have come from such an implement. The stepped junction is very slender and the back is broken unevenly where it would have formed the pierced central element of the hinge. The piece is broken and folded, and there is the possibility that this was a piece of scrap for metal-working by the time it entered the archaeological record. Something similar may have been happening to no 134 from a Period 6 context. This could originally have been an oval-bowled spoon, but if so the bowl has been deliberately flattened and the front bent and snapped off. The broken handle has been bent out of shape.

No 135 from a 3rd century fill in the Period 6 double pit has been tentatively identified as a flesh-hook. This piece is well-preserved with a coating of vivianite. Part of the bar has been twisted and this normally indicates a non-utilitarian piece of ironwork which might have been intended for display, the intricately wrought cauldron suspension chains of the 4th century being a good example of this. No 135 retains a hook at one end and the beginning of a branch going off at an angle in a different plane. All of this would be consistent with the piece coming from a flesh-hook (Manning 1985, 105). The only argument against the identification is that the shaft would be a little more slender than is normal. Given the special circumstances of preservation that deposits of vivianite suggest, this need not be a bar to the identification. Without them the diagnostic features would have been lost to corrosion and all that would have been left was a miscellaneous piece of bar. Smaller flesh-hooks may have been more common than we appreciate. Certainly the recovery of a flesh-hook from within a small town would not be unexpected. They are much more regularly recovered from small towns and rural sites than they are on more substantial urban and military ones (Cool 2006b, 50).

113. Body fragment. Colourless. Convex-curved side; two slender trails. Dimensions 18 x 12mm, wall thickness 1mm. Weight 0.3g. Small find 57: 6491: Period 6. (not illustrated)

114. Base ring; colourless. Tubular-rimmed pushed-in base ring; lower body possibly deliberately grozed. Base diameter *c* 45mm. Weight 0.66g. Small find 344: 7192: Period 5. (not illustrated)

115. Tubular-rimmed bowl; two rim fragments. Blue/green. Wall bent in slightly, tubular rim edge rolled out and down. Present height 12mm. Weight 2.62g. EVE 0.2. Small find 312: 7192: Period 5. (not illustrated)

116. Jug, handle fragment. Blue/green. Side prong of lower attachment retaining convex-curved side. Dimensions 34 x 19mm. Weight 7.56g. Small find 347: 7119. Period 6–11 Tillage soil. (not illustrated)

117. Jug; handle fragment. Blue/green. Fragment from lower attachment with pinched projection, and small part of handle. Dimensions 21 x 19mm. Weight 4.22g. Small find 360: 6626: Period 12. (not illustrated)

118. Jar; rim fragment. Blue/green. Out-turned rim, edge fire-rounded. Rim diameter 110mm, wall thickness 1.5mm. EVE 2.2mm. Small find 135: 6520: Period 6.

119. Jar; rim fragment. Blue/green. Outbent rim, edge rolled in. Rim diameter 70mm. Weight 0.5g. Small find 227. Unstratified. (not illustrated)

120. Base ring. Blue/green. Tubular pushed-in base, small part of wide lower body, base missing. Base diameter 90mm, wall thickness 1mm. Small find 316: 6915: Period 6. (not illustrated)

121. Base fragment. Blue/green. Thick base with outsplayed tubular pushed-in base ring, lower body lying on top of base ring forming a figure of eight fold. Base diameter *c* 45–50mm. Weight 2.8g. Small find 345: 7044: Period 6. (not illustrated)

122. Base fragment. Blue/green. Tubular pushed-in base ring; lower body rests on top of base ring; part of concave base. Base diameter *c* 60mm. Weight 1.5. Small find 346: 7044: Period 6. (not illustrated)

123. Base fragment. Blue/green. Tubular pushed-in base ring; slightly concave base; lower body grozed. Base diameter 65mm. Weight 6.9g. Small find 162: 6492: Period 6. (not illustrated)

124. Base fragment. Blue/green. Flat base retaining slivers from side of base ring. Dimensions 34 x 13mm. Weight 1.41. Small find 170: 6492: Period 6. (not illustrated)

125. Indented body fragments (2). Blue/green. Largest fragment has base of oval indentation with convex-curved lower body sloping in. Dimensions 36 x 34mm, wall thickness 1mm. Small find 200: 6006: Period 4. (not illustrated)

126. Bottle; rim fragment. Blue/green. Rim bent out, up, in and flattened; small part of cylindrical neck. Rim diameter 45mm. Weight 10.34g. EVE 0.14. Small find 352: 6745: Period 6.

127. Bottle; rim fragment. Blue/green. Rim bent out, up, in and flattened; cylindrical neck. Rim diameter 40mm. Present 15mm. Weight 4.24. EVE 0.14. Small find 319: 8662: Period 6–7. (not illustrated)

128. Bottle; cylindrical neck fragment broken at junction with shoulder. Neck diameter 45mm. Weight 7.7g. Small find 329: 8663: Period 6. (not illustrated)

129. Bottle, handle fragment. Blue/green. Edge of upper part of reeded handle with part of return trail. Small find 236: 8662: Period 6–7. (not illustrated)

130. Bottle; handle fragment. Blue/green. Lower part of reeded handle. Weight 13.07g. Small find 322: 7044: Period 6. (not illustrated)

131. Square bottle; base fragment. Blue/green. Base design – circular moulding with small cross moulding in centre, extant corner has triangular pellet. Base width *c* 55mm. Weight 18.19g. EVE 0.28. Small find 332: 8839: Period 5.

132. Spoon; bowl and small fragment of handle. Copper alloy coated with white metal. Mandolin-shaped bowl; rectangular-sectioned handle with off-set with ridge running on underside of bowl. Length of bowl 45mm, width of bowl 28mm. Small find 186: 7025: Period 5.

133. Spoon. Copper alloy. Back of mandolin-shaped bowl and thin broken junction to handle, part of bowl folded; front of bowl and handle missing. Present length 41mm. Small find 154: 6925: Period 5.

134. Spoon? Copper alloy. Back of oval bowl flattened and deliberately snapped across; circular-sectioned tapering handle with broken end, bent irregularly. Present length *c* 75mm, width of bowl 23mm, handle section 3.5mm. Small find 275: 8802: Period 6.

135. Flesh hook(?). Iron. Rectangular-sectioned bar, one end broken across twisted stem; other tapers to broken hook with the stump of a lateral bar at the point where the bar tapers. Now broken in two and coated with vivianite. Present length 147mm, section 10 x 3mm. Small find 191: 6908: Period 6.

Writing equipment (Fig 152.136)

The implement no 136 has been included here as a possible stylus. Normally copper alloy styli are relatively rare as iron was the preferred material. In the West Country/Severn Valley region they are noticeably more common. The preferred form has a splayed triangular blade for the eraser and the handle terminates in a point for the writing end, as can be seen in those from Wilcote (Hands 1998, 58 no 57–60, fig 20). At Nettleton, in addition to these there was also one with a thistle-shaped eraser and a point of smaller diameter than the rest of the shank (Wedlake 1982, 236, fig 103 no 14). The junction between the point and the shaft is marked by a group of mouldings. On no 136 there is an irregular area on one side of the mouldings that could well be the broken stump of just such a smaller diameter point. The other end has a terminal that tapers in thickness and has a bevelled edge as would be appropriate for an eraser.

136. Stylus? Copper alloy. Circular-sectioned shank with moulded section – two barrel-shaped units separated by rib and with one rib above and two below; rounded irregular area in one side, other end has semi-circular eraser of tapering thickness with bevelled edge. Length 69mm, shank section 3mm, width of blade 11mm. Small find 169: 6962: Period 6.

Buildings

The most prolific find in this category is, as always, the iron nail. These are summarised according to number of heads present and by Period in Table 28. Most are fragmentary with only 21 now being complete. The bulk of those are the typical joiners nail size between 40 and 70mm. There are also two between 80 and 90mm and a single very long one of *c* 120mm in length (context 6745, Period 6). This sort of size distribution is typical of that found on most Romano-British sites (Manning 1985, 134). The only other item of structural ironwork was a T-clamp (no 137). A small quantity of cast window glass of the 1st to 3rd centuries was also found (no 138–40).

137. T-Clamp. Iron. Head curves down one side. Length 130mm, width head *c* 40mm. 6566: Period 6–8. (not illustrated)

138. Window glass. Blue/green. Small sliver. Cast matt/glossy. 0.5 cm². Weight 0.7g. Small find 328: 8712: Period 5. (not illustrated)

139. Window glass. Pale green. Cast matt/glossy. Area 3.5 cm². Weight 2.4g. Small find 353: 6556: Period 5. (not illustrated)

140. Window glass fragment. Blue/green. Cast matt/glossy. 1cm². Weight 0.7g. Small find 364: 6438: Period 12. (not illustrated)

Tools and knives (Fig 152.141)

As much of the ironwork was studied solely from the X-radiographs without additional investigative conservation, some of the following identifications should be viewed as probable rather than certain. No 141 has a distinctive shape which has been identified as a slicker used in leatherworking to scrape tanned hides (Manning 1985, 39). Carpentry is represented by no 142. This piece has been conserved and the diagnostic flanges on either side of the blade show that it was a gouge (Manning 1985, 24). No 143 and 144 could be either carpenter’s or a smith’s tool, but their present state means that closer identification is not possible.

There are two possible knife fragments (no 145–6); neither have been investigated to confirm that they do have blade edges. No 145 had a tang that continued the line of the back of the blade and so might have been an example of Manning’s type 11 (Manning 1985, 114).

141. Slicker. Iron. Long blade, one end broken, other end has a tang at 90 degrees to blade, end of tang bending over. Present length 105mm, depth of blade *c* 16mm. 6570: Period 5.

142. Gouge. Iron. Rectangular-sectioned bar with flat head not showing any battering marks; bar tapers to chisel end with slight flanges on either side on one face. Length 132mm, head dimensions 17 x 11mm, width blade 10mm. 6984: Period 5.

143. Punch? Iron. Square-sectioned bar tapering to damaged tip. Length 82mm, maximum width 14mm, minimum width 4.5mm. 6376: Period 5. (not illustrated)

144. Chisel or punch?; now fragmented. Iron. Now all that remains is a bar expanding to a flat head. Present length 66mm, width of head at least 25mm. 6475: Period 5. (not illustrated)

145. Knife, fragment. Iron coated with vivianite. Tang and rear part of blade, back follows the line of the tang. Present length 75mm, depth of blade 20mm. 6908: Small find 193: Period 6.

146. Blade (?), fragment. Iron. Possibly, straight-backed. Length 43mm, width 13mm. Sample 264: 6403: Period 4. (not illustrated)

Fasteners

As is normal there are numerous items in this category. No 147–8 are the type of composite fittings that are frequently found on boxes and chests (see for example those on boxes found in graves at Butt Road, Colchester – Crummy 1983, 85–8). The split pin (no 149) is of the type used to fasten drop handles to such items. The studs and mounts no 150–3 could also have been part of box fittings, though the short shanked pieces (no 150 and 153) are more likely to have been used on leather. Two very small iron nails have also been included in this section (no 156) as they are too short to be joinery nails, and seem more likely to have some use such as fastening upholstery. Two pieces of diamond-shaped pieces of sheet folded in a distinctive fashion have been included in this section. In the medieval period such item were used to mend metal vessels (eg Egan 1998, 176). They occur sporadically in Roman assemblages (Cool 1990, 83, 89 no 51–7, fig 72), but their use at that time is unclear other than as presumably some form of fastener. This example comes from a Phase 6–7 context and so the Roman date is uncertain. The iron from the site in this category includes perforated straps (no158–61) which might have been from hinges or from large chests and a loop-headed spike retaining its ring (no 161).

The conservation of pottery vessels is indicated by the lead H-shaped pottery repair (no 164).

147. Composite stud. Copper alloy hollow hemispherical head with lead alloy infill. Diameter 11mm. Small find 199: 6006: Period 4. (not illustrated)

148. Circular mount. Copper alloy. Part of flat flange and central dome. Some traces of lead alloy. Diameter *c* 25mm. Small find 165: 6482: Period 10–12. (not illustrated)

149. Split pin. Copper alloy. Rectangular-sectioned bar, bent in half with loop end and parallel legs; blunt ends. Length 38mm, bar section 5 x 1.5mm. Small find 74: 6491: Period 6. (not illustrated)

150. Stud. Copper alloy. Flat-headed very corroded. Length *c* 12mm, head diameter 5x4mm. Small find 127: 6006: Period 4. (not illustrated)

151. Stud. Copper alloy. Globular head; square-sectioned tapering shank broken at tip. Present length 20mm, head diameter 7 x 6mm, shank section 2mm. Small find 287: 7258: Period 5. (not illustrated)

152. Stud. Copper alloy. Slightly globular head; square-sectioned broken shank. Present length 19mm, head diameter 2.5mm, shank section 2mm. Small find 162: 6492: Period 6. (not illustrated)

153. Mount. Copper alloy. Rectangular strip with integral rivet at one end. Dimensions 41 x 15mm, thickness 1mm, depth of rivet 6mm. Small find 127: 6006: Period 4. (not illustrated)

154. Diamond clip. Copper alloy. Sheet strip with pointed ends, folded towards centre and folded back to edge; flattened. Dimensions 17 x 15mm, thickness 2mm. Small find 127: 6006: Period 4. (not illustrated)

155. Diamond clip. Copper alloy. Diamond-shaped piece of sheet folded and flattened into rectangular packet. Dimensions 21 x 13mm, thickness 2mm. Small find 250: 8657: Period 6–7. (not illustrated)

156. Small nails (2). Iron. Small flat heads with tapering shanks. Lengths 24mm, 20mm, head diameters 11mm, 9mm. Small find 287: 6158: Period 5. (not illustrated)

157. Hook. Iron. Square-sectioned bar with broken arm and tapering to hook. Present length 38mm, section 5mm. Small find 249: 8732: Period 5. (not illustrated)

158. Strap terminal / bucket escutcheon. Iron. Strap with rounded end and circular perforation. Other end broken. Present length 55, width 33mm, perforation diameter 7mm. 7192: Period 5. (not illustrated)

159. Perforated strap. Iron. Rectangular with one broken end and circular perforation. Present length 38mm, width 22mm, perforation diameter 4mm. Sample 262: 6378: Period 6. (not illustrated)

160. Perforated straps (2). Iron. One a blunt-ended asymmetrical lozenge-shaped plate with circular perforation at widest point; also another perforated plate with damaged edges. Lozenge plate dimensions 94 x 31mm, current thickness 4mm. 6745: Period 6. (not illustrated)

161. Strap. Iron. Strap expanding to rounded upper end where bending through 90 degrees; other end possibly perforated. Present length 62mm, width 21–10mm. 6378: Period 6. (not illustrated)

162. Bolt (?). Iron. Curved shank with drum-shaped head. Present length 55mm, width head 13mm. 6570: Period 5. (not illustrated)

163. Loop-headed spike with ring. Iron. Part of ring held by broken spike. Mineralised wood at top of spike. Present length of spike 31mm, diameter of ring *c* 35–40mm. 8762: Period 6. (not illustrated)

164. Pottery repair. Lead alloy. H profile 18g. Small find 257: 8801: Period 6–11 Tillage soil. (not illustrated)

Agricultural equipment (Fig 152.166)

Two items in the iron from the site might be associated with agriculture or horticulture. In both cases the identifications have been made from X-radiographs. No 165 may be from one of the range of hooks used for pruning etc (Manning 1985, 57–8). No 166 has features that are very similar to those found on a rake tine. In the Roman period each tine was separately made and attached to a wooden beam via a tang (Manning 1985, 59). This piece though has a void on the end opposite to the point and may have been socketed, but without further investigation, the identification must remain tentative.

165. Hook blade fragment. Iron. Triangular-shaped blade, very slightly curved back; surfaces exfoliated and blade edge missing. Present length 55mm, depth 21mm, thickness 13mm. 6491: Period 6. (not illustrated)

166. Rake tine? Iron. Gently curved square-sectioned rod tapering to point, upper end broken across a void. Length 100mm, maximum section *c* 15 x 11mm. 6519: Period 4.

Craft working and small-scale industry

There is a small amount of evidence for the working of copper alloys. From Period 5 this takes the form of casting waste found in pit 8543 (fill 8542). The Period 6 finds were vesicular slag, associated with soil layers (8802 and 8882) and the malting oven (context 8804). The presence of this material is interesting given the suggestion made that the spoon no 133 and the possible spoon no 134 may have been pieces of scrap intended for re-melting. The

X-radiograph of the iron bar no 171 shows slag in corrosion products and the piece was possibly a billet for forging.

One other piece that appears to be residue from a high temperature industry was also found, though has not been otherwise identified (small find 325 context 7092).

167. Casting waste. Copper alloy. Weight 10.98g. Small find 311: 8542: Period 5. (not illustrated)

168. Vesicular slag. Copper alloy. Weight 1.39g. Small find 259: 8802: Period 6. (not illustrated)

169. Vesicular slag. Copper alloy. Weight 6.16g. Small find 264: 8802: Period 6. (not illustrated)

170. Vesicular slag. Copper alloy. Weight 30.92g. Small find 335: 8882: Period 6. (not illustrated)

171. Bar. Iron. Length 85mm, width 32mm. Small find 289: 8804: Period 6. (not illustrated)

Miscellaneous (Fig 152.172, 181, 187)

The more diagnostic of the miscellaneous items from the stratified Roman contexts are catalogued here but call for no additional comment.

172. Rod with decorative end. Copper alloy. Circular-sectioned shank; rectangular-sectioned rectangular terminal with two channels on upper face. Length 44mm, shank section 3mm, terminal section 4 x 2mm. Small find 188: 7025: Period 5.

173. Shank fragment. Copper alloy. Circular-sectioned, one end flattening, other broken. Present length 39mm, section 1.5mm. Small find 72: 6006: Period 4. (not illustrated)

174. Shank fragment. Copper alloy. Circular-sectioned; both ends broken. Present length 27mm, section 2mm. Small find 145: 6533: Period 5. (not illustrated)

175. Shank fragment. Copper alloy. Circular-sectioned, both ends broken. Present length 41mm, diameter 2mm. Small find 171: 6964: Period 4. (not illustrated)

176. Shank fragment. Copper alloy. Circular-sectioned; one end flat, other broken. Present length 57mm, section 1.5mm. Small find 176: 6951: Period 5. (not illustrated)

177. Shank or pin, fragment. Copper alloy. Both ends broken. Present length 22mm, section 1.5mm. Sample 296: 6843: Period 5. (not illustrated)

178. Shank; fragment. Copper alloy. Circular-sectioned shank tapering to point. Present length 20mm, shank section 1.5mm. Small find 235: 8657: Period 6–7. (not illustrated)

179. Shank fragment. Bone. Circular-section tapering shank; both ends broken. Present length 30mm, section 3mm. Small find 198: 6493: Period 3–6. (not illustrated)

180. Shank fragment. Bone. Circular-sectioned tapering shank; both ends broken. Present length 49mm, section 3mm. Small find 150: 6824: Period 4. (not illustrated)

181. Peg or shank. Antler. Oval-sectioned, flat-topped shank; tapering to chipped point. Length 62mm, maximum shank section 8 x 7mm. Small find 318: 8662: Period 6–7.

182. Ring, half. Iron. Diameter 15mm, section 2.5mm. Sample 273: 6466: Period 3–6. (not illustrated)

183. Ring, Iron. Approximately square-sectioned. Diameter 50mm, section *c* 6mm. Small find 207: 7095: Period 4. (not illustrated)

184. Ring, half extant. Iron. Rectangular-sectioned. Diameter 39mm, section 8.5 x 7mm. Sample 302: 6911: Period 5. (not illustrated)

185. Ring. Iron. Diameter 35mm, section 4mm. 6627: Period 6. (not illustrated)

186. Ring; fragment. Copper alloy. Circular-sectioned hoop; tapering slightly to one end. Original diameter *c* 25mm, hoop section 3.5mm. Small find 278: 7192: Period 5. (not illustrated)

187. Bar. Lead alloy. Approximately rectangular-sectioned tapering to rounded point at one end, flattening at other and bent over. Length 88mm, section 18 x 9mm, weight 80g. Small find 323: 7025: Period 5.

188. Stopper. Lead alloy coated with copper alloy corrosion products. Oval. Upper face concave, under face conical. Dimensions 35 x 27mm, depth 16mm, weight 30g. Small find 82: 6823: Period 6.

Overview of the Roman small finds assemblage

The material from The Hive is overwhelmingly of 2nd and 3rd century date. Despite the bulk of the material coming from Period 5 and 6 contexts, ie to be dated after the mid-3rd century, 4th century material is relatively scarce. The absence of 4th century vessel glass might just be part of the local pattern, but the rarity of the normally ubiquitous light bangle bracelets is curious. Glass beads are also lacking and these are another common 4th century find, as the wearing of bead strings was another 4th century fashion. Given the efficiency with which the sampling regime recovered the hobnails, this must be a real absence.

The value of the small finds from The Hive is that is that they provide a good insight into the regional identity adopted in this part of Roman Britain. The area around the Severn estuary to the south had a very distinctive suite of material culture. Regularly in this assemblage, it is possible to see the same features seen further south being repeated. This pattern includes both the use of particular regional types such as the brooch no 4 and the bracelet no 47, and more general traits such as the fashion for penannular bracelet wearing in the second and third centuries, the preference for styli made of copper alloy and possibly the adopting of belts by the males in the fourth century. The area is being influenced by fashions that are more appropriate for the midlands as can be seen by brooches no 6 and 8. On the whole, however, it is the broad Severn estuary area with which the Worcester finds have the most similarities. This can also be seen in material from other Worcester sites. At both Deansway and the City Campus sites there were examples of the nail cleaners with button heads that have the Severn Estuary distribution (Eckardt and Crummy 2008, 66, fig 30, 130). In the Roman period the inhabitants of Worcester appear to have been adopting the same regional identity as the people to the south, rather than developing a separate and distinctive west midlands one.

Roman industrial residues: slag, iron ore and hammerscale

C Jane Evans and Dennis Williams

A total of 4914.14kg of iron slag was recovered, 96.6% of which (4746.55kg) came from Roman deposits dated to Periods 3 to 6–8 (Table 30). Only this material is discussed in the text that follows. As noted in the methodology above (Roman industrial residues), the vast quantity of iron slag recovered during excavation, combined with the absence of features that could clearly be associated with metal working, led to the development of a strategy for recording, selected retention and on-site discard policy, based on advice from David Starley. David Starley scanned a sample of the material, but it was not practical during quantification to visually inspect all individual fragments. This approach particularly affected the large dumps of material associated with later Roman activity. It was noted that much of the slag used for metalling appeared to have been broken down to achieve fairly even surfaces, while other deposits included a wide range of sizes.

Table 30:

Period	Weight (kg)	% weight
3	1.038	0
3–4	10.256	0
3–6	1.332	0
4	33.452	1
4–5	249.509	5
4–6	5.458	0
5	510.346	11
5–6	20.615	0
6	3,896.434	82
6–7	17.847	0
6–8	0.258	0
Total	***4,746.545***	***100***

Table 30: Summary of the industrial residues by site period

The detailed analysis of iron slag from Roman sites in Worcester has been undertaken over a number of years, and the general characteristics of the material are well established (McDonnell and Swiss 2004) as well as the wider chronological and economic aspects of the industry (Jackson 2004a). None of the slag from The Hive was associated with *in situ* metalworking, but its presence must reflect significant iron working somewhere in the vicinity. No detailed scientific analysis was undertaken. A detailed study was made of ironworking waste from the neighbouring site at 14–24 The Butts, where there was also no evidence for iron production (Blakelock 2011). Although The Hive assemblage was much larger, visual inspection indicated that essentially the same types of debris were represented. It was therefore considered that further scientific analysis would show similar compositions.

Additional fragments of slag were noted adhering to clay furnace lining. This is discussed separately in the fired clay section below.

Slag

Very little slag was associated with Period 3 deposits, though this may partly reflect the limited excavation of features dating to this period. Most came from the early roadside ditch (AU501, 1.010kg).

More slag was recovered from Period 4 deposits, dating from the mid-2nd to early 3rd century. The highest concentrations came from the cobble layer under the oven/hearth in Building 2A (AU 503, 10.8kg) and from a pit group on the floodplain (AU 529, 10.584kg). Smaller concentrations came from deposits associated with the construction of the stone well (AU 506, 3.544kg), the re-cut of the east west ditch (AU 502, 2.042kg), pits 7232 (3.952kg) and 6886 (0.982kg), and a range of other features. A substantial amount, although only a sample was retained (58.114kg), was observed at the riverside (AU 551).

A significant quantity came from Period 5 contexts. This was predominantly from layers sealing the cobbled surface (AU 526, 389.971kg) and features cutting this (AU 523, 26.087kg), from surfaces and dumps in Building 3 (AU 521, 30.551kg), from the oven and occupation in Building 2D (AU 519, 19.686kg) and from pits at the rear of the buildings (AU 527, 29.781kg). The slag used as metalling, from the various layers and surfaces, showed signs of wear.

However, the majority of the slag came from later Roman Period 6 deposits (Table 30). Most (Table 31) came from the quarry pits (AU 510), particularly pit (CG 1057; 3708.7kg) and primarily from a single upper layer (fill 6492, 3665.851kg), with small quantities recorded from nine other fills. Most of the slag from the adjoining quarry pit (CG 1108) came from the uppermost fill (6745, 148kg) with much smaller assemblages coming from two other fills. This slag from the quarry pits was not very worn, perhaps suggesting that it came from iron working nearby or perhaps reflecting the length of time the pits were open. A scattering of material was recovered from a range of other Period 6 deposits, including the malting oven and tillage soil around it (CG 1049, 10.352kg), post-pads of the aisled building (CG 1040), robbing of the stone well (CG 1015) and various pits and ditches (CG 1072, CG 1091 and ditch 6468).

This pattern of later Roman dumping, associated particularly with pits and layers, is paralleled at the neighbouring City Campus site (Evans and Williams 2014, table 33). This is consistent with evidence summarised elsewhere (Jackson 2004a), which has indicated that smelting shifted to the northern side of Roman Worcester sometime in the 3rd to 4th century. Furnaces excavated in Broad Street (Barker 1969c) are thought to date to the latter half of the 3rd century, possibly into the 4th. Other extensive slag dumps have been excavated in this area at the Farrier Street site (Dalwood *et al* 1994) and the Kardonia site, also on Farrier Street (unpublished), and the slag dumps re-worked in the 17th century are also in this area (Jackson 2004a). The evidence from another neighbouring site, at 14–24 The Butts, is not so consistent. Of the 60.039kg of slag recorded from Roman contexts there, only 42% came from 3rd and 4th century context, while 44% came from late 2nd century deposits (Blakelock 2011, table 5.3).

Table 31:

Feature type	Weight (kg)	% weight
Oven	15.656	0
Malting oven	0.720	0
Quarry pit	3,862.505	81
Pit	121.688	3
Robber pit	3.701	0
Posthole	2.471	0
Post pad	1.876	0
Construction cut	18.093	0
Ditch	3.970	0
Layer/surface	693.544	15
Well	4.520	0
Floor	1.392	0
Other/unstratified	16.409	0
Total	***4,746.545***	***100***

Table 31: Summary of the industrial residues by feature type

Smelting slag

The slag was typical of that found as a waste product of iron smelting with only a small amount of slag from subsequent smithing processes, though as discussed below hammerscale was recorded in a number of features. The assemblage included tap slag, deliberately drained from the furnace, which has characteristic flow patterns on its top surface and occasional rods of slag that solidified within the furnace tap-hole (also noted at the adjacent City Campus). In a few cases, shrinkage during solidification of these rods had resulted in an internal pipe. It was noted that a higher proportion of tap slag would have been expected if smelting had taken place directly at this site. The remainder of the slag consisted of irregular blocks from inside a furnace, particularly at the hearth bottom, but there were relatively few instances of clay furnace lining adhering to this slag.

Practically all the slag was very dense, with few inclusions or pores, although traces of charcoal were often present. Some large, dense pieces of slag may have elemental iron remaining at the centre. As a result of the inefficient bloomery process used by the Romans, up to 70% of the iron would be left in the slag, which mainly comprises the mixed oxide fayalite (2FeO.SiO2). A useful observation is that this material leaves grey smears when scratched against a hard surface, such as a highly fired tile.

Iron ore

As at the neighbouring sites, City Campus (Evans and Williams 2014) and 14–24 The Butts (Blakelock 2011, 78, fig 5.5), a very small quantity of iron ore was recovered: two fragments were recorded from Period 5, Building 2D (AU 519, 0.281kg); one from the aisled building (AU 508, 0.197kg) and one from the quarry pits (AU 510, fill 6492, 0.083kg), both in Period 6. A further piece was found in the slag deposits at the riverside (Period 4; AU 551). The presence of ore is of interest because of its relative rarity in Worcester; the only two other sites where ore has been recorded are Deansway (McDonnell and Swiss 2004, 371) and White Ladies Close (Jones 2016, table 10). One fragment had possibly been subjected to a preliminary roasting process, under highly oxidising conditions, to drive off water, carbon dioxide and other volatile impurities. Some iron ore was also noted to be adhering to fragments fired clay (Roman fired clay).

Hammerscale

Hammerscale was noted in a number of Roman contexts from which environmental samples were taken (Tables 32 and 33). In most cases this was recorded as ‘occasional’ (82 contexts), but ‘moderate’ (7 contexts) and abundant hammerscale was also noted, the latter from a Period 5 layer (8844) and Period 6 layers associated with the malting oven (8893 and 8894).

Table 32:

Period	**Frequency**	**No of contexts**
3	mod/abt	1
3–4	occ	1
3–4	occ-mod	1
3–5	occ	1
3–6	occ	2
4	occ	18
4	occ-mod	1
4–5	mod	2
4–6	occ	1
5	abt	1
5	mod	3
5	mod-abt	1
5	occ	34
5	occ?	1
5	occ-mod	1
5–6	occ	3
6	abt	2
6	occ	10
6–7	occ	4
6–8	occ	4
Total		***92***

Table 32: Occurrence of hammerscale by period (number of contexts)

Hammerscale was associated with a range of feature types, particularly with Period 5 pits, layers and ovens. The presence of hammerscale associated with some of the oven structures is possibly of interest, though this was only occasional in frequency, so is unlikely to indicate an industrial purpose for these features. Hammerscale was associated with Period 4 ovens in Buildings 2A (CG 1007), 2B (CG 1012) and 3 (CG 1074), and two other possible Period 4 ovens (CG 1102, CG 1109); with Period 5 ovens in Building 2D (CG 1069, CG 1070) and 3 (CG 1083); and the oven in the aisled building (CG 1019).

Hammerscale is usually a good indicator of smithing, even when diagnostic bulk smithing slag is not found (David Starley pers comm). It could, arguably, relate to bar smithing, when large billets were forged down to more tradable bars, an activity that might accompany smelting. Bar smithing, however, would produce a higher proportion of spheroidal hammerscale, being a stage closer to smelting. The three samples of hammerscale available for assessment were all plate hammerscale, though moderate quantities of spheroidal hammerscale were noted in one of the Period 5 pits to the rear of the Buildings (CG 1095).

Table 33:

Feature type	**Period 3**	**Period 3–6**	**Period 4**	**Period 4–6**	**Period 5**	**Period 5–6**	**Period 6**	**Period 6–7**	**Period 6–8**	**Total**
Oven			8		11				4	**23**
Malting oven							3			3
Quarry pit							6			6
Pit		1	4	3	15		1	4		28
Robber pit							1			1
Posthole		2	3							5
Construction cut							1			1
Ditch		1	2							3
Layer/surface	1				13	3				17
Other		1	2		2					5
Total	***1***	***5***	***19***	***3***	***41***	***3***	***12***	***4***	***4***	***92***

Table 33: Occurrence of hammerscale by feature type (number of contexts)

Roman oven material: pre-formed ceramic ovens and plates

C Jane Evans

1103 fragments of oven material were recovered, weighing 110.3kg. The assemblage can be split into two categories of material: fragments from pre-formed ovens and fragments of large ceramic baking plates. The numerous diagnostic and joining fragments allowed the oven superstructure to be reconstructed, and provided evidence for how they and the ceramic plates were manufactured, while the associated dating allowed the chronology of these ovens to be reviewed.

These finds are of national significance. Roman ceramic ovens are rare in Britain and, more generally, anywhere other than the Mediterranean, perhaps because remains are not being recognised (Darling 2012). Fragments of similar material have previously been noted in small quantities on a number of sites across the county (Table 34), but this is by far the largest assemblage excavated to date. The small size of previous assemblages has made reconstruction difficult, and there has been little associated evidence to support interpretation. Of particular importance at The Hive, therefore, is the clear association of some of this material with *in situ* burning.

Table 34:

Context	Site name	Count	Weight (g)
Urban/suburban (Worcester)	The Hive	1,103	110,290
Urban/suburban (Worcester)	City Campus (Crawford 2014)	276	24,807
Urban/suburban (Worcester)	Sidbury (Darlington and Evans 1992)	14	1,367
Urban/suburban (Worcester)	Deansway (Bryant 2004)	27	1,851
Urban/suburban (Worcester)	New Police Station, Castle Street (Griffin 2002)	3	232
Urban/suburban (Worcester)	Condor building (sic; Morgan 2003)	1	?
Rural	Hindlip (Griffin 2010)	206	5,628
Rural	Throckmorton (Griffin 2005)	3	486
Rural	Beckford (Hurst pers comm)	23	5,436
Rural	George Lane, Wyre Piddle (Griffin forthcoming a)	16	1,766
Rural	Linacres Farm (Buteux 1998)	9	726
Industrial (salt production)	Old Bowling Green, Droitwich (Hurst and Woodiwiss 1992)	117	?
Industrial (pottery production)	Hygienic Laundry kiln, Malvern (Peacock 1967, fig 4 80–2, 86–8)	6?	?

Table 34: Quantification of pre-formed oven and oven plates from other Worcestershire sites

Table 35:

	Period	Count	% count	Weight (g)	% weight	Average weight (g)
Roman	3–5	78	7	5,134	5	66
	3–6	6	1	477	0	80
	4	25	2	2,469	2	99
	4–5	3	0	70	0	23
	4–6	6	1	426	0	71
	5	440	40	28,482	26	65
	5–6	20	2	2,797	3	140
	6	323	29	40,734	37	126
	6–7	21	2	2,149	2	102
	6–8	39	4	6,388	6	164
Sub-total		***961***	***87***	***89,126***	***81***	***93***
Post-Roman	6–11	9	1	1,207	1	134
	9	1	0	122	0	122
	10	3	0	151	0	50
	10–12	30	3	7,097	6	237
	11	11	1	443	0	40
	11–12	33	3	2,638	2	80
	12	37	3	7,548	7	204
	13	2	0	144	0	72
	unstrat	16	1	1,814	2	113
Sub-total		**142**	**13**	**21,164**	**19**	**149**
Total		**1,103**		**110,290**		**100**

Table 35: Summary of the ceramic oven and plates by period

The majority of the assemblage (87% by count, 81% by weight) came from stratified Roman or late Roman to post-Roman contexts (Periods 3 to 6–8), particularly from Period 5 and 6 deposits (Table 35). The remainder was incorporated mainly in modern pit fills and layers. The level of preservation was generally good with the majority of fragments displaying only moderate levels of abrasion. Of the material from stratified Roman deposits, the majority was retrieved from pits (Table 36, Fig 153), in particular the two Period 6 quarry pits (CG 1057 and CG 1108, 25% and 8% by weight respectively). However, a significant quantity, more than 20% by weight, was associated with *in situ* ovens. These stratified groups are discussed below.

Fabric

The plates and superstructure were all slab-built or hand made in a hard or very hard Malvernian metamorphic fabric (Peacock 1967; Hurst and Rees 1992, 200–9; http://www.worcestershireceramics.org). They typically had common-abundant, ill-sorted, angular inclusions of Malvernian rock, <6mm but usually 1–2mm, and a hackly fracture. The colour varied from oxidised to reduced, ranging from reddish yellow (7.5YR 6/6), through light yellowish brown (10YR 6/4) to grey or dark grey (5Y 5/1, 5Y 4/1). Fragments of similar material have previously been classified as Fabric 3.1, defined as 'slab-built' Malvernian ware. This fabric code was retained for the material reported on here, to distinguish it from Fabric 3 handmade Malvernian pottery, but the actual method of manufacture may have varied.

Table 36:

Feature type	Count	% count	Weight (g)	% weight	Average weight (g)
Oven	279	25	18,175	16	65
Oven (group)	22	2	1,698	2	77
Quarry pit	289	26	37,925	34	131
Pit	93	8	8,753	8	94
Robber pit	7	1	797	1	114
Posthole	82	7	5,603	5	68
Post pad	3	0	404	0	135
Construction cut	3	0	224	0	75
Ditch	8	1	1,082	1	135
Layer/surface	150	14	12,112	11	81
Well	6	1	624	1	104
Finds ref.	19	2	1,729	2	91
Post-Roman features/ unstrat	142	13	21,164	19	149
Total	***1,103***	***100***	***110,290***	***100***	***100***

Table 36: Summary of the Malvernian oven and plates by feature type

Forms

The fragments divided into two distinct classes, discussed by class and type below (Table 37): pieces from large, near-oval plates or ‘bakestones’; and component parts of pre-formed oven superstructure.

Oven plates

Thirty-one percent of the assemblage comprised flat, or near-flat, fragments of oven plate. Similar plates have been found on a variety of sites in Worcestershire (Hurst and Woodiwiss 1992, fig 46.2; Griffin 2015, 92–93; Morgan 2003; Bryant and Evans 2004, 366, fig 210.6) and neighbouring Warwickshire (J Evans 1996; Cool 2006b, 41–2).

Most examples from The Hive were characterised by having a wiped upper surface and a coarser, often sanded, underside. This reflects the manufacturing process, the upper side having been wiped as the clay was flattened out and the underside pressed onto the ground. Sand may sometimes have been deliberately sprinkled on the floor first, to prevent the plate sticking. As at the adjacent City Campus site (Crawford 2014, fig 50) there was some variability in surface treatment; the upper surfaces sometimes had pronounced finger wipe marks (Fig 154.1) or could be wiped smooth, and some examples had sparse or no sand on the base. The presence of one example with hobnail impressions (Fig 154.2) and another with a possible animal print (not illustrated) provide further evidence that, like tiles, the plates were left to dry on the ground prior to firing. One fragment had fingerprints and a textile impression on the upper surface (Fig 154.3), identified as a tabby weave using wool or linen (Alan Clapham pers comm).

Table 37:

Object specific type	Count	% count	Weight (g)	% weight	Average weight (g)
Oven plate	344	31	37,555	34%	109
Oven base edge	96	9	9,661	9%	101
Oven base edge?	3	0	28	0%	9
Oven edge mouth	3	0	968	1%	323
Oven edge mouth?	4	0	759	1	190
Oven wall flanged	50	5	11,077	10	222
Oven wall flanged?	4	0	302	0	76
Oven rim	14	1	2,608	2	186
Oven wall ledge	14	1	1,254	1	90
Oven wall ledge?	3	0	172	0	57
Oven wall perforated	11	1	936	1	85
Oven wall	518	47	43,401	39	84
Oven wall uncertain	38	3	1,560	1	41
Oven?	1	0	9	0	9
Total	***1,103***	***100***	***110,290***	***100***	***100***

Table 37: Summary of Malvernian oven material by component type

Two near-complete examples were recovered, both sub-rectangular forms with rounded corners. Of particular interest was an *in situ* plate, forming the base of a Period 5 oven (CG 1075) in Building 3 (Fig 38). Unfortunately this was shattered *in situ*, from use or subsequent post-depositional processes, and was too fragmentary to be reconstructed after excavation. The other, from an unidentified, hollow feature below the tillage soil was reconstructed (Fig 154.1). Many of the other fragments clearly came from similarly shaped plates; they had straight or very slightly curving sides or a marked change in curvature, indicating a corner. A number of pieces, including those illustrated, had curving sides (Fig 154.2–5). Consideration of this in analysis suggests that these are most likely from the curving corners or ends of sub-rectangular plates, rather than circular plates. Circular clay discs have been described elsewhere, from Worcestershire (Hurst and Woodiwiss 1992; Hurst *et al* 2011, fig 18), and in Oxfordshire and Warwickshire (Cool 2006b, 41–2; Evans 2011, 44–5, fig 31.1–3; Evans 1996, 96). The curving edge fragments from The Hive were small, most representing 13% or less of the plate if round and the largest two 18% and 19% respectively. Even the latter need not be from circular plates. 'Diameters' of the curving fragments were measured; they ranged from 18–40cm, comparable with the examples described by Cool (2006b). A subjective impression is that the thickness of most of the curving fragments suggested larger plates than the diameters indicated. No other near-complete plates are known to this author and the 'circular plates' described elsewhere are also very fragmentary. It is possible that these have been misidentified, particularly given that straight-sided sections of plate could have been recorded separately as tile. One fragment was quite angular, suggesting a more rectangular form (Fig 154.6).

The plates were roughly made and varied in thickness from 11–2mm up to 25–8mm, though most were between 13 and 22mm thick. They were often thicker towards the knife-trimmed edge, sometimes creating a slightly raised lip around the edge (Fig 154.5). Three examples had finger pinched decoration around the edge, one of which is illustrated (Fig 154.4).

The colour of the plates, presumed to reflect use more than manufacture, varied; some were oxidised, some reduced and some had patchy coloration. Three fragments were very hard fired, suggesting use with high temperatures. Eighteen pieces had surface blackening, occurring on the upper surface, the upper surface and edge, and occasionally on all surfaces. One fragment, from Period 6 quarry pit (CG 1057, fill 7000) appeared to have patches of mortar attached, indicating that it had been reused in a structure before deposition.

Oven superstructure

A number of joining fragments of oven superstructure were recovered from a posthole (Period 3–5, posthole 6114, fill 6113), having been re-used as post packing. These provided the first evidence for how the component parts fit together (Fig 154.7; Crawford 2014). Each diagnostic component is discussed below, drawing on other examples from the site.

Straight or partially curving flange rims: oven mouths

One of the characteristic elements identified as possible oven material elsewhere has been a heavy flange rim with no obvious curvature (Darlington and Evans 1992, 67–8, fig 35.4a; Hurst and Woodiwiss 1992, fig 46.1; Crawford 2014, fig 50: 1). One suggestion was that these came from rectangular, straight sided, open topped vessels (Bryant 2004, 366, fig 210.1). Reconstruction of the oven fragment from posthole 6114 (Fig 154.7) shows that these are in fact the straight sides of an oven mouth. A variety of examples were recovered, many from quarry pit CG 1057. One (Fig 154.9) illustrates how the oven mouth curves at the top. Another (Fig 155.10) gives some indication of the minimum height of the oven mouth. The size and shape of the flange varied; some examples were more rounded and others larger and more elongated (Fig 155.11–12). Some examples clearly showed how the flange had been formed over a roll of clay (Fig 155.13), while others had just been folded over (not illustrated). The base of the mouth was flat. The central oven in the aisled building had an oven base *in situ* (CG 1019, context 6364; Fig 156.17). This indicated that the oven mouth was *c* 26 cm wide, and illustrates the heavy finger wiping present on some flanges. A ‘heavy rim with a termination’ from the Bredon Hill area (Derek Hurst pers comm) is probably the base of a similar oven mouth. The colour of the flanges varied; a few were oxidised and others reduced, but most had patchy firing. Fifteen fragments had smoke fuming or sooting on the flange, usually both internally and externally but occasionally only on one side.

Curving flange rims: oven vent or chimney

Associated with the oven material in posthole 6114 was a heavy, curving, flange rim (Fig 155.14). Although this did not join, it is likely to be part of the same oven; the fabric and firing are the same and the outer surface has heavy finger wipe marks like other oven fragments. These are possibly the fragments most likely to be recorded as pottery (large storage jars) on sites or in contexts where no other diagnostic oven material has been found. They could also be confused with fragments from the curving top of the oven mouth. These are interpreted as from vents or chimneys at the top of the domed oven (Fig 154.7; Crawford 2014, fig 50: 4). Diameters ranged between 15cm and 23cm. Firing colour and flange shape varied, as with the other flange pieces (Fig 155.14–5). One example was reduced over the flange but oxidised on the oven wall, and one had slight sooting external to the rim but not internally.

Not included in this category are the heavy, faceted rims (Fig 110. 159, 160). The firing of these, with reduced cores, brown margins and blackened surfaces, was untypical of the oven material, but is typical of the late Iron Age and early Roman Malvernian forms found in this region, for example at the Worcester St John's site (Evans 2014, fig 13.10–13). Similar rims are also illustrated from a late Roman kiln site in Malvern, though not thought to be kiln products (Peacock 1967, fig 4.81–2). Based on the evidence from this site, faceted rims do not seem to be characteristic of the ovens. Another faceted rim, evenly reduced, had a more substantial profile and was clearly from a jar (Fig 110.161).

Flat, splayed base fragments

Another element noted previously, though not identified, is a flat, slightly splayed edge, sometimes with little apparent curvature (Darlington and Evans 1992, 67–8, fig 35.4c; Bryant 2004, 366, fig 210: 4, 5; Hurst and Woodiwiss 1992, fig 46.2; Crawford 2014 fig 50: 5). The joining fragments from The Hive show this to be the base of the oven. The example from posthole 6114 had a natural break *c* 160mm above the base, where probably one slab of clay finished and the next was joined on. At this point there was also at least one small perforation through the wall of the oven (Fig 155.16). Similar perforations were noted on five other examples, and on some of the wall sherds (see below). The base from this oven, and the majority of other fragments, was characterised by heavy finger wiping. Most of the base had a band of fire blackening near the edge. Similar sooting or smoke fuming was noted on 26 other examples though, as with the other oven elements, firing varied. The base fragments were mostly between 17 and 23mm thick, a few being slightly thicker or thinner. The reconstructed oven from fragments in posthole (6114) has an estimated diameter of 520mm, while the base of the *in situ* oven in the aisled building had a diameter of 600mm (Fig 156.17).

Internal ledges

A number of sites in the county have produced distinctive wall fragments with an internal ledge (Hurst and Woodiwiss 1992; Darlington and Evans 1992, 67–8, fig 35.4b), the most complete example previously coming from Roman levels at the rural site at Beckford (D Hurst pers comm). A good example was recovered from one of the Period 6 quarry pits at The Hive (CG 1057, fill 7000; Fig 157.18), though these were not a common find and no ledge was included amongst the reconstructed fragments from posthole 6114. Like the Beckford example, the ledge had a circular perforation at either end. The curving outer wall of the sherd indicated a diameter of *c* 56cm for the oven at that point. Another, smaller fragment was recovered from one of the ovens in Building 2D (CG 1069, fill 6894: Fig 157.19). Firing of these fragments was again variable. One example, also from the quarry pit (CG 1057, fill 7044) had a burnt residue. No ledges were identified amongst the oven material from the neighbouring City Campus site (Crawford 2014).

Oven wall

Fragments of oven wall were the most common element recorded (Table 36, Fig 157.20–*25*). Like the flange rims described above, these fragments are also likely being recorded as pottery elsewhere, particularly if no diagnostic oven material is present. One distinguishing factor is the surface treatment, which is rougher than usually found on large storage jars. Many fragments displayed distinct finger wipe marks, sometimes very pronounced (Fig 157.20), usually internal but sometimes external, and in a couple of cases, on both faces. This characteristic was also noted in the City Campus assemblage (Crawford 2014). There it was suggested that the finger wiping reflected the forming process, with one hand inside and one outside to push the clay into shape, a logical explanation. Some fragments were wiped smooth, suggesting that an additional process of surface finishing sometimes took place. There was a lot of variability in the thickness of the oven walls, from 9 to 32mm. Ten examples were perforated, with holes ranging in diameter from *c* 18–25mm. Perforations were also noted in the City Campus assemblage (Crawford 2014, fig 50.6), with diameters ranging from 8–30mm. One example from The Hive, described above (Fig 156.17), was positioned with its lowest point *c* 155mm above the base, at the point where two slabs joined. It has already been noted that some wall perforations are associated with the internal ledges (Fig 157.18). The position of the other perforated fragments is uncertain. They could have been intended to allow a flow of air into the oven. It seems unlikely that they were used to insert bellows, they are small and firing patterns provide little evidence for very high temperatures having been reached. Another possibility is that they were intended to support rods, inserted to lift the superstructure or suspend meat while cooking.

One oven in Building 2D (CG 1070, context 6586) produced a large fragment of oven flue formed from fragments of oven material bonded with clay. This is included in the fired clay report (Roman fired clay).

The *in situ* ovens

A total of 14 ovens were excavated, excluding the malting oven, of which 6 produced fragments of portable oven material (Table 38).

As noted above, very little pre-formed oven material came from Period 4 deposits, despite the fact that a number of ovens were excavated in Buildings 2 and 3 and within the footprint of the aisled building. It is possible that these earlier ovens were in fact used for a different purpose, such as smelting hearths (see discussion). All four fragments form Period 4 came from an oven feature in Building 3, the form of which was not clear. Four Period 5 ovens produced oven plates and superstructure. The largest quantity came from an oven in Building 3 (CG 1075), all from a near-complete oven plate incorporated in the oven floor (Fig 38).

Another large group came from a circular oven in Building 2D (CG 1070). Fragments of oven superstructure were mixed in with the clay deposit filling the sub-oval cut (context 6587, 40 fragments, 1690g), the lenses of clay and charcoal above this (6584, 6585, 5 fragments, 424g), and were embedded in the clay oven base (context 6584, 19 fragments, 2930g). This was covered by a further layer of demolished oven superstructure (context 6543, 14 fragments, 2180g). The assemblage included fragments of oven wall, mouth (Fig 155.13) and, only from the upper layer, fragments of oven base. No oven plate was recovered. Another oven in this building (CG1069) also produced fragments of oven superstructure, wall and mouth, from the packing of the construction cut (context 6894, 3 fragments, 414g) and the oven floor (context 6850, 40 fragments, 414g).

A smaller quantity, including oven wall, mouth and a fragment of oven plate, came from a circular oven in Building 3 (CG 1083), from the collapsed superstructure of the oven (context 7168, 11 fragments, 711g) and the clay deposits sealing this (context 7154, 2 fragments, 392g). The best preserved *in situ* material came from an oven in the aisled building, (CG 1019). The presence of an *in situ* base, 0.6m in diameter, (context 6364, 22 fragments, 1698g; Fig 156.17) provides the first conclusive evidence for the use of these structures. In addition, fragments of oven plate and superstructure from an earlier oven were incorporated into the clay base of the structure (context 6557, 14 fragments, 4576g; Fig 51 and 52) and the clay packing that surrounded the oven (context 6549, 3 fragments, 114g).

The association of oven material with *in situ* firing provides the first clear indication of the function of this material. This showed that some fragments had sooting or smoke fuming associated with oven mouths, vent/chimneys and bases (Fig 154.7); burning on the base has been noted as a characteristic of portable ovens (Cubberley 1995, 58). Where sooting was noted on oven walls, this tended to be slight and occurred both internally and externally. It was seen on some, but by no means all, of the plates; on the upper surface, the upper surface and edge, and occasionally on all surfaces. Interestingly, examples from Warwickshire tend to show signs of heating on the underside (Evans 2011, 44–5), perhaps indicating a slightly different pattern of use or that assumption about what should be the top and bottom of the plates are not necessarily correct. The fact that sooting was not always present has made it harder to identify the function of oven fragments in the past (Dalwood *et al* 1998, 17). It was also absent on the ovens from Chesterton described by Perrin (1999). There was certainly nothing to suggest that the ovens of this type were associated with very high temperature industrial processes; a couple of fragments were recorded as 'hard fired' but there was no vitrification and no obvious industrial residues. The functional relationship between the ceramic plates and the oven superstructures is not clear and evidence from elsewhere for these types indicates that they were not always used together, as detailed further below. The plates appear to be the wrong shape and size to have fitted inside the ovens. Fragments of both types were often found in close association, however, and broken fragments of plate were often reused in the construction of oven bases.

Other groups

The majority of the oven material was redeposited with other rubbish, dumped in pits or spread in layers. Surprisingly, it was a posthole that produced sufficient joining fragments for the form of the oven to be reconstructed (fill 6113, posthole 6114, 78 fragments, 5134g; Fig 154.7). This must have been taken from a demolished oven nearby and used as packing. Unfortunately this could not be tied in to an identified building and is only broadly dated to Period 3–5.

Parallels

Fragments of similar material have been regular finds on sites in Worcestershire, particularly the curved edges of ceramic plates and the flanged mouth and splayed base fragments of the superstructure. The precise function and form of these 'slab built vessels' has, until now, been uncertain; suggestions have included portable bread ovens or beehives (Darlington and Evans 1992, 68; at Beckford, Hurst pers comm), or vessels used in cheese making or preserving meats (Dalwood *et al* 1998, 17).

The evidence from some sites has indicated a link between this material and bread making. Excavation at Hindlip, a rural site near Worcester, provided associated evidence for bread making alongside a relatively large assemblage of oven material (Griffin 2015; 25 fragments of oven superstructure, 181 fragments of ceramic platter). The late 3rd to 4th century occupation layers associated with the oven material also produced fragments of at least four rotary querns, and rich environmental samples of cereal chaff (spelt wheat glumes) consistent with flour and bread making (Clapham 2015). The most interesting find from this site was a sherd of Severn Valley ware with a graffito interpreted as a Roman *modius* holding ears of corn, a motif that on coins represents the imperial provision of food (Tomlin 2015). While it is tempting to link the oven material and bread making with a provisioning function for that site, the graffito came from the fill of an earlier ditch containing 3rd century pottery (fill 178), so may not be directly related to the activity that gave rise to the oven material.

The ceramic plates could be the *testelli* referred to in Roman literature (Cubberley 1995, 60). Cubberly quotes Ovid's description of a baking technique where 'the hearth itself baked the bread which was put under the ashes, and a broken tile had been lain on the floor' (Cubberley 1995, 67). He also notes that similar plates were used for baking buns in recent times, the bun being put on the plate and cooked in the embers. The *in situ* plate in Building 3 (Fig 38) supports this interpretation and was perhaps used in the same way as the 'tiled hearths' from Caistor-on-Sea (Darling 2012, 347). Excavations at Wroxeter baths basilica, site C, provide another good parallel. Here, layers of short-term hearths with tiles incorporated into the surface were interpreted as places where flat bread was cooked, supported by the presence of rye grains in the hearth debris (Barker *et al* 1997, 135–8). These were dated to the late 5th/ early 6th century dismantling of the basilica. Ceramic plates from sites in Warwickshire (Evans 2011, 44–5, fig 31.1–3; Evans 1996, 96; Ferguson 1994, fig 69.2) and Oxfordshire (Sanders 1979, 54, fig 28.124–7) have been interpreted in this way, described as 'chapatti' discs for baking unleavened bread (Evans unpublished, cited in Cool 2006b, 41–2). Elsewhere, similar plates are associated with ovens: at Chesterton, Cambridgeshire semi-circular plates were interpreted as oven floors or associated warming stands (Perrin 1999, fig 74.504), and at West Heslerton, Yorkshire, flat plates were associated with a stone-built bread oven.

The first major study of Roman baking covers was published in 1988 (Cubberley *et al* 1988). *Clibani* and *testa* were referred to frequently in Roman literary records, suggesting that they were a common feature of Roman kitchens, but no contemporary descriptions survive. In this study, the authors used literary and archaeological evidence to suggest their form and discuss how they were used for *sub testu* cooking, where bread or meat was cooked under an earthenware vessel covered by hot ashes or coals. The precise meaning of the word *clibanus* is unclear; it may have had a specific meaning but could have been used simply to distinguish a portable oven from a stationary *furnus* (Cubberley *et al* 1988, 101).

Analysis of material from The Hive has allowed the oven superstructure to be reconstructed (Fig 158). These ovens are not like the *clibani* described and illustrated in the 1988 study, though they would fall within the broader definition of the term. A more recent work (Darling 2012) provides better parallels from Lincolnshire and Cambridgeshire, described as a *furnus*. They share a similar vertical mouth with a thickened rim, and seem to have a domed shape (Darling 2012, fig 4.19); the fingered decoration around the base is not found on examples in Worcestershire so seems to be an east midlands characteristic. Of particular interest is a group cited from Chesterton (Perrin 1999, figs 1–2; fig 52, 510, 512; fig 74, 502, 506–13) which, like the *in situ* examples found here, are associated with large barns, burnt oven bases and flat plates.

Other parallels for the Worcestershire ovens come from Holt, Prestatyn (Darling 2012, fig 2.10, 11) and Chester; the latter from Bridge Street (Jones 2008, 170), Gorse Stacks (Heke 2012), and notably from excavations in the Roman amphitheatre (Heke pers comm). These, however, have a wider opening at the top than the Worcestershire examples, a smaller mouth, and no evidence of ledges. They do share the characteristic finger wiping. These ovens have distinctive finger impressed decoration, on the mouth and upper opening, and Darling classifies these as *tannurs*. The relatively small size of the upper opening on The Hive oven, and the incurving, domed form, make it unlikely that bread could have been cooked on the inside walls. It is, however, quite possible that they could have been used in part as braziers with pots placed on the upper opening. This was suggested for another *tannur* discussed by Darling, but was considered less likely for the Holt-type ovens which have a much larger upper opening. Darling suggests that the *tannur* type oven, as found at Holt, Prestatyn and Chester, would have been heated by an internal fire which could have been tended and kept going over a long period, unlike a *clibanus* or *testum*, allowing bread to be produced for a large number of people, as required.

A characteristic of The Hive ovens is the presence of holes in the wall, associated with ledges or at slab joins. Cubberley *et al* (1988) use literary evidence to suggest these were intended to regulate or lower the temperature (Cubberley *et al* 1988, 101). Darling (2012) describes similar perforations on North African braziers, providing a draught of air. No parallels have been found for the internal ledges evidenced on some fragments from The Hive.

There is presently no obvious evidence for how the oven was closed, which would have been needed to retain heat after the hot ashes had been raked out. One possibility is that the oven plates had this function as well, or perhaps a makeshift fragment of tile could also have been used instead.

Size

The *clibani* described by Cubberley *et al* (1988) range in diameter from 200mm to a maximum of 500mm. These authors suggest that there is a chronological variation in size, with examples ranging from 350–500mm in the 1st and 2nd centuries AD, 240–300mm after the mid-3rd century AD, and 240–60mm in the late 4th to 5th centuries. Whether this chronological trend is applicable to the type of ovens found at The Hive is uncertain; the two ovens discussed measured 520mm and 600mm. The furnus ovens described by Darling are much larger, with diameters of 860mm (from Wygate), 850mm (from Grandford), 900mm (from West Deeping) and 900–1000mm (from Chesterton).

Manufacture

Darling (2012) has noted that large ovens would need to have been made by skilled potters. This specialisation can be seen in later periods. In the 17th century, earthenware 'cloam' ovens were produced at Bideford in North Devon, and marketed as far as Wales, Ireland and even the colonies (Grant 1983, 55–6). In modern times, portable bread ovens are still made by potters in Pereruela, in the Zamora provence of Spain (Williams and Evans 1991). This specialisation is evident at Holt, and it is not surprising, therefore, that the distinctive fabric of the Worcestershire ovens indicates that they were made in the Malvern area, where there was a significant pottery industry and evidence for tile production. Some large rims illustrated from the Newland Hopfields kiln site in Malvern were identified as possible ovens; a heavy flange rim may be part of an oven mouth (Evans et al 2000, fig 37.JLS4), and another rim described as 'crudely finished with finger marks below the rim' could be an oven chimney or vent (Evans et al 2000, fig 37.JLS5). Similar fragments are published from another Malvern kiln site (Peacock 1967, fig 4: 80 and possibly 86–7), though not identified as oven. At neither of these sites, however, was it certain that these were made at that specific production site.

Portable ovens are made in coarse fabrics, to resist thermal shock (Cubberley 1995, 58). The Malvernian fabric, with its inclusions of igneous rock, is very well suited to this use. Elsewhere, the ceramic plates from Warwickshire are described as in 'soapy oxidised fabric with common large organics' (Evans 2011, 44–5), while the oven material from the east midlands is in a shelly fabric, and the ceramic plates from Yorkshire in a 'coarse' fabric (Darling 2012). The rural site at Beckford seems to be at the edge of the Malvernian distribution, as 20% of the ceramic plates recorded there were in a local shelly fabric (Derek Hurst pers comm).

As mentioned above, portable bread ovens are still produced in Pereruela, Spain. These small, domed, ovens are *c* 3 feet in diameter and 2.5 feet high (Williams and Evans 1991). Their method of production is instructive when considering how the Malvern ovens might have been made; at the time of writing this process can be viewed online (Grillsnovens 2012). The Pereruela ovens have an integral base, which the Malvern ovens do not. The ceramic plates, however, could have served the same function and could well have been made in a similar way. Sand is sprinkled on the floor, then a lump of clay thrown down. This is roughly pressed into shape, then flattened by hand, giving distinctive wipe marks similar to those recorded on some examples from The Hive (Fig 154.1). The wet surface is then wiped smooth with a block of wood and the edges are trimmed into shape. The distinctive wipe marks suggest that this method is more likely for the examples here than rolling out the plates, as done in Bideford in the 17th century (Grant 1983, 48).

At Pereruela, slabs of clay are extruded to build the oven superstructure. Similar slabs could have been formed by treading or pummelling the clay and cutting it roughly into shape. The first slabs are joined to form the oven base and lower wall. A similar approach would explain the structural join at the top of some of base fragments from The Hive (Fig 156.17). The wet clay is joined and shaped, with one hand inside supporting the wall and the other smoothing the exterior. The clay is then pulled up and smoothed further with the wooden tool, working diagonally up as the potter moves around the base. Once this is complete another slab of clay is added and the upper half worked in to form a dome. It seems likely that the Malvern potters would have added the internal ledge before the second band was added, and the perforations may have also been made at this stage. When the upper section is complete, the Pereruela potters add an additional collar of clay to the top to seal the dome. A similar collar could have been added by the Malvern potters to form the flanged chimney/vent. Heavy hand and finger marks can be seen where the collar is joined, which are then smoothed off. The mouth is cut out once the dome is formed, and rolls of clay are pressed around it, presumably for strength. A similar roll of clay can be seen inside the flanges on the Malvern ovens, which would presumably have been added at the next stage.

Dating

The majority of both the plates and superstructures came from Period 5 and 6 deposits (Table 38; Fig 159), dating to the 3rd to 4th centuries. This supports the evidence from other occupation sites (Darlington and Evans 1992, 68; Derek Hurst pers comm; Buteux 1998, 16; Crawford 2014, fig 30), and production sites in Worcestershire (Peacock 1967). The ceramic plates found in Warwickshire and Oxfordshire are also most common in late Roman contexts (Cool 2006b, 41–2).

While it is clear that both plates and oven superstructures are most common in the late 3rd to 4th century, it is less clear when they were first produced. It may be that they have different dates; there seems to be more evidence for earlier production of the plates than the superstructures. At Old Bowling Green, Droitwich (Hurst and Woodiwiss 1992, 64, fig 46) two fragments were recorded from a mid-1st to early 2nd century deposit and in other counties there is evidence for the use of oven plates from the later 1st century on (Cool 2006b, 41–2). There is slightly more evidence for 2nd to 3rd century use. At The Hive, a small quantity of oven material was recorded from mid-2nd to early–mid-3rd century deposits (Table 38, Period 4). This included seven diagnostic fragments of oven plate, but there was no definitive evidence for oven superstructures as only wall fragments were recovered. The neighbouring City Campus site is similar; only three fragments came from late 2nd to late 3rd century deposits, two being from oven plates and one from an oven wall. Similarly at Hindlip (Griffin 2015), only two fragments of oven plate were recovered from phase 5 (mid-2nd to 3rd century), and no oven superstructure. The finds from the Malvern, Newland Hopfields kiln site (Evans *et al* 2000) might indicate mid–late 2nd to 3rd century production of the oven superstructures, but the context of these needs to be reassessed; there is activity on the site into the late 3rd to 4th century so these finds could post-date the kiln. At George Lane, Wyre Piddle (Griffin forthcoming a) ceramic plates were recorded from early to mid-2nd century layers, the latest Roman activity on the site dating to the later 2nd to early 3rd century. There is also evidence for 2nd and 3rd century use of these ovens further afield; late 2nd to 3rd century at Wygate, early to mid-3rd at Grandford, and mid–late 2nd to 3rd century at Chesterton (Darling 2012).

Table 38

				Oven super-structure	**Oven plate**	**Total count**	**Total wt (g)**		
Period	**AU name**	**CG no/name**	**CG no**	**Count**	**Wt (g)**	**Count**	**Wt (g)**		
4	Building 3	Earlier oven/ hearth	1074	1	52	3	200	4	252
5	Building 2D	Circular oven with flue	1070	78	7,224	0	0	78	7,224
5	Building 2D	Oven/hearth (context 6850)	1069	40	2,198	0	0	40	2,198
5	Building 3	Base of oven/ hearth	1075	0	0	127	2,708	127	2,708
5	Building 3?	Oven/hearth prep-dating aisled building	1083	12	847	1	256	13	1,103
6–8	Aisled building	Oven 6364	1019	28	2,249	11	4,139	39	6,388
Total				***159***	***12,570***	***142***	***7,303***	***301***	***19,873***

Table 38: summary of Malvernian oven material from in-situ ovens

Given all the existing evidence for the date of these ovens, from this site and others, it is frustrating that the archaeomagnetic dates do not provide any further clarity. Archaeomagnetic dating of the oven in Building 2D (CG 1070) produced a very wide range of dates (*c* AD 110–560, AD 1200–1324, AD 1360–1608), of which the Roman date seems most likely. The oven associated with the aisled building (CG 1019) has a post-Roman date of *c* AD 990–1250. This date seems very implausible, given that the oven was built using Roman material and was within a Roman building. The archaeomagnetic dating is discussed in detail elsewhere in this report (Greenwood and Batt 2009; Appendix 7).

Distribution

Any analysis of the distribution of this material is, necessarily, dependent on the degree to which it has been recognised and previously published. In Worcestershire, the ceramic plates and oven fragments are often recorded from the same sites, suggesting they were used in association. This is true of urban sites such as Worcester (eg Darlington and Evans 1992;

Bryant and Evans 2004; Crawford 2014) and Droitwich (Hurst and Woodiwiss 1992), and rural sites such as Beckford (Derek Hurst pers comm) and Hindlip (Griffin 2015). This association of ceramic plates and ovens is supported by evidence further afield, from Chesterton and West Heslerton (Darling 2012). Ceramic plates, however, seem not always to have been used in association with pre-formed ovens. At two rural sites in Worcestershire, George Lane, Wyre Piddle and Church Farm West, Grimley only plates were recovered (Griffin forthcoming a; Griffin forthcoming b). In Warwickshire and Oxfordshire ceramic plates are more common on rural sites, and are not associated with oven superstructures. There they are thought to represent ‘an indigenous practice which acquired ceramic expression in the Roman period’ (Evans 2011). It may be that more evidence for superstructures will come to light now that the component parts are better understood; a Malvernian rim illustrated from Alcester, for example, could well be from an oven mouth (Lee *et al* 1994, fig 2, R.41). Fragments of oven and plate were found at the Magistrates’ Court on Castle Street, but at the time of writing these are subsumed in pottery fabric G47 (Jerry Evans pers comm).

Considering the wider geographic distribution of the ovens and plates, Jerry Evans (2011) has suggested that the ceramic plates are restricted to the west midlands, centred on Warwickshire and Oxfordshire, with Bubbenhall marking a northerly limit. He noted that they are not found, for example, at Leicester. The evidence from Worcestershire shows that the focus of their production and use extends west, while the evidence from Chesterton (Perrin 1999) suggests a more easterly and northerly distribution. There is at present little evidence for their use in Herefordshire; none is described or illustrated from previous excavations at Kenchester (Wilmott and Rahtz 1985) and none was found at the more recent Yazor Brook excavations, near Kenchester (HEAS 2011a), or at Wellington Quarry (Griffin 2011). Examples of oven plate and occasional superstructure fragments have been recorded on sites in north Gloucestershire, but not from the central and southern Cotswolds (Ed McSloy pers comm). Excavation along the line of the Wormington to Sapperton pipeline produced oven plates from Honeybourne, but not from sites further south (Ed McSloy pers comm). A rural site at Wheatpieces near Tewkesbury produced a fragment of a sub-rectangular plate, an oven base and internal ledge (Holbrook 2008, fig 16). Malvernian ‘circular tiles’ are also recorded from other sites south-east of Tewkesbury (Timby 2004b, 76, fig 20.48), and some of the heavy, Malvernian rims illustrated could be from portable ovens (Timby 2004b, 76, fig 20.24, 36, 43). An unidentified ceramic object from Kingscote (site 2), south Gloucestershire could be from a portable oven, particularly as it is from a late 2nd– 3rd century oven fill (building VIII, room 4; Scott 1998, 206, fig 99, 18.44). This fragment, in a tile fabric, has finger impressed decoration reminiscent of the ovens from Holt and the east midlands. The site is interpreted as an estate centre, with craft and agricultural activities and possibly a role in the collection of tax (Timby 1998, 290–2), so there would presumably have been a need to feed numbers of people. Given that the main distribution does seem to be across the midlands, the oven plates from West Heslerton, North Yorkshire (Darling 2012) seem rather anomalous. A fragment of oven has, however, also been recorded from Catterick (Williams and Evans 1991). The oven superstructures seem, on present evidence, to have a slightly different geographic distribution, with production known further north at Holt in north Wales, as well as the midlands, perhaps reflecting a different pattern of use.

Catalogue of illustrated oven material

Oven plates (Fig 154: 1–6)

1. Near-complete, sub-rectangular plate, with finger wiping on the upper surface and a sanded underside. The plate is warped, rather than completely flat. Maximum length 500mm, maximum width 368mm, thickness 16–19mm. Period 5, unidentified feature 6607, fill 6602. Database Rec 767.

2. Slightly curving, edge fragment of plate, with hobnail impression. Similar impressions were noted on an example from the City Campus site (Crawford 2014, fig 50.10). Upper surface wiped smooth, underside sanded. Thickness 16–19mm. Period 6, CG 1057, double marl quarry pit, fill 7001. Database Rec 796.

3. Curving edge fragment of plate with textile impression and fingerprints on upper surface. Upper surface wiped, underside sanded. This could be from the rounded corner of a sub-rectangular plate, or from a circular plate with a diameter of 310mm (13%). Thickness 19–21mm. Reduced and hard fired. Period 6–7, CG 1089, timber well pit, fill 8659. Database Rec 1086.

4. Curving fragment of plate with finger pinched rim. The upper surface is smoothed with shallow finger impressions and underside rough with fine sanding. This could be from the corner of a near-oval plate or from a rounded plate. If the latter, the diameter would be 26cm. Thickness 18–20mm. Period 6, CG 1108, double marl quarry pit, fill 6745. Database Rec 902.

5. Curving fragment of plate with thickened rim creating raised lip. Upper surface wiped smooth, underside roughly gritted and crudely formed. This could be from the corner of a near-oval plate or from a rounded plate. If the latter, the diameter would be *c* 30cm Thickness 17–22mm. Oxidised. Period 5, CG 1087, fill 6905. Database Rec 796.

6. Angular corner fragment of plate. Surface wiped. Thickness 16–18mm. Period 6, CG 1057, double marl quarry pit, fill 6491. Database Rec 1040.

Oven superstructure (Fig 154.7–9; Fig 155.10–16; Fig 156.17; Fig 157.18–25)

7. Joining fragments reconstructed for display, showing how the various component parts (base, mouth and chimney) fit together. Period 3–5, posthole 6114, fill 6113. Database Recs 751–64.

8. Section of flanged oven mouth from the reconstructed oven (Fig 154.7). The flanged 'rim' has straight sides, curving slightly towards one end, presumably towards the top of the mouth. A layer of additional clay has been added to form the flange, which is sooted through use, particularly externally. Period 3–5, posthole 6114, fill 6113. Database Rec 760–1.

9. Section of oven mouth with an elongated flange. The mouth has straight sides and curves over sharply at the top. The flange is formed around a roll of clay, and has broken away from the oven wall at a weak point where this joined. There are wipe marks along the straight section, and a heavy finger impression externally on the curving section, where the flange must have been pressed onto the wall to secure it. Reduced. Thickness 14mm. Period 6, CG 1057, double marl quarry pit, fill 6592. Database Rec 839.

10. Two fragments of flanged oven mouth, not joining but from the same oven. The lower section has the base and straight sides, while the upper section curves in gently towards the top. Patches of sooting on internal surface and outer surface of the flange. With vertical wipe marks externally where the flange joined the oven wall. Thickness mm. Period 6, CG 1057, double marl quarry pit, fill 7044. Database Recs 808 and 826.

11. Straight section of flanged oven mouth, formed over a roll of clay. The flange is reduced but not the external or internal oven walls. The outer surface has diagonal finger wiping on the oven wall and vertical wipe marks on the flange. There is an accretion of clay on the inside surface, indicating that the fragment may have been re-used in the base of a later oven or bonded into other structure. Wall thickness 12–14mm. Period 6, CG 1057, double marl quarry pit, fill 6592. Database Rec 840.

12. Straight section of oven mouth with very large flange. The flange is formed over a roll of clay then pressed into the external wall, leaving wipe marks near the flange. Wall thickness 10–17mm, flange thickness 20–39mm. Patchily fired, slightly reduced on the flange. Period 5, Building 2D, CG 1070, circular oven with flue, context 6584. Database Rec 1019.

13. Fragments of flanged oven mouth, clearly showing how the flange was formed over a roll of clay. Reduced over the flange. Period 5, Building 2D, CG 1070, circular oven with flue, context 6587. Database Rec 1026.

14. Fragment of curving, everted, flanged rim, from the reconstructed oven (Fig 154.7), interpreted as a vent or chimney. It shows slight sooting from use around the rim but not on the internal or external oven wall. The wall is roughly finished, with wipe marks, and varies in thickness between 15–18mm. Diameter 16cm (40%). Period 3–5, posthole 6114, fill 6113. Database Rec 762.

15. Fragment of curving, everted, elongated-flange rim, probably the vent from another oven. Wiped smooth with no obvious finger marks. Diameter 23cm. Thickness 14–16mm. The rim is hard fired and reduced. Period 6, CG 1057, double marl quarry pit, fill 6592 Database Rec 844.

16. Fragments of splayed base from the reconstructed oven (Fig 154.7). The base has heavy finger wipe marks externally but is wiped smooth internally. The base appears to have broken along a join, roughly 17cm above the base, where another slab of clay would have been attached. There is one perforation in the wall at this point, pushed through from the exterior. Another base fragment has a similar perforation lower down, about 13.5cm above the base. Not enough survives to indicate whether this was a join. There is a band of sooting around and underneath the base, and on the inner wall below the perforation. Thickness 16–19mm. Period 3–5, posthole 6114, fill 6113. Database Rec 751–7.

17. Joining fragments of base and mouth from an *in situ* oven. The base was recorded as having a diameter of 600mm *in situ*. There are finger marks external to the flange, presumably where the folded-over flange was pressed onto the oven wall, to attach it firmly. The base is 18mm thick, the walls 13–18mm, and the flange 28mm. The base is reduced. Period 6–8, aisled building, CG 1019, oven fill 6364. Database Recs 777–8 and 979–80.

18. Joining wall fragments with an internal ledge. The ledge is *c* 130mm long, with curving ends, 12–15mm thick and projects *c* 40mm from the inside wall of the oven. The wall is 11–18mm thick. There are perforations, of uncertain diameter, at either end, roughly level with the flange. The clean break between the upper and lower sections of the wall indicates that the ledge was added where two slabs joined. Reduced. Period 6, CG 1057, double marl quarry pit, fills 7000 and 7001. Database Rec 788 (7000) and 793 (7001).

19. Fragment from a similar flange, perforated slightly above the flange. Thickness 13–20 mm. Oxidised. Period 5, Building 2D, CG 1069, oven/hearth context 6894. Database Rec 998.

20. Oven wall fragment, with very pronounced finger wiping externally, wiped smooth with some finger impressions internally. Thickness 13–18mm. Oxidised. Residual in Period 10–12, CG1029, saw mill building pit, fill 6063. Database Rec 1174.

21. Wall fragment, possibly from an oven, showing an unusual firing pattern externally, with a blackened internal surface. Wiped smooth. Period 4, CG 1006, re-cutting of ditch aligned east to west, fill 6278. Database Rec 1191.

22. Oven wall, perforated just below a join, possibly where a ledge was added. The perforation was pushed through from the exterior and is c 25mm in diameter. The fragment is patchily fired and has diagonal wipe marks. Thickness 14–16mm. Period 5, CG 1046, layer 6529. Database Rec 1123.

23. Oven wall, with a perforation pushed through from the inside, diameter *c* 25mm. The fragment is reduced internally and in the perforation. Period 5–6, CG 1047, layer 6517 Database Rec 1051.

24. Oven wall, with perforation pushed through from the exterior, diameter *c* 25mm. Possibly from near a slab join. Oxidised. Period 5, CG1086, pit fill 6588. Database Rec 1029.

25. Oven wall, with perforation pushed through from the exterior, diameter *c* 20mm. Sooting internally, externally and through the perforation. Period 6, CG 1057, double marl quarry pit, fill 7044. Rec 810.

Roman fired clay

Dennis Williams and C Jane Evans

A large number of fired clay fragments were recovered, mainly associated with Period 5 and 6 (Table 39). The majority was associated with ovens and pits (Table 40). While most was undiagnostic, some fragments exhibited characteristics indicating that they came from ovens or smelting furnaces.

The largest single assemblage (1232 fragments, 15,637g, representing 31% by weight) came from the large quarry pit (CG1057), particularly from fill 6962. This feature also produced huge quantities of slag and a fragment of ore (see Roman industrial residues). It is not surprising, therefore, that some of the fired clay from this pit is vitrified, ranging from partly vitrified to ‘highly fired with a cinder like texture’, and that some fragments were recorded as having traces of iron or slag adhering. A number of larger fragments (74,4516g) showed part vitrification of the clay, consistent with the inner surfaces of iron smelting furnaces. Fragments of vitrified clay, also interpreted as smelting debris, came from a range of other features. Small quantities were associated with Period 4 deposits: a pit in Building 2B (CG1009); a ditch (CG1094), pit 7232, and an oven (CG1109). Most, however, came from Period 5 contexts; a couple of dense and glassy fragments came from the upper cobbled surface (CG1098) and a feature cutting this (CG1086).

Table 39:

Period	Count	% count	Weight (g)	% weight	Average weight (g)
3	17	1	270	1	16
3–4	3	0	54	0	18
3–6	57	2	1,264	2	22
4	286	12	7,673	15	27
4–6	4	0	98	0	25
5	649	26	20,077	39	31
5–6	21	1	888	2	42
6	1,378	56	19,445	38	14
6–7	22	1	1,404	3	64
6–8	20	1	64	0	3
Total	***2,457***	***100***	***51,237***	***100***	***21***

Table 39: Summary of the fired clay by period (Roman periods only)

Table 40:

Feature type	Count	% count	Weight (g)	% weight	Average weight (g)
Oven	525	21	14,327	28	27
Oven (group)	20	1	64	0	3
Oven?	29	1	5,574	11	192
Malting oven	94	4	2,418	5	26
Quarry pit	1,232	50	15,637	31	13
Pit	234	10	4,629	9	20
Robber pit	13	1	408	1	31
Posthole	33	1	494	1	15
Post pad	10	0	1,214	2	121
Construction cut	3	0	210	0	70
Ditch	17	1	507	1	30
Layer/surface	212	9	4,969	10	23
Well	3	0	34	0	11
Floor	14	1	350	1	25
Other/unstratified	18	1	402	1	22
Total	**2,457**	**100**	**51,237**	**100**	**21**

Table 40: Summary of the fired clay by feature type (Roman periods only)

Eight ovens produced fragments of fired clay, presumably derived from the oven structure. The distribution tended to match that of the portable oven material, with most coming from four Period 5 ovens. A large chunk of oven flue (6025g) was found in the Building 2D oven (CG1070), made from fragments of pre-formed oven bonded together with clay. Large fragments with pebble impressions on the underside were recorded from a possible oven dated to Period 4 (CG1109), perhaps fragments of clay from an oven floor incorporating heat-retaining pebbles. Other ovens produced fragments with intact surfaces; usually flat or slightly convex but occasionally concave, some with wiped surfaces. Similar fragments were found dumped in pits dated to Period 4 (pit 6404) and 5 (pit 6895). A few fragments displayed intact smooth surfaces on both faces, as might be expected for walls of ovens.

A few fragments bore wattle impressions, or lathe/ wood grain impressions, indicating that the clay had been plastered onto a structure. Only one fragment can definitely be attributed to a building; a well-fired piece with patches of possible lime plaster surviving on a flat surface.

Roman ceramic building material

Laura Griffin

There was a total of 961 fragments (102.3 kg) of Roman ceramic building material. All material from Roman contexts was quantified and visually scanned. A sample of 427 fragments (58.4kg) was fully analysed, focussing on the assemblage from the quarry pits, and any diagnostic pieces.

Fabrics

Five fabric types were recognised (Table 41) using a binocular microscope (x20). In the absence of a comprehensive fabric series for Roman tile in Worcester, a site-based series was developed. Where possible, these fabric types have been cross-referenced with tile fabrics at Sidbury (Lentowicz 1992), and those used at nearby site, 14–24 The Butts (Macey-Bracken 2011).

Table 41:

	Total	% total	Weight (g)	% weight
Fabric 1	205	47	24,494	42
Fabric 2	48	11	7,283	12
Fabric 3	58	14	8,684	15
Fabric 4	63	15	13,614	23
Fabric 5	54	13	4,819	8
Total	***428***	***100***	***58,894***	***100***

Table 41: Quantification of the Roman CBM assemblage by fabric

The fabrics identified were categorised as below:

Fabric 1: High-fired dark orange fabric with fine sand and occasional red inclusions and lenticular voids (equivalent to Sidbury fabric 2j; 14–24 The Butts fabric 1).

Fabric 2: Orange fabric of poorly mixed clay with white streaking and clay pellets (equivalent to Sidbury fabric 2d).

Fabric 3: Pale orange/buff fine, sandy fabric (equivalent to Sidbury fabric 2e; 14–24 The Butts fabric 8).

Fabric 4: Fine, sandy orange fabric with red and white inclusions and lenticular voids (equivalent to Sidbury fabric 2j; 14–24 The Butts fabric 2).

Fabric 5: Coarse, sandy orange fabric (equivalent to 14–24 The Butts fabric 5).

Fabrics 1 and 4 were very similar in appearance, with the latter appearing to be a slightly coarser and softer version of Fabric 1. It is likely that all fabrics were produced locally, especially as all bore similarities to those of medieval date, which are known to have been produced in Worcester.

Forms

Owing to the abraded and fragmentary nature of much of the tile assemblage, the vast majority of fragments were undiagnostic. However, those which could be identified as of a specific type are quantified (Table 42) and discussed below.

Tegula

A total of 59 fragments of *tegulae* were identified, although it is likely that a significant number of the undiagnostic flat tile fragments also belong to this group. This class of tile was identified in all five fabric types, although Fabrics 1 and 4 were the most common, accounting for 65% of this group.

Table 42:

Tile form	Count	Weight (g)
Box-flue	6	1,336
?Box-flue	1	22
Brick	1	259
Imbrex	123	16,560
Tegula	59	20,646
Undiagnostic tile	238	20,071
Total	***428***	***58,894***

Table 42: Quantification of the Roman CBM assemblage by form type

Fabric 1 (24 *tegulae* fragments)

Thickness varied between 14–30mm but with majority falling between 20–23mm. Six lower cutaways, two upper cutaways and two signature marks were identified in this group. The majority also had a distinct finger groove at the base of the flange which ran the length of the tile. Such a groove is common on this form of tile and it is assumed that these were important for the channelling of rainwater away from the roof. A small number also had a similarly produced groove along the top of the flange.

Unusual examples

A number of tiles of this fabric had distinctive attributes that are not commonly seen on *tegulae.* The most unusual of these was a tile with a dark red slip painted on the upper surface (CG 1108, fill 6745), and applied half way up the flange, where any unpainted area would have been hidden by an *imbrex* when *in situ.* In addition to the slip, this tile is further decorated with what appears to be a series of light brush marks scratched into the upper surface, running diagonally from the flange and butting up against deeper incised diagonal line running in the opposite direction. The use of coloured tiles to form patterned roofs has been noted at Fishbourne (Perring 2002, 121), Lullingstone, (De la Bédoyère 1991, 26) and Piddington villa (Ward 1999, 15–19). In the case of Piddington, this was achieved by the same use of a red wash or slip as noted on the above tile.

Another feature also noted amongst tiles of this fabric, was the use of knife trimming on the sanded surface (Fig 160.11). This was generally seen on the back of the flange and/or at the angle between the flange and base. In some cases, this knife trimming cut across this corner to leave a faceted profile, presumably to facilitate a good fit/meshing when positioned in the roof.

One of the most complete *tegulae* in the assemblage was of this fabric type (CG 1049, context 8804; Fig 161.13). This had been reused in the flue of the stone-built Roman oven and is of particular interest because almost every feature of note observed on tiles of this fabric can be seen on this single example. Perhaps most importantly, this is the only *tegula* within the assemblage to yield full dimensions (415x340mm and 20mm thick). The tile has two upper cutaways and one lower surviving, and also a double-arc signature mark towards the bottom end of the upper surface. In addition, there are three finger grooves running parallel to each other at the base of the flange. The cutaways and the top of the flange are neatly knife-trimmed, as is the underside of the tile where the right angle between the flange and tile body has been removed.

Fabric 2 (3 *tegulae* fragments)

Despite the small size of the group, one signature mark, one lower cutaway and evidence of knife trimming to the back of the flange were observed. Once again, tile thickness was varied with two tiles being 21–2mm thick but the third measuring 28mm. One tile (CG 1057, fill 6914) was of particular note due to being warped and dark purple in colour, suggesting that it had either been misfired in the kiln, or exposed to high temperatures either during use or following discard.

Fabric 3 (9 *tegulae* fragments)

Six pieces came from a single tile (CG 1057, fill 6520). *Tegulae* of this fabric tended to have a higher average thickness than those of the other groups ranging between 25–31mm. Again, the majority had a finger-groove channel on the upper surface where the flange met the base. Of note was one of just two upper cutaways noted in the whole assemblage (CG 1057, fill 6520), and two tiles with knife-trimming, but this time running over the whole of the base underside and removing the sanding (CG 1057, fill 6520 and CG 1108, fill 6908).

Fabric 4 (16 *tegulae* fragments)

Thirteen individual tiles were represented, and there were many similarities between the tiles of this group and those of Fabric 1. Once again, thickness was variable ranging between 18–29mm and finger grooves forming channels were identified running along both the bottom and the top of the flange, as seen in Fabric 1 tiles.

This fabric group displayed the largest number of cutaways with seven being identified. There were also four signature marks and frequent examples of knife-trimming, which, as in the case of Fabric 1 tiles, was mainly restricted to the back of the flange and the angle between flange and base on the underside of the tile.

Another of the more complete *tegula* in the assemblage (CG 1061, layer 6984; Fig 161.12) was of this fabric type and consisted of three large, adjoining fragments which formed the complete width of *tegula* at 300mm and around 50% of the length. The flanges displayed the characteristic finger-groove channel along the bottom, whilst the tops of them seemed almost facetted. There were also two knife-trimmed lower cutaways, and further knife trimming could be observed on the reverse of the flange and the underside of the base, near to the angle, though, in this case, not cutting across it. In addition, there was a faint double signature mark, which although only partial, looked to be forming a loop. An uneven underside was observed but it was not clear whether this was a result of manufacture or abrasion.

Fabric 5 (7 *tegulae* fragments)

Thickness ranged from 15–20mm. One fragment (CG 1069, layer 6850) had a knife-trimmed lower cutaway but this was notably less neat that those observed in other fabric types, appearing to have been cut in two stages. A further tile (CG 1048, fill 7199) displayed the second upper cutaway recorded within the assemblage. This one was of particular note for being hand-formed, rather than knife-cut, resulting in the end of the flange being ‘squashed’ to form the correct profile.

Imbrex

A total of 123 *imbrex* fragments were identified within the assemblage; none were complete. This class of tile was identified in all five fabric types, although Fabrics 1 and 2 were the most common forming 58% of the group between them. Unlike the *tegulae*, *imbrices* from the site were fairly uniform in appearance with few features which set each fabric type apart. Thickness (10–24mm) varied throughout the group and did not appear to be related to fabric.

Unusual examples

Two fragments were of particular note. The first of these was a fragment which displayed a dark red slip (Fabric 2, CG 1045, layer 6502), similar to that seen on a *tegula* (see above). The tile itself was thicker than the average, measuring 24mm and also appeared to be more highly fired than the rest of the group, although whether this was during production was unclear.

The second fragment of note was the most complete *imbrex* retrieved at *c* 50% of the total tile length (Fabric 3, pit 8719, fill 8718; Fig 162.14), with tapering to 95mm across at the narrowest end, rising to 130mm at the break which was considered to be mid-tile point.

Box-flue

Just six fragments of box-flue tile were identified, forming a notably small proportion considering the size of the assemblage. The tiles were identified as being Fabrics 1, 2, 4 and 5 and all displayed combing. Once more, thickness (13–18mm) was varied. Combing was also varied but the majority of examples displayed a combination of straight and wavy lines made using either 3- or 5-toothed combs. Tiles of Fabric 1 and 4 appeared to have far deeper comb marks than those of other fabrics, once more indicating that the two fabrics were closely related and probably from the same production site.

The most notable exception was the Fabric 2 tile (CG 1015, fill 6823), on which the combing consisted of very faint, straight lines made using a 6- tooth comb. Also of note was a tile of Fabric 1 (CG 1057, fill 6592) which was knife trimmed on the underside to remove the sanded surface, and this was also the largest surviving piece of box-flue from the site.

Thicker tiles/bricks

A small number of fragments were notably thicker than the majority of the assemblage, ranging from 33–42mm. Once again, the group consisted of a range of fabric types (1, 2, 3 and 5) and all were sanded on the underside. Although all were incomplete, the thickness of these tiles and the sanding suggest that they may well have been used as *pilae* and therefore were either *bessalis* or *pedalis* forms.

Antefix

Perhaps the most important find of the ceramic building material assemblage was a fragment of antefix (see Fig 163), which is the only known antefix from Worcester to date and also from the wider region.

The piece is fairly roughly formed in a coarse sandy fabric which is oxidised to a pale orange with what appears to be a darker wash over the upper surface. Only the top third of the object survives and appears to depict the hair of a female in relief. It is not of typical form, with most other examples being either triangular or having a curved top. Instead, this piece appears to be of truncated triangular form having a straight edge at the top. It also appears to have been chipped around the edges – perhaps an indication of reuse.

Antefixes were attached to the gable ends or along the eaves of the roof to conceal the open ends of the *imbrices*. They are often highly decorative and are most commonly associated with public, sacred or important private buildings. Many examples depict Roman gods and are thought to have been used as a form of protection for the building and its inhabitants. If the decoration on this example does indeed depict a female hairstyle, then this could well be a goddess. It is, therefore, likely that this antefix decorated the roof of a high status Roman building, and presumably the same one from which the above box-flue tiles and majority of ceramic roof tile also came.

This find came from the fill of a Period 5 pit (CG 1087, fill 6952) which was cut through the cobbled surface. Other finds from this pit included further Roman building material (ceramic roof tile, stone roof tile and mortar), as well as fragments of oven wall, slag and a substantial quantity of pottery. Such an assemblage would indicate the deliberate disposal of demolition material, in much the same way as the quarry pits were used in Period 6.

Catalogue of the Roman ceramic building material
(Figs 160.1-11, 161.12-13, 162.14-17, 163.18)

1. *Tegula* with type A lower cutaway in Fabric 4, Period 5, pit CG 1095, fill 6916.
2. *Tegula* with type B lower cutaway in Fabric 1, Period 6, quarry pit CG 1108, fill 6745.
3. *Tegula* with type B lower cutaway in Fabric 1, Period 6, quarry pit CG 1108, fill 6745.
4. *Tegula* with type B lower cutaway in Fabric 2, Period 6, quarry pit CG 1108, fill 7050.
5. *Tegula* with type B lower cutaway in Fabric 4, Period 6–11, Tillage soil CG 1056.
6. *Tegula* with type B lower cutaway in Fabric 5, Period 5, oven CG 1069.
7. *Tegula* with type C lower cutaway in Fabric 1, Period 6, quarry pit CG 1057, fill 6491.
8. *Tegula* with type C lower cutaway in Fabric 1, Period 6, quarry pit CG 1057, fill 6520.
9. *Tegula* with upper cutaway in Fabric 5, Period 4, pit CG 1048, fill 7199.
10. *Tegula* with upper cutaway in Fabric 3, Period 6, quarry pit CG 1057, fill 6520.
11. *Tegula* in Fabric 4 with knife-trimmed base, Period 6, pit CG 1015, fill 6823.
12. Full-width *tegula* in Fabric 4 with knife-trimmed lower cutaways and double arc signature mark, Period 5, CG 1061, floor 6984.

13. Near complete *tegula* in Fabric 1 with knife trimmed upper and lower cutaways, double arc signature mark and 3 finger grooves along base of flange on upper surface, Period 6, malting oven CG 1049.

14. Full-width *imbrex* in Fabric 3, Period 5, linear 8719, fill 8718.

15. *Imbrex* fragment in Fabric 5 with finger incised 's', Period 5, oven CG 1069.

16. Undiagnostic tile in Fabric 1 with scored lattice on sanded surface, Period 5, pit CG 1095, fill 6896.

17. Undiagnostic tile in Fabric 1 with knife trimmed, chamfered edges and square nail hole, Period 6, quarry pit CG 1057, fill 6520.

18. Antefix fragment with relief decoration, Period 5, pit CG 1087, fill 6952.

Markings, nail holes and other diagnostic features

Signature marks

Eleven signature marks were identified in the assemblage, nine of which were on tiles of Fabrics 1 and 4. All were incomplete and some extremely faint. Examples included single and double types with the 'arc' form being the most common (see Fig 161.12). Two tiles of Fabric 4 displayed the same double 'looped' signature and are therefore assumed to have been produced by the same tiler.

Other markings

One fragment of *imbrex* had a finger incised 'S' (Fabric 5, CG 1069, layer 6850; Fig 162.15). Such markings are rare on *imbrices* (Brodribb 1987, 24) and often classed as graffiti (Ward 1999, 21). Although there is no knowing that this 'S' was intended to represent, the theory that it is the initial of the tile maker is probably the most plausible.

Two undiagnostic fragments (CG 1072, fill 6378 and CG 1095, fill 6896; Fig 162.16) had distinctive knife-incised lattice on the sanded surface. These appeared too thick for standard box-flue but it is assumed that this lattice was intended to aid keying of mortar. Both were in Fabric 1 and of the same thickness and therefore, even though from different contexts, could well be from a single tile.

Five flat tiles had finger swipes forming 'rills' on the upper surface (contexts 6475, 6592, 6823 and 7050). These did not appear to be signature marks as they were all located near to and running parallel with the tile edge, rather than being in the standard signature location near to the bottom of the tile. All these tiles of were of Fabrics 1 or 4, and it remained unclear what purpose such marks had.

Nail holes

Three nail holes were noted in the assemblage, two square and one round (see Fig 162.17). The square examples were both on tiles of Fabric 1 and had both been made prior to firing (CG 1057, fill 6520 and CG 1069, layer 6850). The round example was on a tile of Fabric 4 and appears to have been drilled after firing and possibly related to reuse of the tile (CG 1057, fill 6492). The thickness of all these tiles would suggest them to be *tegulae*, though generally these did not have nail holes since the pitch of Roman roofs was such that tiles did not need to be secured by nails (Ward 1999, 14). Perhaps such tiles indicate a roof of steeper pitch or are the result of later reuse.

Knife-trimming

In addition to the knife-trimming seen on the back of *tegulae* flanges noted above, knife-trimming was also noted along the straight edge of at least two tiles in the form of a bevel both to the upper and lower surfaces, forming a flat-bottomed 'V' shape. The tiles on which it was observed were all of Fabric 1 and consisted of three undiagnostic, flat fragments (contexts 6896, 6523 and 6745) and one box flue tile (CG 1057, fill 6592).

Cutaways

A total of 19 cutaways were identified on tegulae from the assemblage and of these, 15 were of the lower type.

Lower cutaways (see Fig 160, nos. 1-8)

All but one lower cutaway were of Fabrics 1 or 4 and were neatly knife cut. The remaining example was on a tile of Fabric 5 and, although also knife cut, was less neat and had been formed in two stages.

Where complete or near-complete profiles survived, the form of these cutaways was classified according to the groups set out by Warry (2006, fig1.3) (see Table 43). From this classification, it is possible to see that the majority of lower cutaways within the assemblage were of group B, a type which Warry dates as early–late 2nd century (Warry 2006, fig 4.3). The remaining two cutaway types identified within the assemblage are A and C, which can be dated as mid-1st to early 2nd century and mid-2nd to mid-3rd century respectively.

Upper cutaways (see Fig 160, nos. 9-10)

There were far fewer upper cutaways in the group with just four noted. Of these, two were on the near-complete Fabric 1 *tegula*, and the other examples on Fabric 3 and Fabric 5 tiles. As seen with the lower cutaway of Fabric 5, the upper cutaway was roughly formed, this time by hand with end of the flange having been 'squashed' to form the correct profile. Likewise, the Fabric 3 example was roughly finished, although this one at least appeared to have been cut to shape rather than hand-formed.

Table 43:

Cutaway group	Tile fabric	Total
A	4	1
B	1	2
B	4	5
B	5	1
C	1	2

Table 43: Quantification of the lower cutaways by group (after Warry 2006)

Overview of ceramic building material

Due to the selective nature of the full analysis, a phased discussion of the ceramic building material is not presented here. However, it has been possible to make general observations about the assemblage, including dating and use.

Quantification by period shows that the vast majority of the ceramic building material was found in Period 6 features (see Table 44). However, because most of this Period 6 material (38%) was retrieved from quarry pit backfill contexts, it cannot be directly associated with any specific structures on the site. The earlier, lower fills of these pits contained a far smaller proportion of material than upper fills (see Tables 45 and 46) and are thought to relate to site clearance, with the upper levels being made up of material later brought in from elsewhere in the vicinity for disposal. If this is the case, then it may be that the small assemblage from these earlier, lower layers came from disuse of the buildings.

The dating of the *tegulae* by cutaway type would suggest that the majority of the *tegulae* was produced in the 2nd century, which ties in with the construction of the first phase of timber-framed buildings on the site (Period 4). It is known that ceramic tiles were used on timber-framed wattle and daub buildings elsewhere in the country (Crummy 1984, 22) and so this seems entirely possible in Worcester. As noted in the report on the stone building materials (see Roman stone building material), the occurrence of a large quantity of stone tile from the early to mid-3rd century onwards suggests that the ceramic roof was replaced at this date. This appears to be a common pattern repeated elsewhere, with evidence from sites both in Worcestershire (eg at Bays Meadow villa in Droitwich; Barfield 2006b, 166), and across the country, indicating a widespread move from ceramic to stone roofing material around this time (Perring 2002, 120). However, the use of ceramic tile on the early buildings does not extend to the box-flue tile, the antefix, nor the slipped *tegula*. The most likely explanation for the presence of these items and a proportion of the rest of ceramic building material is that it came from a higher status building elsewhere in Worcester, and had been brought to the site for disposal. Such a building may have been located to the east, in the vicinity of 1 The Butts, where a late Roman well produced a range of ceramic building material of the same fabric types as those recorded above, including *lydion, pilae, tubuli, teguale* and *imbrices.* Non-ceramic building material from that site included *tesserae*, painted plaster and the base of a limestone column, and other finds continue this litany of higher status items: fine moulded glass, and jewellery (Napthan 2011a). Further excavations at 14–24 The Butts also revealed a fairly significant assemblage of ceramic building material in a similar range of forms and fabrics (*cf* Macey-Bracken 2011, 110), as did the City Campus excavations to the north of The Hive, where this material was also largely from infilled quarry pit contexts (Evans and Crawford 2014, 62).

There is some evidence of re-use of ceramic building material, for instance with *tegulae* set in the base of the malting oven flue, and it is highly likely that this happened elsewhere on site. *Tegulae* are known to have been recycled in a variety of ways following removal from roofs. Documented re-use on other sites includes finds of *tegulae* in the levelling courses of buildings, flue and hypocaust channels, and as flooring either in the form of flat slabs with the flange removed or cut up to form *tesserae* (Ward 1999, 17).

Table 44:

Period	Total	% total	Weight (g)	% weight
–	43	4	400	0
3	4	0	537	1
3–6	1	0	332	0
4	108	11	10,290	10
4–6	8	1	1,568	2
5	162	17	21,238	21
5–6	18	2	1,395	1
6	493	51	51,112	50
6–7	60	6	4,992	5
6–8	15	2	6,186	6
6–11	21	2	2,088	2
7–10	3	0	373	0
10–12	6	1	61	0
12	19	2	1,785	2
Total	***961***	***100***	***102,357***	***100***

Table 44: Quantification of the ceramic building material by period

Table 45:

	Count	% count	Weight (g)	% weight
Fabric 1	22	27	4,168	30
Fabric 2	19	23	3,497	25
Fabric 3	19	23	2,762	20
Fabric 4	11	13	2,325	17
Fabric 5	12	14	1,034	8
Total	***83***	***100***	***13,786***	***100***

Table 45: Roman CBM from lower fills of Quarry Pits

Table 46:

	Count	% count	Weight(g)	% weight
Fabric 1	162	58	13,137	50
Fabric 2	25	9	3,079	12
Fabric 3	28	10	3,828	14
Fabric 4	31	11	4,508	17
Fabric 5	31	11	1,972	7
Total	***277***	***100***	***26,524***	***100***

Table 46: Roman CBM from upper fills of Quarry Pits

Roman stone building material

C Jane Evans

This is the largest assemblage of Roman stone building material from Worcester to date; 722 fragments of building stone, weighing *c* 505kg, from Roman deposits (Tables 47– 49). A further 115 stones comprised the late Roman malting oven (Period 6, CG 1049). This was dealt with on site as a structure rather than individual finds; the stone was therefore not weighed, but a photographic record was made of each stone so that the oven could be reconstructed in The Hive building. Together with two large worked pieces of architectural stone, also not weighed (from AU 518 and AU 510), this represents the most extensive evidence of Roman masonry structures from Worcester to date. The assemblage also included a significant quantity of stone roof tile. This and other sites in The Butts provide the first clear

evidence for this type of roofing from Worcester, providing important information on Roman building technology.

Fragments of building stone were deposited throughout the stratigraphic sequence, but were mainly associated with later Roman deposits, in particular Period 6 (Table 47). The majority had been dumped in pits (63% by count), with smaller quantities coming from floors and surfaces (8%), ovens (7%), postholes (5%), wells and ditches (3% each). The stone was quantified by type and material (Table 48) and Period/type (Table 49).

General building stone

The material classified as general building stone included fragments of sandstone, lias and limestone (Table 48). Possible sources for these are discussed below.

The earliest fragment of building stone came from Period 3 (Table 49), from the east–west ditch (CG 1003, fill 6340). This was an irregular, damaged block, with two surfaces showing evidence of 'scutching' and picking, to create a roughened surface for keying in mortar. A larger quantity of stone was deposited in Period 4, mainly associated with the stone-lined well (AU 506; Figs 27 and 28). Only a sample of the stone lining was removed and recorded during excavation, the remainder being left in situ. The 17 fragments recorded comprised 11 fragments of lias and 6 of sandstone, along with three fragments of stone roof tile. Single, undiagnostic lias stone fragments were also recovered from a pit in Building 2A (CG 1008, fill 6876) and sandstone from a beam slot defining a possible earlier building with an oven (CG 1111, fill 7096). The Period 3–6 stone was recorded as mainly coming from the packing of a small posthole (fill 6493), although given the mass of stone recorded (56,500g), this allocation or measurement seems to be the result of an unresolved numerical error during the excavation. This included 14 fragments of lias, possibly paving or perhaps from a well, and seven fragmentary sandstone blocks, again with keying.

The largest assemblages came from later Roman Periods 5 and 6. Most of the Period 5 assemblage was from an upper cobbled surface (CG 1098, layer 6158, 50 fragments, 5058g); all limestone. Of particular interest was a post-pad from Building 2C (CG 1065, fill 6978). This was photographed and drawn on site (Fig 164.1) but not retained, so was not weighed. Small quantities of stone also came from Building 2D (AU 519), a surface and features cut into it on the east part of the site (AU 525), and various pits (CG 1093, CG 1095 and CG 1051). This included a mixture of sandstone and lias, with no significant pieces. Most of the Period 6 building stone was associated with the robbing of the stone well (AU 507, 34 fragments, 17,355g). The stone was mainly found in fill 6823; 16 pieces of sandstone, including two substantial blocks with tool marks, 18 fragments of lias, possibly from the well lining, and one fragment of limestone. The most interesting find came from one of the upper fills of quarry pit (CG 1057, fill 6491); a square block of sandstone with a socket, thought to be for a door lintel (Fig 165.2). This was not retained and was not weighed. Three fragments of sandstone also came from this pit. A further four fragments from the pit cut into the well (AU 507, fill 6943) included a sandstone block. Smaller quantities of stone came from a post-pad in the northern footings for the aisled building (CG 1040, fill 6816), and the quarry pits, the latter comprising 6 fragments of lias from pit (CG 1108).

A small quantity of stone was associated with Period 6–7 deposits. The most interesting piece was a sandstone block with possible foot wear, found in the backfill of the timber well pit (CG 1089, fill 8659). Other finds included a damaged, square sandstone block and four lias fragments, both from pits (CG 1090, fill 8653 and 6841, fill 6840).

Sources

Fiona Roe's report on stone from Deansway provides a valuable discussion of probable sources (Roe 2004, 463–6). At The Hive, all the sandstone used for roof tile, and most of the sandstone building material, was identified as Lower Old Red sandstone. This is thought to be from east Herefordshire, possibly around Wellington Heath, *c* 19km south-west of Worcester. A couple of the building stones were identified as Triassic Bromsgrove sandstone, from a few possible sources to the north of Worcester, *c* 7km and 8.3km away. The Jurassic Blue Lias is most likely from a fairly local source; there are sources *c* 4.8km away from Worcester. The oolitic limestone was probably from the Cotswolds.

Floor tile

A single fragment of sandstone was classified as a floor paver, based on its upper surface being worn smooth. This was associated with the slumped construction fill of the Period 4 stone-lined well (AU 506, 6972).

Roof tile

Roof tile was the most common building material recorded, all made in Old Red sandstone. The assemblage included many diagnostic fragments of hexagonal roofing tile, including a near complete tile (Fig 165.3), and a number with square peg holes.

Previous excavations in this area of Worcester have already suggested the presence of Roman buildings with stone roofs. A late Roman well at 1 The Butts produced *c* 80kg of stone roofing tile, including similar hexagonal tiles with single peg holes (Napthan 2011a, 36–7). For comparison, 143kg of roof tile was excavated at The Hive. The fill of the late Roman well provided other evidence for a significant Roman structure. Stone roof tile was also recorded at the neighbouring City Campus site (Williams 2014, 17.5kg). In contrast, another neighbouring site, 14–24 The Butts, produced only two fragments of stone roof tile (Ixer and Bracken 2011, 110), both from a late Roman dumping layer. Old Red Sandstone tiles have also been recorded from other Roman sites in the region, notably from Bays Meadow villa, Droitwich (Roe and Barfield 2006) and from the edge of Kenchester, in Herefordshire (Wilmott and Rahtz 1985, archive section 101.3; Dennis Williams pers comm).

Stone roof tile was present throughout the sequence, occurring in very small quantities in Periods 3 and 4 (Table 49). The three fragments from Period 3 all came from the early roadside ditch (CG 1003, fill 6340). The Period 4 roof tile came from the re-cut of this ditch (CG 1004), the construction of the stone well (AU 506, fills 6824, 6972), a beam slot in the possible earlier building (CG 1111, fill 7096) and from a pit (7232, fill 7231). There was a significant increase in the deposition of stone roof tile in Period 5; 25% of the assemblage by count came from this period, from a wide range of features; pits, layers and ditch fills. The largest group came from pit 8841, part of CG 1051 (fill 8839, 41 fragments). Other concentrations came from pit 6476 (fill 6474, 18 fragments) and pit CG 1095 (fill 6900, 10 fragments).

The largest quantity of tile however, 54% by count, was deposited in Period 6. The roof tile had a different distribution to the architectural stone described above, the majority coming from the quarry pits. Quarry pit (CG 1108) produced 115 fragments, mainly from the uppermost fill (6745, 92 fragments), with smaller quantities distributed through other fills. Quarry pit (CG 1057) produced 109 fragments, from the upper fill (6520, 27 fragments), and a range of other fills. Some tile was found with other building stone associated with the robbing of the stone well (AU 507, 7054, 34 fragments), and small quantities were recovered from a ditch (6468) and a couple of pits (CG 1090). Another concentration of tile was associated with aisled building (AU 508), from the fill of the Period 6–7 construction cut (11 fragments) and from the fill of the internal oven (CG 1019, fill 6566, 50 fragments).

Table 47:

Period	AU no	AU name (feature/feature type)	Count	Weight(g)
3	501	Early east-west ditch	4	6,302
3–4		(Pit 8724)	1	200
3–6		(mainly posthole 6494; 56500g)	29	57,766
4		(Pit 7232)	1	48
	502	Re-cut east-west ditch	1	240
	503	Strip building 2A (pit fill)	1	313
	506	Well - construction	23	100,532
	530	Possible earlier building with oven (beam slot)	2	576
4–5	500	Roman deposits in palaeochannels	1	35
4–6		(Post-hole fill 6933)	2	333
5		Dispersed pits (various pits/features, mainly pit 8841, 43 frags, 20770g)	69	25,103
	518	Strip building 2C	5	1,270
	519	Strip building 2D (oven)	6	2,251
	523	Features cutting cobbled surface (various pits)	52	9,563
	525	Surface and features cut into it in east part of site (layer 7192)	2	889
	526	Deposits sealing cobbled surface	50	5,058
	527	Pits at rear of strip buildings south-west part of Area 1 (pit 6895)	13	8,562
5–6		Levelling above cobbled surface (layer 6837)	2	211
	524	Timber well pit	2	682
6		Soils around malting oven (mainly 8802, 24 frags, 3312g, also 8882)	34	4,442
	507	Well - robbing	74	150,282
	508	Aisled building structural components	1	2,330

Period	AU no	AU name (feature/feature type)	Count	Weight(g)
	510	Quarry pit (pits 6521 and 6746; mainly from pit 6521, fill 7094)	233	82,178
	520	Later intrusions into SB 2D 3rd–4th century	1	166
	523	Features cutting cobbled surface (various pits and ditch)	10	948
6–7		Top of well pit (pits 8654 and 8701)	23	32,888
	508	Aisled building structural components	11	2,780
	522	Post-Roman? features	13	1,580
	524	Timber well pit	6	2,982
6–8	508	Aisled building central oven	50	4,619

Table 47: summary of the stone building material by period and activity unit (AU), where applicable

Table 48:

Object specific type	Material subtype	Count	% count	Weight (g)	% weight
Architectural stone	lias	58	8	114,522	23
	limestone	51	7	5,327	1
	sandstone	49	7	241,519	48
Total architectural stone		158	22	361,368	72
Floor tile	sandstone	1	0	330	0
Roof tile	sandstone	563	78	143,431	28
Total		***722***	***100***	***505,129***	***100***

Table 48: summary of the building stone by type and material

Table 49:

	Architectural stone		Floor tile		Roof tile	
Period	**Count**	**Weight (g)**	**Count**	**Weight (g)**	**Count**	**Weight (g)**
3	1	6,000	0	0	3	302
3–4	0	0	0	0	1	200
3–6	22	50,766	0	0	7	7,000
4	19	97,101	1	330	8	4,278
4–5	1	35	0	0	0	0
4-6	0	0	0	0	2	333
5	59	25,825	0	0	138	26,871
5–6	0	0	0	0	4	893
6	50	149,509	0	0	303	90,837
6–7	6	32,132	0	0	47	8,098
6–8	0	0	0	0	50	4,619
Total	***158***	***361,368***	***1***	***330***	***563***	***143,431***

Table 49: Summary of the stone by period and type

Catalogue of illustrated stone building material (Figs 164 and 165)

1. Post-pad in Bromsgrove Sandstone. Period 5 Building 2C, AU 518, posthole CG 1065.

2. Square block of Bromsgrove Sandstone with a socket cut into the horizontal face to accommodate a wooden post, probably to support a door lintel. 45x41x0.35cm. Period 6 quarry pit CG 1057.

3. Near complete hexagonal tile with a square hole, in Old Red Sandstone. The surface around the nail hole on the lower side of the tile had been pecked away when the hole was being made (not shown in the illustration). The dimensions place this in the mid- to large range of tiles described from Bays Meadow villa, Droitwich (Roe and Barfield 2006, 168). Maximum width 27cm, maximum height 30cm. Period 6, robbing of well CG 1015.

Tessera

In addition to the material quantified above, a single *tessera* in light grey lias was recovered from the Period 6 robbing of the stone well (CG 1015, fill 6942; not illustrated). Almost 200 similar tesserae were recovered from the late Roman well at 1 The Butts (Napthan 2011a, 37). Like the examples from 1 The Butts, this was crudely cut and presumably came from a tessellated pavement rather than a more sophisticated mosaic.

Overview of the stone building material

The assemblage provides significant evidence for the use of stone building materials in this area of the Roman settlement. The stone roof tiles and other sandstone building material are particularly associated with later Roman deposits (Fig 166 and 167), although small quantities were found in earlier contexts. This is consistent with evidence from elsewhere; for example, stone roofing was the norm at Bays Meadow villa in Droitwich by the late 3rd century (Barfield 2006b, 166) and it is perhaps significant to The Hive that the stone roof tiles at Bays Meadow were particularly associated with the aisled building (Roe and Barfield 2006, 167). At Bays Meadow villa and at 1 The Butts there was evidence for the roof tiles having been burnt; no evidence for burning was recorded here. The lias shows a different chronological and functional pattern to the roof tile; it is predominantly associated with the construction of the Period 4 well (AU 506) and the Period 6 robbing of this well (AU 507). Lias from other contexts may also have been used in well construction, or could have been used in building or as paving, though no evidence of wear was recorded. The limestone fragments were all undiagnostic, and all but one fragment came from the Period 5 surface sealing the cobbled surface (AU 526). Limestone was used as a building material at this period; the late Roman well at 1 The Butts produced a column fragment in Cotswold limestone along with other limestone fragments (Napthan 2011a, 36–7) and its use is recorded at Bays Meadow villa (Barfield 2006a). Limestone could also have been brought here for lime working, especially given that lime-mortar and lime plaster have been identified.

Preparation of this report has highlighted issues with the way stone building material can be recorded during excavations; material *in situ*, such as wells and above ground structures, is recorded differently to stone that is removed. The latter should be fully recorded as finds, as has been attempted here, though there are problems weighing large stone blocks on site. One challenge of analysing any category of finds is estimating what proportion of 'the whole' is being studied. This has proved difficult with the stone assemblage; there is detailed quantification of the stone roof tile but no real idea of the area of roofing this might represent. Likewise, there is quantification of the stone removed from the well, but no quantification of the stone lining left *in situ*, or any real idea of the quantity of stone required to construct the well. There is also limited consistency between sites in the way that material is recorded; the report on the late Roman well at 1 The Butts, for example, provides a total weight of roof tile dumped during infilling, which can be compared to quantities found here, but only refers to 'a substantial number' of fragments of sandstone and lias. The Period 4 well here, dating to the mid-2nd to early 3rd century, appears to be a fairly basic construction using roughly shaped lias blocks. The late Roman well at 1 The Butts, with *tpq* in the late 3rd to 4th century for construction (Evans 2011, 32), was a more sophisticated structure. It was made from carefully re-cut sandstone blocks, some of which were clearly derived from relatively high status stone buildings (Napthan 2011a, 30). This provides important evidence for the demolition of stone buildings in this period and perhaps, given the careful re-working of the stone, for the continuing presence of established masons working in Worcester at this time. The infilling of the well, dated to sometime between *c* AD 370 and 390 (Napthan 2011a, 41) seems to indicate another phase of demolition somewhere in the vicinity.

Roman stone objects

Ruth Shaffrey with Katherine Andrew

Eleven stone objects were recovered during excavations. Of these, ten were assessed by Ruth Shaffrey; seven rotary querns, two hones/possible hones and a stone basin. A further hone was separated out during later analysis of the stone building material (no 10). Geological identification of this was provided by Katherine Andrew of the Earth Heritage Trust.

With the exception of one quern, which is coarser than the rest and could be Millstone Grit, all the querns are made from pebbly sandstone typical of the Old Red Sandstone quartz conglomerate of the Wye Valley in the Forest of Dean area. The rotary querns were mainly from Period 4 and 5 contexts, dating broadly to the late 2nd to early 4th century. At this time, querns of Old Red Sandstone dominated the market around Worcester, probably because of the relative ease with which it could have been transported up the River Severn. Examples have been found on a number of previous excavations in Worcester; at Sidbury, Deansway and Blackfriars (Roe 1992, 85; Roe 2004, 466; Fiona Roe pers comm). The fragments from The Hive continue to support a pattern of Old Red Sandstone being a far more significant quern material than Millstone Grit during the Roman period. Although they are fragmentary, it is possible to identify a number of forms, including flat-topped (no 1 and 2), lozenge shaped (no 3) and a hybrid type, being somewhere between a lozenge form quern and a pyramid form (Fig 168. 4; and see Shaffrey 2006, Fig 43). One fragment appeared thick enough to be from a millstone (no 5) but was not complete enough for certain identification. These are typical forms and with no positive proof of millstones, indicative of domestic grinding.

Two pebbles had been used as hones without any alteration to their natural shape, other than that which occurs through use (no 8 and 9). They could easily have been collected locally and are suggestive of domestic use, rather than being tools providing evidence of industry. Another hone was identified as a reused sandstone slab (Fig 169.10). A stone trough is the only other significant item of worked stone (Fig 170.11). It retains tool marks and has been rather crudely shaped. Its purpose is not entirely clear but it is not worn inside suggesting it was used to store something, perhaps animal feed or water.

Catalogue of stone objects

1. Upper rotary quern fragment (not illustrated). Old Red Sandstone, quartz conglomerate. Flat topped type, pecked all over but worn on upper surface suggesting possible reuse. The quern is broken across the lateral handle slot. Measures 44mm thick. Period 5, ditch fill 6376.

2. Upper rotary quern (not illustrated). Old Red Sandstone, quartz conglomerate, in three adjoining fragments. Neatly pecked all over except for the grinding surface which has harped grooving. The quern is of typical, flat-topped type, tapering to centre slightly. Part of a damaged rynd socket set into the grinding surface. Measures 430mm diameter and 55mm thick. Period 4, Building 2B posthole, two fragments from fill 6737 and one fragment from fill 6738.

3. Lower rotary quern (not illustrated). Old Red Sandstone. The grinding surface is slightly sloping and worn smooth, although some evidence of the original pecking is evident. Lozenge shaped stone, fully perforated with a biconical hole drilled from both sides measuring 20mm at its narrowest point and 38mm at the grinding surface. The original circumference is heavily damaged. Measures approximately 300mm diameter and 100mm thick. Period 5, malting oven 8804, small find 51.

4. Lower rotary quern (Fig 168). Old Red Sandstone, quartz conglomerate. Approximately 70% of the stone survives. The central socket is partially perforated and the quern has a slightly sloping grinding surface and flat base. It is pecked all over but there is some rotational wear to the grinding surface. Measures 420mm diameter and 50–110mm thick (110mm at centre). Period 4, layer 7073.

5. Rotary quern or millstone fragment (not illustrated). Coarse grained sandstone, probably Old Red Sandstone, but possibly Millstone Grit. Damaged but with some rotational wear evident. Period 4, Building 2B, cobble floor 6665.

6. Upper rotary quern fragment (not illustrated). Old Red Sandstone, quartz conglomerate. Small edge fragment, with neat pecking to edges and grinding surface. Burnt. Measures >70mm thick. Period 4, oven in Building 2A, layer 6862.

7. Upper rotary quern fragment (not illustrated). Old Red Sandstone, quartz conglomerate. Roughly shaped upper face. The edges are straight and vertical and the grinding surface is slightly concave. Both are pecked and the grinding surface has some rotational wear. Measures approximately 480mm diameter and 60mm thick. Period 6, quarry pit fill 7050.

8. Hone (not illustrated). Fine grained micaceous pale brown sandstone. Pebble with rounded, sub square cross-section, broken at one end and probably used as a hone. Measures >100x33x35mm. Period 6–7, pit fill 6840.

9. Possible hone (not illustrated). Medium grained quartz sandstone. Elongate pebble, fractured along the bedding lengthwise and possibly used as a hone. Measures 130x33x>25mm. Period 5, clay floor in Building 2C, layer 6984.

10. Hone (Fig 169). Sub-rectangular fragment of a sandstone slab, with three broken edges and one worked edge. This has been re-used as a hone; the worked edge and two flat surfaces are worn smooth, and the angle between the upper surface and worked side has cut marks where blades have been worked against the stone. Fine grained red sandstone with quite rounded quartz grains, suggesting they were wind deposited, and pink feldspar crystals. Possibly Bridgnorth Sandstone. Period 4, Building 2B, oven layer 7017.

11. Large square basin (Fig 170. Old Red Sandstone. Crudely square basin with diagonal tool marks surviving on the internal faces. Measures 300x280x170mm externally and 250x230x110mm internally. Period 5, pit fill 8873, small find 276.

Roman plaster and mortar

C Jane Evans with Shona Robson-Glyde

A total of 942 fragments of mortar/plaster were recovered from the site, weighing 20,768g. Only mortar and plaster from stratified Roman deposits is included in this report (637 fragments, 10,966g).

While small quantities were found in Periods 4 and 5, the majority came from Period 5–6 deposits (Fig 171, Table 50). The largest group by far came from a Period 5–6 dump (6836) amongst demolition layers (CG 1047). Another large assemblage came from the Period 6 quarry pits, nearly all from pit (CG 1057; 111 fragments, 2410g), and particularly from fills (6520; 74 fragments, 1519g), (6592; 21 fragments, 283g) and (6915; 12 fragments, 565g).

Most of the assemblage comprised lime mortar. Some fragments had flat surfaces, with residues of a lime plaster face or ‘intonaco’. A few fragments of thicker lime plaster, finer textured than the mortar and typically soft, white and crumbly, were also identified. Of particular interest were fragments of mortar with lath impressions, all from Period 6. These provide rare evidence for building practices in this period. On one example two clear additional layers of mortar were visible (Fig 172), possibly applied when the building was constructed or potentially indicating later repair. Also of interest was a fragment of *opus signinum*, mortar packed with smashed ceramic fragments to increase its strength. This was typically used for paving. A couple of fragments of lime were also identified, one burnt and one not. These came from Period 5 and could relate to the building of one of the structures.

Table 50:

Period	AU no	AU name (feature/feature type)	Type	Count	% count	Weight (g)	% weight
4		(layer 6519)	mortar	6	1	392	4
4		(pit 8872)	plaster	1	0	46	0
4	502	Re-cut East-West ditch	mortar	6	1	93	1
4–6	528	Strip Building 1	plaster	1	0	9	0
5		(pit 8836)	plaster	1	0	12	0
5	519	Strip building 2D	mortar	1	0	65	1
5	523	Features cutting cobbled surface	mortar	19	3	379	3
5	523	Features cutting cobbled surface	plaster	7	1	65	1
5	525	Surface and features cut into it in east part of site	lime plaster	2	0	125	1%
5	527	Pits at rear of strip buildings south-west part of Area 1	mortar	3	0	23	0
5–6		(layer 6836)	mortar	446	70	5,935	54
5–6		(layers 6514, 6516, 6517, 6837)	mortar	27	4	1,013	9
6	507	Well – robbing	mortar	2	0	36	0
6	510	Quarry pit	mortar	111	17	2,596	24
6	510	Quarry pit	opus signinum	1	0	21	0
6	510	Quarry pit	plaster	1	0	16	0
6–7	508	Aisled building structural components	mortar	2	0	140	1
Total				***637***	***100***	***10,966***	***100***

Table 50: Summary of the mortar and plaster by period and activity unit

A small quantity of plaster and mortar was noted at the neighbouring City Campus site (Evans 2014b, 65–6) also mainly from later Roman deposits. That assemblage included red-painted plaster, though no red-painted plaster was recovered from The Hive. Another neighbouring site, 14–24 The Butts, also produced a small quantity of mortar (15 fragments) from 4th century deposits (Macey-Bracken 2011b, 110), described as including some thick fragments with a flat side and traces of whitewash. This was thought to be contamination from 18th and 19th century deposits, but given the subsequent discovery of mortar from later Roman deposits elsewhere in this area, could be similar to the material described here. A significant quantity of plaster/ mortar (*c* 4.5kg) was recovered from the late Roman well at 1 The Butts (Napthan 2011a, 37), including red painted plaster. Most of the plaster in this assemblage is described as mortar backed. Some had timber impressions, perhaps like the examples from The Hive, but most appeared to have been used on smooth masonry walls. The late Roman well also produced occasional fragments of *opus signinum*.

Roman leather

Quita Mould

One piece of leather came from a Roman context. This comprised a piece of cattle hide edge (small find 193) and was recovered from fill 6908 in the large Period 6 Roman quarry pit (CG 1108).

Catalogue of Roman leather

1. Leather primary waste. Length of hide edge, now twisted toward one end. Small holes visible in the flesh surface that do not penetrate to the grain surface appear to be the result of infestation. No other discernible features present. Waste leather of this type cannot be independently dated. Leather cattle hide 5.33mm thick. Length 158mm, max width 48mm. Area 1, fill 6908, small find 193. (not illustrated)

Medieval and post-medieval finds

Pottery

C Jane Evans

Medieval pottery (64 sherds, weighing 1185g) was mostly residual in post-medieval contexts; only 8 sherds (86g) came from Period 9 (ie medieval deposits). Fabrics included a range of locally produced wares, such as Malvernian unglazed cooking ware (Fabric 56), Worcester-type sandy glazed ware (Fabric 64.1), and oxidised glazed Malvernian ware (Fabric 69), as well as a buff sandy glazed ware (Fabric 64.2) thought to be from Staffordshire.

The excavations also produced 1450 sherds of post-medieval pottery, weighing 34.275kg. Only 11 sherds, (74g, <1% by weight), came from deposits dating from the 16th to mid-18th century (Period 10). A further 86 sherds, 1457g, came from mid-18th to 19th century contexts (Period 11). Most sherds, however, (907, 20,273g, 59% by weight) were residual in modern deposits (Period 12), with significant quantities coming from Periods 10–12 (277 sherds, 8033g, 23% by weight) and 10–11 (42 sherds, 3603, 10% by weight). A range of fabrics was noted, as follows:

- Late 16th to early 18th century – tin-glazed ware (Fabric 82).
- 17th to 18th century – North Devon gravel tempered ware (Fabric 75), red sandy ware (Fabric 78), and Westerwald stoneware (Fabric 81.2).
- 18th century – manganese mottled ware (Fabric 91), white salt-glazed stoneware (Fabric 81.5) and cream ware (Fabric 84).
- Late 18th century to modern – porcelain and china (Fabrics 83, 85).

Coins and tokens

Cathy King

The excavations produced nine coins from post-Roman contexts and three trade tokens and a jeton (Table 51). The coins and tokens came from modern (Period 12) or poorly stratified (Period 6–11) deposits. The jeton was included amongst finds retrieved from the tillage soil around the Period 6 malting oven (CG 1049).

Iron

C Jane Evans

Only two objects, a nail and an unidentified iron fragment, came from medieval deposits (Period 9), representing 1% of the post-Roman iron assemblage by count. Seven nails came from the 16th to mid-18th century deposits (Period 10; 2%), while the mid-18th to 19th century deposits produced 18 nails and 3 unidentified iron fragments (Period 11; 5%). The great majority of the iron came from modern deposits (Period 12; 60%) or deposits assigned to Periods 10–12 (20%).

Table 51:

Obverse	Ruler	Reverse	Mintmark	Mint	Start date	End date	Denom	Material	Reference	SF no	Context	CG no	AU no	Period
CAROLVS DG MAG BRI	Charles I	FRAN ET HIB REX			1625	1649	Rose Farthing token	AE		255	8801	1056		6–11
CAR[.], C R II .	Charles I	[N]EMO [ME IMPVNE LA[CESSIT], thistle		Scottish	1632	1639	Turner	AE	SCBI 35,1552-5	214	8512	1056		6–11
CAROLVS A [ ]	Charles II	[BRITANNIA]			1660	1685	Farthing	AE		06	6164			12
[ ] AROLO	Charles II	[ ]NIA, Britannia		London	1672	1679	Farthing	AE		173	6004	1056		6–11
GEORGIVS II REX	George II	Illeg			1727	1760	Halfpenny	AE		18	6317			12
GEORGIVS III [ ] REX	George III	Illeg, stuck to Bilston token			1806	1806	Halfpenny	AE		314				
GEORGIVS III DEI GRATIA	George III	[BRITANNIA]			1807	1807	Halfpenny	AE		04	6013	1099		12
Illeg	Illeg	Illeg			18th	20th		AE		28	6317			12
GEORGIVS VI DG BR OH REX	George VI	FARTHING, wren			1950	1950	Farthing	AE		118	unstrat			
Illeg	Illeg	Illeg, stuck to halfpenny			19th	19th	Trade token, Bilston	AE		218	unstrat			
Illeg	Illeg	Shield?			19th	19th	Trade token	AE		14	unstrat			
Illeg	Illeg	Illeg			early 19th?	early 19th	Trade token?	AE		123	6052	1025	509	12
Illeg	Illeg				*c* 1461	1497	Jeton	AE		266	8802	1049		6

Table 51: Post-medieval coins

Clay pipe

C Jane Evans

There were 467 fragments of clay pipe recorded but not studied in detail. The majority were associated with modern deposits (Period 12; 229 fragments) or contexts assigned to Period 10–12 (147 fragments). The assemblage included a number of bowls and two stamps; 'FI' and 'IB'.

Brick and tile

C Jane Evans

Significant quantities of ceramic building material were recovered, mainly post-medieval but including some medieval fragments. A total of 389 fragments (334.743kg) was discarded on site, predominantly from Period 11–12 and Period 12 deposits. A further 2502 fragments (293.756kg) were retained. The majority of these (865 fragments, 132.671kg, 49% by weight) also came from modern deposits (Period 12), with significant quantities also from Periods 10–12 (651 fragments, 65.503kg, 24%) and 11–12 (317 fragments, 34.079kg, 13%).

Glass

C Jane Evans

There were 516 fragments of post-medieval glass, the majority being from modern deposits (Period 12, 239 fragments), though a significant quantity was from Period 10–12 deposits (155 fragments), in particular from the additional Civil War period defences (AU 516, 119 fragments). Vessel/bottle glass and window glass were both represented.

Summary of finds from key post-medieval features

C Jane Evans

The fill of the Period 9–10 medieval ditch (AU 512, CG 1035, fills 2545 and 2563) produced a late medieval sherd of glazed Malvernian ware (Fabric 69) and a partial block of Triassic sandstone building stone, assumed to be from the city wall. The lower fill of the subsequent Civil War re-cut, Period 10 (AU 513, CG1036, fill 2544) included a clay pipe dated *c* 1640–60/80 and a fragment of ridge tile broadly dated *c* 1600–1800. Other finds were less diagnostic fragments of slag and building stone. The final re-cut contained finds dated to the late 17th to 18th century (AU 514, CG1037, fill 2543). This produced the largest pottery assemblage (27 sherds), comprising late 17th to 18th century North Devon gravel tempered ware (Fabric 75) and red sandy ware (Fabric 78), as well as a fragment from a broadly late 17th to early 18th century glass onion bottle.

The finds from the civil war defences (Period 10–12, AU 516, CG 1059) included post-medieval pottery (147 sherds), clay pipe, ceramic building material, vessel and window glass, metal finds and slag (13.9kg), along with sherds of residual Roman and medieval pottery. The brick, discarded on site, dated broadly to the 17th to18th centuries. The majority of other finds, including a bobbin, could only be dated in general terms to the post-medieval period. The assemblage included a small quantity of medieval pottery and tile, as well as residual Roman pottery and coins. The lower fills of the ditch (6157, 6396) produced mid/late 18th to 19th century pottery; red sandy ware (Fabric 78), cream ware (Fabric 84), white stoneware (Fabric 81.5), porcelain (Fabric 83), tin-glazed ware (Fabric 82), manganese-mottled ware (Fabric 91). The secondary ditch, identified as part of the Civil War defences (Period 10, AU 516, CG

1058) produced a very small assemblage of post-medieval finds (clay pipe stem and a sherd of glazed Malvernian ware (Fabric 69) dating to *c* 1550–1625).

A Period 11 pit (8646) associated with the Joseph Wood timber yard produced tile and post-medieval pottery: creamware (Fabric 84), red sandy ware (Fabric 78) and white stone ware (Fabric 81.5). The pottery dated to *c* 1760–1820, consistent with an associated coin dated to 1750–1800 (8632, fill 8623). Finds from another pit (8632) were more mixed, all fills including modern (late 19th and 20th century) pot, tile or glass, as well as finds dated broadly to the post-medieval period, and some slag (58g); and associated bricks were dated to the 18th to 19th centuries.

Post-Roman small finds

Hilary Cool

The excavations produced a small number of medieval to post medieval items which are briefly detailed here.

Nos 189–90 are hooked dress fittings. No 189 belongs to the late Anglo-Saxon to medieval range discussed by Crummy in connection with those found at Deansway (Crummy 2004, 433), whilst no 190 belongs to the later Tudor renaissance of the type which has been discussed by Gaimster *et al* (2002) and Egan (2005, 42–3). There is also a fragmentary wound wire accessory (no 191) of a type used during the sixteenth and seventeenth centuries (Egan 2005, 55).

There are a number of items associated with medieval and post-medieval dress that were found stratified in Roman contexts. Three of the five pins with wire-wound heads (‘sewing pins’) come from the Period 6 tillage soil (no 192–4). These are a post-Norman Conquest form, becoming extremely common in the 14th century when very large numbers were needed to fix veils (Egan and Pritchard 2002, 297). The type continued to be manufactured into the early modern period by which time they were being used for textile work. The lace tag from a Period 6 context (no 197) is another very common medieval dress fitting used, especially with the laces needs to fasten 14th century clothing (Egan and Pritchard 2002, 281). Neither of these forms are Roman types and these pieces must be intrusive. Something similar may also be suspected of the much corroded piece no 198 with its looped shank. Again this is not a feature seen on Roman studs but is regularly encountered on the buttons that started to be used from the 13th century when the fashions for tighter fitting clothing started to appear (Egan and Pritchard 2002, 272).

No 199 is a small bobbin of the type thought to have been used as a needlework accessory. They have a *floruit* of the 12th to 14th centuries (MacGregor 1985, 183–4). No 200 is a lead cloth seal. The 1805 on it may be a date as the use of such seals did continue into the nineteenth century (Egan 1994, 4). No 201 is a late medieval seal matrix. No 202 is a die with the opposing faces adding up to seven, a pattern that has been favoured from the Roman period to the present day. Whilst it might be residual in the Period 10 context, it is probably more likely to be contemporary with it. It would be very small for a Roman die.

1. Hooked tag. Copper alloy. Hollow-backed oval head, with slot on upper part and mouldings on front; triangular shank with hooked end bent out of shape. Length 30mm, head dimensions 15.5x13mm, shank section 2.5x2mm. Small find 260: Unstratified.

2. Dress hook. Copper alloy. Perforated trefoil terminal, forked plate with central perforation, long hook. Length 41mm, width 15mm, thickness 1mm. Context 6744: Small find 68: Period 12.

3. Wound wire accessory. Copper alloy. Wire curved into semi-circle with one end broken and other bent into small loop with free end wrapped in a spiral of six turns around hoops. Diameter 12mm, wire section *c* 0.5mm. Context 6395: Small find 202: Period 8–10.

4. Sewing pin. Copper alloy. Circular-sectioned tapering shank; spiral globular wire head. Length 40mm, head diameter 3.5mm, shank diameter 1.5mm. Context 8802: Small find 261: Period 6.

5. Sewing pin. Copper alloy. Circular-sectioned pointed wire shank; small globular head of spirally wound wire; bent. Length 22mm, head diameter 1.5mm, shank section 0.5mm. Context 8802: Small find 267: Period 6.

6. Sewing pin. Copper alloy. Circular-sectioned pointed wire shank; small globular head of spirally wound wire. Length 25mm, head diameter 1mm, shank section 0.5mm. Context 8802: Small find 265: Period 6.

7. Sewing pin; shank only. Copper alloy. Present length 26mm, shank section 1mm. Context 8603: 237: Period 10.

8. Sewing pin. Copper alloy. Wound head of two turns, circular-sectioned shank with pointed end. Length 56mm, head section 4mm, shank section 2mm. Context 6396: Small find 294: Period 10–12.

9. Lace tag; fragmented. Copper alloy. Sheet wrapped into cylinder. Length 22mm, section 3mm. Context 6492: Small find 164: Period 6.

10. Stud/button. Copper alloy; highly corroded. Domed head, looped shank. Head diameter 10mm, length 9mm. Context 6484: Small find 206: Period 3 to 6.

11. Bobbin; broken in two. Bone. Cylindrical shaft tapering slightly to base. Head two rounded reels with three grooves between, flat-topped ridge terminal; 11 grooves below head; lower part of shaft plain; lower terminal has two grooves above rounded button. Length 55mm, maximum section 8mm. Context 6396: Small find 293: Period 10–12.

12. Cloth seal. Lead. Oval with moulded letters on both sides. NP | H12 H | 1805. Other side AA | EPA | GWKC | H. Dimensions 22x19mm. Small find 120: Unstratified.

13. Seal matrix. Copper alloy. Handle of openwork lattice, slightly faceted oval conical matrix. Face of matrix corroded and design in very shallow relief – framed with ring of dots, central pattern obscure but appears to include a shield with a chequerboard pattern. Length 27mm, face of matrix 16.5x15mm. Context 6540: Small find 161: Period 11.

14. Die. Bone. Cube with sharp edges; ring and dot pips with opposite sides adding up to seven. Width of side 7mm. Context 8581: Small find 232: Period 10.

Post-medieval leather

Quita Mould

A man's shoe of welted construction (small find 245) dating to the second half of the 18th century was found in the fill (15132) of a Civil War period ditch in Trench 15 (CG 1060). The low-heeled, low-sided shoe had a pointed toe and fastened across the tongue at the instep with a buckle. The shoe upper was of 'suede' made with the flesh side of the leather facing outward (Fig 173). The shoe had been very heavily worn, the sole and heel having been repaired and those repairs having been subsequently worn through before it was finally discarded. The vamp had three vertical slashes running down to the toe; if cut by the wearer they must have been intended to relieve a painful foot condition. It is possible that they were cut to 'slight' the shoe before it was disposed of, though this is usually only seen on shoes concealed within buildings. A small triangular piece (small find 347) of very heavily degraded leather or possibly a felt was found in fill 15027 of the same ditch.

Catalogue of post-medieval leather (Fig 173)

1. Leather man's buckled shoe of welted construction, worn on right foot. Bottom: bottom with pointed toe, made straight but position of wear suggests it was worn on the right foot. A hole has been worn right through the tread and seat areas. Lower tread and seat of welted sole, tread had been worn through and the upper tread area and toe torn off (now missing). Remaining sole has a wide tread and waist with a repair piece or half-sole added to the tread and held in place with square-headed iron nails. The sole has a grain/flesh seam, stitch length 5–6mm. A separate seat piece has been added and is held in place by wooden pegs. The large, low, D-shaped heel comprises a single lift and a top piece or repair held by iron nailing. Welt, width 23mm, present around the seat area of the sole with middle packing present at the waist. Insole with pointed toe, natural wide tread and waist, irregularly cut away at the seat. Raised rib seam around the edge on the flesh side of the insole changing to an edge/flesh seam around the small remaining area of the seat. Holes present from the half-sole repair nailing and suggestion of the impression of bracing thread on the flesh side. Fragment of the lasting margin of a vamp lining present attached to the left side of the insole at the tread. Upper: vamp with pointed toe and straight tongue, short vamp wings and low, sloping, dog-leg side seams. The side seams are butted grain/flesh, stitch length 2.5mm each with double line of stitching where the quarters latchet seam was sewn on top of the vamp. Lasting margin, stitch length 6mm. Vamp has been deliberately cut with three vertical slashes running down from the instep to the toe. Left and right quarters, cut low but slightly peaked at the back seam, back height *c* 60mm, with dog leg front seams. Stitching on the interior for a heel stiffener and low lining. Right quarter latchet torn off and a vertical slash present, a small fragment of the latchet survives but is detached. Left quarter extends into a broad buckle fastening

latchet, 46mm wide, with two broken areas marking where a buckle had been attached. Heel stiffener with broken top edge, small area with whip stitching surviving on the left side only, worn grain side to the foot. Piece of internal lining from the right side of the shoe with whip stitched top edge, max height 54mm. Leather upper cattle hide 2.45mm thick, suede (flesh side outward). Insole surviving length 200mm, width tread 86mm, waist 70mm, seat 80mm. Estimated maximum shoe length 260mm, estimated insole length 255mm. Estimated modern shoe size adult 5–6(38–9). Area 3, Trench 15, context 15132, small find 245.

2. ?Leather offcut. Triangular piece with three straight cut edges. One edge has a series of randomly spaced small holes visible along its length, one surface has four holes visible the other also has four holes but differently spaced. They do not form a seam and no obvious thread impressions can be seen. The material could be much degraded leather, as no grain surface is present it may also be a split skin, or possibly a felt. No diagnostic features present. Dimensions 58x39x1.29mm. Area 3, Trench 15, Context 15027, small find 347.

Post-medieval vessel moulds

Stuart Blaylock

The 40kg of vessel-casting mould was broadly dated to the early post-medieval period, perhaps with a preference for the 17th century. This was recovered from thirteen separate contexts, although the greatest amount was from two deposits in Area 3, Trench 15 (contexts 15077 and 15137), which together produced 38.5kg of mould, or 95% of the whole collection.

Cauldron mould form and identification

There were essentially two components to a cauldron mould: an inner mould, or core, which was formed in one piece, probably on a wooden or mould-clay pattern, but possibly by hand; and an outer mould, or cope, normally formed in two pieces (again around a pattern) with a longitudinal join or seam running through the centre line of the vessel (Fig 174). In casting, the two halves of the mould were kept apart by accurate registration of core and cope at the base, ensured by a moulding at the core rim which fitted into an appropriately-formed registration groove in the cope, and by chaplets, small fragments or offcuts of copper alloy placed at intervals to keep the two halves of the mould properly registered. In theory the chaplets would become fused with the new metal during casting; in practice, however, the metal did not fuse completely and the positions of chaplets invariably remain visible in the finished vessels, often representing weak points at which holes would develop. The moulds for legs and handles were added to the cope during the mould-making and assembly process. Both were made separately (again presumably around patterns) and inserted into holes cut to fit in the cope mould, the joins being sealed by layers of additional (luting) clay. Cauldrons typically had three legs, sometimes with clustered vertical ribs and sometimes with flat legs with axial and/or lateral ribs, and generally with a splayed ‘foot’, sometimes articulated by a cordon or collar. The vessels invariably had two angular handles from neck to shoulder, from which the vessel could be hung. Leg ribs would sometimes be continued up onto the body of the vessels as decorative vertical and diagonal ribs and the body of the vessel was often ornamented by horizontal lines known as moulding wires.

Mould fragments can generally be identified as follows: the casting surface of the mould is invariably the smoother, having been finished with fine clay, wiped with a cloth or brush. In cope mould the surfaces are invariably concave in circumference; in core they are convex. The colour also helps to identify and distinguish the two types. In general, cope mould is orange or red on the outside, and grey on the inside: the mould being oxidized where it was in contact with the air during casting and reduced where the flow of air was limited. Core mould is generally more heavily reduced and grey in colour because the inside of the mould had little contact with air during casting. Typical mould clay was composed of natural clay mixed with plentiful fine chopped vegetable matter, probably straw or chaff (frequent chaff casts are visible to inspection by the naked eye). The mould when dry was light and porous enough to permit the escape of air and gases through the fabric during the casting process.

Quantification of the collection

The collection of mould fragments comprises 1918 mould fragments, weighing 40.40kg (Table 52). Cope mould fragments form 93% of the total by weight; core mould fragments about 7%. This imbalance is typical of such collections of mould as core mould was very much more prone to destruction during the extraction of finished castings, being dug out of the cast vessel and breaking up, whereas cope mould fragments survived more easily as these were broken off the exterior of the finished vessels. The same imbalance is visible in the selected fragments for study and illustration; only three core fragments (one rim and two body fragments) survived with a profile suitable for illustration.

Table 52:

Context	Core/no	Core/wt	Cope/no	Cope/wt	Total/no	Total/wt	Discard/no	Discard/wt
15006	3	17	5	147	8	164	6	49
15029	0	0	4	54	4	54	3	20
15030	0	0	10	201	10	201	5	30
15077	33	1,775	781	15,094	814	16,869	452	2,802
15122	0	0	1	4	1	4	1	4
15123	0	0	1	3	1	3	1	3
15135	5	102	72	1,236	77	1338	48	470
15137	25	894	971	20,732	996	21,626	752	9,496
15138	0	0	5	45	5	45	3	8
15139	0	0	1	50	1	50	1	50
15142	0	0	1	42	1	42	0	0
Totals	***66***	***2,788***	***1,852***	***37,608***	***1,918***	***40,396***	***1,272***	***12,932***

Table 52: Summary quantification of the mould fragments

A separate category of material common to similar assemblages comprises oxidised baked clay fragments without a finished mould surface. Surviving surfaces are typically crudely finished and are mostly flat rather than curved. Bells and larger vessels would be cast with the mould buried in casting pits for reasons of stability and safety, and the molten metal would be run into the moulds through temporary channels lined with mould clay that would inevitably be broken up on extraction of the finished castings, resulting in the presence of this material alongside the mould fragments. Some fragments of this type of material were observed, although identification was complicated by the demonstrable presence of residual Roman baked clay material deriving from the main occupation on the site in some of the features. Totals of this material recovered are given in Table 53. In view of the uncertainty over the introduction of residual Roman clay material, these totals should be seen as a maximum.

Table 53:

	Certain mould clay		**Uncertain/not mould clay**		**Total**	
Context	**No**	**Wt**	**No**	**Wt**	**No**	**Wt**
15006			18	866		
15030			1	8		
15045			1	86		
15077	1	16*	3	112*		
15120			4	348		
15122			7	178		
15123			19	416		
15184			2	96		
15185			17	2,430		
Total	***1***	***16***	***72***	***4,522***	***73***	***4,538***

*Table 53: Summary quantification of fired clay. Entries marked * are approximate*

Table 54:

D(mm)	**160**	**180**	**200**	**220**	**240**	**260**	**280**	**300**	**320**	**340**	**360**	**380**	**400**	**420**	**440**	**Unm**
Rims																
15077	1			1	5	3	3	4	4	1						
15135								1								
15137					3	4	8	5	3	4	3	1			1	1
Total	1			1	8	7	11	10	7	5	3	1			1	1
Body																
15006							1		1							
15142					1											
Overall total	***1***			***2***	***9***	***7***	***12***	***10***	***8***	***5***	***3***	***1***			***1***	***1***

Table 54: Summary of mould fragments with measurable diameters

Size range of vessels as represented by measurable rim fragments

Cope rim mould fragments were the largest single category of mould fragments with some chance of yielding a reliable diameter measurement, with a total sample of 57 pieces. These are quantified in Table 54. Occasionally cope body fragments provided another opportunity of obtaining a diameter measurement, and three of these are listed separately at the bottom of the table. As a general rule maximum diameters are usually equal to or slightly greater than rim diameters.

Nature and survival of the mould

The mould fragments have a marked tendency to a laminated structure. This may be related to the building up of the moulds in layers, and is often clearly visible in differential colouring section where the boundary of oxidisation and reduction respects the layer structure (seen most clearly in no 20, Fig 175; Fig 183). The mould fragments also tend to fracture along the laminations, particularly noted in fragments 25 and 26 which display fractured surfaces with striations possibly representing the mould-maker's finger marks. The tendency to exfoliate along laminations also probably accounts for the limited survival of mould as many of the smaller pieces in the collection lacked one surface or the other, indicating extensive fragmentation and militating against the survival of larger pieces.

Registration of cope and core

One core mould rim fragment (Fig 175.1) was suitable for illustration and shows a pronounced groove representing the rib on the interior of the rim of the vessel. Below this the rim of the mould has a convex moulding which was designed to fit into a similarly shaped straight or concave section of the cope mould seen in no 2–4 (Fig 175) and 14 (Fig 177). This device formed the main means of registering cope and core during mould assembly (by ensuring the two halves of the mould fitted tightly together) and of ensuring a good casting at the rim of the vessel by permitting small amounts of metal to spill below the actual rim. A similar device is implied for skillet moulds by one fragment of cope (Fig 175.7), although the equivalent core mould was not observed in the collection.

Vessel form/profiles

At least three different vessel profiles are represented in the mould collection: a conventional bag-shaped or low-waisted cauldron profile (eg Fig 175.5, 6, 7 and Fig 176.17); a more globular, or high-waisted cauldron profile (Fig 176.18); and an open skillet form with a slightly flared rim (Fig 176.8). Although there is at least one cope mould fragment with a section of moulding wire (Fig 176.12), these are not common and there are several other large cope fragments with sufficient profile to show that they belonged to cauldrons without moulding wires (Fig 176.17, 18 and 21). The conclusion must be that the vessels were both with and without horizontal moulding wires (the most common form of ornament on such vessels). The poor survival of mould fragments with moulding wire traces may well be accounted for by the poor quality of the mould clay.

Mould-makers' scratch marks

Four fragments showed lightly inscribed marks on the interior of the cope, three with traces of a 'W' composed of two intersecting 'V's (Fig 175.9, 10, 11;Fig 184.9, 10); the fourth with an ornate 'I' or 'J' (indistinguishable from each other in the 16th/17th centuries), with concave vertical strokes and a cross stroke (Fig 176.17; 184.17). Unusually this mark was placed low down on the body of the vessel; usually such marks appear on the shoulder, where they are more readily seen. These marks were scratched into the mould surface with a sharp point after the mould was completed and dried, but before it was assembled for casting, and should be distinguished from inscriptions, initials, dates and other decoration that were formally placed on the mould. The latter are not uncommon and are usually interpreted as commemorative inscriptions and/or dates ordered by clients; the former are accepted to be the marks of the founder or mould-maker, and were sometimes accompanied by a generic foundry mark (see Butler and Green 2003, 11).

Details of mould assembly

The moulds varied in thickness according to their relative strength at various points. The angle at the transition of neck and shoulder was always a weak point, and moulds tended to fracture at this point on removal of the castings so the moulds were thicker, presumably to prevent premature breakage (visible in Fig 175.2, 5 and 19, in which the transition survives). Seams marking the junction of the two halves of the cope mould survive on one edge of a number of fragments (Fig 175.2, 3 and Fig 176.17). Moulds for handles and legs were made separately and added into the cope mould during assembly; the joins were then sealed with luting clay. Although no examples of attached leg or handle mould survived in the collection, attached luting clay showing the position of such moulds did survive in a number of examples: Fig 176.8 (leg), Fig 176.18, 20 and Fig 175.19 (handles), plus Fig 175.7 (possible leg) and Fig 176.21 (possible handle). Many of the leg-mould fragments also show layers of luting clay on the exterior (Fig 177.13; 52–4, not illustrated).

Leg types

Few leg mould fragments are well preserved, and there is no example of a complete leg mould in the collection (as sometimes happens when a casting failed: compare Blaylock 2000, fig 23, no 107). Most leg-mould fragments appear to belong to the clustered-rib type, broadly triangular in section with five ribs (although no 13 appears to have seven, Fig 177.13 and Fig 185), a slightly splayed foot and a collar marking the turn of the foot. Several fragments show sections of rib and collar (Fig 177.13, 14; 27, 40, 41, 45 and 46 not illustrated). An important detail shown by fragments 13 and 15 is that the leg moulds were closed at the foot (the top when the mould was positioned for casting). This confirms that, in common with many other cauldron foundries, the mould must have been filled from a central in-gate. In an alternative type of mould the legs doubled as additional in-gates, permitting the leg moulds to be individually filled or at least ‘topped up’ (Blaylock forthcoming, fig 9). This was superficially a much more sensible and straightforward form of mould construction than the closed leg form, in which the founder relied on gravity and pressure of the molten metal to adequately fill the leg moulds. In addition, there are a number of fragments of the flat rear face of leg moulds (Fig 177.36; Fig 186.36, 42 and 43; 32 not illustrated). Just one piece may be a fragment of a flat leg mould with a marginal rib (Fig 177.47); this is an important piece for showing that more than one leg type was made in the foundry from which this material originates.

Unfortunately the absence of mould evidence linking leg types and body profiles (caused by the poor condition and limited survival) means that we cannot known certainly which leg types went with which body. On the evidence of the mould alone, however, the presumption must be that most vessels were of the clustered-rib type.

Possible skillet handles

Two pieces were interpreted as possible skillet handle mould fragments (Fig 177.22 and 55). Both have longitudinal grooves and/or ribs, a flat form, and a suggestion of a rounded terminal at one end. Some doubt remains in that both could be fragments of ribbed leg moulds, although on balance they have been judged more likely to be handles rather than legs. No evidence for patterned or inscribed handles was observed in the collection. Nor did the collection contain examples of moulds for cauldron handles, although luting clay marking positions testifies to their existence.

Exotics

Of numerous fragments of in-gate, three are catalogued (Fig 189.33–5); these are typically cylindrical or slightly splayed tubes of mould clay with a diameter up to 50mm, used to form the funnel through which metal was poured into the moulds. Two (no 33 and 35) retained some traces of encrusted metal waste on their interior surfaces.

One class of mould fragment remains unidentified. This consists of fragments of moulds with a truncated pyramidal form with a flat terminal, representing the base or top of the object (no 23 and 24, plus 28–31; Fig 187, Fig 177.23, 24). All were small and poorly preserved, with only traces of mould surface on their interiors, hampering identification of the item cast within them. It seems most probable that these represented another form of closed leg, perhaps the tapering legs of skillets, but insufficient detail survived to be sure of this and it remains possible that they formed some other class of object.

Catalogue of diagnostic mould fragments

Abbreviations: RD = rim diameter; MaxD = maximum diameter; D = diameter; Th = thickness; W = width; H = height; De = depth; Wt = weight.

Illustrated fragments Figs 175–189

1. Core mould rim fragment, the only measurable example from the whole collection. RD *c* 300mm (*c.*280mm at rim of vessel); Wt 224g; W 140mm; H 104mm (oblique); Th 25mm. Vertical moulding below vessel rim (not a good fit with typical cope rim moulds from the assemblage, qq.v. no 2–4) and a groove representing the rib on the interior of the vessel rim. Preserves the turn of the neck of the vessel. Fabric all reduced, paler grey on int. Fill 15077.

2. Cope mould rim fragment, including transition from neck to shoulder, base of mould less well preserved than no 3 and 4. RD 220mm; Wt 262g; W 112mm; H 95mm; Th 44mm max. Suggestion of seam in mould on right hand side of fragment, but very weathered/abraded. Fill 15077.

3. Cope mould fragment, includes well preserved base of cope mould: flattish ring coming to a point and with acute curve to receive moulding of core mould; not well fitted. Remains of a seam in the mould on the right hand side (not vertical). RD 240mm; Wt 226g; W 157mm; H 77mm; Th 25mm. Fill 15077.

4. Cope mould rim fragment, relatively well-preserved base, complementary to no 3. Larger vessel than others. RD 320mm; Wt 166g; W 156mm; H 80mm; Th 18–25mm. Fill 15077.

5. Cope mould body fragment spanning the transition from neck to shoulder, the only piece in the collection so to do, so important for reconstructing a cauldron-mould profile. Very small vessel, *c* 140mm diameter at the inner angle of the neck, so projected RD perhaps *c* 200mm (ie 30mm in each direction); Wt 54g; H 66mm; W 80mm; Th 10–20mm. Fill 15077.

6. Cope mould fragment showing lower body profile and beginning of the curve of the base. Has one edge of a diagonal moulding rib on the left hand side, the only piece to show evidence for such a feature, thus demonstrating Cauldron Form 1 (with leg ribs and presumably a horizontal moulding wire). MaxD approx. 260mm; Wt 242g; W 140mm; H 113mm; Th 21–5mm. Fill 15077.

   6a Cope mould fragment showing the curve of the body and base to complement no 6, though perhaps not much more present than in that fragment. MaxD v. approx. 280mm; Wt 134g; W 105mm; H 87mm (oblique); Th 20mm. Fill 15077.

7. Cope mould rim fragment from an open vessel form, probably a skillet. A variant in a number of ways: mould is generally thinner than cauldron; has an outward-splayed moulding for registration of the core at the base. Gentle, slightly convex profile, perhaps with the turn of the base of the vessel. The fragment includes a thickened section of wall towards the base that may represent a vestige of the luting clay for the attachment of a leg mould, although this is inconclusive. RD *c* 160mm (significantly smaller than most cauldrons, N.B.); Wt 166g; W 105mm; H 122mm; Th 16–20mm. Fill 15077.

8. Cope mould body fragment from the turn of the base of a small cauldron. A fragment of luting clay attached to one edge represents the position of a leg mould, but no detail is preserved. This at least indicates which way up the fragment should be stanced. Too small to measure the diameter reliably, perhaps *c* 180–200mm, but very uncertain; Wt 36g; W 50mm; H 71mm; Th 16mm. Fill 15077.

9. Cope mould fragment with body profile with scratch mark of two deeply intersecting ‘V’s forming a ‘W’. Similar marks of intersecting ‘V’s occur in moulds from Cowick Street, Exeter, and South Petherton, Somerset. D v. approx. 260–80mm; Wt 136g; W 97mm; H 104mm; Th 19–22mm. Fill 15077.

10. Cope mould fragment with body profile and scratch mark of two intersecting ‘V’s forming a ‘W’. There is nothing in the fragment itself to confirm the orientation of the piece, although ‘W’ is assumed on

analogy with fragment no 9. D approx. 320mm; Wt 134g; W 102mm; H 90mm; Th 23–4mm. Fill 15077.

11. Cope mould fragment with body profile and scratch mark, consisting of two parallel diagonal lines, almost certainly a fragment of two intersecting 'V' shapes as in the previous two examples (no 9 and 10). The remainder is lost off the edge of the fragment. Again, there is little to confirm the orientation of the fragment, except that the mark is perhaps more likely to be read as a 'W' than as an 'M' (as above). D perhaps *c* 340mm (larger than the others, though uncertain); Wt 112g; W 75mm; H 100mm; Th 25mm. Fill 15077.

12. Cope mould body fragment with a short section of moulding wire. This is the only piece in the collection with a well-preserved moulding wire: a handful of other pieces retained one edge of a moulding wire, but broken along its axis. Although small it does demonstrate that this founder made vessels with horizontal wires, so this is an important fragment. D too small to measure, although possibly *c* 280–300mm; Wt 18g; W 46mm; H 45mm; Th 12–14mm. Context 15077.

13. Leg mould fragment, one of the most complete in the collection, showing the following features: (i) clustered rib form, probably with seven (rather than the three or five ribs), since the last surviving rib (the fourth) appears to be on the central axis; (ii) collar; (iii) the beginning of ribs above the collar; (iv) 'box' construction, showing the original mould construction in the inner thin skin, covered in luting clay to seal the mould once inserted into the mould. H 83mm; W 66mm; Th (original mould) 11mm; Th (total, including luting clay) 22mm; De of leg at foot 34mm; MaxH (surviving) 72mm; W of leg (projected) *c* 44mm; Wt 108g. Fill 15077.

14. Leg mould fragment consisting of two ribs and collar, selected because it extends the surviving leg mould above the collar, for comparison with no 13. H 77mm; W 45mm; Th 22mm; Wt 52g. Fill 15077.

15. Base of a leg mould; no mould surface survives, but the fragment shows the outline of the sub-triangular base of the inner mould for the base of the leg. Important for complementing the evidence of no 13 and confirming that the leg moulds were closed at the foot. W 66mm; De 49mm; Th 12mm; W of foot impression 43mm; De of foot impression 28mm; Wt 26g. Fill 15077.

16. Core mould fragment representing the transition from body to base. One of the very few surviving core fragments of any size in the collection. The bulk of the profile probably represents the body of the vessel. MaxD *c* 340mm, though uncertain; W 95mm; H 70mm; Th 21–8mm; Wt 138g. Fill 15077.

17. Cope mould body fragment with lower profile and turn of the base of a cauldron. Notable for its relatively full profile and the fact that it is

unlikely to have had a moulding wire (thus complementary to no 18) and for a scratch mark, an 'I or 'J', positioned low down on the vessel. A key piece for the evidence it provides of a second founder at work, after the 'W' of context 15077 (no 9–11). Clear laminations in section. Traces of a seam in the mould survive on the left-hand edge. MaxD *c* 260mm; W 99mm; H 120mm; Th 25mm; Wt 198g. Fill 15137.

18. Large cope body fragment with surviving vessel profile from the handle to the turn of the base. Distinctive because there is no moulding wire present in the profile; this is sufficiently preserved to show it if it had been there. Luting clay for a handle mould at the upper left edge, though no handle mould survives. MaxD *c* 280mm; Wt 218g; H 130mm; W 135mm; Th 19mm (normal), 32mm (at luting clay). Fill 15137.

19. Two joining rim fragments of a cope mould. Well preserved with flat base to mould. Slight articulation at the point where the core rim must have joined. Luting clay for a handle on the left-hand edge. RD 260mm; H 97mm; W 171mm; Th (normal) 28mm, (at luting for handle) 40mm; Wt 330g. Fill 15137.

20. Cope mould body fragment, preserving the upper part of the vessel profile. Notable chiefly as a large fragment, unusual in the collection, and for very clear lamination of the mould fabric into three visible layers. MinD *c* 280mm; MaxD *c* 320mm; W 141mm; H 98mm; Th 20–3mm; MaxTh (at luting) 35mm; Wt 214g. Context 15137.

21. Cope mould fragment preserving the body profile; no features. Possibly a skillet profile rather than a cauldron, with a relatively straight-sided profile, although the approximate measurements suggest that this is a cauldron profile. The comparatively thin mould wall is reminiscent of the other fragments in the collection identified as skillet moulds. MinD *c* 280; MaxD *c* 320mm; H 125mm; W 102mm; Th 20–6mm; Wt 198g. Fill 15137.

22. Possible skillet handle mould fragment. Could be a leg, but looks horizontal and has a central rib. Comparable to another example (no 55). L 67mm; W 40mm; Th 14mm; W (of 'handle') 19–23mm (tapering); Wt 22g. Fill 15137.

23. Mould fragment of a leg or handle[?] consisting of a truncated pyramidal form, tapering faces on all four sides, flat end; oxidised on exterior, reduced inside, but no mould surfaces preserved so the nature and precise form of the object is uncertain. In conjunction with no 24 and four other fragments of similar objects from the same context (no 28–31) they must be an established form, possibly the end of a simple tapering leg, and therefore of importance in identifying typical products. MaxW 27–9mm; W (at base) 20–1mm; H 30mm; Th 7–11mm; Wt 18g. Fill 15137.

24. Fragment of one side of a truncated pyramidal piece, similar to no 23. Trapezoidal form. Again hardly any mould surface is preserved, but a trace in the middle of the reduced area may represent part of the surface. H 51mm; W 26–30mm; Th 14mm; Wt 16g. Fill 15137.

36. Flat back of a leg mould; flange to one side representing the turn of the front of the leg; otherwise broken edges. A rare example in the collection, along with no 42 and 43. H 53mm; W 35mm; Th 8mm; Wt 16g. Fill 15137.

47. Small flat mould fragment with a rib, probably a flat leg mould with a marginal rib. W 26mm; H 46mm; Th 9mm; Wt 10g. Fill 15077.

55. Another ?skillet handle fragment, complementary to no 22. Assigned as a ribbed handle on the basis of the tapering form and flat profile in long section. Asymmetrical in section, so not the ‘classic’ box form characteristic of many skillet handle moulds. L 66mm; W 43mm; Th 21mm; W of ‘handle’ in mould 18–23mm; Wt 38g. Fill 15077.

Other diagnostic fragments in the collection; not selected for illustration

25. Cope body fragment, inner layer only with striations from the mould-maker’s finger impressions on the exterior. H 50mm; W 76mm; Th 14mm; Wt 40g. Fill 15137.

26. Cope body fragment, outer layer with striations of ?finger impressions/ridges on the interior, complementary to no 25. H 93mm; W 103mm; Th 13–27mm; Wt 142g. Fill 15137.

27. Tall leg fragment with ribs and trace of the collar, rounded rear face. H 99mm; W 41mm; Th 23mm; Wt 60g. Fill 15137.

28. Truncated pyramidal mould fragment. H 26mm; W 19x20mm (min/base) to 25x27mm (max); Th 9mm; Wt 12g. Fill 15137.

29. Another fragment of the same consisting of the base and one side of the top, showing clearly the folding of the clay/construction. H 26mm; W 19x21mm; Th 6mm; Wt 10g. Fill 15137.

30. Another fragment of the same, consisting of just the base and one side. H 31mm; W 22mm; Th 9mm; Wt 8g. Fill 15137.

31. Another fragment of the same, just one side present, but complementary to no 23–24 and 28–30. H 29mm; W 23mm; Th 9mm; Wt 4g. Fill 15137.

32. Fragment of the flat rear face of a leg mould. Exterior surface survives but interior surface missing. H 32mm; W 38mm; Th 10mm; Wt 8g. Fill 15137.

33. In-gate fragment; trace of reduced clay or casting detritus on the interior surface. D *c* 50mm; H 41mm; W 33mm; Th 8mm; Wt 10g. Fill 15137.

34. In-gate fragment; oxidised on interior and exterior surfaces. D *c* 40mm; H 37mm; W 25mm; Th 6mm; Wt 6g. Fill 15137.

35. In-gate fragment; oxidised throughout; trace of grey encrustation on interior surface. H 37mm; W 26mm; Th 8mm; Wt 6g. Fill 15137.

37. Cope mould fragment with a small area of the junction of the neck and the shoulder (complementing the evidence of no 5). H 35mm; W 35mm; Th 13mm; Wt 14g. Fill 15137.

38. Oxidised mould clay fragment, buff-pale red throughout with a convex mould surface; probably a fragment of core mould oxidised by unusual baking or casting conditions, or perhaps baked but never used in casting. W 43mm; H 29mm; Th 17mm; Wt 16g. Fill 15137.

39. Large mould fragment, a possible bell mould fragment or very well-finished flue or furnace lining fragment; wiped, no detectable curvature. All oxidised red, pale red interior surface (wiped); brittle and friable. H 59mm; W 91mm; Th 34mm; Wt 104g. Fill 15137.

40. Ribbed leg mould fragment; complementary to no 13 and 14. H 55mm; W 41mm; Th 17mm; Wt 26g. Fill 15137.

41. Ribbed leg mould fragment; complementary to no 13 and 14. H 65mm; W 59mm; Th 26mm; Wt 50g. Fill 15137.

42. Flat rear or a leg mould fragment; one edge flanged, representing the turn of the front of the leg, the remainder broken; flat rear exterior face. W 39mm; H 36mm; Th 11mm; Wt 16g. Fill 15137.

43. Flat rear face of a leg mould fragment; one edge flanged, remainder broken. H 42mm; W 29mm; Th 12mm; Wt 12g. Fill 15137.

44. Cope mould fragment of a small cauldron with curve of the base and lower wall of the vessel. Complementary to no 6, 6a and 17. MaxD *c* 180mm; H 79mm (oblique); W 78mm; Th 11–17mm; Wt 52g. Fill 15137.

45. Ribbed leg mould fragment; complementary to no 13 and 14. H 64mm; W 57mm; Th 27mm; Wt 62g. Fill 15077.

46. Ribbed leg mould fragment, comprising the lower half of collar and two ribs of a splayed foot; complementary to no 13 and 14. H 41mm; W 35mm; Th 12–24mm; Wt 18g. Fill 15077.

48. Cope mould fragment with one edge of a moulding wire on its upper edge; thin, representing one ‘skin’ of the cope mould. Complementary to no 12. H 36mm; W 46mm; Th 10mm; Wt 16g. Fill 15077.

49. As no 48, cope mould fragment laminated with one edge of a moulding wire on upper edge. Complementary to no 12. H 36mm; W 66mm; Th 10mm; Wt 18g. Fill 15077.

50. Luting from around the base of a leg mould; complementary to no 13. H 34mm; W 49mm; Th 5–12mm; Wt 18g. Fill 15077.

51. Luting from the base of a leg mould, analogous to no 15 and complementary to no 13 and 15. L 44mm; W 54mm; Th 11mm; Wt 16g. Fill 15077.

52. Luting from the base and wall of a leg mould; as no 50. H 31mm; W 45mm; Th 5–8mm; Wt 10g. Fill 15077.

53. Luting clay and finger impressions from the ?rim of a cope mould. L 55mm; W 50mm; Th 11mm; Wt 30g. Fill 15077.

54. Curious luting clay fragment with 'hogs back' section (analogous to some of the cruciform fragments from Exeter foundries, eg Blaylock 2000, fig 28/no 143–4). W 54mm; L 27mm; Th/H 18mm; Wt 20g. Fill 15077.

55. Cope mould fragment with single stroke of a scratch mark or a very shallow moulding wire. H 57mm; W 52mm; Th 23mm; Wt 34g. Fill 15077.

The significance of the material and previous evidence from Worcester

This collection represents the first excavated evidence for post-medieval cauldron manufacture on any scale in Worcester, although similar material has been recovered during work at Lowesmoor to the east of the city which yielded one box of cauldron mould comprising some 250 fragments, weighing 7.5kg (WA 2014). The Lowesmoor site is close to a foundry known to have been occupied by John Martin (the second) in the second half of the 17th century, and the vessel mould found there has a distinctive appearance, being speckled with infused traces of bronze corrosion product. This includes a mould for a skillet handle with a shallow central groove, which might be identifiable, and somewhat resembles the two fragments from The Hive tentatively identified as ribbed or grooved skillet handles (catalogue no 22 and 55). There was also a substantial medieval period bronze foundry excavated at Deansway, where vessel sherds and a fragment of a central-ribbed flat cauldron leg with a splayed foot were identified (Crummy 2004, fig 243). Other occasional finds have been recovered across the city, such as those from the Sidbury excavations of the 1970s, where a long-lived metal-worker's workshop of medieval and post-medieval date was excavated (Carver 1980a, 174–5). One piece of bell or cauldron mould and two rim sherds of bronze, described as fragments of bells, were published (Carver 1980a, 201–2; fig 59), but in view of the diameters of these pieces (*c* 300–40mm, 180mm and 120mm respectively) they are perhaps more likely to be vessel fragments than bells (despite the published comments). There is a better likelihood that sherds and other vessel fragments found locally, whether formally excavated or more casual finds, belonged to locally-made vessels, but the previously available evidence certainly does not seem to point to a strong local representation of cast vessels that could be of Worcester origin.

Aspects of mould-making

A marked characteristic of the mould from The Hive is that it is typically laminated and in its preserved state is very prone to exfoliation, which reflects the mould-making technique of building moulds up in layers. Other distinctive aspects of the mould material that contribute to our knowledge of foundry practice include the leg moulds with closed terminals, showing that the moulds were filled from a central in-gate rather than through the legs, and the absence of moulding wires in some of the cauldron profiles.

Vessel forms

Conventional bag-shaped cauldrons appear in a variety of sizes (nos 5, 6, 17, plus cope rim fragments); there is one piece that appears to represent a globular cauldron form (no 18), others that may also be of this type (nos 6a, 8), and at least one piece of skillet profile (no 7). There is only one piece of mould showing an unequivocal moulding wire (no 12, and this is very small, plus a possible trace of the same on fragment no 9), and at least two body profiles showing that the foundry also made cauldrons without moulding wires (nos 17, 18); this may have been the norm, although the material is hardly plentiful enough to confirm this assertion. One fragment (no 6) shows the trace of a diagonal rib rising from the top of the leg and may indicate that some vessels possessed such ribs (which usually consist of a central vertical rib on the axis of the leg with two flanking diagonal ribs; these are reconstructed by dashed lines on the drawing in Fig 190). Moulds for open skillets are not plentiful, but are definitely present in the collection (one almost full profile, no 7; another much smaller rim fragment, not illustrated). Unfortunately there is no conclusively identified inscribed handle material, although there are two possible ribbed, or grooved, handle fragments (nos 22, 55). Thus at least three different vessel forms are represented: two cauldrons and one skillet. These have been reconstructed from the fragmentary evidence discovered here (Fig 190).

The variety is limited by survival however. Many of these observations are supported by only one piece, and in general there were very few diagnostic pieces noted in the collection (some 55 pieces worth description from a total of some 1900). More measurable rim fragments were certainly present, although adding little to the information provided by the selected fragments. The more-than-usual friable nature of the Worcester mould clay may be largely responsible for this; all the mould fragments laminated very readily, and one can see core mould breaking up very easily as it was removed from the cast vessels. For this reason core fragments are always under-represented in relation to cope in such assemblages (Blaylock 2000, 43).

Identifying craftsmen from the mould

Two mould-makers' scratch marks have been observed in the collection: one a 'W', represented by three examples; the second an ornate 'I' or 'J', represented by a single example. Thus, there is internal evidence for two nearby founders, or perhaps two mould makers at work in a single foundry, from which the material originates. Scratch marks were incised into the mould after manufacture but before final assembly and casting, and are generally accepted to represent the device or initial(s) of the mould-maker and/or founder. On sites where a dynasty of craftsmen is demonstrable the marks can sometimes be linked to individual family members, and are often coupled with a generic 'foundry mark' (see for instance the trefoil and quatrefoil scratch marks used by the Fathers and Sturton family foundries in South Somerset, at Montacute and South Petherton respectively; Butler and Green 2003, 49–65 and 90–119).

A 'W' mark formed of two interlocking 'V's is a common device, seen on 17th century vessels from across the country (Butler and Green 2003). It seems often to correspond to the name William, but surely simply reflects the ubiquity of this first name, and other attributions must remain possible. The 'I' mark formed of deeply concave curves with a cross-stroke, appears less commonly, but examples are known from South Petherton in Somerset, standing for

John Sturton II (late 17th–early 18th century; Butler and Green 2003, 119). Another example, apparently with a double cross stroke and lacking lines at top and bottom (possibly through wear), appears on an early 17th century cauldron of unknown origin, with the comment that this cauldron and another by the same founder, 'are not a familiar Westcountry type' (Butler and Green 2003, 144, catalogue no 148 and 149). These two vessels share similar profiles, with deep bases, clustered rib legs, and plain exterior surfaces without moulding wires. Since these represent the only vessels in the Butler collection that share some characteristics with the mould material under study here, they might, very tentatively, be suggested as possible candidates for products of the Worcester foundry represented with The Hive assemblage. Although there is really very little objective evidence to link them with this collection of mould, the absence of moulding wires is, at least, consistent with the Worcester mould evidence. The single 'I'/'J' scratch mark is unusual in that it is placed towards the base of the vessel, near the widest part of the profile (an unprecedented position on the evidence of the 40 or so cauldrons with scratch marks in the Butler collection). If placing a scratch mark low down on the vessel was a normal practice of this founder, then the position of the mark should also aid identification of any surviving vessels of this foundry, should they ever appear. One further vessel (Butler and Green 2003, 156; catalogue no 161), can be cited: this is a plain vessel (ie without moulding wires) and bears a double 'W W' mould-maker's mark. The vessel is unprovenanced, although Butler and Green draw a comparison with a vessel in Selly Manor Museum, Birmingham, with a similar scratch mark. Mere presence in a west midlands collection is, of course, no basis on which to suggest a local origin, and in other respects this vessel is demonstrably inconsistent with the Worcester mould material (such as the three-ribbed legs and rather larger-than-usual handles).

Although there are known Worcester bell founders and brasiers, there is no specific documentary evidence for founding in this area of the city. Even with the presence of some direct evidence for the identity of the founders, in terms of their (presumed) initials, little can be determined of the origin of the material. There are no obvious candidates for the identification of a 'W' and an 'I' or 'J' in the same family, despite the many common first-name possibilities, nor have any connections been discovered between any of the known practitioners of the craft and this locality (specifically in St Clement's parish), which might have provided an informed guess as to the identity of the founder(s) represented by this deposit.-

Together, the various classes of evidence outlined above add up to a picture of a well-established and durable industry in medieval and post-medieval Worcester (one that is perhaps under-represented in present accounts of the city's industry, eg Hughes and Leech 2011, 50–3; Dyer 1973). Although perhaps never very significant numerically (and therefore financially), bell and vessel founding was highly significant in terms of the technological sophistication and complexity of the processes involved. Indeed, what we know of this industry in other English towns and cities surely demonstrates that a city of Worcester's standing would have been unusual if it had not been the seat of such an industry. Equivalent places where evidence for the existence of this industry on an enduring basis represented by more than one foundry through this period include York, Winchester, Chester, Exeter, and, no doubt, London (there are, of course, many more places where single-period foundries are known). Brasiers, bell-founders and the allied trades supplied products (both household and ecclesiastical goods) for which there was a continual demand from the later medieval period through the 16th and 17th centuries, and possessed the transferable skills to produce precision castings of other types when these became necessary towards the end of this period (Blaylock 2000, 86).

Ecofacts

Plant macrofossils

Elizabeth Pearson

As noted above, 38 samples were selected for final analysis of all macrofossil remains (Table 55; Table 56).

Period 4 Roman (mid-2nd century to early-3rd century)

Environmental remains were poorly preserved from this period; the only exception was a moderately rich assemblage of charred cereal crop waste from a pit/posthole fill (8558). The latter (Table 57) was dominated by fescue/rye grains (*Fescue/Lolium* sp), large grass (*Poaceae sp indet*) grains and chaff (glume bases) of spelt wheat (*Triticum spelta*) and emmer or spelt wheat (*Triticum dicoccum/spelta*). This type of waste is fairly common on Roman sites, most likely representing crop processing waste used as fuel for hearths within nearby structures, perhaps one with which the pit/posthole was associated. Alternatively, it could imply that a building was used for processing or storing crop processing waste in the vicinity that was subsequently charred in an accidental fire, but there was no evidence for *in situ* burning.

Period 5 Roman (early/mid-3rd to early 4th century)

Plant remains were similarly sparse from this period, although three pit fills (6897, 6901 and 6917) at the rear of the buildings in the south-west part of Area 1 (AU 527, CG 1095) contained significant quantities of charred cereal crop remains. Assemblages from fills (6897) and (6917) were the most rich, being dominated by large grass grains and other weed seeds, with a smaller proportion of cereal grain and chaff (Table 58 and Fig 191). The wheat grain was most likely to have been dominated by spelt (*Triticum spelta*), as where it was identifiable the chaff derived from spelt wheat, although occasional emmer (*Triticum dicoccum*) glume bases and free-threshing wheat grains were recorded. Brome grass (*Bromus* sp) and oat (*Avena* sp) grains, which were abundant, are characteristic of charred cereal crop assemblages of Roman date. These grasses may have been crop contaminants but could also have been tolerated or even encouraged in arable fields at this time. The weed component was diverse and numerous, and apart from brome grass and oat, was dominated by the small seeds of scentless mayweed (*Tripleurospermum inodorum*) and the nitrophilous (nitrogen loving) fat hen (*Chenopodium album*), and goosefoot/orache (*Chenopodium/Atriplex* sp).

The assemblages appear to represent mixed crop processing waste dominated by large grass grains which were probably hand-sorted from the cereal grain. Some of the smaller weed seeds (scentless mayweed, fat hen and goosefoot/orache) may have been harvested with the crop still intact with large aggregate seed heads, and subsequently hand-sorted from the crop. Small grasses are most likely to derive from fine-sieving waste (Hillman 1981).

It is possible that these remains represent fuel waste associated with small-scale smithing or other iron working, as alongside the charred cereal crop waste spheroidal hammerscale was moderately abundant in (6917) and slag was abundant in both contexts (6897) and (6917).

Period 6 Roman (early 4th to late 4th century)

Primary fills 7050 and 7051 large quarry pit (CG 1108, AU 510)

Well-preserved waterlogged plant remains survived from approximately 1.30m (bgs) to the base of the pit (Table 59). The waterlogged plant remains were fairly similar in all samples, being dominated by seeds of plants growing in scrub wasteland (particularly nitrogen-rich waste ground) and grassland, as might be expected for this location given the stratigraphic information which suggests a period of disuse.

Abundant elderberry (*Sambucus nigra*) and blackberry/bramble (*Rubus* sect *Glandulosus*) and occasional sloe (*Prunus spinosa*), hawthorn (*Crataegus monogyna*) and alder (*Alnus glutinosa*) suggest that the pit was located in a shrubby neglected and overgrown area. Although some of these remains may derive from cess, there was little evidence of latrine waste in the form of phosphate concretions and only one mineralised oat floret. Nitrophilous weeds such as henbane (*Hyoscyamus niger*), nettle (*Urtica dioica*), fat hen (*Chenopodium album*) and goosefoot/orache (*Chenopodium/Atriplex* sp) were also abundant. They may reflect manured or composted garden plots or refuse and middens.

Rushes (*Juncus* spp) and sedges (*Carex* spp) would have grown around the wet muddy or marshy edge of the pits, but in the absence of aquatic plants such as pondweed it cannot be certain whether the pits contained persistent standing water. These assemblages probably reflect the vegetation in the immediate vicinity of the pit edge. However, segetal weeds (associated with cornfields), such as corn marigold (*Glebionis segetum*), corncockle (*Agrostemma githago*) and corn spurrey (*Spergula arvensis*) suggest some dumping of crop processing waste. Of note, also, is the presence of flax species. Although this was mostly identified as biennial or perennial flax (*Linum bienne*/*perenne*) and fairy flax *(Linum catharticum*), with only some possible cultivated flax (*Linum usitatissimum*), these and other associated weeds within the assemblage may be indicative of flax cultivation in the vicinity. As flax pollen in the large quarry pits is identified as *Linum bienne* type, the *L. bienne/perenne* identified here is most likely to be *L. bienne*. Fairy flax (*Linum catharticum*) is often found associated with cultivated flax; moreover weeds such as corn spurrey (*Spergula arvensis*), abundant in the samples, and corn marigold (*Glebionis segetum*) are also known as common flax weeds. Although later in date, other examples include corn spurrey associated with flax in several samples from West Cotton, Raunds, Northamptonshire (Campbell and Robinson 2010), where it is discussed as a weed associated with flax. It is also known as a specialised flax weed in Poland (Latalowa and Rączkowski 1999) and was common in the Anglo-Saxon timber lined pit at Clifton Quarry, Worcestershire (Clapham forthcoming) and early post-medieval charred material from the King's School, Worcester (Pearson 2014), both in association with abundant flax waste. Corn spurrey is also commonly associated with wild radish (*Raphanus raphanistrum*) and corn marigold (*Glebionis segetum*) as part of the arable weed community Spergula-oxalidon (Silverside 1977) which grows on acid sandy soils. These three species are present in the assemblage and may have been associated with a flax crop, or perhaps a cereal crop, as unidentified straw waste was also abundant in some samples.

Also of interest is the presence of food waste in the form of seeds from coriander (*Coriandrum sativum*) and summer savoury (*Satureja hortensis*), both culinary herbs, and fig (*Ficus carica*). Cultural waste is minimal in this pit, with the majority of remains deriving from vegetation growing in the immediate vicinity, although artefactual remains such as iron slag and nails, pottery and fired clay were present in low levels in most spit samples. Carrot (*Daucus carota*) and *Brassica* species (cabbage, cole, swede or turnip etc) may indicate cultivation of these crops, although they could equally have been naturalised relics of cultivation.

A small quantity of charred cereal crop remains included grains and chaff of spelt wheat (*Triticum spelta*) with occasional weed seeds. The overlying layer in the top of the pits (context 6745) showed poor preservation of waterlogged remains but was richer in both small fragments of charcoal and large well-preserved charcoal which may have been specifically produced to fire hearths or ovens (see Charcoal).

Period 10 post-medieval (16th–mid-18th centuries) to Period 11 Late post-medieval (mid-18th–19th century)

A deep sequence of well-preserved waterlogged remains was analysed from the city ditch (Table 60; Fig 192). The plant remains suggest a relatively stable environment throughout the life-span of the ditch, although there are some indications of more wet and overgrown conditions during Period 10 (contexts 2556 and 2557) with the presence of alder trees (*Alnus glutinosa*) which presumably grew along the ditch. Otherwise, evidence for wet bankside and aquatic vegetation is abundant and consistent throughout the deposits, represented predominantly by abundant water-crowfoot (*Ranunculus scelaratus*), duckweed (*Lemna* sp) and water-cress (*Nasturtium officinale*), demonstrating that the ditch consistently held either stagnant or slow-flowing water. Abundant hemlock (*Conium maculatum*), common nettle (*Urtica dioica*), henbane (*Hyoscyamus nige*r) and white horehound (*Marrubium vulgare*) flourish in nutrient-rich conditions, and are particularly common in this type of environment. Other species suggest either disturbed or cultivated ground and neglected grassy areas. Occasional cornfield weeds, such as corncockle (*Agrostemma githago*) and corn marigold (*Glebionis segetum*), are most likely to derive from straw waste deposited in the ditch.

The assemblage is very similar in composition to that recorded from a site nearby at 3 – 5 The Butts (Bretherton and Pearson 1998). Although evidence for dumped refuse was sparse, remains of a number of crops and cultivars were recorded, also found at 3–5 The Butts. Hemp (*Cannabis sativa*), hop (*Humulus lupulus*), dyers rocket (*Reseda luteola*) and flax (*Linum usitatissimum*) were found in contexts (2556), (2557) and the middle of (2543). These remains are probably waste from textile and other industries known to have been active along The Butts during 16th and 17th centuries. This type of waste is generally associated with hemp and flax processing for production of rope, sack and linen or linseed oil, dyeing cloth, and brewing. Wild teasel (*Dipsacus fullonum*) may also be associated with these remains. Although this is not the cultivated teasel (*Dipsacus sativa*) which was used to raise the nap on woollen cloth, the wild teasel rarely occurs in waterlogged assemblages, and when it does occur it is most often associated with other remains indicative of textile industry. Hemp and flax, along with fragments of leather and twine have been identified from the city ditch from 3–5 The Butts in deposits within what is interpreted as a Civil War re-cut of the ditch. Wild teasel (*Dipsacus fullonum*) found here and at 3–5 The Butts may also have been associated with the craft waste as, although not the cultivated teasel used for raising the nap of cloth, it is most often associated with hemp, flax and dye crop waste. Hop (*Humulus lupulus*) may have been used for brewing but could also have been growing wild in the shade of the ditch and city wall. These remains have been recorded from deposits which could be as early as 1600 in date, although they are also present in deposits associated with the later re-cut (context 2543).

Pips and fruit stones from plum (*Prunus domestica*), sour cherry (*Prunus cerasus*), apple or pear (*Pyrus/Malus* sp) and fig (*Ficus carica*) are most likely to derive from cess or latrine waste, along with culinary herbs such as summer savoury (*Satureja hortensis*) and coriander (*Coriandrum sativum*). Radish (*Raphanus raphanistrum*) and carrot (*Daucus carota*) may represent vegetable food waste, although the former was often also an arable weed and the latter can grow wild or be a relic of cultivation. Elderberry (*Sambucus nigra*), bramble (*Rubus* sect *Glandulosus*), hazelnut (*Corylus avellana*) and watercress (*Nasturtium officinale*) could be the remnants of food collected from hedgerows and shrubs or ditches locally, but, equally, might have been growing alongside the ditch. The food remains probably flowed into the ditch in latrine waste or were dumped with kitchen waste from houses known to have grown up between the city wall and ditch from the 1600s (Bretherton and Pearson 1998).

Well preserved waterlogged plant and insect remains were noted in the fill of a V-shaped ditch on the floodplain in Area 3 (CG 1060). The identifiable seed remains appear to derive from the nearby wet grassland and wasteland with occasional finds of possible fig (*Ficus carica*) suggesting some food or cess waste component.

Summary

Evidence for processing or storage of cereal crops which are often ubiquitous on Roman settlements was noticeably limited on this site, with the exception of a small number of pits and a posthole. This could be interpreted as showing limited use of cereal products (either clean grain or chaff for fuel) and limited or no agricultural processing. However, rich assemblages of charred cereal crop waste in rubbish pits and winnowing or threshing waste in postholes suggest a building was used for cereal crop processing on the adjacent site at City Campus (Sworn *et al* 2014). As this was adjacent to the present day railway viaduct which separates the two sites, it was in close proximity to the buildings and other features at The Hive. Therefore, it may be that storage and agricultural processing was concentrated in the Castle Street area.

The charred cereal crop remains in the pits to the rear of the buildings (Period 5) at The Hive clearly show disposal of cereal crop waste rather than storage of grain. The waste may derive from ovens associated with the buildings and as spheroidal hammerscale and slag was found alongside, it is possible that these remains represent fuel waste associated with small-scale smithing or other iron working.

Waterlogged plant remains from the Period 6 quarry pit (CG 1108, AU 510) indicate that the pit was located in an overgrown area in which there were nitrogen-rich soils, perhaps resulting from middens and refuse dumps. This may imply that the deposits were formed during a post-Roman phase, or simply that this part of the Roman settlement was less intensively used for domestic activity and more for refuse disposal. There was some evidence for disposal of cereal crop waste. The presence of culinary herbs such as coriander and summer savoury may also imply the dumping of food or latrine waste, or that these were relics of earlier garden cultivation in the vicinity. The presence of fairy flax and biennial or perennial flax may relate to the processing of cultivated flax, as although they are not cultivars, they are often associated with archaeological finds of flax processing waste.

The location of waterlogged deposits within the quarry pits and on the lower lying area (Trench 15, Area 3) at the edge of an urban Roman settlement is fortuitous as there has been little opportunity to date to identify signs of Romanisation in the form of exotic cultivars which are generally only found in waterlogged deposits. There are some signs of use or cultivation of crops and foodstuffs which could be associated with a more Romanised lifestyle, although these are limited to occasional finds of fig, culinary herbs (coriander and summer savoury) and possible cultivation of cabbages and carrot.

Waterlogged plant remains surviving within the city ditch suggest a stable environment through the lifespan of the ditch deposits, which potentially date from the late medieval period at the base of the sequence that could be safely sampled. The ditch appears to have carried standing or slow-flowing water during the build-up of deposits from base to top, although the earlier fills shows signs of alder trees and hence possibly more overgrown and shaded conditions at this time. The evidence for disposal of food and textile craft waste mirrors that recorded at 3–5 The Butts nearby, with some of the food waste possibly deriving from houses that are documented between the city wall and ditch from the 1600's (Bretherton and Pearson 1998).

Table 55

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
2543	425	0.00–0.10m	20	8	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.10–0.20m	30	17	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.20–0.25m	30	18	10–11	Ditch	City Ditch - latest re-cut	No	No
2543	425	0.25–0.30m	30	17	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.30–0.35m	30	17	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.35–0.40m	30	16	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.40–0.45m	30	18	10–11	Ditch	City Ditch - latest re-cut	Yes	Yes
2543	425	0.45–0.50m	30	18	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.50–0.55m	30	18	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.55–0.60m	30	17	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.60–0.65m	30	18	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2543	425	0.65–0.70m	30	17	10–11	Ditch	City Ditch - latest re-cut	Yes	No
2545	410		20	10	09–10	Ditch	City Ditch - medieval ditch	Yes	No
2556	425		20	10	10	Ditch	City Ditch - Civil War defences	Yes	No
2556	425	1.05–1.10m	30	17	10	Ditch	City Ditch - Civil War defences	Yes	No
2556	425	1.10–1.15m	30	16	10	Ditch	City Ditch - Civil War defences	Yes	No
2556	425	1.15–1.20m	30	20	10	Ditch	City Ditch - Civil War defences	Yes	Yes
2557	425	0.70–0.75m	30	20	10	Ditch	City Ditch - Civil War defences	Yes	No

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
2557	425	0.75–0.80m	30	16	10	Ditch	City Ditch - Civil War defences	Yes	No
2557	425	0.80–0.85m	30	20	10	Ditch	City Ditch - Civil War defences	Yes	No
2557	425	0.85–0.90m	30	15	10	Ditch	City Ditch - Civil War defences	Yes	Yes
2557	425	0.90–0.95m	30	20	10	Ditch	City Ditch - Civil War defences	Yes	No
2557	425	0.95–1.00m	30	16	10	Ditch	City Ditch - Civil War defences	Yes	No
2557	425	1.00–1.05m	30	13	10	Ditch	City Ditch - Civil War defences	Yes	No
6004	342	0.30–0.40m	10	0	06–11	Layer	Tillage soil	No	No
6004	342	0.40–0.50m	10	10	06–11	Layer	Tillage soil	Yes	No
6004	342	0.50–0.60m	10	10	06–11	Layer	Tillage soil	Yes	No
6004	342	0.60–0.70m	10	10	06–11	Layer	Tillage soil	Yes	No
6004	342	0.70–0.80m	10	10	06–11	Layer	Tillage soil	Yes	No
6004	342	0.00–0.10m	10	0	06–11	Layer	Tillage soil	No	No
6004	342	0.10–0.20m	10	0	06–11	Layer	Tillage soil	No	No
6004	342	0.20–0.30m	10	0	06–11	Layer	Tillage soil	No	No
6006	260		40	10	04	Ditch	Re-cutting of east-west ditch 6450 - fill	Yes	Yes
6056	250		10	10	12	Posthole	Saw Mill building - ‘Shed’ 1	Yes	Yes
6058	251		10	10	12	Well	Well - same as CG 1096?	Yes	Yes
6067	252		10	10	12	Posthole	Saw Mill building - ‘Shed’ 1	Yes	Yes
6132	253		10	10	10–12	Posthole	Saw Mill building - associated features	Yes	Yes
6133	259		20	10	05	Pit		Yes	Yes
6158	287		80	75	05	Surface	Upper cobbled surface	Yes	Yes
6278	261		40	10	04	Ditch	Re-cutting of east-west ditch 6450 - fill	Yes	Yes
6364	267		10	10	06–08	Oven (group)	Aisled building - oven group number	Yes	Yes
6375	263		30	10	10–12	Pit	Saw Mill building - associated features	Yes	Yes
6378	262		40	35	06	Pit	Later pit in clay lined pit cutting strip building 2D	Yes	Yes
6385	271		20	10	05	Pit	Clay lined pit cutting strip building 2D	Yes	Yes
6395	265		10	10	08–10	Posthole		Yes	Yes

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
6403	276		10	2	04	Pit	Isolated pit - cuts 6416	Yes	Yes
6403	264		40	35	04	Pit	Isolated pit - cuts 6416	Yes	Yes
6466	273		10	10	03–06	Posthole		Yes	Yes
6491	313		40	35	06	Quarry pit	Double marl quarry pit	Yes	Yes
6492	318		40	10	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	0.00–0.10m	10	10	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	0.10–0.20m	20	20	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	0.20–0.30m	10	10	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	0.50–0.55m	30	24	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	0.75–0.80m	30	26	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	1.00–1.08m	30	1	06	Quarry pit	Double marl quarry pit	Yes	Yes
6521	337	1.00–1.08m	30	0	06	Quarry pit	Double marl quarry pit	No	No
6543	268		40	10	05	Oven	Circular oven with flue in strip building 2D	Yes	Yes
6547	266		10	1	06–08	Oven	Aisled building - oven 6364	Yes	Yes
6549	269		20	17	06–08	Oven	Aisled building - oven 6364	Yes	Yes
6552	270		10	10	04	Posthole		Yes	Yes
6560	286		10	1	05	Layer	Deposit above 1041, 1042	Yes	Yes
6561	285		10	7	05	Layer	Deposit above 1041, 1042	Yes	Yes
6566	272		20	18	06–08	Oven	Aisled building - oven 6364	Yes	Yes
6575	279		40	10	05	Oven	Circular oven with flue in strip building 2D	Yes	Yes
6583	274		10	9	05	Pit	Clay lined pit cutting strip building 2D	Yes	Yes
6583	357		20	10	05	Pit	Clay lined pit cutting strip building 2D	Yes	Yes
6584	280		30	10	05	Oven	Circular oven with flue in strip building 2D	Yes	Yes
6585	281		40	10	05	Oven	Circular oven with flue in strip building 2D	Yes	Yes
6586	282		10	0.5	05	Oven	Circular oven with flue in strip building 2D	Yes	Yes
6587	283		30	10	05	Oven	Circular oven with flue in strip building 2D	Yes	Yes
6590	275		10	2	05	Pit	Clay lined pit cutting strip building 2D	Yes	Yes
6592	330		10	6	06	Quarry pit	Double marl quarry pit	Yes	Yes
6600	278		35	35	05	Pit	Pits between 1041, 1043	Yes	Yes

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
6602	277		10	4	05	Unknown		Yes	Yes
6661	284		2	2	13	Construction cut		Yes	Yes
6745	326	0.15–0.20m	40	36	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
6745	326	0.35–0.40m	30	24	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
6745	326	0.55–0.60m	40	33	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
6751	288		40	10	06–07	Construction cut	Aisled building - western wall footing	Yes	Yes
6745	326	0.75–0.80m	40	10	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
6776	289		15	10	03–05	Posthole		Yes	Yes
6792	290		20	10	06	Construction cut	Aisled building - postpad in N footings	Yes	Yes
6794	291		10	10	05	Pit	Strip building 2D - Occupational activity	Yes	Yes
6796	292		20	20	05	Pit	Strip building 2D - Occupational activity	Yes	Yes
6823	298		40	35	06	Robber pit	Robbing of stone well	Yes	Yes
6830	293		10	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6836	294		30	30	05–06	Layer	Demolition/levelling above surface CG 1045 - wall plaster	Yes	Yes
6840	300		20	20	06–07	Pit	Pit cutting AU 507 top of robbed well	Yes	Yes
6843	296		20	20	05	Oven	Oven/hearth in strip building 2D	Yes	No
6845	297		20	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6849	299		10	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6850	301		30	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6856	312		20	20				Yes	Yes
6862	365		10	10	04	Oven	Hearth/oven in SB 2A AU 503	Yes	Yes
6863	366		20	10	04	Oven	Hearth/oven in SB 2A AU 503	Yes	Yes
6865	368		1	1	04	Pit fill	Strip building 2B Pit AU 504	Yes	Yes
6866	369		2	2	04	Pit fill	Strip building 2B Pit AU 504	Yes	Yes
6868	370		3	3	04	Pit fill	Strip building 2B Pit AU 504	Yes	Yes
6869	371		2	2	04	Pit fill	Strip building 2B Pit AU 504	Yes	Yes
6875	372		20	6	04	Pit fill	Strip building 2A Pit AU 503	Yes	Yes
6876	373		20	10	04	Pit fill	Strip building 2A Pit AU 503	Yes	Yes
6881	414		10	10	04	Oven	Cobble layer under hearth/oven in SB 2A AU 503	Yes	Yes
6883	415		10	10	13	Posthole		Yes	Yes
6885	418		10	10	04	Pit		Yes	Yes
6887	419		10	10	03	Pit		Yes	Yes

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
6889	420		10	10	13	Pit		Yes	Yes
6894	304		40	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6897	308		40	36	05	Pit	Large pit in SW corner of Area 1	Yes	Yes
6901	310		30	30	05	Pit	Large pit in SW corner of Area 1	Yes	Yes
6902	305		10	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6907	306		10	2	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6908	331	0.95–1.00m	10	0	06	Quarry pit	Double marl quarry pit - southern part	No	No
6908	331	1.15–1.20m	10	0	06	Quarry pit	Double marl quarry pit - southern part	No	No
6910	303		40	10	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6911	302		40	40	05	Oven	Oven/hearth in strip building 2D	Yes	Yes
6912	307		30	10	05	Oven	Strip building 2D - Oven	Yes	Yes
6917	309		20	20	05	Pit	Large pit in SW corner of Area 1	Yes	Yes
6918	311		20	20	05	Pit	Large pit in SW corner of Area 1	Yes	Yes
6921	314		10	4	04	Oven	Earlier oven/hearth associated with strip building 3	Yes	Yes
6929	324			0	04	Oven	Earlier oven/hearth associated with strip building 3	Yes	No
6929	315		10	10	04	Oven	Earlier oven/hearth associated with strip building 3	Yes	No
6943	451		10	7	06	Robber pit	Robbing of stone well	Yes	Yes
6950	316		20	16	04	Oven?	Possible remains of oven/hearth	Yes	Yes
6960	317		5	5	04	Oven?	Possible remains of oven/hearth	Yes	Yes
6962	319		40	40	06	Quarry pit	Double marl quarry pit	Yes	Yes
6963	320		5	5	04	Oven?	Possible remains of oven/hearth	Yes	Yes
6964	321		20	10	04	Oven?	Possible remains of oven/hearth	Yes	Yes
6966	455		10	0	04	Well	Stone well - construction cut fill	No	No
6977	323		40	10	05	Floor	Earlier clay floor in strip building 2C	Yes	Yes
6981	367		20	10	05	Floor	Earlier clay floor in strip building 2C	Yes	Yes
6986	326	0.75–0.80m	40	10	06	Quarry pit	Double marl quarry pit - southern part	No	Yes
6987	322		20	20	04	Posthole	Possible earlier building - beam slot and postholes	Yes	Yes
6994	339		10	6	04	Oven?	Possible remains of oven/hearth	Yes	Yes
7028	328		10	10	04	Oven	Strip building 2B oven 7040	Yes	Yes
7034	329		20	10	04	Oven	Strip building 2B oven 7040	Yes	Yes
7035	325		10	6	13	Pit		Yes	Yes
7050	331	1.25–1.30m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.30–1.35m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
7050	331	1.35–1.40m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.40–1.45m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.45–1.50m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.50–1.55m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.55–1.60m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.60–1.65m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.65–1.70m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.70–1.75m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7050	331	1.30–1.35m	10	1	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7050	331	1.45–1.50m	10	1	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7050	331	1.55–1.60m	10	1	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7050	331	1.75–1.80m	10	1	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7051	334	1.80–1.85m	10	10	06	Quarry pit	Double marl quarry pit - southern part	No	No
7051	334	1.85–1.90m	20	10	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7051	334	1.90–1.95m	20	10	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7051	334	1.95–2.00m	10	0	06	Quarry pit	Double marl quarry pit - southern part	No	No
7051	334	2.00–2.05m	20	0	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7051	334	2.05–2.10m	20	6	06	Quarry pit	Double marl quarry pit - southern part	Yes	Yes
7057	338		40	40	06	Quarry pit	Double marl quarry pit	Yes	Yes
7059	340		10	10	03–06	Oven	Heavily truncated possible oven/hearth	Yes	Yes
7065	341		10	10	04	Linear		Yes	Yes
7078	343		10	10	04	Oven	Heavily truncated possible oven/hearth	Yes	Yes
7095	344		10	10	04	Oven	Heavily truncated possible oven/hearth	Yes	Yes
7096	352		10	5	04	Beam slot	Possible earlier building - beam slot and postholes	Yes	Yes
7122	353		10	10	04	Posthole	Possible earlier building - beam slot and postholes	Yes	Yes

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
7137	355		40	36	05–06	Layer		Yes	Yes
7138	354		10	10	04–06	Pit		Yes	Yes
7140	356		5	5	04	Posthole		Yes	Yes
7152	360		5	5	03–06	Curvilinear		Yes	Yes
7155	358		10	10	03–06	Posthole		Yes	Yes
7159	359		40	10	05	Oven	Oven/hearth pre dates aisled building - part of SB 3?	Yes	Yes
7160	361		20	10	05	Surface	Upper cobbled surface	Yes	Yes
7165	363		40	10	05	Surface	Upper cobbled surface slag deposit	Yes	Yes
7169	362		20	10	05	Layer	Deposit above 1041, 1042	Yes	Yes
7193	364		10	10	05–06	Layer		Yes	Yes
7204	433		40	10	05	Layer	Deposit above 1041, 1042	Yes	Yes
7243	434		3	3	05	Layer	Strip building 3 - occupation debris	Yes	Yes
7244	435		1	1	05	Layer	Strip building 3 - occupation debris	Yes	Yes
7245	436		10	6	05	Layer	Strip building 3 - occupation debris	Yes	Yes
7246	437		10	10	05	Layer	Strip building 3 - occupation debris	Yes	Yes
7247	438		10	10	05	Layer	Strip building 3 - occupation debris	Yes	Yes
7248	439		1	1	05	Surface	Strip building 3 - internal floor layer	Yes	Yes
7255	440		10	10	05	Surface	Strip building 3 - internal floor layer	Yes	Yes
7258	448		40	10	05	Surface	Strip building 3 - internal floor layer	Yes	Yes
7266	450		10	10	05	Oven	Base of oven/hearth in strip building 3	Yes	Yes
7266	452		40	10	05	Oven	Base of oven/hearth in strip building 3	Yes	Yes
7273	453		10	10	05	Oven	Base of oven/hearth in strip building 3	Yes	Yes
7273	454		1	1	05	Oven	Base of oven/hearth in strip building 3	Yes	No
7274	456		4	4	05	Posthole	Strip building 3 - structural element	Yes	Yes
8509	351		4	4	10	Ditch	Civil War? ditch	Yes	Yes
8510	350		40	10	10	Ditch	Civil War? ditch	Yes	Yes
8529	345		20	20	10–11	Ditch	Post-med curvilinear ditch	Yes	Yes
8531	346		10	10	10–11	Ditch	Post-med curvilinear ditch	Yes	Yes
8542	347		10	9	05	Pit	Dispersed group of pits - rubbish pits?	Yes	Yes
8544	348		40	10	10	Ditch	Civil War? ditch	Yes	Yes
8546	349		10	0	10	Ditch	Civil War? ditch	Yes	Yes
8546	139		10	10	10	Ditch	Civil War? ditch	Yes	Yes
8558	401		10	10	04	Posthole		Yes	Yes
8559	400		20	10	04	Posthole		Yes	No
8560	396		10	7	04	Posthole		Yes	Yes
8562	397		20	10	13	Posthole		Yes	Yes
8564	398		10	6	13	Pit		Yes	Yes
8568	399		50	50	04	Pit		Yes	No
8655	392		40	40	06–07	Pit	Large well pit - upper backfill	Yes	Yes

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
8656	385		40	10	06–07	Pit	Large well pit - upper backfill	Yes	Yes
8657	386		40	10	06–07	Pit	Large well pit - upper backfill	Yes	Yes
8658	387		40	10	06–07	Pit	Large well pit - upper backfill	Yes	Yes
8659	388		40	10	06–07	Pit	Large well pit - upper backfill	Yes	Yes
8660	389		40	10	06–07	Pit	Large well pit - upper backfill	Yes	Yes
8662	390		40	10	06–07	Pit	Large well pit - upper backfill	Yes	Yes
8670	380		10	10	09	Pit	Medieval pits in Area 7	Yes	Yes
8671	377		40	10	06–11	Layer	Tillage soil	Yes	Yes
8674	374		20	10	05	Layer		Yes	Yes
8676	375		10	5	13	Grave	Neonate burial	Yes	Yes
8678	376		20	10	05	Pit		Yes	Yes
8686	379		10	10	04	Pit		Yes	Yes
8688	378		10	6	03–06	Pit		Yes	Yes
8691	381		20	10	09	Pit	Medieval pits in Area 7	Yes	Yes
8693	382		30	10	05	Pit	Clay-lined pit	Yes	Yes
8694	383		20	10	05	Pit	Clay-lined pit	Yes	Yes
8700	384		40	10	06–07	Pit	Pit cut into upper fills of well AU 524	Yes	Yes
8706	391		40	10	05–06	Pit	Large well pit - fill	Yes	Yes
8712	402		10	8	05	Pit		Yes	Yes
8718	393		40	40	05	Linear		Yes	Yes
8720	394		40	6	13	Pit		Yes	Yes
8725	395		10	10	09	Pit	Medieval pits in Area 7	Yes	Yes
8732	403		10	10	05	Ditch		Yes	Yes
8756	404		10	10	09	Pit	Medieval pits in Area 7	Yes	Yes
8758	406		3	3	09	Posthole	Medieval pits in Area 7	Yes	Yes
8759	405		10	10	03–06	Posthole		Yes	Yes
8762	407		20	10	05–06	Well	Large well pit - fill of well	Yes	No
8832	413		10	10	13	Posthole		Yes	Yes
8833	417		40	9	06	Malting oven	Malting oven - Roman structure	Yes	Yes
8839	416		40	9	05	Pit	Dispersed group of pits - rubbish pits?	Yes	No
8844	461		5	1	05	Layer		Yes	Yes
8873	428		6	1	05	Pit	Dispersed group of pits - rubbish pits?	Yes	Yes
8873	429		20	9	05	Pit	Dispersed group of pits - rubbish pits?	Yes	No
8873	427		20	8	05	Pit	Dispersed group of pits - rubbish pits?	Yes	Yes
8874	430		5	5	05	Pit	Dispersed group of pits - rubbish pits?	Yes	Yes
8875	431		20	7	05	Pit	Dispersed group of pits - rubbish pits?	Yes	No
8881	449		20	9	05	Layer		Yes	No
8885	457		40	10	06	Malting oven floor	Malting oven - Roman structure	Yes	No

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
8887	424		10	8	06	Malting oven	Malting oven - Roman structure	Yes	Yes
8892	432		20	8	05	Pit	Dispersed group of pits - rubbish pits?	Yes	Yes
8893	447		40	40	06	Malting oven	Malting oven - Roman structure	Yes	Yes
8894	458		10	10	06	Malting oven	Malting oven - Roman structure	Yes	Yes
8895	459		3	3	06	Malting oven	Malting oven - Roman structure	Yes	Yes
8896	460		60	6	06	Malting oven floor	Malting oven - Roman structure	Yes	No
15006	57		10	9	11	Layer		Yes	Yes
15006	58		10	8	11	Layer		No	Yes
15023	1		1	0	12	Demolition layer	Cattle market - made ground/features	No	No
15026	62		10	0	10–12	Ditch	Civil War? V-shaped ditch in Trench 15	No	No
15027	53		20	1	10–12	Ditch	Civil War? V-shaped ditch in Trench 15	Yes	Yes
15031	45	0.00–0.05m	10	5	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	Yes	Yes
15031	45	0.05–0.10m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.10–0.15m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.15–0.20m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.20–0.25m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.25–0.30m	10	7	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	Yes	Yes
15031	45	0.30–0.35m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.35–0.40m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.40–0.45m	10	1	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.45–0.50m	10	7	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	Yes	Yes
15031	45	0.50–0.55m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.55–.060m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	O.60–0.65m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.65–0.70m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.70–0.75m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
15031	45	0.80–0.85m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15031	45	0.85–0.90m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	No	No
15032	35		10	0	05	Layer		No	No
15033	45	1.00–1.05m	10	0	06–10	Ditch	North-south ditch possibly post-Roman Trench 15	Yes	Yes
15035	64		20	0	12	Pit	Cattle market - made ground/features	No	No
15045	3		30	25	11	Posthole		Yes	Yes
15045	3		30	25	11	Posthole		Yes	Yes
15056	40	0.20–0.25m	10	0	11	Pit		No	No
15056	40	0.25–0.30m	10	0	11	Pit		No	No
15056	40	0.30–0.35m	10	0	11	Pit		No	No
15048	40	0.15–0.20m	10	1	11	Layer		Yes	Yes
15048	40	0.20–0.25m	10	0	11	Layer		No	No
15048	40	0.25–0.30m	10	0	11	Layer		No	No
15048	40	0.30–0.35m	10	0	11	Layer		No	No
15048	40	0.35–0.40m	0	0	11	Layer		No	No
15048	40	0.40–0.45m	10	0	11	Layer		No	No
15049	40	0.50–0.55m	0	0	05	Layer		No	No
15049	40	0.55–0.60m	10	0	05	Layer		No	No
15049	40	0.60–0.65m	10	1	05	Layer		Yes	Yes
15049	40	0.60–0.65m	10	10	05	Layer		No	No
15050	40	0.65–0.70m	0	0	05	Layer		No	No
15051	40	0.70–0.75m	0	0	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No
15051	40	0.75–0.80m	10	0	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
15051	40	0.80–0.85m	0	0	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No
15051	40	0.85–0.90m	10	0	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No
15051	40	0.90–0.95m	10	1	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	Yes	Yes
15051	40	0.90–0.95m	0	0	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No
15051	40	0.95–1.00m	10	1	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	Yes	Yes
15051	40	0.95–1.00m	10	10	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No
15053	45	1.00–1.05m	10	1	03–04	Layer		Yes	Yes
15056	40	0.15–0.20m	10	0	11	Pit		Yes	Yes
15060	2		10	10	05	Curvilinear		Yes	Yes
15060	2		10	8	05	Curvilinear		Yes	Yes
15064	7		20	1	05	Pit	Later pits in group on flood plain Trench 15	Yes	Yes
15064	7		20	6	05	Pit	Later pits in group on flood plain Trench 15	No	Yes
15066	11		10	7	04	Pit	Earlier pit group on flood plain in Trench 15	Yes	Yes
15066	29		10	0	04	Pit	Earlier pit group on flood plain in Trench 15	No	No
15068	30		20	15	05	Pit	Later pits in group on flood plain Trench 15	Yes	Yes
15070	4		40	1	05	Layer		Yes	Yes
15070	4		40	38	05	Layer		Yes	Yes
15071	8		10	1	04	Pit	Earlier pit group on flood plain in Trench 15	Yes	Yes
15072	13		10	10	05	Layer		Yes	Yes
15073	10		20	0	05	Layer		No	No
15074	26		20	0	05	Layer		No	No
15075	5		40	10	05	Layer		Yes	Yes
15077	42		30	14	11	Pit		Yes	Yes

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
15078	12		20	10	12	Layer	Cattle market - made ground/features	Yes	Yes
15078	15		20	8	12	Layer	Cattle market - made ground/features	Yes	Yes
15087	6		20	1	03–04	Pit	Earlier pit group on flood plain in Trench 15	Yes	Yes
15088	51		40	0	03–04	Pit	Earlier pit group on flood plain in Trench 15	No	No
15092	59		20	0	04–05	Palaeo channel, upper fill	Palaeo-channel - secondary infill	No	No
15107	9		10	1	05	Layer		Yes	Yes
15107	9		10	16	05	Layer		No	No
15112	60		20	0	02–03	Palaeo channel, lower fill	Palaeo-channel - primary infill	No	No
15113	61		20	1	03–04	Layer		Yes	Yes
15119	17		10	1	04	Pit	Earlier pit group on flood plain in Trench 15	Yes	Yes
15119	74		10	0	04	Pit	Earlier pit group on flood plain in Trench 15	No	No
15120	16		10	0	11	Pit		No	No
15122	70		20	0	11	Pit		No	No
15123	69		20	0	11	Pit		No	No
15124	18		20	10	03	Layer		Yes	Yes
15133	38		10	0	05	Layer		No	No
15134	39		5	5	05	Layer		Yes	Yes
15137	19		40	10	10	Pit	Casting waste pit	Yes	Yes
15138	20		20	10	10	Pit	Casting waste pit	Yes	Yes
15139	21		25	9	11	Pit		Yes	Yes
15145	22		20	20	04–05	Pit	Later pits in group on flood plain Trench 15	Yes	Yes
15147	24		20	0	04–05	Pit	Later pits in group on flood plain Trench 15	No	No
15148	40	0.35–0.40m	10	1	04–05	Pit	Later pits in group on flood plain Trench 15	No	No
15149	65		20	0	04–11	Pit		No	No
15149	40	0.50–0.55m	10	1	04–11	Pit		No	No
15150	66		20	0	04–11			No	No
15151	40	0.80–0.85m	10	1	04–11	Pit		No	No
15151	40	0.70–0.75m	10	1	04–11	Pit		No	No

Context	Sample	Spit/ sub-sample	Sample vol (L)	Vol processed (L)	Period	Feature type	Context group name	Residue assessed	Flot assessed
15152	68		10	0	04	Pit		No	No
15154	67		10	8	04	Posthole		Yes	Yes
15157	49		10	0	05	Layer		No	No
15158	48		10	10	05	Layer		Yes	Yes
15159	28		20	0	05	Layer		No	No
15160	27		10	0	05	Layer		No	No
15163	37		5	0	03–04	Layer		No	No
15168	47		10	0	03–04	Layer		No	No
15171	36		10	10	03–04	Ditch		Yes	Yes
15174	63		20	0	11	Ditch		No	No
15175	31		10	0	04–05	Pit	Later pits in group on flood plain Trench 15	No	No
15177	32		10	0	05			No	No
15179	33		10	0	03–04	Pit	Earlier pit group on flood plain in Trench 15	No	No
15181	34		20	10	04–05	Pit	Later pits in group on flood plain Trench 15	Yes	Yes
15183	14		20	0	03–04	Layer		No	No
15184	71		20	20	11	Pit		Yes	Yes
15185	72		20	0	11	Pit		No	No
15186	73		10	0	11	Pit		No	No
15194	43		10	10	04	Pit	Earlier pit group on flood plain in Trench 15	Yes	Yes
15195	44		10	0	04	Pit	Earlier pit group on flood plain in Trench 15	No	No
15199	54		20	20	10–12	Ditch	Civil War? V-shaped ditch in Trench 15	Yes	Yes
15147	25		10	0	04–05	Pit	Later pits in group on flood plain Trench 15	No	No

Table 55: List of environmental bulk samples

Table 56:

Context	Sample	Spit/Sub-sample (m)	Large mammal	Small mammal	Fish	Frog/toad	Bird	Mollusc	Insect	Charcoal	Charred plant	Mineralized plant	Waterlog plant	Hammer-scale	Comment
Key: occ = occasional, mod = moderate, abt = abundant															
2543	425	0.00–0.10	occ							occ	occ		abt		
2543	425	0.10–0.20		occ					occ	occ			abt	occ (spheriod)	occ – pot, tile
2543	425	0.20–0.25		occ				occ	occ	occ			abt		mod – coal, occ – fired clay, CBM, pot, mortar, ?Cu alloy slag
2543	425	0.25–0.30	occ					mod	mod*	occ			abt		occ – pot, tile, Fe slag, * incl fly pupae
2543	425	0.30–0.35	occ					occ		occ			abt		
2543	425	0.35–0.40								occ			abt		
2543	425	0.40–0.45		occ				occ	mod	occ			abt	abt	
2543	425	0.45–0.50cm						occ–mod		occ			abt		
2543	425	0.50–0.55	occ	occ				abt	occ	occ			abt		
2543	425	0.55–0.60	occ	occ				mod	mod	occ			abt		mod – mortar, occ – fired clay, CBM, pot, Fe slag
2543	425	0.60–0.65	occ	occ					mod	occ/mod	occ–mod	occ–mod	abt		occ – tile, Fe slag, glass (vessel), ceramic mould
2543	425	0.65–0.70	occ					mod	occ	mod	mod	occ	abt		occ – ?tile, Fe slag
2556	425	1.05–1.10	occ							occ	occ				
2556	425	1.10–1.15	occ		occ					abt					

Context	Sample	Spit/Sub-sample (m)	Large mammal	Small mammal	Fish	Frog/toad	Bird	Mollusc	Insect	Charcoal	Charred plant	Mineralized plant	Waterlog plant	Hammer-scale	Comment
Key: occ = occasional, mod = moderate, abt = abundant															
2556	425	1.15–1.20	occ						occ	occ/mod				abt	
2557	425	0.70–0.75	occ	occ	occ			occ/mod		occ			abt		occ – pot, tile, clay pipe
2557	425	0.75–0.80	occ	occ				mod		mod*			abt		mod – tile, occ – pot, Fe slag
2557	425	0.80–0.85	occ				occ	mod		abt			abt		abt – mortar, coal & clinker, CBM, occ – fired clay, Fe slag
2557	425	0.85–0.90	occ					mod	mod–abt	mod–abt*			abt	abt	occ – Fe slag, Fe pin, ceramic mould
2557	425	0.90–0.95	occ					occ/mod		mod/abt*			abt		occ – tile, ceramic mould
2557	425	0.95–1.00	occ		occ	occ			occ	occ/mod	occ–mod	occ			
2557	425	1.00–1.05	occ	occ	occ			abt	occ	abt				v	abt – coal & clinker, CBM, Fe slag, ceramic mould
6158	287		occ–mod	occ						occ	occ		occ	occ	occ – shell, glass, Fe object, bead, burnt stone, Fe concretions, fired clay, mod tile, mod–abt – pot, abt – Fe slag
6552	270		occ							mod	occ	occ		occ	occ – pot, Fe slag, burnt bone
6745	326	0.15–0.20	mod		occ					mod	occ–mod			occ	occ – Fe objects, occ/mod – pot, mod/abt – Fe slag, roof tile
6745	326	0.35–0.40	occ		occ					occ	abt				occ – Fe slag, Fe objects, glass, Fe concretions, ?flint, mod – pot
6745	326	0.55–0.60	occ–mod	occ	occ					occ	occ			occ	occ – Fe slag, Fe objects, glass, iron concretions, abt – pot
6745	326	0.75–0.80	occ	occ	occ					occ	abt				occ – pot, Fe slag, Fe objects

Context	Sample	Spit/Sub-sample (m)	Large mammal	Small mammal	Fish	Frog/toad	Bird	Mollusc	Insect	Charcoal	Charred plant	Mineralized plant	Waterlog plant	Hammer-scale	Comment
Key: occ = occasional, mod = moderate, abt = abundant															
6830	293		occ–mod*	occ	occ					mod	abt				occ – Fe slag, Fe object, occ–mod – pot (incl base & rim), *diagnostic animal bone
6901	310		mod	mod	occ					abt	abt			occ	mod – pot, Fe object, abt – Fe slag
6911	302		abt	occ						mod–abt	occ		occ	occ	occ – Fe object & slag, bone pin, abt – pot (base & body sherds)
6917	309		mod–abt	occ						mod	abt			mod – spheroid	mod – Fe object, mod–abt – pot, abt – Fe slag
6962	319		mod	occ	occ					mod	occ			occ	occ – pot, Fe object, clay, glass, burnt stone, abt – Fe slag
6987	322		occ	occ	occ					abt	occ			occ	occ – pot, Fe objects, Fe slag, glass, fired clay, head cracked stone, mod small mineralised concretions
7050	331	1.30–1.35							occ				abt		
7050	331	1.35–1.40	occ					occ	occ				abt		occ – ?glass vessel, burnt clay, mortar, mod pot
7050	331	1.40–1.45													
7050	331	1.50–1.55			occ										FIND RECORD SHEET
7050	331	1.55–1.60			occ				occ				abt		occ – paphrica/water flea eggs
7050	331	1.70–1.75	occ						occ		abt		abt		occ – phosphate concretions, burnt clay, pot Fe slag & object
7050	331	1.75–1.80							occ		mod		abt		

Context	Sample	Spit/Sub-sample (m)	Large mammal	Small mammal	Fish	Frog/toad	Bird	Mollusc	Insect	Charcoal	Charred plant	Mineralized plant	Waterlog plant	Hammer-scale	Comment
Key: occ = occasional, mod = moderate, abt = abundant															
7051	334	1.80–1.85	occ	occ				occ	occ	abt			abt		occ – phosphate concretions, pot, Fe slag, burnt stone, burnt clay
7051	334	1.85–1.90	mod							occ–mod	abt		abt		occ – shell, pot, building mat, tile, Fe slag, Fe objects, burnt stone, nut shell
7051	334	1.90–1.95	occ						occ	mod	occ		abt		occ – pot, Fe slag
7051	334:	2.00–2.05	occ		occ					abt	occ–mod		abt		occ – pot, Fe slag, Fe objects, nut shell
7051	334:	2.05–2.10	occ	occ	occ				occ	mod	occ		abt		occ – tile, Fe slag, fired clay, charred thorns, nut shell, occ/mod – pot
8558	401		occ		occ					occ	abt				occ – pot, Fe slag, glass

Table 56: Summary of environmental remains from bulk samples

Table 57:

Habitat: A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar				
Latin name	**Family**	**Common name**	**Habitat**	**8558**
Triticum spelta glume base	Poaceae	spelt wheat	F	31
Triticum spelta rachis	Poaceae	spelt wheat	F	2
Triticum dicoccum/spelta grain	Poaceae	emmer/spelt wheat	F	3
Triticum dicoccum/spelta glume base	Poaceae	emmer/spelt wheat	F	36
Triticum dicoccum/spelta rachis	Poaceae	emmer/spelt wheat	F	2
Triticum sp grain	Poaceae	wheat	F	1
Cereal sp indet grain	Poaceae	cereal	F	12
Cereal sp indet embryo shoot	Poaceae	cereal	F	2
cf *Avena* sp grain	Poaceae	oat	AF	1
Festuca/Lolium sp grain	Poaceae	fescue/rye-grass	ABD	27
Bromus sp grain	Poaceae	brome grass	AF	3
Poaceae sp indet grain (small)	Poaceae	grass	AF	5
Poaceae sp indet grain (fragments)	Poaceae	grass	AF	25

Table 57: Charred plant remains from Phase 4

Table 58:

Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar					
Quantity	+ = 1–10					
Latin name	**Family**	**Common name**	**Habitat**	**6897**	**6901**	**6917**
Charred plant remains						
Triticum dicoccum glume base	Poaceae	emmer wheat	F			3
Triticum spelta grain	Poaceae	spelt wheat	F	26	5	21
Triticum spelta glume base	Poaceae	spelt wheat	F	74	1	1
Triticum spelta rachis	Poaceae	spelt wheat	F	23		16
Triticum dicoccum/spelta grain	Poaceae	emmer/spelt wheat	F	100	26	55
Triticum dicoccum/spelta glume base	Poaceae	emmer/spelt wheat	F	29		17
Triticum dicoccum/spelta spikelet fork	Poaceae	Emmer/spelt wheat	F		1	
Triticum dicoccum/spelta rachis	Poaceae	emmer/spelt wheat	F	19		
Triticum aestivo-compactum grain	Poaceae	club wheat	F		1	8
Triticum sp (free-threshing) grain	Poaceae	free-threshing wheat	F		8	4
Triticum sp grain	Poaceae	wheat	F	5	1	
Triticum sp tail grain	Poaceae	wheat	F	47		1

Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar
Quantity	+ = 1–10

Latin name	Family	Common name	Habitat	6897	6901	6917
Hordeum vulgare grain (hulled)	Poaceae	barley	F	16	1	4
Cereal sp indet grain	Poaceae	cereal	F	254	38	94
Cereal sp indet culm node	Poaceae	cereal	F			1
Cereal sp indet awn fragments	Poaceae	cereal	F			+
Cereal sp indet embryo shoot	Poaceae	cereal	F	26		6
Avena sp grain	Poaceae	oat	AF	8		35
cf *Avena* sp grain					1	
Papaver somniferum	Papaveraceae	opium poppy	ABF	1		
Ranunculus acris/repens/ bulbosus	Ranunculaceae	buttercup	CD			1
Melilotus/Medicago sp	Fabaceae	melilot/medick	ABD		1	2
Rubus sect *Glandulosus*	Rosaceae	bramble	CD	1		
Hypericum sp	Hypericaceae	St Johns's wort	CD			1
Nasturtium officinale	Brassicaceae	water-cress	EF		1	
Raphanus raphanistrum (pod fragments)	Brassicaceae	wild radish	ABG	2		1
Persicaria hydropiper	Polygonaceae	water-pepper	E	1		
Polygonum aviculare	Polygonaceae	knotgrass	AB			2
Fallopia convolvulus	Polygonaceae	black bindweed	AB			2
Rumex sp	Polygonaceae	dock	ABCD	16		14
Stellaria graminea	Caryophyllaceae	lesser stitchwort	D	1		
Spergula arvensis	Caryophyllaceae	corn spurrey	AD	59	1	
Chenopodium glaucum/ rubrum	Amaranthaceae	oak-leaved/red goosefoot	AB			5
Chenopodium album	Amaranthaceae	fat hen	AB	99		47

Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar
Quantity	+ = 1–10

Latin name	**Family**	**Common name**	**Habitat**	**6897**	**6901**	**6917**
Chenopodium sp	Amaranthaceae	goosefoot	ABD			17
Atriplex sp	Amaranthaceae	orache	AB	5		2
Chenopodium/Atriplex sp	Amaranthaceae	goosefoot/orache	AB	56		
Hyoscyamus niger	Solanaceae	henbane	AB	1		
Centaurea sp	Asteraceae	knapweed/cornflower	ABD			1
Lapsana communis	Asteraceae	nipplewort	BCD			4
Anthemis cotula	Asteraceae	stinking chamomile	AB	3		
Glebionis segetum	Asteraceae	corn marigold	AB	2		1
Tripleurospermum inodorum	Asteraceae	scentless mayweed	AB	149	7	244
Sambucus nigra	Caprifoliaceae	elderberry	BC	1		
cf *Daucus carota*	Apiaceae	carrot	DF			1
Eleocharis sp	Cyperaceae	spike-rush	E			
Carex sp (3-sided) nutlets	Cyperaceae	sedge	CDE	1	1	
Festuca/Lolium sp grain	Poaceae	fescue/rye-grass	ABD	112	2	136
Poa sp grain	Poaceae	meadow-grass	ABCD	1		
cf *Poa* sp grain	Poaceae	meadow-grass	ABCD			8
Bromus sp grain	Poaceae	brome grass	AF	117	1	108
Poaceae sp indet grain	Poaceae	grass	AF	646	7	333
Poaceae sp indet grain (small)	Poaceae	grass	AF	50	3	26
unidentified seed	unidentified			18		+
Mineralised plant remains						
Lithospermum arvense	Boraginaceae	field gromwell	AD	4		2

Table 58: Plant remains from Phase 5 pits

Table 59:

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Triticum spelta grain	Poaceae	spelt wheat	F										+	
Triticum spelta glume base	Poaceae	spelt wheat	F	+			+							+
Triticum dicoccum/ spelta grain	Poaceae	emmer/spelt wheat	F						+				+	
Triticum dicoccum/ spelta glume base	Poaceae	emmer/spelt wheat	F						+					
Cereal sp indet grain (fragment)	Poaceae	cereal	F											+
Medicago sp	Fabaceae	medick	ABD	+										
Trifolium cf *pratense*	Fabaceae	red clover	ABD			+								
Urtica urens	Urticaeae	small nettle	AB									+		
Corylus avellana shell fragment	Betulaceae	hazelnut	C				+							
Rumex acetosella	Polygonaceae	sheep's sorrel	ABD				+							
Poaceae sp indet grain (small)	Poaceae	grass	AF	+		+								
Mineralised plant remains														
Avena sp floret	Poaceae	oat	AF			+								
Waterlogged plant remains														
Cereal sp indet grain	Poaceae	cereal	F				+		+					
Papaver somniferum	Papaveraceae	opium poppy	ABF	+										

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Papaver argemone	Papaveraceae	prickly poppy	AB										+	
Fumaria sp	Papaveraceae	fumitory	ABC										+	
Caltha palustris	Ranuculaceae	marsh-marigold	E								+			
Ranunculus acris/ repens/bulbosus	Ranunculaceae	buttercup	CD		++	+	+++	+	++	++	+	+	+++	+
Ranunculus sardous	Ranunculaceae	hairy buttercup	ABD	+		+	+	+	+	+				
Ranunculus arvensis	Ranunculaceae	corn buttercup	A											+
Ranunculus sbgen *Batrachium*	Ranunculaceae	crowfoot	E											+
Prunus spinosa	Rosaceae	sloe	C		+									
cf *Prunus spinosa* (fragment)	Rosaceae	sloe	C			+								
Crataegus monogyna	Rosaceae	hawthorn	C			+								
Rubus idaeus	Rosaceae	raspberry	CD									+		
Rubus sect *Glandulosus*	Rosaceae	bramble	CD	+++	+++	+++	++	+++	++	++		++		
Fragaria vesca	Rosaceae	wild strawberry	C	++		++	++		++		+	+	+++	+
cf *Fragaria vesca*	Rosaceae	wild strawberry	C		+									
Ficus carica	Moraceae	fig	F										+	

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Urtica dioica	Urticaeae	common nettle	ABCD	++	+	+	+		+	+		++/+++	+	+
Urtica urens	Urticaeae	small nettle	AB	+	+	+++	+	+	++	+	++	++		+
Alnus glutinosa (fruits)	Betulaceae	alder	CE								+	+		
Salix sp bud	Salicaceae	willow	C									+		
Viola sp	Violaceae	violet	DF			+	+							
Linum usitatissimum seed	Linaceae	flax	AF				+/++							
Linum bienne/*perenne*	Linaceae	perennial flax	D					+	+			+		+
Linum catharticum	Linaceae	fairy flax	D				++			+		+	++/+++	+
Hypericum sp	Hypericaceae	St johns's wort	CD							+				
cf *Hypericum* sp	Hypericaceae	St John's wort	ABCD	+										
Brassica sp	Brassicaeae	cabbages	ABDF								+			
Thlaspi arvense	Brassicaceae	field penny-cress	AB					+						
Persicaria maculosa	Polygonaceae	redshank	AB			++	+							
Polygonum aviculare	Polygonaceae	knotgrass	AB	+	+	+	++	+	+	+		+	+	+
Fallopia convolvulus	Polygonaceae	black bindweed	AB			+	+			+	+			
cf *Fallopia convolvulus*	Polygonaceae	black bindweed	AB											+

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Rumex acetosella	Polygonaceae	sheep's sorrel	ABD							+		+	++/+++	+
cf *Rumex acetosella*	Polygonaceae	sheep's sorrel	ABD			+								
Rumex sp	Polygonaceae	dock	ABCD	+	+	++	+++	+++	+++	+++	+	+	+++	+
Rumex sp (bladders)	Polygonaceae	dock	ABCD										+	+
Rumex spp	Polygonaceae	dock	ABCD											
Stellaria media	Caryophyllaceae	common chickweed	AB	+	+	+	+		++	+/++		++	+	
Stellaria graminea	Caryophyllaceae	lesser stitchwort	D	+	+	++	++	+	+			+	+	+
Cerastium sp	Caryophyllaceae	mouse ear	DE										+	
Spergula arvensis	Caryophyllaceae	corn spurrey	AD	+++	+++	++++	+++	+++	+++		+++	+++	+	
Agrostemma githago	Caryophyllaceae	corn cockle	AB				+	+	+	+	+			
Silene sp	Caryophyllaceae	campion	AB	+						+				
Chenopodium hybridum	Amaranthaceae	maple-leaved goosefoot	AB					++		++				
Chenopodium album	Amaranthaceae	fat hen	AB		+++	+++	+		+++	+	+	+++	+++	+
Atriplex sp	Amaranthaceae	orache	AB		+	+	+	+	+	+	+	+		
Hyoscyamus niger	Solanaceae	henbane	AB	+	+	+	++	++	++	+	+	+	++	
Solanum nigrum	Solanaceae	black nightshade	AB	+++	+++		+/++	+	++	+	+	+		+
Solanum dulcamara	Solanaceae	bittersweet	CDE			++				+				

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Plantago major	Plantaginaceae	greater plantain	ABD				+++							
Plantago lanceolata	Plantaginaceae	ribwort plantain	ABD				++							
Lamium sp	Lamiaceae	dead-nettles	ABF									+		
Marrubium vulgare	Lamiaceae	white horehound	ABD	+	+			+	+++	++			+	
Prunella vulgaris	Lamiaceae	selfheal	D			+	+++	+	+++	++/++	+	+	+++	+
Satureja hortensis	Lamiaceae	summer savory	AF			+								
Lycopus europaeus	Lamiaceae	gypsywort	E	+					+					
Mentha aquatica	Lamiaceae	water mint	E			+								
Mentha sp	Lamiaceae	mint	ABDEF	+										
Carduus sp	Asteraceae	thistle	BCD										+	
cf *Carduus* sp	Asteraceae	thistle	BCD							+				
Cirsium sp	Asteraceae	thistle	ABDE					+		+				
Carduus/Cirsium sp	Asteraceae	thistle	ABDE									+		
Onopordum acanthium	Asteraceae	cotton thistle	B	+				+	+		+			
Centaurea sp	Asteraceae	knapweed/ cornflower	ABD											+
Centaurea sp (pappas)	Asteraceae	knapweed/ cornflower	ABD					+						
Lapsana communis	Asteraceae	nipplewort	BCD								+			
Leontodon sp	Asteraceae	hawkbit	D							+				

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Sonchus asper	Asteraceae	prickly sow-thistle	ABD					+	+					
Glebionis segetum	Asteraceae	corn marigold	AB				+	+					+	
Leucanthemum vulgare	Asteraceae	oxeye daisy	BD					+				+		
Leucanthemum sp	Asteraceae	ox-eye daisy	BD						+	+				
Sambucus nigra	Caprifoliaceae	elderberry	BC	+++	+++	++++	++	+++	++	++	+++	+++	+++	
Sambucus cf *ebulus*	Caprifoliaceae	dwarf elder	BD											+
Valerianella dentata	Valerianaceae	narrow-fruited cornsalad	AB			+								
Anthriscus caucalis	Apiaceae	bur chervil	ABC				+			+				
cf *Anthriscus caucalis*	Apiaceae	bur chervil	ABC						+					
Coriandrum sativum	Apiaceae	coriander	ABF					+						
Oenanthe sp	Apiaceae	water-dropwort	E					+	+					
Aethusa cynapium	Apiaceae	fool's parsley	AB		+	+					+	+		
Conium maculatum	Apiaceae	hemlock	AB			+	+	+	+	+	+	+		
Apium graveolens	Apiaceae	wild celery	E									+		
Apium nodiflorum	Apiaceae	fool's watercress	E						+					
Daucus carota	Apiaceae	carrot	DF				+							
cf *Daucus carota*	Apiaceae	carrot	DF							+				
Lemna sp	Lemnaceae	duckweed	E										+	

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
Juncus cf *bufonius*	Juncaceae	toad rush	E										+	
Juncus cf *effusus*	Juncaceae	soft-rush	CDE										++	
Juncus sp	Juncaceae	rush	DE				+		+	+	+			+/++
Schoenoplectus tabernaemontani	Cyperaceae	club-rush	E			+								
Eleocharis sp	Cyperaceae	spike-rush	E	+	+/++	+/++	+	++	+	+	+	++	++	+
Cyperus sp	Cyperaceae	galingale	ABDE						+					
Carex sp	Cyperaceae	sedge	CDE											+
Carex sp (2-sided) nutlets	Cyperaceae	sedge	CDE	++			+	++		+/++	++			
Carex sp (3-sided) nutlets	Cyperaceae	sedge	CDE		++	+++	+++	+++	++		++		+	+
cf *Poa* sp grain	Poaceae	meadow-grass	ABCD							+				
cf *Bromus* sp grain	Poaceae	brome grass	AF							+				
Poaceae sp indet grain	Poaceae	grass	AF				+	+	+			+		
Poaceae sp indet grain (small)	Poaceae	grass	AF				+							+
unidentified twig/bud fragments	unidentified				+++	+++		++	++/+++	+	++			
unidentified moss fragments	unidentified							++	+	++	++	++/+++	+	+
unidentified thorn	unidentified								+	+				
unidentified seed	unidentified			+				+	+					

Latin name	Family	Common name	Habitat	Context 7050 1.30–1.35m	Context 7050 1.35–1.40m	Context 7050 1.40–1.45m	Context 7050 1.50–1.55m	Context 7050 1.55–1.60m	Context 7050 1.70–1.75m	Context 7050/7051 1.75–1.80m	Context 7051 1.80–1.85m	Context 7051 1.85–1.90m	Context 7051 1.90–1.95m	Context 7051 2.00–2.05m
	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar												
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+												
Charred plant remains														
unidentified leaf fragments	unidentified								+	++				
unidentified wood fragments	unidentified				+++		+++	+++	+++	++++	+++	++++	++++	++++
unidentified straw fragments	unidentified									+++		+++	++/+++	
unidentified herbaceous fragments	unidentified				+++		+++		+++				++/+++	++++

Table 59: Plant remains from Phase 6 large quarry pit (AU 510; CG 1108)

Table 60:

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar															
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+															
Latin name	**Family**	**Common name**	**Habitat**	**Context 2543 0.v10–0.20m**	**Context 2543 0.20–0.25m**	**Context 2543 0.25–0.30m**	**Context 2543 0.30–0.35m**	**Context 2453 0.40–0.45m**	**Context 2543 0.45–0.50m**	**Context 2543 0.50–0.55m**	**Context 2543 0.55–0.60m**	**Context 2543 0.60–0.65m**	**Context 2557 0.80–0.85m**	**Context 2557 0.85–0.90m**	**Context 2557 0.90–0.95m**	**Context 2557 1.00 – 1.05m**	**Context 2556 1.15 – 1.20m**
Charred plant remains																	
Secale cereale grain	Poaceae	rye	F	+													
Cereal sp indet culm node	Poaceae	cereal	F		+												

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar															
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+															
Latin name	**Family**	**Common name**	**Habitat**	**Context 2543 0.v10–0.20m**	**Context 2543 0.20–0.25m**	**Context 2543 0.25–0.30m**	**Context 2543 0.30–0.35m**	**Context 2453 0.40–0.45m**	**Context 2543 0.45–0.50m**	**Context 2543 0.50–0.55m**	**Context 2543 0.55–0.60m**	**Context 2543 0.60–0.65m**	**Context 2557 0.80–0.85m**	**Context 2557 0.85–0.90m**	**Context 2557 0.90–0.95m**	**Context 2557 1.00 – 1.05m**	**Context 2556 1.15 – 1.20m**
Waterlogged plant remains																	
Fumaria sp	Papaveraceae	fumitory	ABC							+							
Ranunculus acris/repens /bulbosus	Ranunculaceae	buttercup	CD	+		+	++	+	+	+			+	+	+	+	
Ranunculus sardous	Ranunculaceae	hairy buttercup	ABD												+		
Ranunculus arvensis	Ranunculaceae	corn buttercup	A					+									
Ranunculus sceleratus	Ranunculaceae	celery-leaved buttercup	E	+++	+++	++++	++++	++++	++++	++++	+++	++++	+++	+++	+++	++++	++++
Ranunculus flammula	Ranunculaceae	lesser spearwort	E								+						
Ranunculus sbgen *Batrachium*	Ranunculaceae	crowfoot	E										+				
Vitis vinifera	Vitaceae	grape-vine	F	+	+					+							
Prunus spinosa	Rosaceae	sloe	C			+											
Prunus domestica	Rosaceae	plum/bullace/ damson	CF						+								
Prunus cerasus	Rosaceae	dwarf cherry	CF			+											
Prunus sp	Rosaceae	sloe/damson/ plum/ cherry etc	CF	+					+	+							

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar															
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+															
Latin name	**Family**	**Common name**	**Habitat**	**Context 2543 0.v10–0.20m**	**Context 2543 0.20–0.25m**	**Context 2543 0.25–0.30m**	**Context 2543 0.30–0.35m**	**Context 2453 0.40–0.45m**	**Context 2543 0.45–0.50m**	**Context 2543 0.50–0.55m**	**Context 2543 0.55–0.60m**	**Context 2543 0.60–0.65m**	**Context 2557 0.80–0.85m**	**Context 2557 0.85–0.90m**	**Context 2557 0.90–0.95m**	**Context 2557 1.00 – 1.05m**	**Context 2556 1.15 – 1.20m**
Pyrus/Malus sp	Rosaceae	pear/apple	CF					+			+						
Rubus sect *Glandulosus*	Rosaceae	bramble	CD	+		+	+	+	+	+	+					+	+
Rubus sp	Rosaceae	raspberry/ bramble/ dewberry	BC													+	
Cannabis sativa	Cannabaceae	hemp/ cannabis	ABF					+					+			+	
Humulus lupulus	Cannabaceae	hop	CF			+	+	+		+							
cf *Humulus lupulus*	Cannabaceae	hop	CE	+													
Ficus carica	Moraceae	fig	F		+	+		+									
Urtica dioica	Urticaeae	common nettle	ABCD	++	+++	+++	+++	+++	++++	++++	+++	+++	++++	++	+++	++	
Urtica urens	Urticaeae	small nettle	AB													+	
Malva sp	Malvaceae	mallow	AB										+				
cf *Malva* sp	Malvaceae	mallow	AB								+						
Betula pendula	Betulaceae	silver birch	C					+									+
Betula sp	Betulaceae	silver birch	C							+							
Alnus glutinosa (fruits)	Betulaceae	alder	CE									+	+			+	
Corylus avellana shell fragment	Betulaceae	hazelnut	C		+												

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar															
	Quantity	+ = 1–10 ++ = 11–50 +++ = 51–100 ++++ = 101+															
Latin name	**Family**	**Common name**	**Habitat**	**Context 2543 0.v10–0.20m**	**Context 2543 0.20–0.25m**	**Context 2543 0.25–0.30m**	**Context 2543 0.30–0.35m**	**Context 2453 0.40–0.45m**	**Context 2543 0.45–0.50m**	**Context 2543 0.50–0.55m**	**Context 2543 0.55–0.60m**	**Context 2543 0.60–0.65m**	**Context 2557 0.80–0.85m**	**Context 2557 0.85–0.90m**	**Context 2557 0.90–0.95m**	**Context 2557 1.00 – 1.05m**	**Context 2556 1.15 – 1.20m**
cf Corylus avellana shell fragment	Betulaceae	hazelnut	C														+
Euphorbia helioscopia	Euphorbiaceae	sun spurge	AB										+				
Euphorbia peplus	Euphorbiaceae	petty spurge	AB		+	+				+							
Salix sp bud	Salicaceae	willow	C					+					+				
cf *Linum usitatissimum* seed	Linaceae	flax	AF					+									
Linum usitatissimum capsule segment	Linaceae	flax	AF								+						
cf *Linum catharticum*	Linaceae	fairy flax	D													+	
Reseda luteola	Resedaceae	dyer's rocket, weld	ABDF	+				+									
Nasturtium officinale	Brassicaceae	water-cress	EF	++	++	++	+	+	++	+	+	+	++	+	++	+	
Brassica sp	Brassicaeae	cabbages	ABDF													+	
Raphanus raphanistrum (pod fragments)	Brassicaceae	wild radish	ABG					++					+				
Persicaria amphibia	Polygonaceae	amphibious bistort	BE										+			+	

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Persicaria maculosa	Polygonaceae	redshank	AB	+		+			+						+		+
Persicaria cf *maculosa*	Polygonaceae	redshank	AB					+									
Persicaria hydropiper	Polygonaceae	water-pepper	E			++	+/++		+		+						
Persicaria mitis/minor	Polygonaceae	tasteless/small water-pepper	E					+									
Polygonum aviculare	Polygonaceae	knotgrass	AB	++		++	++	+	++	+	+	+	++	+	+	+	+
Rumex cf *crispus*	Polygonaceae	curled dock	ABE														+
Rumex sp	Polygonaceae	dock	ABCD	+			+	+	+	+	+	+	+++	+	+	+++	+
Rumex sp (bladders)	Polygonaceae	dock	ABCD											+			
Stellaria media	Caryophyllaceae	common chickweed	AB		+		+				+	+	+		+	+	++
Spergula arvensis	Caryophyllaceae	corn spurrey	AD		+	+							+				
Agrostemma githago	Caryophyllaceae	corn cockle	AB							+							
Silene vulgaris	Caryophyllaceae	bladder campion	D										+				
cf *Silene* sp	Caryophyllaceae	campion	AB									+					
Chenopodium glaucum/ rubrum	Amaranthaceae	oak-leaved/red goosefoot	AB	+++	++	+					+++		+	+	+	+++	

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar																
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Latin name	**Family**	**Common name**	**Habitat**	**Context 2543 0.v10–0.20m**	**Context 2543 0.20–0.25m**	**Context 2543 0.25–0.30m**	**Context 2543 0.30–0.35m**	**Context 2453 0.40–0.45m**	**Context 2543 0.45–0.50m**	**Context 2543 0.50–0.55m**	**Context 2543 0.55–0.60m**	**Context 2543 0.60–0.65m**	**Context 2557 0.80–0.85m**	**Context 2557 0.85–0.90m**	**Context 2557 0.90–0.95m**	**Context 2557 1.00 – 1.05m**	**Context 2556 1.15 – 1.20m**
Chenopodium hybridum	Amaranthaceae	maple-leaved goosefoot	AB													+	
Chenopodium album	Amaranthaceae	fat hen	AB	++		+			++			+					
Atriplex sp	Amaranthaceae	orache	AB	+		+	+	++				+	+	+	+	++	+
Hyoscyamus niger	Solanaceae	henbane	AB	++		+		+	+		++	+	++	+	+	+	
Solanum nigrum	Solanaceae	black nightshade	AB	++		+	+	+		+	+	+	+			+	
Stachys sylvatica	Lamiaceae	hedge woundwort	CD			+			+				+			+	
Ballota nigra	Lamiaceae	black horehound	C												+		
cf *Ballota nigra*	Lamiaceae	black horehound	C										+				
Lamium sp	Lamiaceae	dead-nettles	ABF			+			+	+	+		++		+	+	
Marrubium vulgare	Lamiaceae	white horehound	ABD	+++		+++	++	+++	++	+++	++/ +++	+++		+	++	+	+
Satureja hortensis	Lamiaceae	summer savory	AF					+					+				
Lycopus europaeus	Lamiaceae	gypsywort	E	+		+							+			+	+
Mentha arvensis	Lamiaceae	corn mint	ACDE	+		+											
cf *Arctium lappa*	Asteraceae	greater burdock	ABC			+											

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Latin name	**Family**	**Common name**	**Habitat**	**Context 2543 0.v10–0.20m**	**Context 2543 0.20–0.25m**	**Context 2543 0.25–0.30m**	**Context 2543 0.30–0.35m**	**Context 2453 0.40–0.45m**	**Context 2543 0.45–0.50m**	**Context 2543 0.50–0.55m**	**Context 2543 0.55–0.60m**	**Context 2543 0.60–0.65m**	**Context 2557 0.80–0.85m**	**Context 2557 0.85–0.90m**	**Context 2557 0.90–0.95m**	**Context 2557 1.00 – 1.05m**	**Context 2556 1.15 – 1.20m**
Arctium minus	Asteraceae	lesser burdock	ABC					+									
Carduus sp	Asteraceae	thistle	BCD	+					+		+		+/++			+	
Carduus sp (fragment)	Asteraceae	thistle	BCD														+
Cirsium sp	Asteraceae	thistle	ABDE			+	+		+	+			+				
Carduus/ Cirsium sp	Asteraceae	thistle	ABDE					+									+
Onopordum acanthium	Asteraceae	cotton thistle	B					+									
Eupatorium cannabinum	Asteraceae	hemp-agrimony	DE										+				
Lapsana communis	Asteraceae	nipplewort	BCD					+			+						
Sonchus oleraceus	Asteraceae	smooth sow-thistle	ABD	+		+	+	++	+	+	+		+		+	+	
Sonchus asper	Asteraceae	prickly sow-thistle	ABD			+		+	+/++			+					
Sonchus sp	Asteraceae	thistle	ABD					+									
Taraxacum sp	Asteraceae	dandelion	BDE													+	
Anthemis cotula	Asteraceae	stinking chamomile	AB													+	
Glebionis segetum	Asteraceae	corn marigold	AB					+									
Bidens sp	Asteraceae	bur-marigold	ABE													+	

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar															
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Sambucus nigra	Caprifoliaceae	elderberry	BC	+	+				+				+				
Sambucus ebulus	Caprifoliaceae	dwarf elder	BD									+					
Dipsacus fullonum	Dipsacaceae	wild teasel	BCD										+				
Anthriscus caucalis	Apiaceae	bur chervil	ABC													+	
Coriandrum sativum	Apiaceae	coriander	ABF									+					
Oenanthe sp	Apiaceae	water-dropwort	E										+				
Conium maculatum	Apiaceae	hemlock	AB	+		+		+		+	+	+	+++	+	+++	++	++
Apium graveolens	Apiaceae	wild celery	E												+	+	
Apium nodiflorum	Apiaceae	fool's watercress	E	+		+			+		+		+		++	+	+
Apiaceae sp indet	Apiaceae	carrot family	ABC DEF					+									
Lemna sp	Lemnaceae	duckweed	E	+	+	+	+		+				++		+	+	+
Potamogeton sp	Potamogetonaceae	pondweed	E			+											
Iris pseudacorus (fragment)	Iridaceae	yellow iris	E										+			+	
Eleocharis sp	Cyperaceae	spike-rush	E													+	

	Habitat	A= cultivated ground B= disturbed ground C= woodlands, hedgerows, scrub etc D = grasslands, meadows and heathland E = aquatic/wet habitats F = cultivar															
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Carex sp	Cyperaceae	sedge	CDE							+							
Carex sp (2-sided) nutlets	Cyperaceae	sedge	CDE					+									
Glyceria/ Melica sp	Poaceae	sweet grass/ melick	CDE			++	++		+				+				
Poaceae sp indet grain	Poaceae	grass	AF			+		+									
Poaceae sp indet grain (small)	Poaceae	grass	AF		+												
unidentified thorn	unidentified															+	
unidentified seed	unidentified												+				+
unidentified leaf fragments	unidentified				+											+	
unidentified herbaceous fragments	unidentified															+++	
unidentified capsule fragments	unidentified					+											
unidentified	unidentified												+				

Env Table 60: Plant remains from Phase to 12 City ditch

Charcoal

Elizabeth Pearson

The results are summarised in Table 61.

Period 4 Roman (mid-2nd century to early 3rd century)

A small quantity of charcoal was identified from posthole fill (6552) consisting of oak (*Quercus robur/petraea*) and alder (*Alnus glutinosa*).

Period 5: Roman early/mid-3rd to early 4th century

All contexts were dominated by oak (*Quercus robur/petraea*), but charcoal (up to 100 fragments) in oven deposits (CG 1069) associated with the Building 2D (AU 519) consisted solely of oak, demonstrating exclusive selectivity.

Occasional fragments of pear/apple/whitebeam/hawthorn (Maloideae sp), alder (*Alnus glutinosa*), possible lime (cf *Tilia*) and guelder rose (*Viburnam opulus*) were also identified on the upper cobbled surface (CG 1098).

Period 6 Roman (early 4th to late 4th century)

Larger fragments of well-preserved roundwood charcoal were hand-collected from fills (6745 and 6915) in the large quarry pit (AU 510) (Figs 193 and 194). They had the appearance of charcoal resulting from wood converted to charcoal for fuel, possibly in a charcoal clamp, and more descriptive recording was undertaken for this material.

Recording of dimensions (length, width and thickness) allowed estimation of diameter, and number of growth rings indicated the age of branch material selected and any changes in growth from year to year. The age is a minimum age as sapwood was not always present, and some of the inner growth is missing for some fragments, so the total number of growth rings is not necessarily known. Hand-collection of the charcoal may have introduced some bias to the results, so interpretation is made with consideration that the diameter and age range of the roundwood will be less representative with smaller/younger roundwood.

Diameter of fragments is shown for both contexts, irrespective of species (although for both contexts oak is dominant: Figs 195 and 196). The majority of roundwood fragments from context (6745) were of up to 40mm diameter, and some larger fragments ranging up to 140mm. When non-oak species are excluded there is a normal distribution curve around 21 to 30mm (Fig 197). The pattern was less clear for context (6915) on account of the small number of fragments; for all species, most fragments were within a range up to 70mm with occasional fragments over 110mm (Fig 198). Roundwood from context (6915) was more mixed, consisting of oak, hazel and alder/hazel, so the diameter range for oak could only be recorded for sixteen fragments. These were mostly of 21 to 30mm size.

Allowing 15% for shrinkage from raw wood, then most fragments collected from (6915) were of up to 34mm size and from (6745) were of up to 42.5mm size (oak 18 to 26mm size).

The distribution of number of annual growth rings per fragment (ie age in years) for charcoal from context (6745) was less clear than the diameter profile (Fig 199), perhaps because the inner growth was missing for some fragments, but it varied from to 3 to 22 years.

The roundwood assemblage for context (6915) was much smaller and made up of a combination of oak and hazel, so interpretation of results is more difficult (Fig 200). However, there is a distinct peak in oak diameter of 21 to 30mm.

Summary

Out *et al* (2013) have looked at branch age and diameter of wood as criteria for identifying woodland management. The samples discussed here from the Period 6 quarry pit are somewhat small for using these criteria, and biased against smaller roundwood which may not have been collected on site. Nevertheless, there is no distinct cut-off in diameter or age of roundwood fragments from the largest assemblage (context 6745), when compared to results from Out *et a*l (2013), which would suggest a lack of evidence for managed woodland. It is difficult to determine whether there is any evidence for selection of wood of a particular diameter, as the results are similar to that of the range expected of roundwood from unmanaged woodland (irrespective of selection for diameter).

Table 61:

Latin name	**Family**	**Common name**	**Habitat**	**6158**	**6552**	**6745**	**6830**	**6911**	**6915**	**6962**
cf Maloideae sp	Rosaceae	pear/apple/white-beam/ hawthorn	CF	1						
Quercus robur/ petraea wood	Fagaceae	oak	C	16	1	34	100	100	16	50
cf *Quercus robur/petraea* wood	Fagaceae	oak	C	16	4					
cf *Tilia* sp wood	Tiliaceae	lime	C				1			
Betula pendula	Betulaceae	silver birch	C			2				1
Alnus glutinosa (wood)	Betulaceae	alder	CE	5						
Corylus avellana wood	Betulaceae	hazelnut	C			1			5	
cf *Corylus avellana* wood	Betulaceae	hazelnut	C			1			3	
Alnus glutinosa wood	Betulaceae	alder	C		3					
Alnus/Corylus sp	Betulaceae	alder/hazel	C	2					1	2
Viburnum opulus	Caprifoliaceae	guelder rose	C	1						
cf *Viburnum opulus*	Caprifoliaceae	guelder rose	C	2						

Table 61: Charcoal (hand-collected and from bulk samples)

Palynology, non-pollen palynomorphs and parasite ova

Suzi Richer and Nicholas Daffern

The results of the pollen assessment are summarised in Table 62.

In addition to the samples discussed below, sub-samples from Monoliths 41, 46, 56, 422 and bulk Samples 003 and 008 from Trench 28 were assessed. Due to poor preservation and/or low concentrations however, complete assessment counts were not achieved. These sequences were characterised by preferential preservation and post-depositional damage to the grains. Damage included broken and crumpled grains, thinned exines and fusion of sculptural and structural elements, thus indicating chemical oxidation and/or physical transport and post depositional transport (Delcourt and Delcourt 1980). Due to the poor condition of these sequences, they did not merit further consideration.

Pollen and non-pollen palynomorphs (NPPs)

Monolith <332>

Primary fill of Roman double quarry pit (CG 1108, AU 510; context 7050)

Preservation in the basal samples was good, although the upper samples were exceptionally poor, exhibiting preferential preservation and post-depositional damage akin to that mentioned previously.

Herbaceous species dominated this sequence (*c* 92% TLP) with Poaceae indet (*c* 56% TLP) being the main contributor with *Cichorium intybus*-type (11% TLP) and *Filipendula* (5% TLP) being the significant contributors. Lesser contributions (<5% TLP) were made by *Plantago lanceolata* (ribwort plantain), *Urtica dioica*, *Linum bienne*-type, *Cyperaceae* undiff (sedges), *Caryophyllaceae* (pink family), *Solidago virgaurea*-type (daisies/goldenrods) and *Valeriana officinalis* (common valerian). Pollen from *Cerealia* indet and *Secale cereale* were also identified

Tree and shrub were present in low quantities with no individual species making a contribution in excess of 5% TLP. Despite the low quantities, species diversity was good with *Alnus glutinosa*, *Betula*, *Corylus avellana*-type, *Fraxinus excelsior*, *Pinus sylvestris*, *Quercus*, *Rhamnus cathartica* (buckthorn) and *Salix* being identified.

Calluna vulgaris (heather) was the sole heath species identified within the sequence; aquatics were represented by grains of *Butomus umbellatus* (flowering rush), Lemnaceae and *Nymphaea alba*, and spores by *Polypodium*, *Pteridium aquilinum* and *Pteropsida* (mono) indet. High quantities of the fungal spores from *Chaetomium*-type and *Podospora*-type were present in the sample from 0.56m, along with lower quantities of *Cercophora*-type and *Sporormiella*-type, all of which have a preference for decaying matter and/or herbivore dung. *Ustilago* sp and *Lophiostoma corticolum* were also present, the first being a smut fungus on grasses, weeds and cereals and the latter being a fungus on the bark and twigs of deciduous trees.

Monolith <336>

Fills of Roman double quarry pit (CG 1057, AU 510; contexts 7058, 7056 and 7044)

Similarly to the previous sample, concentrations in the upper samples were inferior to the underlying samples, although in this case the preservation of grains was good. The underlying samples exhibited moderate to good concentrations of pollen accompanied with good preservation.

Between 93% and 97% TLP was contributed by herbaceous species with *c* 52% TLP of this figure from Poaceae indet with *Cichorium intybus*-type (19–23% TLP) being the sole additional species to make a significant contribution. Pollen from Rosaceae, *Ranunculus acris*-type, *Urtica dioica*, Cyperaceae undiff, Amaranthaceae (goosefoot family), *Linum bienne*-type, *Erodium* undiff (stork's-bill) and *Solidago virgaurea*-type were also present but in lesser quantities. The cultivars *Cerealia* indet, *Avena/Triticum*-type, *Hordeum*-type (barley) and *Secale cereale* were also identified.

Trees and shrubs were represented at low levels by *Alnus glutinosa*, *Betula*, *Corylus avellana*-type, *Fraxinus excelsior*, *Quercus, Salix* and *Tilia cordata* (small-leaved lime).

Spores of *Polypodium*, *Pteridium aquilinum* and *Pteropsida* (mono) indet were present within the sample. This monolith was devoid of fungal spores.

Monolith 426 (Figs 67 and 192)

Post-medieval city ditch (CG 1036, CG 1037; contexts 2543, 2557 and 2556)

Herbaceous species (90–94% TLP) were dominant throughout this sequence with Poaceae indet contributing 47–58% TLP. The sequence had high herbaceous species diversity with species including *Urtica dioica*, *Rumex acetosella*, *Cichorium intybus*-type, *Cyperaceae*, Amaranthaceae, *Solidago virgaurea*-type, *Valeriana dioica* and *Linum bienne*-type, *Achillea*-type (yarrow), Brassicaceae (cabbage family), Fabaceae (pea family), *Plantago lanceolata*, Rosaceae sp and *Ranunculus acris*-type being identified although *Urtica dioica* and *Cichorium intybus*-type (7% TLP respectively) were the sole species to make a significant contribution.

It is worth noting that one of the Rosaceae grains referenced above exhibited features that may tentatively have allowed it to be identified as *Prunus* sp (cherries, plums and sloe), although in this case, due to morphological and sculptural variations within the species and the Rosaceae family as a whole, caution has been exercised and the original Rosaceae sp identification has remained.

Arable cultivars and associated arable weeds were present throughout sequence at less than 5% TLP with grains of *Cerealia* indet, *Avena/Triticum*-type, *Hordeum*-type, *Secale cereale*, *Agrostemma githago* (corncockle) and *Centaurea cyanus* (cornflower) being identified.

Trees and shrubs were poorly represented contributing between 5–10% TLP with grains of *Quercus*, *Alnus*, *Betula*, *Fraxinus excelsior*, *Corylus avellana*-type, *Ilex aquifolium, Salix* and *Hedera helix* being identified.

Heath species were represented in the sequence by *Erica* sp (heaths) and *Calluna vulgaris* whilst Lemnaceae, *Nymphaea alba* and *Potamogeton natans*-type were the aquatic species identified.

The spores of *Equisetum* (horsetails), *Polypodium*, *Pteridium aquilinum* and *Pteropsida* (mono) indet were also present. Fungal spores from *Sporormiella*-type and *Podospora*-type, both associated with herbivore dung, were present throughout the sequence, but with the highest amounts seen in the lower samples. *Chaetomium*-type and *Glomus* were present in higher quantities in the lower sample, indicative of soil/decaying matter and erosion, respectively. *Lophiostoma corticolum*, *Ustilago* sp and *Tilletia* were also present, but with increased numbers in the upper sample. *L. corticolum* is found on the bark and twigs of deciduous tree and the latter two are found as smut fungi on grasses, cereals and weeds.

Monolith <55> Trench 15

Basal fills from V-shaped ditch (CG 1060; contexts 15199 and 15027)

Herbaceous species dominated this sequence, contributing between 86% and 92% TLP, with Poaceae indet (grasses) being the greatest component of this figure, 57–64% TLP.

Cerealia-type indet (indeterminable cereal/large grass) was the sole other herbaceous species to make a significant contribution (7% TLP) with *Cichorium intybus*-type (dandelion/chicory), *Ranunculus acris*-type (buttercup), *Filipendula* (meadowsweet), Rosaceae (rose family), *Urtica dioica* (stinging nettle), *Rumex acetosella* (sheep's sorrel) and *Centaurea nigra* (common knapweed) identified throughout in lesser concentrations (<5% TLP). Identifiable cereals were present with *Avena/Triticum*-type (oat/wheat) and *Secale cereale* (rye) being identified. A single grain of *Linum bienne*-type (flax) was also identified.

Trees and shrubs were present in low concentrations although species diversity was good with *Alnus glutinosa* (alder), *Betula* (birch), *Corylus avellana*-type (hazel), *Fagus sylvatica* (beech), *Fraxinus excelsior* (ash), *Hedera helix* (ivy), *Ilex aquifolium* (holly), *Pinus sylvestris* (Scots pine), *Quercus* (oak), *Salix* (willow) and *Ulmus* (elm) being identified.

Aquatics present were: *Nymphaea alba* (white water-lily), *Potamogeton natans*-type (broad-leaved pondweed), Lemnaceae (duckweed family) and a solitary grain of *Nuphar* sp (yellow water-lilies).

Spores identified included *Polypodium* (polypody), *Pteridium aquilinum* (bracken) and *Pteropsida* (mono) indet (ferns). Small amounts of fungal spores were identified: *Cercophora*-type, *Sporormiella*-type and *Sordaria*-type, with slighter higher amounts being present in the two lower samples. The fungi *Cercophora*-type, *Sporormiella*-type and *Sordaria*-type are all associated with herbivore dung, *Cercophora*-type is also associated with decaying organic matter.

Grab samples from Trench 28

Pre-Roman river bank <007> (context 28112); Fill of posthole with in situ Roman timber <009> (context 28117); Primary fill of re-cut post-Roman palaeochannel <001> (context 28102)

Pollen concentration was moderate, and preservation was variable in samples 001 and 009, with some pollen being very well preserved in sample 009. However, sample 007 displayed low concentration of pollen and preservation was poor. Some of the pollen showed signs of mechanical damage, ie grains were folded and/or broken, suggesting that the grains had been physically transported and suffered from compaction of the sediment (Delcourt and Delcourt 1980).

Herbaceous species dominated these samples (52–71%), with Cyperaceae pollen being the main component of all samples (25–44%). The diversity of species across the samples was low, with only 15 species noted in sample 007, 14 species in sample 001 and 18 species in sample 009. The main species noted after Cyperaceae were *Cichorium intybus*-type (up to 9%), Poaceae (6–12%), *Aster*-type (daisy/aster) (up to 12%), and Chenopodiaceae (goosefoot subfamily (up to 11%). Other herbaceous taxa were present in smaller quantities (0.5–2%), such as *Achillea*-type, Apiaceae (carrot family), *Cirsium*-type (thistles), *Plantago lanceolata* and *Ranunculus acris*-type, *Filipendula*, *Medicago sativa* (Lucerne), *Oxalis acetosella* (wood sorrel), *Rumex acetosella* and *Rumex acetosa* (common sorrel) and *Polygonum* (knotgrass).

Pollen from trees contributed 7–19% to TLP. *Alnus glutinosa* and *Quercus* dominated the tree pollen in all three samples, with the highest percentages seen in sample 001 (alder 8% and oak 7%). *Betula* and *Pinus sylvestris* were also present in low quantities in sample 001 and a single grain of *Tilia* was present in sample 9.

The shrub component decreased through time, with contributions of 39%, 19% and 14% to TLP respectfully. *Salix* is the primary contributor throughout, but it dominated the earliest level, sample 007, with 37% TLP. *Corylus avellana*-type pollen rivalled the *Salix* pollen only in the most recent level (sample 001) with 6% TLP.

Heath species were represented solely by *Calluna vulgaris* contributing <1% in samples 007 and 009, and providing 3% of TLP in sample 001. Aquatic pollen was represented in sample 001 by only two grains of *Sparganium* undiff (bur-reed) in sample 001. The only spores present in all three samples were from *Polypodium*, however, *Pteridium aquilinum* was also present in low amounts in samples 007 and 001.

Fungal ascospores were present in high concentrations and their preservation was excellent in sample 001. *Sporormiella*-type dominated the sample with over 300 part spores counted (a full spore consists of 4 parts). Other types present included *Cercophora*-type, *Podospora*-type, *Sordaria*-type, and *Tripterospora*-type. All of the species present are affiliated with dung, with *Sporormiella*-type, *Podospora*-type and *Sordaria*-type having a preference for herbivore dung; *Cercophora* can also be indicative of more general degraded organic matter (van Geel *et al* 2003; Davis and Shafer 2006; Aproot and van Geel 2006). Sample 009 contained fewer fungal ascospores, but the dung fungi *Sordaria*-type and *Tripterospora*-type were both noted. In addition, 38 *Lophiostoma corticolum* ascospores were recorded in sample 009; a fungus that grows on the bark and twigs of deciduous trees and shrubs, and has previously been found archaeologically in conjunction with willow bark (Aproot and van Geel 2006).

Parasite ova from palynological samples

Parasite ova were present in sample 009 from Trench 28, and from sequences 55, 332 and 426.

In all cases, the main ova identified were of the genus *Trichuris* (whipworm) which is a parasite of the large intestine. Unfortunately, this genus is present within the intestinal tract and faecal material of many mammals including humans, livestock and domestic pets and therefore identifying the source is extremely difficult.

Despite this, in sample 0.38m from <426> in the Civil War period city ditch (context 2557), it appears that there were two species of *Trichuris* present. The first was identified as *Trichuris vulpis*, whipworm of dogs/canines, due to the size of the ova (72–85 μm in length) as *T. vulpis* has larger ova (Jones 1982, 69) and it also possessed a flattened middle which is typically regarded as a diagnostic feature (Donald Price Centre for Parasite Repository and Education). The remaining ova were either *T. suis* or *T. trichiura* although due to overlaps in morphology and size and the lack of suitable reference material, this identification must remain cautious. The former is a whipworm whose natural hosts are pigs, and the latter infects humans and causes Trichuriasis, although it should be noted that Beer (1976) has shown that humans can be infected with *T. suis* whilst Hall and Sonnenberg (1956) and Dunn *et al* (2002) have shown the same to be true of *T. vulpis*.

Also of note was the quantity of *Trichuris suis/trichiura* ova present (over 96 occurrences) within sample 0.56m from monolith <332> in the large Roman quarry pit (context 7050), which far exceeded the number of identifications made in any other sample, although no notable variation in species was noted. All of the *Trichuris suis/trichiura* ova were typically small, being between 35–45µm in length (measured without the polar plug). Size of the ova is likely to be a product of chemical processing (Dark 2004) and a similar range of measurements (34–47µm) have been recorded by Hall *et al* (1983) for *Trichuris trichiura* from Viking age samples in York, suggesting that the ova seen in <332> might be that of the human-infecting *Trichuris trichiura.* People can potentially become infected with whip worm when they consume soil or water infected with the parasite or parasite ova – this usually occurs through coming into direct contact with faecal matter (Erickson Gabbey 2012). It is important to realise that there are multiple causes of human infection and the presence of the ova does not necessarily mean that people were living in squalid conditions; for instance, water sources could have become contaminated with storm run-off through rubbish areas.

One ovum of *Capillaria* (round worm) was found in the same sample 0.56m from monolith <332> (context 7050). *Capillaria* is a parasite that affects domestic animals and rats; it can also infect people if hygiene conditions are particularly poor.

Palynology, non-pollen palynomorphs and parasite ova summary by period

Period 2 Prehistoric – Pre-Roman riverside

The preservation and concentration of pollen grains within sample 007 from Trench 28 (context 28112) were both poor and suggested that the pollen had been transported. Given the clayey nature of the sample and its location within an old river/steam bank, the pollen is very likely to have been transported and laid down by water. The presence of high percentages of willow (37%) and chicory/dandelion (9%) within the sample should also alert us to the possibility that the assemblage might be slightly distorted, as both pollen types are known to be more resistant to decay (Bunting and Tipping 2000; Davis 2012). Despite the possibility of distortion and that some of the more delicate pollen types may not have survived, the presence of a variety of herbaceous pollen types suggests that the assemblage is still representative of the local environment.

The pollen profile is indicative of an open, meadow-type environment, seen through the presence of grasses, daisy, buttercup, dandelion/chicory and yarrow/chamomile. Only very limited disturbance in the area is alluded to by the presence of single grains of both goosefoot and ribwort plantain.

Willow pollen dominates the shrub and tree component of the sample, which is typical of a riverine environment. It is likely to have been growing along the river bank, or at least within damp/waterlogged soils close to the river bank. Other species present include alder, oak and birch.

The pollen profile from sample 007 shows similarities to that of the lower half of pollen assemblage zone WAZ-3 from BH8 at Worcester Arena, located less than 500m from the current site, but on the western side of the Severn (Daffern 2016). Both sample 007 and the WAZ-3 suggest pockets of willow or alder carr within an open landscape dominated by grass, chicory/dandelion and other herbaceous plants. A number of radiocarbon dates were submitted from the Worcester Arena site, but the dates were considered to be anomalous due to the fact that many were inverted; they are assumed to have been from reworked sediment. Despite the radiocarbon dates failing to provide a precise date for the zone, correlation with other sites within the region (eg Cookley, Greig n.d.; Wellington, Greig 2011; Ryall Quarry and Clifton, Head and Daffern forthcoming) has led Daffern (2013) to suggest an Iron Age or Roman date for WAZ-3. The positioning of sample 007 (context 28112), below known Roman deposits, in conjunction with the pollen profile from Worcester Arena would, therefore, suggest that the riverbank recorded here was Iron Age in date.

Period 4 Roman (mid-2nd to early 3rd century) – Roman posthole with ***in situ*** timber

The tree pollen from sample 009 from Trench 28 (context 28117) showed increased deterioration compared to the herbaceous pollen, suggesting two different sources for the pollen assemblage. The tree pollen showed signs of degradation, typical of oxygenation, which could be associated with shallow oxygenated water (Delcourt and Delcourt 1980). Herbaceous pollen grains were generally in better condition and therefore probably originated from a source closer to the sampling site, becoming incorporated into the sediment more rapidly.

The pollen present within sample 009 (context 28117) shows that a similar environment existed on the floodplain to that depicted by the pollen from the Roman pits (see discussion of Phase 6 Roman Pits) – an open environment dominated by grasses and other herbaceous types. However, this sample depicts the close proximity of a riverside/wetland habitat, seen through the high percentages of willow (17%) and sedge (24%) pollen. The presence of the goosefoot pollen (11%) would suggest that disturbed/waste ground was also located close by during this phase.

As well as providing information about the early Roman environment, this sample also contained further information about the *in situ* timber post (28115). The post, thought to have acted as a mooring post within a riverside structure, was a young oak tree with extant bark that dated to cal AD 70–230 (SUERC-38442). The presence of *Lophiostoma corticolum* spores was noted within the samples. *L. corticolum* is a fungus that grows on the dead twigs and bark of deciduous trees (Aproot and van Geel 2006). The presence of the fungal spores in high quantities and close proximity to a known host material (deciduous wood) in an alien habitat (ie aquatic) that is beyond the natural ecological range of the fungus, all suggest that the fungus was present on the bark of the tree before it was used as a mooring post, rather than having developed on the post once it was in place. For a large number of spores to exist, such as the amount recorded in sample 009, the fungus will need to have been present on the tree for a minimum of two springs. This life cycle would suggest that the tree had been dead/seasoning for at least a year prior to use as mooring post.

Oak is long-lived (at least 100–300 years) and the best crops (in terms of timber for construction) are obtained from trees over 80 years old (Royal Forestry Society 2013), so considering the relatively young age of the oak tree (40 years old) it appears to have been selectively felled or perhaps removed as part of a thinning exercise or a coppice rotation. The low amount of oak pollen in this sample (6%), as well as the low percentages seen in the wider area, eg from sample 007 from the pre-Roman river bank (7%) and from the BH8 at Worcester Arena (<5%), would suggest that scattered trees might have been growing in the local area, but not enough for large-scale timber production. Although unlikely, it is also possible that oak was being coppiced and managed and not reaching an age where it was sexually mature and therefore producing pollen. Oak trees can take between 30–40 years to produce pollen if they are growing in closed stands (Aas 2014); therefore the presence of younger coppice trees in the area would not necessarily be seen in the pollen profile.

Overall, it is suggested that prior to use as a post, the tree was growing at some distance from the river bank before felling and that while left to season for at least a year the fungus formed on it. This implies that there was a conscious system of woodland management in the wider area that involved coppicing.

Period 6 Later Roman (early to late 4th century) – Roman quarry pits

Both samples from the large quarry pits (monoliths 332 and 336) exhibit evidence of an open environment with grassy waste/rough ground dominating. This probably reflects the immediate surroundings of the pits, with wet and scrubby grassland in the wider environs, most likely upon the lower floodplain to the west.

The sequences, particularly their upper samples, exhibit an element of damage and/or deterioration to the pollen grains. The damage to the material from the upper parts of the sequences may be post-depositional, such as disturbance or water-table fluctuations, but the less pronounced/frequent mechanical damage which was identified in the lower margins may be indicative of some kind of previous mixing or disturbance prior to material becoming incorporated into the pit fills. This could occur through middening (ie refuse heaps) which were then redeposited into the pits. It is possible that during the intervening period between the earlier buildings collapsing/being demolished and the aisled building being constructed, the site became an abandoned waste plot and therefore a convenient dumping spot for refuse, leading to a mix of artefactual and environmental material.

The presence of cereals throughout the sequence is unlikely to represent cultivation within the immediate vicinity; it probably represents the transportation and subsequent disposal of material. It is proposed that these cereals and some of the abundant grass pollen identified within the sequences are indicative of the disposal of fodder, stabling material, flooring and/or roofing material. This theory is supported by the high percentage of grasses and the presence of herbaceous species that would more commonly be associated with floodplain grassland or hay meadow habitats such as sedges, marsh and common valerian, stork's-bill, yarrow, meadow buttercup, common knapweed and meadowsweet. The suggestion that stabling material was being disposed of is also further supported by the presence of high numbers of dung fungi in sequence 332 (especially from 0.56m, context 7050).

The presence of stabling material is also supported by the large quantities of *Trichuris* sp parasite ova within sequence 332, again at 0.56m (context 7050), which tends to indicate that quantities of faecal material were entering the pit. This combination of herbaceous species, cultivars, dung fungi and parasite ova reinforces the hypothesis that waste stabling material and/or fodder was being disposed of within this feature. As previously mentioned, no separation between *Trichuris* species could be made and, therefore, the source of the faecal material could be either human and/or animal. However, the dung fungi present in sequence 332 from 0.56m (context 7050) is indicative of herbivore dung, allowing us to suggest with some certainty that animal waste was entering the pits.

Disposal of waste material has been locally identified by Clapham (2010) where a plant macrofossil assemblage indicating a charred hay deposit was recovered during an investigation at Sanctuary House, Worcester, less than 300m to the north-east. This deposit was classified as MG6 (*Cynosurus cristatus* – *Centaurea nigra*) grassland being traditional grazed hay meadow (similar to sites discussed by Greig 1988 and Rodwell 1992). Wetland species were also present thus indicating a meadow situated close to a water body, with the most obvious candidate being the River Severn with a meadow situated in a similar locale to what is now Pitchcroft. Clapham (2010, 17–18) goes on to state that:

> Hay meadows require some form of management in order to maintain species diversity and nutritional value. In Britain this has been traditionally carried out by allowing grazing early in the year, usually in spring. This would have added nutrients to the grassland via dung and other excretory products. The livestock are removed in early summer to allow the grasses and other plants to grow. The meadow is then cut in late summer and the wet hay is gathered and stored in stooks in the field and allowed to dry naturally. After drying, the hay is stored inside and fed to livestock in the winter months.

This process would account for the type of material that is being identified from the pollen assemblages recovered from the Roman pits. The majority of the evidence for Roman hay in Britain is from waterlogged remains, especially those found in wells (Greig 1988), though another hay deposit (again charred like the Sanctuary House sample) was recovered from Causeway Lane, Leicester (Monckton 1996; Connor and Buckley 1999). The plant remains at The Hive indicate similar habitats to those identified at Sanctuary House (ie grassland, damp or wet ground and disturbed/cultivated ground) but there they were from a rubbish pit which exhibited evidence for *in situ* burning. The interpretation of the assemblage was that it represented fodder, including hay, which was burnt possibly for disposal or as fuel or kindling. The material may have also been burnt to reduce any unpleasant odours. A comparable interpretation can be made for the assemblages from The Hive and it appears that, after its use, this material was dumped into the pit along with other rubbish.

It should also be noted that although herbivore dung was almost certainly entering the pits, the presence of high numbers of dung fungi and parasite ova was restricted to one sample, indicating a discrete episode. Sequence 336 did not show signs of having any waste stabling material/fodder/dung within it indicating that different types of waste were being deposited in discrete loads.

Given the morphology of the pits, the nature of the fills and the nature and condition of the material encountered during the analysis, it is proposed that these fills represent the rapid backfilling of the pits with mixed waste from the surrounding industrial, agricultural and domestic activities, with the possibility that some of this material may in fact be derived from middening.

Period 7 Post-Roman (5th–9th centuries) onwards – Post-Roman alluvial clay

Sample 001 (context 28102) from the floodplain was from the primary fill of a re-cut channel (28120). The bank of the channel was formed of a series of dumped slag deposits (CG 1205), dating to the late 2nd to early 3rd century AD, meaning that the fill dates from at least the later Roman period. Context (28101) above contained a fragment of clay pipe, dating sample 001 (context 28102) to sometime between the Roman and post-medieval periods.

Tree pollen showed increased deterioration compared to the herbaceous pollen and fungal ascospores, indicating that the pollen had probably arrived from two different sources. The tree pollen showed signs of degradation, typical of oxygenation, which could be associated with shallow oxygenated water (Delcourt and Delcourt 1980). Considering that this sample was taken from the alluvial clay, the tree pollen is likely to have been transported from further upstream. The herbaceous pollen shows fewer signs of degradation, suggesting that it was derived from a more local source.

The overall landscape represented in sample 001 is similar to that of Phases 4 and 6 (see above); an open grassy landscape, with sedges, alder and willow present which suggest that damp areas existed close to a channel. However, one difference is that tree and shrub pollen contributed more to the assemblage than in previous phases, together accounting for 33% of TLP. The species diversity is broader than earlier periods, including alder, oak, birch, pine, hazel and willow, suggesting that there may well have been some limited regeneration of woodland at this time.

Of particular note in this sample was the presence of high numbers of coprophilous fungal spores preserved in excellent condition. The presence of *Sporormiella*-type, *Podospora*-type and *Sordaria*-type suggests that dung originating from herbivores was present (van Geel *et al* 2003, Davis and Shafer 2006, Aproot and van Geel 2006). Given the very high number of fungal spores (accounting for 70% of the total pollen and spore assemblage) and that the channel was beginning to infill, the most likely source of the dung fungi is from direct grazing on the site. The combination of the alluvial context with the presence of sedges, grasses and dung fungi, points towards this area being a flood-meadow used for the seasonal grazing of animals.

Period 10 Post-medieval (16th–mid-18th centuries) to Period 11 Late post-medieval (mid-18th–19th century)

V-shaped ditch

The samples from the V-shaped ditch in Trench 15 (monolith 55) were dominated by herbaceous species with percentages remaining constant throughout the sequence. This tends to indicate that the feature was either backfilled rapidly, or that the landscape was being managed to ensure that shrubs and pioneer tree species were unable to establish themselves, allowing the landscape to maintain an open character. The former is unlikely, as a ditch, probably the one sampled, is shown on the 1651 map of Worcester and is still extant on George Young's 1779 map, therefore suggesting that the feature had a lifespan of at least 120 years.

The maps do not indicate a particular landscape function yet the dominance of grasses would tend to suggest that it is open wet meadow/pasture. The presence of occasional cereal pollen, including oat/wheat and rye, does suggest however that at least some arable cultivation was occurring within the landscape. Also of note is the presence of pale flax/flax grains, another possible cultivated species. Despite the identification of these cultivars, there are no weeds of arable agriculture (ie cornflower, corn cockle or prickly poppy), suggesting that the cultivation was occurring away from the immediate environment. The maps denote a thin treeline flanking the ditch, which fits with the low percentages of tree and shrub pollen identified from the sequence, with a predominantly open landscape that included hedgerows.

Trichuris sp ova suggest the addition of faecal material to the deposit, although separation of species was not possible due to the limited number of ova present and the limited variation in morphology. It is likely that this represents livestock grazing or in-wash from/dumping of waste material, as the presence of dung fungi was noted in all samples, albeit in low quantities.

Civil War period city ditch

One sequence (monolith 426; see Fig 67 and 192) shows some localised change in vegetation and land use through time. The lower fills indicate slow-flowing water, grazing and possible run-off. By contrast the upper fills suggest an infilling of the ditch and rough grassy and disturbed ground in the immediate vicinity.

The dumping of 'unprocessed' cereal remains and/or hay/fodder in some deposits (contexts 2557 and 2543) is demonstrated by the presence of arable crop and weed species such as oat/wheat, barley, rye, corncockle and cornflower, the latter being particularly indicative of hay or crop waste. This is also supported by the high percentage of species which are associated with open meadow grassland and more specifically by the presence of the fungal spores, in the middle and upper sample, from *Tilletia* sp and *Ustilago* sp, both pathogens on grasses and cereals.

Although a tentative hypothesis, the presence of fungal spores relating to decaying stems or plant pathogens may be indicative of the dumping of waste cereal stems into the feature. Material may have been infected by a pathogen and discarded due to it being unfit for human consumption. Alternatively it may have been used/waste fodder or bedding for livestock. Of course, it is also a possibility that both occurred, with the infected stems having been fed to and/or used as bedding for livestock to avoid a waste of resources.

Trichuris sp parasite ova were identified in all of the samples from this sequence, albeit in low quantities, suggesting some influx of faecal material. Given the nature of the feature and its proximity to the settlement, this is not a surprising identification. Of particular interest however is the presence of at least two species, *Trichuris vulpis* and *T. suis*/*trichiura*. Despite the separation of the latter being problematic due to overlaps in morphology and size, the presence of parasite ova from either pigs/humans and canines tends to indicate that there are multiple sources of faecal material entering the feature.

Parasite ova are commonly identified in the fills of medieval and post-medieval defensive features with *Trichuris* sp being identified at Eign Gate, Hereford (Daffern 2011) and King's School, Worcester (Daffern *et al* 2012). *Ascaris* sp (roundworm) was also found at the latter site.

From the lowest samples of the sequence, a somewhat different picture begins to emerge. Slightly higher quantities of *Glomus* sp were noted and *Chaetmomium* sp spores appear for the only time in the sequence. Both of these fungal spores indicate that exposed/eroded soil was present in the ditch at this time. This would be consistent with the ditch's creation, the sides being re-cut, or natural erosion into the ditch. Dung fungal spores are also present in higher quantities lower down in the profile, suggesting that either animal dung was being disposed of during the initial phase of ditch use, or that runoff from grazing land was entering ditch. Perhaps animals were grazing close by, a possibility if the ditch provided an accessible water source. The latter suggestions are the favoured interpretations for the early life of the ditch. The aquatic types present in the lowest and middle samples (Potamogeton natans-type), suggest that slow-flowing water was initially present, potentially making the ditch more useful for watering animals than for use as a dumping area. In addition, the indicators of soil/erosion could be suggestive of run-off (causing small-scale erosion of the ditch bank).

Overall, the local environment of the ditch appears to have changed over time, from one which was within (or on the edge of) grazing land, to one which was filled in, either deliberately or naturally with a certain amount of dumping of waste cereal, fodder and hay occurring.

The presence of crops, albeit ones which have been discarded, has also revealed a wider patchwork landscape of herbaceous-rich, hay meadow and pastoral grassland, most probably in the river valley. This is likely to have been used for the production of livestock fodder and grazing, with arable cultivation of cereals on the higher, drier terraces and in the wider countryside.

Table 62:

Sample number	**1**	**7**	**9**	**55 0.08m**	**55 0.16m**	**55 0.24m**	**332 0.16m**	**332 0.56m**	**332 1.04m**	**336 0.06m**	**336 0.38m**	**336 0.78m**	**426 0.06m**	**426 0.38m**	**426 0.70m**
Context number	**28102**	**28112**	**28117**	**15027**	**15027**	**15199**	**6908**	**7050**	**7050**	**7044**	**7056**	**7058**	**2543**	**2557**	**2556**
Latin name															
Alnus glutinosa	13	4	3	1	2	5		1	4	1	1		1	1	2
Betula	5				1	1			2	3	3	1	1	1	1
Fagus sylvatica				3		4				1					
Fraxinus excelsior				2					2			1	1	1	
Pinus sylvestris	1			2	1	1		3	2					1	
Quercus	11	7	10	1	2	5		1	1		1	7	3	2	2
Tilia cordata			1									1			
Ulmus				1											
Corylus avellana-type	10	3	2	2	3	1			5			2		1	
Hedera helix				2									1		
Ilex aquifolium						1								1	1
Juniperus														1	
Rhamnus cathartica									1						
Salix	11	56	28	4	3	5			1	2		1	2	6	5
Calluna vulgaris	5	1	1						1					1	
Erica sp													2		
Poaceae undiff	9	19	19	100	99	96	1	85	94	5	94	92	92	72	90
Cerealia indet				12	6	7		1	3	2	4	3	5	4	5
Avena/ Triticum-type				3	1							1	6	1	2

Sample number	**1**	**7**	**9**	**55 0.08m**	**55 0.16m**	**55 0.24m**	**332 0.16m**	**332 0.56m**	**332 1.04m**	**336 0.06m**	**336 0.38m**	**336 0.78m**	**426 0.06m**	**426 0.38m**	**426 0.70m**
Context number	**28102**	**28112**	**28117**	**15027**	**15027**	**15199**	**6908**	**7050**	**7050**	**7044**	**7056**	**7058**	**2543**	**2557**	**2556**
Hordeum-type											2		1	3	2
Secale cereale				2					1		1		1		3
Achillea-type		1													
Agrostemma githago											1			1	
Anthemis-type													2		
cf *Anthriscus sylvestris*														1	
Apiaceae	4	2	7			1			1		1	1	1		1
Arctium-type												1			
Artemisia-type								1							1
Aster-type	7		19		1	2		2	2	1	5	3	7	4	4
Brassicaceae								1					1		
Cannabis-type									1						
Caryophyllaceae				2	2	1		3	4	1	1	2	1		2
Centaurea cyanus													1	1	1
Centaurea nigra				1							1	2			1
Chelidonium majus					1										
Chenopodioideae		1	18	3	2	1		4	1	1	4		6	5	4
Cichorium intybus-type		13				6	1	17	7	4	33	19	3	10	5
Cirsium-type		3										1	2		
Cyperaceae undiff	69	38	39	1		2		3	1		2	2	2	2	4
Erodium undiff										2	3				
Fabaceae												2	1		
Filipendula			1	1	3	4		8	1		1	1		1	1
Helleborus viridis				1											
Heracleum sphondylium									1						
Lactuceae undiff				2		3	3	4	2	2	10	14	3	4	1
Linum bienne-type						1		1				1			1

Sample number	**1**	**7**	**9**	**55 0.08m**	**55 0.16m**	**55 0.24m**	**332 0.16m**	**332 0.56m**	**332 1.04m**	**336 0.06m**	**336 0.38m**	**336 0.78m**	**426 0.06m**	**426 0.38m**	**426 0.70m**
Context number	**28102**	**28112**	**28117**	**15027**	**15027**	**15199**	**6908**	**7050**	**7050**	**7044**	**7056**	**7058**	**2543**	**2557**	**2556**
Malvaceae								2							
Medicago sativa			1												
Mycelis muralis-type								1							
Ononis-type													1		
Oxalis acetosella			2												
Persicaria maculosa-type								1							
Plantago lanceolata	4	1	2	7	7			3	8	1	5	1	3	2	2
Plantago major									2						
Plantago media												2	2	1	
Polygonum	1														
Potentilla-type				1	2	2							1	1	1
Primula veris-type													1	1	
Ranunculus acris-type		2	1	11	9	5		3	2	2	3	3	3	2	2
Rosa sp				1											
Rosaceae				2	1	3		2	3			4	5	3	1
Rubiaceae								1							
Rumex acetosa	4		1		1									1	1
Rumex acetosella			1	2					1	1	1		1	2	4
Rumex obtusifolius-type					1	2								1	
Sagina sp					1			2							
Saxifragaceae				1					1				1		
Silene dioica-type												1			
Stachys-type								2							
Succisa pratensis														1	
Tragopogon pratensis											1			1	
Trifolium sp					1										
Urtica dioica				6	5	5		5	5		4	4	12	11	6
Valeriana dioica								1						1	
Valeriana officinalis									2		3	1			

Sample number	**1**	**7**	**9**	**55 0.08m**	**55 0.16m**	**55 0.24m**	**332 0.16m**	**332 0.56m**	**332 1.04m**	**336 0.06m**	**336 0.38m**	**336 0.78m**	**426 0.06m**	**426 0.38m**	**426 0.70m**
Context number	**28102**	**28112**	**28117**	**15027**	**15027**	**15199**	**6908**	**7050**	**7050**	**7044**	**7056**	**7058**	**2543**	**2557**	**2556**
	154	***151***	***156***	***177***	***155***	***164***	***5***	***159***	***162***	***29***	***185***	***174***	***176***	***153***	***156***
Butomus umbellatus									1						
Equisetum														3	1
Hippuris vulgaris											1				
Lemnaceae				1	2	1			2					1	2
Nuphar sp					4										
Nymphaea alba				1		2		2	1					1	
Polypodium	6	5	5			1		1	2	2	1	1	2	3	4
Potamogeton natans-type						1				1				5	4
Pteridium aquilinum	5	1		4		5		9	4		2	3	2	5	5
Pteropsida (mono) indet					1	3		6	2		4	1	4	3	2
Sparganium undiff.	2														
Lophistoma corticolum			38					6					1	2	
Cercophora-type	2				4	2		6	1						
Chaetomium								20	1				1		2
Glomus sp.														1	4
Podospora-type	10							33	2				3	9	14
Sordaria-type	26		9	3	5	5									
Sporormiella-type	309	1			2	1		1					2	5	9
Tilletia													13	11	1
Tripterospora-type	16		1												
Trichuriasis trichiura/suis ova			1					96					2	2	2
Trichuriasis vulpis														1	
Ustilago								2					20	18	6

Table 62: Pollen remains

Insect remains from the city ditch

David Smith

The majority of the insect remains present are adult beetles (Coleoptera), and the pupa of a range of flies (Diptera). A list of the insects recovered is presented in Table 63. The nomenclature for Coleoptera (beetles) follows that of Lucht (1987) and the flies that of K G V Smith (1989).

Where applicable each species of Coleoptera has been assigned to one, or more, ecological groupings and these are indicated in the second column of Table 63. These groupings are derived from the preliminary classifications outlined by Kenward (1978). The classification used replicates that of Kenward and Hall (1995). Some of the Coleoptera have also been assigned codes based upon their extent of synanthropy (dependence on human settlement) and these are indicated in Table 63. The food plants for the various phytophage species of beetle are shown in the right hand column of Table 63 and are taken from Koch (1989; 1992). The plant nomenclature follows that of Stace (2010).

The faunas recovered

All of the samples from the top of the sequence (monolith 426, context 2543) produced relatively large insect faunas (Figs 67 and 192). These are dominated throughout by a range of both flies and beetles, insects commonly associated with settlement waste and rubbish, including cess. This is indicated by the recovery of the small fly *Thoracochaeta zosterae* which is usually associated with cess pits in the archaeological record (Belshaw 1989; Skidmore 1999; Smith 2012). Similarly, both *Sepsis* flies and *Eristalis tenax*, the 'rat tailed maggot', are associated with dung and cess, the latter favouring pools of faecal rich water (Smith, K V G 1989). Several taxa are also common around human settlement (the synanthropic species); for example, the 'woodworm' *Anobium puctatum*, the 'spider beetles' *Ptinus fur* and *Tipnus unicolor* and the 'ground beetle' *Pristonychus terricola (*Hbst.). Other taxa, such as *Cercyon analis*, many of the staphylinid 'rove beetles' and the lathridiidae recovered, are also common in settlement waste. *Sitophilus granaries,* 'the granary weevil', was in the deposits between 25–45cm from the top of sample sequence. This species of beetle is only associated with spoilt grain. It is unclear if it entered the ditch through the dumping of spoilt grain or as part of cess having been consumed by humans (see Osborne 1983; Smith 2012; Smith and Kenward 2011 and 2013).

Summary

It appears that considerable amounts of settlement waste was been dumped into the city ditch during the Civil War period. Though a fauna of water beetles was recovered (for example *Colymbetes fuscus*, the Hydreanidae and some of the Hydrophilidae), this accounts for a relatively small proportion. This suggests that the ditch was filled rapidly, and once this had started, little standing water accumulated in the feature.

There are also indications that a stand of nettles grew near to, or alongside, the ditch. This is demonstrated by the recovery of *Bracypterus urticae* and *Cidnorhynus quadrimacultatus,* both of which feed only this plant. A small number of species recovered may also suggest that grass and grazing land was also present. This is indicated by the recovery of a number of *Aphodius* dung beetles and several species of *Sitona* weevil that are associated with clover.

Table 63:

	Ecological codes	Synanthropic codes	Depth (cm)						Host plant
			25–30cm	40–45cm	45–50cm	55–60cm	60–65cm	85–90cm	
DERMAPTERA									
Forficulidae									
Forficula auricularia (L.)							+		
COLEOPTERA									
Carabidae									
Leistus ferrugineus (L.)	oa						+		
Dyschirius globosus (Hbst.)	oa								
Bembidion doris (Panz.)	oa			+					
Bembidion spp.	oa			+					
Harpalus rufipes (Geer)	oa								
Harpalus spp.	oa			+					
Pterostichus spp.	oa		+				++		
Pristonychus terricola (Hbst.)	u	ss					+		
Agonum sp.	oa		+				+		
Platynus dorsalis (Pont.)	oa			+					
Amara spp.	oa			+					
Dytiscidae									
Colymbetes fuscus L.	oa, w		+				+		
Hydraenidae									
Hydraena spp.	oa, w						+		
Helophorus spp.	oa, w								
Hydrophilidae									
Coelostoma orbiculare (F.)	oa, w		+						
Cercyon ustulatus (Preyssl.)	oa, w						+		
Cercyon haemorrhoidalis (F.)	rf	sf							
Cercyon analis (Payk.)	rt	sf	+++	+			+++		
Megasternum boletophagum (Marsh.)	rt		+				+		
Cryptopleurum minutum (F.)	rf	st		+			+		
Hydrobius fuscipes (L.)	oa, w						+++		
Silphidae									
Silpha spp.	rt				+	+	+		
Catopidae									
Catops spp.	oa					+			

	Ecological codes	Synanthropic codes	Depth (cm)						Host plant
			25–30cm	40–45cm	45–50cm	55–60cm	60–65cm	85–90cm	
Staphylinidae									
Omalium spp.	rt				+		+		
Lesteva longelytrata (Goeze)	oa, d	st					+		
Trogophloeus spp.	u					+			
Oxytelus sculptus Grav.	rt				+				
Oxytelus rugosus (F.)	rt		++			++	+++		
Oxytelus sculpturatus Grav.	rt	sf			+				
Oxytelus nitidulus Grav.	rt, d						+		
Oxytelus tetracarinatus (Block)	rt		+						
Stilicus orbiculatus (Payk.)			+		+	+			
Xantholinus spp.			++			+	++		
Quedius spp.			++	+	+		+++		
Tachinus rufipes (Geer.)	u	st					+++		
Aleocharinidae Genus & spp. Indet.						+			
Cantharidae									
Cantharis sp.	oa				+				
Elateridae									
Agriotes spp.	oa, p				+	+			
Nitidulidae									
Brachypterus urticae (F.)	oa, p				+				Urtica dioica L. (stinging nettle)
Lathridiidae									
Enicmus minutus (Group)	rd, h	st		+					
Corticaria/ corticarina spp.	rt	sf		+					
Anobiidae									
Anobium punctatum (Geer)	l, h	sf		+	+				
Ptinidae									
Tipnus unicolor (Pill. Mitt.)	rd, h	st			+				
Ptinus fur (L.)	rd, h	sf	++		+				
Scarabaeidae									
Geotrupes spp.	oa, rf					+	+		
Oxyomus silvestris (Scop.)	rt	st			+		+		

	Ecological codes	Synanthropic codes	Depth (cm)						Host plant
			25–30cm	40–45cm	45–50cm	55–60cm	60–65cm	85–90cm	
Aphodius sphacelatus (Panz.) or A. prodromus (Brahm)	oa, rf				+				
Aphodius lapponum Gyll.	oa, rf						+		
Aphodius spp.	oa, rf		++	+		+	+		
Chyrsomelidae									
Phyllotreta spp.	oa						+		
Curculionidae									
Apion spp.	oa, p			+					
Phyllobius sp.	oa, p						++		
Strophosoma spp.	oa, p						+		
Sitona lineatus (L.)	oa, p		+						Trifolium species (Clover)
Sitona flavescens (Marsh.)	oa, p						++		Trifolium species (Clover)
Sitona humeralis Steph.	oa, p		+		+				Often on medicks (Medicago)and clover (Trifolium)
Sitona spp.	oa		+	+			+		
Sitophilus granarius (L.)	g	ss	++	+					
Ceutorhynchus contractus (Marsh.)	oa, p		+				+		Usually associated with Resedaceae and Papaveraceae (migonettes and poppies)
Ceutorhynchus pollinarius Forst.	oa, p						++		Urtica dioica L. (stinging nettle)
Cidnorhinus quadrimaculatus (L.)	oa, p		+++		+	++++	++++		Urtica dioica L. (stinging nettle)
DIPTERA									
Syrphidae									
Eristalis ?tenax (L.)			+++						
Sepsidae									
Sepsis spp.			++	+	++	+++	++		
Sphaeroceridae									
Thoracochaeta zosterae (Hal.)			++	+	++++		++		

	Ecological codes	Synanthropic codes	Depth (cm)						Host plant
			25–30cm	40–45cm	45–50cm	55–60cm	60–65cm	85–90cm	
Drosophilidae									
Drosophilia sp.							+		
Fanniinae									
Fannia spp.			+						
Muscinae									
Muscina stabulans (Fall.)					+				
HYMENOPTERA									
Formicoidea Family Genus and spp. indet.			+++		++				
CLADOCERA									
Daphnia Genus & spp. indet.					+	+			

Table 63: Insects.

All are context 2543 (?sample 425) except depth 85–90cm, context 2557.
Host plant(s) are derived mainly from Koch 1992

Ecological coding (Kenward and Hall 1995)
oa (& ob) – Species which will not breed in human housing
w – aquatic species
c – species associated with salt water and coastal areas
d – species associated with damp watersides and river banks
rd – species primarily associated with drier organic matter
rf – species primarily associated with foul organic matter often dung
rt – insects associated with decaying organic matter but not belonging to either the rd or rf groups
g – species associated with grain
l – species associated with timber
p – phytophage species often associated with waste areas or grassland and pasture
pu – species associated with pulses (peas and beans)
h – members of the 'house fauna' this is a very arbitrary group based on archaeological associations (Hall and Kenward 1980)
Synanthropic coding (Kenward 1997)
sf – facultative synanthropes – common in 'natural' habitats but clearly favoured by artificial ones
st – typically synanthropes – particularly favoured by artificial habitats but believed to be able to survive in nature in the long-term
ss – strong synanthropes – essentially dependant on human activity for survival
h – species thought to be particularly associated with human occupation (Kenward and Hall 1995)

Molluscs from the city ditch

Michael Allen

Shell numbers, as indicated in the assessment, were generally good in the main body of the ditch (context 2557; 105–360 shells), but numbers per litre/kg were very low (see Table 65; also 64 and Figs 67 and 192). The assemblages from the upper sampled deposit were small (context 2543, *c* 30 shells) and only sufficient to provide a character of the local environment and land use. The assemblages comprise both freshwater and terrestrial species; the former probably largely represent the wet conditions within the ditch, whilst the latter represent both the ditch and the wider landscape environments. The taphonomy of the assemblages is particularly important, especially the freshwater element which comprises up to 96% of the assemblages. Defining the principal allochthonous component (derived from outside the ditch) from any autochthonous (*in situ*) assemblage is necessary in determining the local lived-in environmental history. The site, lying on the edge of sand and gravels and the alluvial floodplain of the Severn has high groundwater tables and may have been subject to flooding.

Table 64:

Depth (cm)	Context	Selected for analysis
10–20	2543	✓
20–25	2543	×
25–30	2543	✓
30–35	2543	✓
35–40	No sample	
40–45	2543	✓
45–50	No sample	
50–55	2543	×
55–60	2543	×
60–65	2543	✓
65–70	2543	×
70–80	No sample	
80–85	2557	✓
85–90	2557	×
90–95	2557	✓
95–100	2557	×
100–105	2557	✓
105–110	2556/7	✓
110–115	2556	✓
115–120	2556	✓
spot	2556	×

Table 64: List of samples taken and processed, indicating those selected for full analysis (Table 65)

Shell numbers vary with between 17 and 360 per sample (Table 65), with only 1–20 shells per litre indicating sparse presence, but mitigated by the large sample sizes (16–20 litres). Samples from the lowest sampled deposit (2556) contained between 72 and 105 shells and numbers rise through context (2557) with a peak of 360 shells from the base of the re-cut

CG 1037 (context 2543). The upper fills of the Civil War ditch (context 2543, above 45cm) contained low shell numbers with only 17–33 shells present (1.0–1.9 molluscs per litre). The aquatic elements within the ditch are wholly freshwater and slum species. No brackish water species were present, whereas along the riverside at Newport Street, brackish tolerant plants were identified (Pearson 2015, 214; see The site in its landscape context). Mollusc remains deriving from occasional flood events resulting from water coming down the river might have infiltrated the ditch but most of the freshwater assemblage is considered to largely be living in, or near to, the Civil War phases of the city ditch. The fills (context 2556 and 2557) were dominated by freshwater species; only in the upper sample of context (2557) (80–5cm) does the terrestrial component become significant. Through the later ditch re-cut (CG 1037), the terrestrial species are dominant, with the freshwater elements only representing >20% of the assemblages. There is a major environmental change between the main Civil War ditch (CG 1036), and the later deposits (re-cut CG 1037).

Base of the Civil War phase of the city ditch (CG 1036, context 2556=2544)

The base of the Civil War ditch is dominated by freshwater species (85–96%). In the basal sample (115–120cm) the amphibious and slum species *Galba truncatula* (formerly *Lymnaea truncatula*) is predominant and this, with *Anisus leucostoma,* suggest wet habitats subject to drying out. *Planorbis planorbis*, one of the other main species present, is typical of ditches and small ponds, hard and weedy waters (Janus 1965), and muddy swampy ditches liable to drying in the summer (Kerney 1999, 58). This indicates the Civil War ditch was initially one with only little and temporary water, but the nature of the assemblages change in the upper part of this context. While *G. truncatula, A. leucostoma* and *P. planorbis* all decrease, more catholic species typical of muddy ditches and shallow water choked with aquatic and emergent vegetation (eg *Lymnaea palustris* and *Radix balthica*, formerly *Lymnaea peregra*) become more dominant.

There are very few terrestrial species (4–11 shells; Table 65) and detailed palaeoenvironmental interpretation is not possible; it is suggested that the species are, however, those inhabiting wet and slum habitats, including *Zonitoides nitidus* which lives on the emergent vegetation and on decaying *Phragmites, Carex* or driftwood lying on muddy ground (Kerney 1999, 148).

Table 65:

Phase	**Civil War Ditch**						**?17–18th century re-cut city ditch**				
Feature	2559	2559	2559	2559	2559	2559	2559	2559	2559	2559	2559
Recut							2560	2560	2560	2560	2560
Context	2556	2556	2556/7	2557	2557	2557	2543	2543	2543	2543	2543
Sample	425	425	425	425	425	425	425	425	425	425	425
Depth (cm)	115–120	110–115	105–110	100–105	90–95	80–85	60–65	40–45	30–35	25–30	10–20
Vol (l)	20	16	17	13	20	20	18	18	17	17	17
MOLLUSCA											
Oxyloma elagans (Risso)	1										
Oxyloma/ Succinaea spp.					1						
Cochlicopa cf. lubrica (Müller)							11		1	4	

Phase	Civil War Ditch						?17–18th century re-cut city ditch				
Cochlicopa cf. lubricella (Porro)								1			
Cochlicopa spp.							5				2
Pupilla muscorum (Linnaeus)		1									
Vallonia costata (Müller)				1							
Vallonia pulchella (Müller)				1							
Vallonia cf. excentrica Sterki				1							2
Discus rotundatus (Müller)					4	4	57	2	3	4	2
Vitrina pellucida (Müller)						1	5				
Vitrea crystallina (Müller)							1				
Vitrea contracta (Westerlund)						1					
Aegopinella nitidula (Draparnaud)	1		1	1	1					1	2
Oxychilus cellarius (Müller)						1	5			3	1
Zonitioides nitidus (Müller)	4	3			1						
Cecilioides acicula (Müller)							1				
Clausilia bidentata (Ström)				2			11	1			2
Trochulus hispidus (Linnaeus)	2	1	2	6	50	99	215	9	6	10	13
Trochulus striolatus (C. Pfeiffer)										2	
Trochulus cf. sericeus (Draparnaud)									2		
Cepaea hortensis (Müller)						1	2				
Cepaea spp.	1	+			7	13	18	2	3		3
Cornu aspersum (Müller)	2	1	1	+	3	3	4		1		+
freshwater											
Valvata piscinalis (Müller)			2	3							2
Bithynia tentaculata (Linnaeus)	6		5	4							

Phase	Civil War Ditch						?17–18th century re-cut city ditch				
Galba truncatula (Müller)	25	9	7	8	8	13	19	10	1	6	3
Lymnaea palustris (Müller)		30	64	51	21	3	1				
Radix balthica (Müller)	2	24	21	69	132	13	1	2			
Lymnaea spp.				9	33	14	3	3			
Planorbis planorbis (Linnaeus)	16	1		9	2	8					
Planorbis carinatus (Müller)	6	2			1						
Anisus cf. leucostoma (Millet)	6		2	2	1	3	2				1
Pisidium/ Sphaerium spp.						1					
Marine											
Ostrea edulis (L)					1						
Terrestrial and slum taxa	6	4	3	6	7	7	10	5	6	6	8
Freshwater taxa	6	5	6	7	6	6	4	2	1	1	3
Total terrestaial and slum	11	6	4	12	67	123	334	15	16	24	27
Total freshwater	61	66	101	155	198	55	26	15	1	6	6
TOTAL	72	72	105	167	265	178	360	30	17	30	33
Land vs freshwater %	15/85	8/92	4/96	7/93	25/75	69/31	93/7	50/50	94/6	97/13	82/18

Table 65 Mollusca from selected samples analysed from the City Ditch

Fill of Civil War phase of the city ditch (CG 1036, context 2557)

Shell numbers rise though fill (2557; 167–265 shells) and the freshwater component declines from 93% to 31%. The amphibious species (G. *truncatula and A. leucostoma*) become much more significant while the catholic species decline, suggesting the reduction of standing water, and an increase in periods of drying out, with the ditch probably reduced to pools of water. The terrestrial component is dominated by the intermediate species *(Trochulus hispidus*), with the majority of the remaining assemblage being more mesic (*Aegopinella nitidula*, *Oxyloma/ Succinea* spp.), and the presence of the marsh obligate *Z. nitidus*, is reduced. Rather surprising is the presence of the shade-loving species *Discus rotundatus*, which is rare in wet and marshy places, but may represent leaf litter and decaying wood etc.

Later re-cut of the city ditch (CG 1037)

The first sample in the cut (context 2543; 60–5cm) contained high shell numbers (360), albeit representing only 20 shells per litre. The assemblage was dominated by terrestrial species (93%) and in particular by *Trochulus hispidus* (representing over 60%) with *D. rotundatus* at a surprisingly high proportion (16%). This species seems slightly out-of-place on its own and may suggest the introduction of material dumped into the ditch. The high shell numbers at the base of the re-cut, together with the nature of the rich assemblage, is suggestive of temporary stasis and stabilisation in the ditch infilling and possibly even pedogensis and soil formation in the base of the re-cut ditch. Overall this indicated drier conditions, but probably seasonally wet with the ubiquitous species *G. truncatula* being the most significant aquatic.

Although shell numbers in the main part of the upper (late 17th–18th century) fills are low, they are dominated by terrestrial species indicating an open, though possibly slightly shady, and certainly moist ditch. The amphibious aquatic *G. truncatula* is consistently present. Towards the top of these fills (10–20cm) there is a tentative hint of more open conditions with *Vallonia excentrica* present.

Summary

The assemblages provide evidence of the character of the ditch and of the changing local lived-in environment. Although the Civil War fills of the city ditch (CG 1036) contained water in its earliest phases, there are no species that tolerate brackish conditions and no Hydrobiidae (*Ventrosia ventrosa*, *Hydrobia acuta*, *Peringia ulvae*) which are found in great abundance in the mudflats of the Severn estuary (Gilbertson and Hawkins 1985). It can be concluded that floodwaters of the Severn were not an important component, if present at all, during the infilling of the ditch. This does not, however, preclude flooding from any of the other multitude of more ephemeral freshwater channels. The ditch was wet, containing still to stagnant water, fed by local groundwater conditions, but the assemblages must have originated in part from local marsh and from floodwaters from freshwater streams. Stagnant muddy standing weedy water (context 2556) gave way to small pools of temporary water liable to drying out (context 2557) and ultimately almost lacking permanent standing water, but still moist mesic ditch conditions. The wetness is largely due to high local groundwater tables and the drying relates to both infilling of the ditch and probably lowering of local groundwater table. The amphibious species present indicate fluctuating, probably seasonal wetting and drying, with pools of water drying to muddy mesic marsh in the summer months. The ditch water was shallow, weedy and stagnant – quality was poor but the presence of foul water cannot be confirmed *per se.* There are hints of dumping of material and the inclusion of the high numbers of *D. rotundatus* in just one sample may reflect this.

Evidence of maintenance of the ditch may include clearing out of muddy ditch deposits, or of improved quality of the water conditions in the ditch. Information about the former is best derived from geoarchaeological examination of sediment sequence, but the presence of possible stasis event at the top of the Civil War phase of the city ditch (2557, 80–5cm) to the base of the re-cut (2543, 60–5cm) may suggest a lack of maintenance and clearing of ditch sediments. If the higher numbers, and more diverse assemblages, do indicate stasis and possible pedogenesis at the top of the secondary fills (*sensu* Limbrey 1975; Evans 1972), then this suggests a period when the ditch was not cleared out, but was relatively stable in terms of sediment infill. The quality of the water in the base in particular (context 2556) indicates stagnant standing water, which again does not suggest ditch maintenance. The drier conditions in the re-cut suggest drying conditions and maintenance of the ditch here cannot be ruled out, but there is no obvious indication in the mollusc evidence.

Although difficult to discern with any great detail or confidence, it is clear that the ditch was set within a generally dry and open environment. There is no evidence of obvious heavy shading or woody invasion of the ditch during the sampled infill history. If alder or willow, for instance, had become more prominent locally, it might have been expected to see the presence of more shade-loving and rupestral elements in the ditch fills. Only the presence of *D. rotundatus* may suggest this (base of 2543); its higher presence in only this sample is interpreted as being introduced with material dumped into the ditch, but the origin of this is unknown. The fact that it (and other shade-loving species) was not significant in other statistically viable samples suggests little significant change in the adjacent lived-in environments, excepting for possibly drying conditions, and more open environments at the top of the latest re-cut ditch (CG 1037). The terrestrial assemblages are generally too small to provide detailed palaeoenvironmental information, but those in the Civil War fills (CG 1036) suggest very open conditions, while those in the re-cut (CG 1037) indicate more shady conditions. This may denote the presence of long herbaceous vegetation and rough waste ground. This suggests that the land adjacent to the ditch area may have been left to become overgrown, but not woody, and that occupation had lessened in this area during these later phases.

Animal bone

Ian Baxter

A total of 2,484 identifiable animal bone fragments were recovered by hand-collection from features dating from the Roman period. Included in this figure are 38 bones from partial skeletons or articulating limbs counted as one specimen in (Table 66). In addition 228 identifiable fragments were recovered from post-Roman features (Table 67). A further 108 identifiable fragments were isolated from the sifted environmental sample residues obtained from Roman features (Table 68. The only assemblages large enough to enable meaningful comparison are those derived from features dating from site Periods 5 and 6 (Table 69; Table 70 and 71; Table 72 and 73).

The animal bone assemblage from The Hive is dominated by the remains of the main domestic mammals – cattle, sheep, pig and horse (Tables 66 and 67). Domestic birds (fowl and goose) are uncommon, although their numbers are liable to under-estimation due to a recovery bias and a survival bias against smaller bones. Wild animals are scarce, suggesting that hunting played a minimal role in the provision of food.

Cattle are the most common species according to the number of identified specimens (NISP) and minimum number of individuals (MNI) in all periods followed by sheep/goat. This is similar to the situation at City Campus and Deansway (Baxter in Sworn *et al* 2014; Nicholson and Scott 2004b). Pig is much less frequent at The Hive compared with Deansway and equid remains are also uncommon (Fig 201).

Most of the material was excavated from ditches, pits, and postholes. Bone condition is generally good, but bones in articulation were uncommon which suggests that most material comes from secondary deposits.

Table 66:

Taxon	Period 3	Period 3–6	Period 4	Period 4–6	Period 5	Period 5–6	Period 6	Total
Cattle (*Bos* f. domestic)	3	3	36	14	415	97	1214	1782
Sheep/Goat (*Ovis/Capra*)		2	31	4	1421	25	290	494
Sheep (*Ovis* f. domestic)		(1)	(6)	(1)	(29)	(3)	(38)	(78)
Red Deer (*Cervus elaphus*)							+ (*)	+ (*)
Roe Deer (*Capreolus capreolus*)							(*)	(*)
Pig (*Sus scrofa*)			4		18	12	99	133
Horse (*Equus caballus*)	1		3		7	1	21	33
Dog (*Canis familiaris*)			1		72		133	21
Rabbit (*Oryctolagus cuniculus*)				1				1
Chicken (*Gallus* f. domestic)			1	1	2		8	12
Goose (*Anser/Branta* sp.)							1	1
cf Woodcock (*Scolopax rusticola*)							+	+
Raven (*Corvus corax*)					1		1	2
Crow (*Corvus corone/ frugilegus*)					1	34	1	5
Total	***4***	***5***	***76***	***20***	***593***	***138***	***1648***	***2484***

Table 66: Number of hand-collected mammal, bird and amphibian bones (NISP) from the Roman deposits

Table 67:

Taxon	Period 6–7	Period 6–11	Period 7–10	Period 9–10	Period 10	Period 11	Period 10–12	Period 11–12	Total
Cattle (*Bos* f. domestic)	112	5	1	1		24	2		***145***
Sheep/Goat (*Ovis/ Capra*)	33		1	1	2	2	3	1	***43***
Sheep (*Ovis* f. domestic)	(3)				(2)				***(5)***
Pig (*Sus scrofa*)	11	1	1			1			***14***
Horse (*Equus caballus*)	5		1		2	13			***21***
Dog (*Canis familiaris*)	3					1			***4***
Cat (*Felis catus*)	1								***1***
Total	***165***	***6***	***4***	***2***	***4***	***41***	***5***	***1***	***228***

Table 67: Number of hand-collected mammal, bird and amphibian bones (NISP) from the post-Roman deposits

"Sheep/Goat" and "Anuran" also includes the specimens identified to species.
Numbers in parentheses are not included in the total of the period.
Un-quantified presence of deer antler indicated by "(*)" "+" means that the taxon is present but no specimens could be "counted "(see text). Skeletons and associated bones counted as "1".

Table 68:

Taxon	Period 3–6	Period 4	Period 5	Period5–6	Period 6	Total
Cattle (*Bos* f. domestic)			7	1	6	14
Sheep/goat (*Ovis/Capra*)		4	7	3	7	21
Sheep (*Ovis* f. domestic)			(2)			(2)
Pig (*Sus scrofa*)	1		1		+	2
Equid (*Equus* sp.)					1	1
Horse (*Equus caballus*)			1			1
Dog (*Canis familiaris*)					1	1
Mole (*Talpa europaea*)			1			1
Mouse/vole (*Murid/Microtine*)	1	3	18	4	22	48
cf. House mouse (*Mus* sp.)			(1)			(1)
Wood mouse (*Apodemus* sp.)		(1)	(2)	(1)	(2)	(6)
Water vole (*Arvicola terrestris*)					(3)	(3)
Field vole (*Microtus agrestis*)					(1)	(1)
Passerine (*Passeriformes* sp.)			1	3		4
Woodcock (*Scolopax rusticola*)					1	1
Anuran (*Rana/Bufo* sp.)			6	3	4	13
Toad (*Bufo bufo*)					(1)	(1)
Cyprinid (cf. *Leuciscus cephalus*)			1			1
Total	***2***	***7***	***43***	***14***	***42***	***108***

Table 68: Number of mammal, bird amphibian and fish bones (NISP) in the sieved assemblage "Sheep/goat", "Mouse/vole" and "anuran" also includes the specimens identified to species. Numbers in parentheses are not included in the total of the period. "+" means that the taxon is present but no specimens could be "counted "(see text).

Table 69:

Taxon	Period 5		Period 6		Total		Total	
	NISP	%	NISP	%	NISP	%	MNI	%
Cattle (*Bos taurus*)	415	72	1214	76	1629	75	202	77
Sheep/goat (*Ovis/Capra*)	142	25	290	18	434	20	46	18
Pig (*Sus scrofa*)	18	3	99	6	117	5	13	5
Total	***575***		***1603***		***2180***		***261***	

Table 69: Frequencies of the three major domesticates by number of identified specimens (NISP) and by minimum number of individuals (MNI)

Table 70:

	Cattle		Sheep/goat		Pig	
Element	**MNI**	**%**	**MNI**	**%**	**MNI**	**%**
Teeth	12	35	14	52	3	50
Upper limbs	10	29	2	7	1	17
Lower limbs	4	12	9	33	1	17
Feet	8	24	2	7	1	17

Table 70: Period 5. Frequency by MNI of the main parts of the body of the main domestic mammals

Table 71:

	Cattle		Sheep/goat		Pig	
Element	**MNI**	**%**	**MNI**	**%**	**MNI**	**%**
Teeth	38	32	32	48	10	50
Upper limbs	33	28	7	11	4	20
Lower limbs	21	18	22	33	3	15
Feet	28	23	5	8	3	15

Table 71: Period 6. Frequency by MNI of the main parts of the body of the main domestic mammals.

Data from Table 71

“Upper limbs” includes scapula, humerus, pelvis and femur

“Lower limbs” includes radius, ulna, tibia, carpal, astragalus and calcaneum

“Feet” includes metapodials and phalanges

Table 72:

Taxon	Cattle			Sheep/goat			Pig		
Element	**NISP**	**MNI**	**%**	**NISP**	**MNI**	**%**	**NISP**	**MNI**	**%**
Upper deciduous + permanent incisors									
Upper deciduous + permanent canine									
Upper deciduous + permanent premolars	16	3	10	12	2	14	2	1	33
$M^{1/2}$	24	6	19	18	5	36	2	1	33
M^3	12	6	19	4	2	14			
Lower deciduous + permanent incisors	7	2	6				4	1	33
Lower deciduous + permanent canine							6	3	100
Lower deciduous + permanent premolars	29	5	16	57	10	71	8	2	67
$M_{1/2}$	42	11	35	55	14	100	4	1	33
M_3	24	12	39	14	7	50	1	1	33
Horncore	62	31	100	3	2	14			
Malar	5	3	10						
Atlas	2	2	6						
Axis	3	3	10						
Scapula	19	10	32						
Humerus dist	11	6	19	4	2	14			
Radius dist	6	3	10	2	1	7			
Ulna prox									
Carpal 2+3									
Metacarpal dist	16	8	26	3	2	14	2	1	33
Pelvis acetabulum	14	7	23	3	2	14			
Femur dist	3	2	6				1	1	33
Tibia dist	7	4	13	17	9	64	1	1	33
Astragalus	13	7	23	1	1	7	1	1	33
Calcaneum	15	8	26	3	2	14	1	1	33
Centrotarsale	6	3	10						
Metatarsal dist	16	8	26	4	2	14			
Phalanx 1 prox	42	6	19	4	1	7			
Phalanx 2 prox	9	2	6						
Phalanx 3 prox	7	1	3						

Table 72: Period 5 Roman. Body parts of the main domestic mammals by number of fragments (NISP) and minimum number of individuals (MNI)

Note for tables 72 and 73: Unfused epiphyses are not counted. Only hand-collected material is included. The MNI has been calculated as follows: incisors have been divided by 8 for cattle and sheep/goat and by 6 for pig, deciduous + permanent premolars by 6, M1/2 by 4, phalanges by 8 and all other elements, except metapodials and vertebrae, by 2. Metacarpal = (MC1 + MC2/2 + MP1/2 + MP2/4) / 2; Metatarsal = (MT1 + MT2/2 + MP1/2 + MP2/4) /2, where: MC1 = complete distal metacarpal; MC2 = half distal metacarpal; MT1 = complete distal metatarsal; MT2 = half distal metatarsal; MP1 = complete distal metapodial; MP2 = half distal metapodial. Pig metapodials are considered the equivalent of cattle and sheep/goat half metapodials. % = frequency of an element in relation to the most common one (by MNI).

Table 73:

Taxon	Cattle			Sheep/goat			Pig		
Element	**NISP**	**MNI**	**%**	**NISP**	**MNI**	**%**	**NISP**	**MNI**	**%**
Upper deciduous + permanent incisors									
Upper deciduous + permanent canine							2	1	10
Upper deciduous + permanent premolars	38	7	4	11	2	6	12	2	20
$M^{1/2}$	83	21	12	32	8	25	18	5	50
M^3	34	17	10	6	3	9	4	2	20
Lower deciduous + permanent incisors	18	3	2	4	1	3	18	3	30
Lower deciduous + permanent canine							20	10	100
Lower deciduous + permanent premolars	95	16	9	81	14	43	24	4	40
$M_{1/2}$	100	25	15	128	32	100	27	7	70
M_3	76	38	22	41	21	66	12	6	60
Horncore	341	171	100	1	1	3			
Malar	8	4	2	2	1	3			
Atlas	5	5	3						
Axis	12	12	7	1	1	3			
Scapula	66	33	19	5	3	9	1	1	10
Humerus dist	47	24	14	11	6	19	4	2	20
Radius dist	19	10	6	6	3	9	1	1	10
Ulna prox	1	1	<1	2	1	3			
Carpal 2+3	3	2	1						
Metacarpal dist	42	21	12	7	4	13	5	2	20
Pelvis acetabulum	33	17	10	14	7	22	7	4	40
Femur dist	3	2	1	3	2	6			
Tibia dist	41	21	12	43	22	69	5	3	30
Astragalus	42	21	12	1	1	3	1	1	10
Calcaneum	68	34	20	4	2	6			
Centrotarsale	15	8	5						
Metatarsal dist	56	28	16	9	5	16	1	1	10
Phalanx 1 prox	88	11	6	3	1	3	1	1	10
Phalanx 2 prox	24	3	2						
Phalanx 3 prox	13	2	1						

Table 73: Period 6 Roman. Body parts of the main domestic mammals by number of fragments (NISP) and minimum number of individuals (MNI)

Cattle

As noted above, cattle remains are the most numerous by NISP and by MNI in all the main Periods. Also, on account of the much greater carcass weight, beef would have been the main source of meat in all periods.

The cattle found at The Hive belong to small horned and short horned types as classified by Armitage and Clutton-Brock (1976), with small horns accounting for between 8% and 10% of the total. While the majority are adult based on the horncore morphology (Armitage 1982), juveniles and subadults are also represented (Table 74, Fig 202). Cattle mandibles for both Periods 5 and 6 are also dominated by adult and elderly beasts (Table 75 and 76, Fig 203) and most preserved epiphyses are fused (Table 77 and 78, Fig 204). Perinatal and young cattle remains are also present in Roman features but at very low frequency. The morphology of the posterior cranium of the cattle is very variable, particularly in Period 6, suggesting a heterogeneous population consisting of unrelated stock derived from multiple localities (Table 79). Studies on recent cattle have demonstrated that the frontal profile seen from above is closely related to breed (Grigson 1976, 126–8). Cattle crania with a frontal profile consisting of a pointed boss that occur in Period 6 seem to be a new type that is also first seen during the 4th century AD at sites in Cambridgeshire (Baxter forthcoming a and b). Plots of size and shape of the cattle horncores indicate no significant differences between Periods 5 and 6 with cows and oxen (individuals with Wmax over 60.0mm x Wmin over 40.0mm) in the majority (Fig 205).

Withers heights calculated from complete long bones using the multiplication factors of Matolcsi (1970) range between 108–122cm with a mean of 113cm (n = 9) for the Period 5 assemblage, and 104–120cm with a mean of 113cm (n = 21) for the Period 6 assemblage. Plots of size and shape of the metapodials also do not suggest any significant differences in size and lineage between Periods 5 and 6 (Figs 206 and 207; Table 80 and 81). However, plots of size and shape of the astragalus suggest that there may be a higher proportion of larger animals from unrelated stock in Period 6 (Fig 208; Table 80 and 81). Comparison of cattle skeletal parts with the Brain (1976) Kuiseb river goat survival sequence demonstrates that all parts of the cattle skeleton are represented at The Hive (Fig 209).

Dental anomalies of possible genetic significance present in The Hive cattle assemblage include absence of P2 and reduction or absence of the M3 hypoconulid or third pillar (Andrews and Noddle 1975; Albarella and Davis 1994, 1996). Without destructive analysis it is difficult to be certain that the P2 is congenitally absent or has simply been lost with the alveolus healed over. No such examination was undertaken with The Hive assemblage. However, experience with cattle remains of recent date has demonstrated that absence of P2 is a genetic trait common in Iron Age and Roman cattle populations. It may be associated with a misalignment of the teeth and ‘V’ shaped wear on the upper M3 together with concentration of wear on the third pillar of lower M3. At The Hive the cattle M3 hypoconulid was reduced or absent in 6% of cases in the Period 5 assemblage (2 out of 32) and 5% in Period 6 (4 out of 81). Natural occipital perforations with rounded margins were observed frequently in cattle cranial fragments from several contexts in both Period 5 and Period 6. Occipital perforations in bovines are congenital defects (Manaseryan *et al* 1999; Baxter 2002), most probably caused by a developmental disorder during the pneumatisation of the frontal, parietal and occipital bones (Fabis and Thomas 2011). Similar occipital perforations also occur at City Campus but are absent or rare on sites in Cambridgeshire (personal observation).

Pathologies associated with the use of cattle for draught purposes (Bartosiewicz *et al* 1997) were observed in the assemblages from both Period 5 and 6. These primarily affect the metapodials and result in broadening of the distal epiphyses and/or palmar depressions. A metatarsal with broadened distal epiphysis found in Period 5 layer (7165) has exostoses on both the anterior and posterior distal shaft surfaces and the medial condyle is grooved and eburnated indicating osteoarthritis. Of particular interest in this regard is a horncore from Period 6 quarry pit fill (6745) with a basal depression, possibly a cord impression consequent to tethering or yoking (see Milisauskas and Kruk 1991). A second horncore from Period 6 (context 6915) is constricted anterior to the base, possibly from a similar cause. A cattle proximal metatarsal from the same context has signs indicative of infective arthritis. Infective arthritis is infection in the fluid and tissues of a joint usually caused by bacteria, frequently Brucella abortus (Baker and Brothwell 1980, 125).

Evidence for the utilization of cattle horn, otherwise invisible due to the decomposition of the resultant articles in the course of time, is possibly provided by a frontal fragment from Period 5 layer (6514) with cut marks at the base of the horncore. A cattle frontal from Period 5 pit fill (6475) has an impact depression from poll axing. Unusual round holes occur in cattle crania from Period 6 quarry pit fill (7050). These are situated in the centre of the occipital and range from 5.7–7.0mm in diameter. Unlike naturally occurring occipital perforations noted above these are man–made peri or postmortem.

The cattle found at The Hive during the Roman period belong to the small and short horned varieties. Although little significant difference was observed between the cattle of Periods 5 and 6, there is limited and tenuous evidence for some improvement and/or other changes in the cattle stock over time. Most cattle survived until adulthood and there is evidence for the employment of cattle for traction.

Table 74:

	Small horn	Short horned	Medium horned	Juvenile	Subadult	Young adult	Adult	Old adult
Period 5	4	36		8	5	6	27	13
%	10	90		14	8	10	46	22
Period 6	23	257		21	51	53	113	93
%	8	92		6	15	16	34	28

Table 74: Cattle horncores by type and age

Based on Armitage and Clutton-Brock (1976); Armitage (1982).

Table 75:

Taxon	Mandibular wear stages												
	A		B		C		D		E		F		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
Sheep/goat	1	3	3	9	6	19	8	25	11	34			32

Taxon	Mandibular wear stages										
	Juvenile		Immature		Subadult		Adult		Elderly		Total
	n	%	n	%	n	%	n	%	n	%	n
Cattle					3	9	19	59	10	31	32

Table 75: Period 5. Mandibular wear stages (following Crabtree 1989 and O'Connor 1988)

Table 76:

Taxon	Mandibular wear stages												
	A		B		C		D		E		F		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
Sheep/goat			6	10	12	21	15	26	24	42			57

Taxon	Mandibular wear stages										
	Juvenile		Immature		Subadult		Adult		Elderly		Total
	n	%	n	%	n	%	n	%	n	%	n
Cattle	2	2			2	2	55	68	22	27	81
Pig			5	25	11	55	4	20			20

Table 76: Period 6. Mandibular wear stages (following Crabtree 1989 and O'Connor 1988)
See Appendix 1 for a complete list of individual mandibles. Only mandibles with two or more teeth (with recordable wear stages) in the dP4/P4–M3 row, isolated unworn dP4 or worn M3 are considered.

Table 77:

Taxon	Cattle			Sheep/goat			Pig		
Element	n	n_f	%	n	n_f	%	n	n_f	%
Scapula	12	12	100						
Humerus dist	11	11	100	3	3	100			
Radius dist	6	6	100	2	0	0			
Ulna prox									
Metacarpal dist	16	16	100	4	3	75	2	0	0
Pelvis acetabulum	10	10	100	2	2	100			
Femur dist	3	3	100				1	0	0
Tibia dist	7	7	100	17	15	88	1	0	0
Calcaneum	2	1	50	3	1	33	1	0	0
Metatarsal dist	16	16	100	5	3	60			
Phalanx 1	41	41	100	4	4	100			
Phalanx 2	9	9	100						

Table 77: Period 5. Number and percentage of fused epiphyses for the main domestic mammals.
Fused and fusing epiphyses are amalgamated. Only unfused diaphyses, not epiphyses, are counted

Table 78:

Taxon	Cattle			Sheep/goat			Pig		
Element	**n**	**n_f**	**%**	**n**	**n_f**	**%**	**n**	**n_f**	**%**
Scapula	48	48	100	4	4	100			
Humerus dist	47	47	100	11	10	91	4	4	100
Radius dist	19	15	79	6	3	50	1	0	0
Ulna prox	1	1	100	2	1	50			
Metacarpal dist	43	38	88	7	7	100	4	2	50
Pelvis acetabulum	26	25	96	13	13	100	6	6	
Femur dist	3	3	100	3	2	67			
Tibia dist	41	41	100	43	38	88	5	4	80
Calcaneum	15	12	80	3	2	67			
Metatarsal dist	56	48	86	9	4	44	2	1	50
Phalanx 1	90	89	99	3	3	100	1	0	0
Phalanx 2	21	21	100						

Table 78: Period 6. Number and percentage of fused epiphyses for the main domestic mammals. Fused and fusing epiphyses are amalgamated. Only unfused diaphyses, not epiphyses, are counted

n = total number of fused/fusing epiphyses and unfused diaphyses; nf = total number of fused/fusing epiphyses; % = percentage of fused/fusing epiphyses out of the total number of fused/fusing epiphyses and unfused diaphyses.

Percentages for total number of epiphyses smaller than 10 have been omitted.

Table 79:

	Frontal profile	Intercornual ridge	N
Period 5	Convex	High double arch	2
	Convex	High single arch	2
	Convex	Low single arch	1
Period 6	Convex	High double arch	12
	Convex	High single arch	31
	Convex	Low double arch	4
	Convex	Low single arch	2
	Pointed boss	Downward bow	1
	Pointed boss	High single arch	2
	Flat	Low double arch	1

Table 11: Morphology of the Roman cattle crania.

Based on Grigson (1976)

Table 80:

Measurement	Mean	V	Min	Max	N
Horncore Length	1185	18.1	830	1600	24
Horncore W max	497	19.3	363	861	54
Horncore W min	350	21.0	238	588	56
Humerus HTC	301		271	371	8
Metacarpal GL	1812		1783	1870	6
Metacarpal Bd	564	9.2	492	651	14
Metacarpal 3	279	5.2	257	309	12
Metacarpal SD	310		271	348	5
Metacarpal BatF	504	6.9	457	588	14
Tibia Bd	541		533	551	3
Astragalus GLl	608	5.2	548	672	11
Astragalus Bd	385	7.7	343	429	15
Astragalus Dl	347		326	377	9
Metatarsal GL	2117		2033	2234	3
Metatarsal Bd	502	7.8	455	570	14
Metatarsal 3	260	5.1	245	287	11
Metatarsal SD			237	289	2
Metatarsal BatF	470	8.4	421	548	14

Table 80: Period 5. Means, coefficients of variation (V), ranges and sample sizes for cattle measurements

Fusing bones are included, unfused ones are not.
A few measurements are approximated.

All measurements are in tenths of millimetres.

Coefficients of variation only given for samples of at least 10 measurements.

Table 81:

Measurement	Mean	V	Min	Max	N
Horncore Length	1201	20.8	600	2000	129
Horncore W max	498	18.5	292	784	302
Horncore W min	353	18.1	227	530	307
Humerus HTC	314	8.6	270	391	38
Metacarpal GL	1850	4.1	1685	1945	11
Metacarpal Bd	547	8.9	475	666	35
Metacarpal 3	272	7.5	228	320	36
Metacarpal SD	292	10.7	237	341	11
Metacarpal BatF	498	7.2	443	579	34
Tibia Bd	570	7.6	513	660	26
Astragalus GLl	613	5.7	565	720	27
Astragalus Bd	389	6.9	350	467	32
Astragalus Dl	338	6.3	295	407	30
Metatarsal GL	2059	4.6	1908	2189	10
Metatarsal Bd	520	10.6	448	650	36
Metatarsal 3	266	7.6	238	332	34
Metatarsal SD	253	9.6	227	307	10
Metatarsal BatF	478	10.7	406	653	33

Table 81: Period 6. Means, coefficients of variation (V), ranges and sample sizes for cattle measurements

Fusing bones are included, unfused ones are not.
A few measurements are approximated.

All measurements are in tenths of millimetres.

Coefficients of variation only given for samples of at least 10 measurements.

Sheep

The remains of sheep constitute the second most frequent taxon at The Hive by MNI and NISP in Roman assemblages (see above). No specimens could be identified as goat. The few cranial fragments preserved indicate that both horned and hornless sheep were present. Ageable mandibles suggest a generalised kill-off with animals slaughtered at Grant (1982) wear stages C, D and E: perhaps at one year, two years and over four years (Tables 75 and 76; Fig 203). This is largely confirmed by the state of preserved epiphyseal ends of long bones (Tables 77 and 78; Fig 204. All horncores and pelves seen belong to ewes.

Withers heights for the Roman sheep, calculated using the multiplication factors of Teichert (1975), range between 55–66cm with a mean of 61cm (n = 6) in Period 5 and 58–73cm with a mean of 63cm (n=11) in Period 6. Two metapodials from Period 4 came from animals 60cm and 63cm high. Further measurement data is presented in Table 82.

The partial skeleton of a subadult horned sheep was recovered from Period 5 layer (7208). This consisted of the skull and feet only; no major limb bones, vertebrae or ribs were present. Comparison of sheep/goat skeletal parts with the Kuiseb river goat survival sequence (Brain

1976) demonstrates that all parts of the skeleton are represented at The Hive (Fig 209). Butchery of the sheep carcass was generally performed with knives in both main periods although some chopped bones were also observed. Few pathologies or anomalies were seen affecting the Roman sheep apart from infrequent dental anomalies. There is no clear evidence for improvement or significant changes to the sheep during the Roman period.

Table 82:

Measurement	Mean	V	Min	Max	N
Humerus BT	278	8.5	251	340	10
Humerus HTC	144	5.6	130	158	12
Metacarpal GL	1254		1205	1332	5
Metacarpal Bd	235		220	255	6
Pelvis LA	257		245	271	4
Tibia Bd	248	6.3	226	290	34
Metatarsal GL	1399		1362	1438	4
Metatarsal Bd	238		220	251	4

Table 82: Period 6 Roman. Means, coefficients of variation (V), ranges and sample sizes for sheep/ goat measurements

Fusing bones are included, unfused ones are not. A few measurements are approximated. All measurements are in tenths of millimetres. Coefficients of variation only given for samples of at least 10 measurements.

Pig

The remains of pigs are not frequent in the Roman deposits at The Hive compared to Deansway, accounting for 3% of domestic food species by NISP in Period 5 and 6% in Period 6 (Tables 66 and 67; Fig 201). The few mandibles available suggest that most pigs in the Roman period were slaughtered as subadults or young adults, when the lower 3rd molar was coming into wear, and were therefore kept as porkers and baconers (Table 76; Fig 203). Very little further information is added by the few preserved epiphyseal ends of bones (Tables 77 and 78). As with cattle and sheep/goat, all parts of the pig skeleton are represented in both main periods (Table 70 and 71; Table 72 and 73).

Horse

The remains of horses are relatively less frequent in the Roman deposits at The Hive than at City Campus and Deansway (Fig 201). No bones or teeth were seen that could be attributed to donkeys or mules. A metacarpal from a Period 4 pit came from a horse 130cm (13 hands) at the withers based on the multiplication factors of May (1985). From Period 5 pit 6895 another metacarpal belonged to an animal 136cm (13½ hands) high. An ankylosed 3rd and 1st+2nd tarsal found in Period 6 quarry pit fill (6745) is probably a spavin (bony growth) as the joint surfaces are unaffected. This is the result of heavy work, combined with age.

The few ageable teeth derived from the Roman features came from horses aged between seven and ten years based on incisor wear (Barone 1980) or the comparative wear curves of Levine (1982).

Dog

The remains of domestic dogs include two partial skeletons (Tables 66 and 67). Withers heights, following Harcourt (1974) and Clark (1995), range between 29–65cm and cover the whole range of Roman dog sizes. Of particular interest are a maxilla fragment found in Period 6 quarry pit fill (6520), a distal humerus and a mandible from Period 6 quarry pit fill 6745 which belong to midget or toy dogs comparable to the Maltese type. Achondroplastic dwarf types occur in Periods 4–6 and include the tibia of an animal 29cm high from Period 4 well construction fill (6824; see Baxter 2006 and 2010 for a discussion of small Roman dog types). A dwarf radius and fused ulna from a dwarf dog 37cm at the shoulder were recovered from Period 5 pit fill (8839). Dwarf and toy dogs may have been used for herding, similar to the modern Corgi. For example, a specimen from Love's Farm in Cambridgeshire had partially healed foot fractures consistent with being trodden on by cattle or horses (Baxter forthcoming b).

At the other end of the scale the 4th metacarpal of a very large dog of around 65cm at the shoulder was found in quarry pit fill (6520).

Wild mammals

Wild mammals present in the hand-collected material are red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and rabbit (*Oryctolagus cuniculus*) (Tables 66 and 67). Microfauna from the sifted sample residues include mole (*Talpa* europaea), wood mouse (*Apodemus* sp.), house mouse (*Mus* sp.), water vole (*Arvicola terrestris*) and field vole (*Microtus agrestis*) (Table 68).

Roe deer antler fragments were recovered from Period 6 quarry pit fills (6491) and (6592). The antler beam fragment from (6592) is attached to a frontal fragment. Most of the red deer remains consist of antler fragments and were also found in Period 6 quarry pit fills (6491) and 6745. They include two particularly large base and beam fragments from mature animals. None of the antler fragments has any signs of working. A butchered proximal red deer metatarsal was recovered from the same context.

A rabbit mandible from a Period 4–6 posthole fill (6934) is probably intrusive. Other small mammals present in the sample residues represent natural mortalities and possible pitfall victims. Their remains are not sufficiently numerous to shed light on the environmental conditions prevailing when they died.

Birds

Infrequent remains of domestic fowl (*Gallus gallus*) occur in Periods 4–6 and goose (cf *Anser anser*) in Period 6. Wild birds include woodcock (*Scolopax rusticola*) in Period 6, raven (*Corvus corax*) in Periods 5 and 6 and crow or rook (*Corvus corone/frugilegus*) in Periods 5, 5–6 and 6.

Amphibians

Bones of anuran amphibians (*Rana*/*Bufo* sp.) occur sporadically in sample residues from the Roman features.

Summary

Cattle are the most frequent domestic species in the Roman period. The morphology of the posterior cranium of the cattle is very variable, particularly in Period 6, suggesting stock derived from multiple unrelated populations. The genetic relationship of some of these cattle may be indicated by the presence or absence of occipital perforations and reduction or absence of the lower 3rd molar hypoconulid. There is some evidence to suggest the introduction of new types of cattle in Period 6. Sheep and pigs display no appreciable differences during the course of the Roman period. Domestic dogs comprise both very large animals together with both dwarf and toy types which may have been used for herding.

Post-Roman period remains

Most of the material broadly dating from Periods 6–7 is probably Roman. Only 6 fragments were identified from Periods 7–10. The Period 11 remains dating from the mid-18th to 19th century include some interesting cattle horncores and horse elements. The backfill of the Georgian timber water pipes (15007) contained several frontal fragments and horncores of longhorn type. In two cases the tip of the horncore has been cut off. In horn working the solid tip of the horn was sometimes removed in advance of separation either to facilitate separation of the sheath from the core or to use the tips for the manufacture of articles such as handles and buttons. Similar examples were recovered from Birmingham Waterfront sites (Baxter 2005). The remains of horses aged from 7 to 13 years were recovered from Period 11 features. A metatarsal from Georgian timber water pipes backfill (15007) came from an animal of 159cm (16 hands) at the withers. A radius and a metacarpal found in the fill of a pit containing casting waste (15077) possibly came from the same individual 143cm (14 hands) high. A horse lumbar vertebra from the same feature has osteoarthritic lipping.

Isotope ratio analysis on cattle mandibles

Janet Montgomery, Yee-Min Gan, Geoff Nowell and Jacqueline Towers

Tooth enamel from six cattle mandibles was analysed. All of the mandibles were from Roman period contexts and care was taken to ensure that they were from different individuals. The primary aim of the analysis was to obtain information regarding the origins and movement of cattle during the Roman period to determine whether cattle were of local or non-local origin.

Strontium isotope ratios

Strontium isotope ratio results for the six cattle mandibles studied are presented in Fig 210. All $^{87}Sr/^{86}Sr$ values, which range between 0.71211 and 0.71582, lie above the upper limit expected for biosphere values from the region of Triassic geology around Worcester (ie 0.709–0.710; the green areas on the map in Fig 211) and regions of basalt, chalk and limestone to the south and east (ie 0.707–0.709; the dark and light blue areas on the map in Fig 211 (Evans *et al* 2010). Such values therefore largely rule out the majority of England to the north, east and south of Worcester as potential places of origin for the cattle. Moreover, the range of values in the six cattle greatly exceeds the 0.00062 range observed in a single modern herd of grazing cattle (Towers 2013) and suggests diverse places of birth. Three animals (WCM1, 2 and 4) do not appear to have moved during the first *c* 2 years of life as they exhibit only a small change in strontium isotope ratios between their three molar teeth. The remaining three animals have a larger shift in values which may indicate movement between different geological terrains.

$^{87}Sr/^{86}Sr$ values for two of the six cattle are ~0.712–0.713 suggesting possible origins in certain areas of Devon, Wales, the Lake District or Scotland (the tan coloured regions in Fig 211. Such values are highly characteristic of humans and animals originating in regions of Devonian Old Red Sandstone which provides the surface rocks across much of Herefordshire, south Wales and the southwest of England but is largely absent from the rest of England (Evans *et al* 2010). Several non-local cattle with these values were also found in the Roman period at Owlesbury in Hampshire (Minniti *et al* 2014) and were deemed by the authors to be evidence for increasing trade and a widening market compared to the preceding Iron Age period.

The remaining four cattle show high $^{87}Sr/^{86}Sr$ values for Britain (>0.7140), which are usually attributed to granitic or ancient (Proterozoic and Archaean) biospheres. In Britain these are predominantly located in the upland areas of the west and north. Although values above 0.714 have been found in cattle from southern England, they are extremely rare; only 2/124 cattle previously studied. The cattle from Worcester are, therefore, highly unusual in that all are non-local and all have high to very high strontium isotope ratios. This could be due to Worcester's proximity to Wales which is a region of old, mountainous and complex geology. To date, comparable biosphere values from Britain have largely been found in areas of Scotland, eg Aberdeenshire, the Isle of Skye. No consistent evidence has yet been found through biosphere sampling that granitic or ancient geological areas of England can produce vegetation that could provide such high values in animals or humans, although there are a few as yet uncharacterised small areas (eg the Malverns, the Lake District, Anglesey and other regions of Wales) that have the potential to do so. In addition, it is possible that there are other as yet unidentified regions of Britain and Ireland that would produce such values. Suitable ancient terrains also exist elsewhere in the Roman Empire (eg Brittany, Spain, Portugal, southern France).

Variation in $^{87}Sr/^{86}Sr$ values between different molars, particularly for WCM 3, WCM 5 and WCM 6, suggests movement between regions of different geology during early life. None of the animals appear to have moved to Worcester during the period of molar formation except WCM 5 for which the third molar cervical enamel had not completely mineralized at death.

Oxygen isotope ratios

Oxygen isotope ratio results are presented in Fig 212. $\delta^{18}O$ values range between 22.1 and 26.0 ‰ and are broadly comparable with values measured for British cattle enamel, both archaeological and modern (Towers *et al* 2011; Towers 2013). They are comparable with values for enamel originating in large parts of Europe.

The intra-tooth profile for WCM 5 shows a sinusoidal variation with time. This reflects the seasonal variation of precipitation $\delta^{18}O$ values which tend to be higher in summer and lower in winter at mid- to high latitudes (Dansgaard 1964). A sinusoidal pattern is partially observable for WCM 3. Minimum $\delta^{18}O$ values for this animal are lower than for WCM 5 which may indicate a different birthplace, perhaps at a different altitude although they have overlapping strontium isotope ratios. $\delta^{18}O$ values of precipitation decrease with altitude (Dansgaard 1964). In addition, in the British Isles, the values of $\delta^{18}O$ for groundwaters, which preserve long-term average rainfall values, tend to decrease from west to east (Darling *et al* 2003). In the absence of comparative local cattle it is not possible to say if these values are also consistent with the Worcester region.

Carbon isotope ratios

Carbon isotope ratio results are presented in Figure 213. $\delta^{13}C$ values range between -13.3 and -11.6 ‰. They are broadly comparable with values measured for cattle enamel from other British archaeological sites (Towers 2013) and indicate a diet of C_3 vegetation as expected. The variation in $\delta^{13}C$ observed in the WCM 5 profile, from -11.6 ‰ (second molar mid-lobe enamel) to -13.1 ‰ (third molar cervical enamel) may be due to changes in diet perhaps brought about by movement between habitats as it does not appear to be responding closely to changes in season indicated in oxygen isotope ratios above.

Summary

The isotope data provide strong evidence for the following.

- None of the cattle submitted for analysis were raised or grazed in the vicinity of Worcester during the first *c* two years of life.
- The six animals were not all from the same herd or place of origin.
- Two animals would be consistent with origins in Herefordshire/south-west England/ southern Wales.
- Four have unusually high values which are largely inconsistent with England and, to date, rarely found in cattle from archaeological sites in England. If they originated in the British Isles, their place of origin is most likely to be found on granites or ancient (Proterozoic and Archaean) rocks which are principally found in Wales, the Lake District and northern Scotland, but restricted outcrops such as the Malverns remain potential places of origin.

Due to the advanced age of some of the cattle, severe tooth wear prevented seasonal profiles of diet and climate being constructed but one animal appears from the oxygen isotope data to have experienced a different climate to the other cattle during the first two years of life.

Fish and other small bones

Sheila Hamilton-Dyer

A total of 340 individual fish specimens was recorded. A further 54 specimens are not of fish, but represent small bones from mammals, birds and amphibians. Just over 37% of the fish specimens are indeterminate fragments of rays, ribs, spines, cranium and scales. The 213 diagnostic specimens could be identified as belonging to at least eight different taxa and are mainly from Roman contexts. A small number of bones come from the Civil War defences and other contexts (see Table 83).

Roman fish bone

The majority (150 specimens) of the remains are of eel *Anguilla anguilla*, amounting to over 70% of the identified remains. These are mostly vertebrae of small eels under 30cm length, with a few larger specimens from pit fill (6600; CG 1042) of about 40–50cm. A few cranial bones indicate that whole fish are included. A few specimens (from contexts 7065, 6600 and 6840) have a crushed appearance that probably indicates human consumption (Jones 1986).

The next most frequent remains are of Cyprinidae, members of the carp family. These were found in eight contexts and include 24 from layer (7204; CG 1043) that could be from one individual. The remains are all of small fish; none could be exactly identified but several match roach or chub. One of the vertebrae (from context 6840) is crushed and also charred.

Pike *Esox lucius* vertebrae were found in four contexts. Most of these are extremely small but one, from oven layer (6862; CG 1007), is from a fish of about 60cm length. A flatfish caudal vertebra was recovered from another oven context, (6830; CG 1069). Neither of these is burnt, although a few other bones from other contexts had been, and it is not clear whether these are from the period of use or are post-usage.

Nine Clupeid remains are probably from two different species; most are probably of herring *Clupea harengus* but four larger vertebrae in pit fill 6378 (CG 1072) are a good match for shad, probably the twaite shad *Alosa fallax*. Part of a good-sized salmon *Salmo salar* vertebra was recovered from pit fill 6600 (CG 1042).

Post-medieval fish bone

Stickleback *Gasterosteus aculeatus* was identified by four bones from two different individuals from the post-medieval ditch fill 2557 (CG 1036) and a large buckler from a thornback ray *Raja clavata* came from context 2556 of the same ditch.

Other small bones

The 54 other bones are mainly small scraps of mammal or bird bone (34) but 20 could be identified to taxon (Table 84). There are six mouse-sized small mammal bones including a field vole molar from pit fill 6378 (CG 1072). The four bird bones include three of small passerines not further identified and a wader coracoid, cf woodcock, from pit fill 6897 (CG 1095). Fragments of a small reptile jawbone, perhaps grass snake, were found in the later pit cutting the well (6823; CG 1015). Nine specimens are of amphibians. Frog could be identified in posthole fill 6776 and quarry pit fill 7050 (CG 1108), toad from post-medieval ditch 2557 (CG 1036). The remaining bones were not distinguished apart from a dentary from pit fill 6943 (CG 1015); this proved to be of a newt (species not determined), which is very rarely identified in archaeological material.

Summary

The majority of the remains are from small fish that would have come from local streams and rivers; although eels return to breed in the sea when mature, the specimens here are mostly small ones. It is assumed that the cyprinids, pike and stickleback are also all from local waters and the salmon vertebra could have come from a migrating fish caught locally or from the Severn estuary. The herring is a marine fish but the closely related shad can be found in the tidal reaches and spawns in May well upstream. The flatfish is probably plaice or flounder; both can be found in the estuary and flounder can be found upstream in the tidal reaches. The thornback ray from the post-medieval ditch is an obligate marine species, also commonly found in the Severn estuary.

This is an important assemblage despite the relatively small size, as fish remains from previous Roman levels at Worcester have been rare. A small assemblage of eel, herring and flatfish was recovered from the City Campus (Hamilton-Dyer in Sworn *et al* 2014) and there was only one (late Roman) bone from Deansway (Nicholson and Scott 2004). The most frequent species here, eel, is often the most common fish in (sieved) Roman assemblages (Locker 2007). The position of Worcester gives ready access to both freshwater and marine taxa but the exploitation of fish appears to be limited, though more extensive than previously evidenced. The large gadids and variety of other marine fish found in the medieval assemblage at Deansway are lacking, and the fish are mainly those that could be caught locally.

Table 83:

Period	Feature	Context	Sample	Thornback	Eel	Clupeid	Salmon	Cyprinid	Pike	Stickleback	Flatfish	Indet	Total NISP
3–5	posthole	6776	289		1							2	3
3–5	pit	6796	292									1	1
3–6	posthole	6466	273									4	4
4	pit	6403	264		2							1	3
4	oven	6862	365						1				1
4	oven	6863	366									2	2
4	pit	6876	373									8	8
4	pit	6885	418		1								1
4	oven	6921	314					1					1
4	oven	6950	316					1					1
4	posthole	6987	322									1	1
4	linear	7065	341		3							4	7
4	posthole	8558	401		1								1
5	quarry pit	6561	285		1								1
5	oven	6575	279						1			5	6
5	pit	6583	274					1				2	3
5	pit	6600	278		55		1					4	60
5	oven	6830	293		4						1	2	7
5	oven	6843	296		1							1	2
5	pit	6897	308		1							2	3
5	pit	6901	310									2	2
5	oven	6902	305		1								1
5	pit	6918	311									1	1
5	layer	7204	433					24				2	26
5	layer	7246	437					3					3
5	floor	7255	440		1	1						1	3
5	oven	7266	450			1							1
5	linear	8718	393		4								4
5	pit	8892	432		48				8			12	68
5–6	layer	6836	294									1	1
5–6	layer	7193	364									1	1
5–6	pit	8706	391		3								3

Period	Feature	Context	Sample	Thornback	Eel	Clupeid	Salmon	Cyprinid	Pike	Stickleback	Flatfish	Indet	Total NISP
5–6	well	8762	407									1	1
6	pit	6378	262		7	4			1			20	32
6	quarry pit	6491	313									2	2
6	quarry pit	6592	330									2	2
6	quarry pit	6745	326		4			2				8	14
6	robber pit	6823	298					2				2	4
6	robber pit	6943	451									10	10
6	quarry pit	6962	319									1	1
6	quarry pit	7050	331		1							2	3
6	quarry pit	7057	338		1								1
6–7	pit	6840	300		3			1					4
6–7	pit	8655	392		1							3	4
6–7	pit	8658	387					1					1
6–7	pit	8662	390									1	1
8–10	posthole	6395	265									6	6
10	ditch	2556	411		1	2							3
10	ditch	2556	425	1									1
10	ditch	2557	425							4		2	6
10	ditch	8544	348									1	1
10–12	ditch	15199	54									1	1
13	pit	6889	420			1							1
13	pit	7035	325									6	6
13	pit	8720	394		5								5
		total NISP		1	150	9	1	36	11	4	1	127	340
		%		<1	44	3	<1	11	3	1	<1	37	
		% excl indet		<1	70	4	<1	17	5	2	<1		

Table 83: Fish bone species by phase and context

Table 84:

Phase	Feature	Context	Sample	Amphibian	Reptile	Bird	Smm	Mamm/bird	NISP
3–5	posthole	6776	289	1				1	2
3–6	posthole	6466	273					1	1
4	oven	6950	316				1		1
4	linear	7065	341					2	2
5	pit	6583	274					1	1
5	pit	6600	278					2	2
5	pit	6897	308			1			1
5	layer	7204	433	1					1
6	pit	6378	262	2		1	2	15	20
6	quarry pit	6745	326	1		2	3	9	15
6	robber pit	6823	298		1				1
6	robber pit	6943	451	1				3	4
6	quarry pit	7050		1					1
8–10	posthole	6395	265	1					1
10	ditch	2557	425	1					1
Total				***9***	***1***	***4***	***6***	***34***	***54***

Table 84:Other small bones by phase and context

Human bone

Gaynor Western

Three contexts from negative features contained human remains. The articulated remains of a skeleton 8853 were contained in a pit-like feature (8677) identified as a grave (CG 1105). Context (8659) was an upper fill of a pit into which a well had been cut (AU 524), and contained a single disarticulated element. Disarticulated elements were found in the primary fill (8892) of pit 8876 (CG 1051). A disarticulated human bone was also recovered from a further context (8802), consisting of tillage soil surrounding a stone malting oven (CG 1049). These contexts are all thought to date to the Roman period.

Completeness of the human remains

Skeleton 8853 comprised associated skeletal elements representing the remains of one individual deposited in an articulated state. Elements present included a small fragment of skull (temporal bone), the proximal (upper) portions of left and right humerii, the left scapula, eight vertebral bodies (one cervical, three thoracic, three lumbar and one sacral), 23 vertebral arches (some fragmented), six ribs (three left and three right) and one right femur. No dentition was present. Approximately 40% of the skeleton was preserved and was categorised as 25–50% complete. Few elements containing a high proportion of the more fragile cancellous (spongy) bone had survived.

Only one skeletal element was found in each of the contexts 8659 and 8802. Context 8802 contained one left femur while one right tibia was present in context 8659. These remains represent elements deposited in a disarticulated state, likely to have been re-deposited from other disturbed features, such as pits or graves.

Context 8892 contained two seemingly associated elements, one left femur and tibia. Given the lack of further associated human skeletal elements, it is probable that these were also deposited in a disarticulated state, re-deposited from a disturbed feature.

Condition of the bone

The condition of the bone was assessed macroscopically and was generally well preserved in all contexts. Some erosion to the distal ends of the long bones was noted in skeleton 8853 and some post-deposition damage had occurred to the more fragile elements, such as the ribs and scapula, leading to their fragmentation. The ends of the long bones from context 8892 had undergone post-deposition damage, causing them to be incomplete. All the skeletal remains were categorised as being in ‘good’ condition.

Sex determination

The sex of the individuals present could not be assessed due to all the skeletal elements present being identified as sub-adult.

Age assessment

Age assessment of skeleton 8853 was carried out using metric analysis of the left scapula and right femur, both elements being sufficiently preserved to allow measurements to be taken. Assessment of age from dental eruption and development was not possible due to the lack of dentition present. This indicated an age of death at around 40 weeks old. This individual was therefore categorised as a neonate (0–1 month).

Metric analysis was also undertaken on the disarticulated elements present in contexts 8659, 8802 and 8892 where preservation was suitable. The tibia from context 8659 suggested an age at death of 38–40 weeks and that of the femur from context 8802 indicated an age at death of 36–8 weeks. Both elements were classified as belonging to neonates.

The metric analysis of the femur present in context 8892, however, was clearly indicative of an older child. The distal end, or metaphyseal area, of the femur had sustained some damage but the measurement taken of the bone present suggested an age of approximately 3–4 years old to be taken as a minimum estimate. This individual was, therefore, categorised as a child (1–5 years).

Non-metric traits

No non-metric traits were recorded due to the very young age of the individuals present.

Stature and morphometric analysis

Stature was not estimated due to all individuals being of sub-adult age and no morphometric analysis was undertaken.

Skeletal pathology

No skeletal pathology was present.

Dental pathology

No dental pathology was observed due to the lack of observable elements.

Summary

The remains of four individuals were excavated from the site. The bone present was well preserved though some fragmentation had occurred as a result of post-mortem damage. All the remains represented sub-adults; three individuals were identified as neonates and one as a child. Based on the metric analysis undertaken, the disparity present between the size of the disarticulated neonate elements present in contexts 8659 and 8802 and those present in articulated skeleton 8853 suggests that they do not originate from this latter individual. Furthermore, the disparity in size observed between the disarticulated elements themselves suggests that these also belong to separate individuals. The age of the 'neonates' spans from 36 to 40 weeks, suggesting that these individuals were peri-natal; it is not possible from the osteological evidence to infer whether these babies were stillborn or whether they died shortly after birth. Previous evidence of burial practice for infants and neonates in Worcester (eg King's School; Brown and Wichbold 1991 or Deansway; Dalwood and Edwards 2004) indicates that remains could either be treated in a similar fashion to adults, with interment in a formal cemetery, or that they could be deposited in seemingly more secular contexts such as ditches and rubbish pits.

Variation in the post-mortem treatment of neonates and infants in Roman Britain is subject to much debate, particularly in light of the analysis of a large number of peri-natal human remains at Yewden villa, Hambleden, Buckinghamshire where the high proportion of deaths of infants at or around the time of birth has been suggested as indicative of the practice of infanticide (Mays and Eyers 2011). A comprehensive analysis of Roman burials from the South East of England, however, indicates that 22.3% of all burials containing remains that could be assessed for age at death were identified as neonate (Smith nd), a figure consistent with and in some cases lower than other skeletal and historic populations (Chamberlain 2006). The survey also found that in comparison to the 22% of burials from nucleated settlements and 21% of burials from farms, 77% of burials from villas contain the remains of neonates and infants (Smith nd). Three major deposits of infant remains in Roman Britain occur within infant 'cemeteries' at villa sites (Yewden, Barton Court Farm and Keston); other infant remains at villas are deposited in small numbers and are dispersed in and around the villa and its outbuildings (Smith nd). One infant excavated from Yewden villa exhibited cutmarks on the right femur, suggesting that the practice of embryotomy had been undertaken in the case of an obstructed labour by a dead or dying foetus (Mays *et al* 2014); in context of the large numbers of perinates found there, this perhaps points to the villa forming a base for the administration of obstetric medical aid.

At other settlement sites across the country, such as Baldock (Hertfordshire), Woodcuts Common (Dorset), Poxwell (Dorset), Radwinter (Essex) and Porchester Castle (Sussex), infant remains have also been discovered in ditches, gullies and rubbish pits (Brødholt 2012). It is likely in these cases that the age of the infant was a significant factor in its post-mortem treatment. For example, an analysis of the infant burials from the Roman Lankhills cemetery, Winchester by Brødholt (2012, 40) illustrates that children over 2 years old were more likely to receive visible grave goods whereas neonate and infants were much more likely to be buried without any visible items.

Geoarchaeology: cores and monoliths

Keith Wilkinson, Phil Marter, Nick Watson and Suzi Richer

As presented above (Methods), geoarchaeological assessment was carried out across the site during different stages of work, detailing formation processes through a number of different periods. Geological deposits are discussed in Structural analysis and the results presented here reflect geoarchaeolgical information from site periods with an anthropogenic influence.

Period 2 Prehistoric onwards

Three monoliths <52>, <50>, and <41a> sampled fills of what are believed to be late Prehistoric and early Roman palaeochannels that drained the floodplain east of the main river. The later fills all contained cultural material, particularly metal working detritus which may have been deposited in the fill of the channels and levelled the floodplain surface in the Roman period. A fourth monolith (<41b>) sampled only the basal fill of a palaeochannel and did not contain any cultural material which suggests these palaeochannels were active before recognisable human occupation on the floodplain. A Roman ditch was sampled by monolith <46> and it too shows the same pattern as the palaeochannels: an early alluvial fill followed by a later anthropogenic deposit of metal working waste, in this case deposited into the re-cut ditch. The presence of an alluvial fill in the base of the ditch implies that it served as a drainage ditch and was perhaps dug for this very purpose, improving upon or at least augmenting the network of palaeochannels on the floodplain.

Period 3 Early Roman (late 1st – early/mid-2nd century) onwards

Although the lower part of the Elmore Member formed in the prehistoric period, the upper part of the Elmore Member observed in the boreholes, ie the floodplain facies, contained reasonably large quantities of Roman material, including distinctive beds of iron-working slag. The floodplain strata underlying the archaeological deposits of Roman date indicates that the River Severn had migrated westwards to its present position, which therefore permitted the Roman occupation of the floodplain to the east.

The archaeological material observed in the boreholes and monoliths suggests human activity occurred across much of the western and northern part of the site in the Roman period. Meanwhile, floodplain deposits and layers of deliberate human deposition are more mixed in the southern and central parts of the site, suggesting that the southern area was more still more prone to flooding. The southern area is also likely to have included a stream channel, demonstrated by the sloping terrain and the presence of organic rich floodplain deposits, both indicative of the margins of a slow flowing stream.

Period 6 Later Roman (early–late 4th century) and Period 7 Post-Roman (5th – 9th centuries)

'Made ground', or deposits formed by human action, were observed in the boreholes covering the whole site. This deposit varies in thickness from 1.5–5m, with the deepest deposits occurring in the southern part of the site. The deposition has had the effect of evening out natural topographic ‘lows’. In eastern areas of the site the lowest levels of made ground included Roman and post-Roman layers.

Period 9 Medieval (11th–15th centuries) onwards

In the southern part of the site, monolith <426> sampled fills of the medieval and Civil War fills of the city ditch that had been cut through the Sidmouth Mudstone Formation. The early fills are fluvially reworked sandy silt/clay derived from the bedrock and are indicative of running water. With the passage of time the ditch silted up as can be seen from the presence of black organic mud comprising the later fills. Through put of water was intermittent and the ditch would probably have contained isolated ponds of stagnant water for much of the year.

Period 11 Late post-medieval (mid-18th–19th century) to Period 12 Modern (19th–20th centuries)

Whereas deposition to level out topographic ‘lows’ occurred in the eastern part of the site during Roman times, in the western part this was taking place in post-medieval and modern times, with the lowest levels in this area being predominantly comprised of 19th and 20th century material.

Geoarchaeology: soil micromorphology

Richard Macphail, John Crowther and Suzi Richer

The soil micromorph analysis was undertaken on samples from two layers of ‘dark earth’ in the southern half of Area 1 in close proximity to the structural remains of the stone malting oven (CG 1049; see Table 85).

Period 5 Roman (early/mid-3rd century to early 4th century)

A ‘dark earth’ appears to have first developed as a bioworked soil formed in a truncated alluvial sand and gravel subsoil. This became moderately enriched with small amounts of settlement waste, including burned material, such as clay and iron slag, presumably mainly of Roman age and typical of Worcester (cf Deansway; Dalwood and Edwards 2004). The anthropogenic inclusions from context (8882) are sand-size compared to the coarse material found at Deansway (Macphail 2004), suggesting that it may be tertiary waste disposal. The occurrence of small amounts of coprolitic and phosphate nodules, of faecal origin, probably account for the raised phosphate levels. There is no obvious evidence that these are cultivated plaggen-like anthrosols seen at some urban Roman, early medieval and medieval sites (Devos *et al* 2009; Galinié *et al* 2007; Macphail 1994a).

Moving upwards however, context (8882) becomes increasingly stone-free and biologically homogenised. Due to the lack of lime-based building material and/or ashes compared to some London sites (eg Macphail 2003; Macphail and Linderholm 2004), this is probably indicating natural dark earth soil formation; here as a totally decalcified brown earth. The homogenous nature of the soil indicates a period of stasis and soil weathering between the late 1st to late 3rd century and the later Roman activity. This is not unusual, and has been recorded elsewhere, such as at Winchester and Whitefriars, Canterbury (Ford and Teague 2011; Macphail 2010; Macphail and Crowther 2007; Macphail *et al* 2005).

Period 6 Roman (early 4th century to late 4th century)

Renewed middening of tertiary waste formed context (8856). This included more burnt material, such as ubiquitous small sized iron slag, coprolitic bone and phosphate nodules, which sometimes enclosed phytoliths. These nodules may have originated from a latrine 'nightsoil', although experiments have shown that they can also result from keeping pigs (Macphail and Crowther, 2011). It should also be borne in mind that secondary phosphates can form due to a multitude of reasons (Goldberg and Macphail 2006; Thirly *et al* 2006). The inputs from middening help explain the strongly enhanced magnetic susceptibility results and the overall peak in phosphate enrichment. Again, as in context (8882), the dark earth becomes more humic and biologically homogenised upwards, and phosphate fractionation suggests that phosphate additions have not originated solely from inorganic 'bone'. The presence of traces of preserved amorphous organic matter, possibly from dung in the soil, may indicate that domestic animals were managed on grazed wasteland at The Hive site. Late Roman/ early medieval grazing was identified as a land use at Deansway, as well as at Whitefriars, Canterbury, for example (Greig 2004; Macphail 2004; Macphail and Crowther 2007).

Summary

It is possible that this area of Worcester may have been something of a late Roman brownfield site when the malting oven (CG 1049) was constructed. It is not completely clear from this one sequence exactly what was happening on site during the use of the drying oven, but some hearth residues did become incorporated into the dark earth. These residues included soil material with anomalous reddish clay textural pedofeatures, which elsewhere have been associated with the weathering of fire debris; a Roman corn drier at Hethersett, Norfolk is one example (Macphail and Crowther 2005). The dark earth itself was then 'sealed' by a spread of constructional waste or demolition material composed of lime mortar/plaster, burned constructional clay and charcoal. This 'sealing' spread formed the uppermost part of context (8856) and may be demolition material from the oven, or more conjecturally, it may have produced a hard-standing or a raised surface ahead of further, but unrecorded, construction.

Table 85:

Sample no	Depth (mm)
M421A	0–80
M421B	60–140
M421E	120–200
M421C	180–260
M421D	240–320
M421F	300–380
M421G	360–440

Table 85: Sample numbers and depths sampled for soil micromorphological analysis

Scientific dating

Radiocarbon dating

Beta Analytic, SUERC, Nicholas Daffern and Suzi Richer

Results are presented in Table 86. The full radiocarbon reports are appended as Appendix 9.

Roman period dates

Sample (Beta-287692) submitted was from a single piece of waterlogged leather that was once part of a shoe. The shoe was found in the upper layer (context 6908) of the large Roman quarry pit (CG 1108). The radiocarbon measurement returned for this sample was 1850±40 BP, giving a calibrated date of cal AD 60–250, placing it firmly in the early Roman occupation of the area (Periods 3–4).

Sample (Beta-290593) was a piece of chestnut (*Castanea* sp.) charcoal. The charcoal came from the lower context (7050) of the large Roman quarry pit (CG 1108). The radiocarbon date for the sample was 1760±30 BP, giving a calibrated date of cal AD 210–380, placing it within Period 5 (early/mid-3rd century–early 4th century), the main period of urbanisation.

Sample (SUERC-38442) returned a date of 1865±30 BP, providing a calibrated date of cal AD 70–230, the early Roman occupation during Periods 3–4. The sample submitted was from context (28115) in Trench 28, situated at the riverside. Extant bark was present on an oak post thought to have been used as a mooring post on the historic waterfront; the sample sent for radiocarbon dating was taken from this post.

Post-medieval/modern period date

Another sample (Beta-288284) submitted for dating came from a piece of maple (*Acer* sp) wood. The radiocarbon date returned for this sample was 210 ± 40 BP, giving a calibrated range of cal AD 1640–present, which would place this context as being post-medieval/modern. The wood was found in the upper surface of context (6597), the fill of post pad cut 6598, associated with the late Roman aisled building (Period 6; AU 508). However, the context was in turn cut by post-medieval pit.

Summary

Period 3 Early Roman (late 1st – early/mid-2nd century) to Period 4 Roman (mid-2nd – early 3rd century)

Oak is usually avoided for radiocarbon dating because of its potential for longevity (up to 1000 years). However, in the instance of the sample submitted from the riverside (SUERC-38442), the presence of both extant bark and central rings on the post has meant that the age of the tree at death was determinable to ~40 years. Therefore, due to the relatively short life of the tree, the radiocarbon date is considered to be reliable.

The second date from this period (Beta-287692), from the piece of leather, is likely to be from a redeposited fill (see Period 6 discussion below). Despite this, both dates suggest that at least two different activities were occurring during this period; riverside construction work (SUERC-38442 – the wooden post) and disposal of waste material in this area (Beta-287692 – the piece of leather).

Period 6 Later Roman (early 4th to late 4th century)

The Roman dates from the large marl quarry pits (Beta-287692 and Beta-290593), which are thought to have once been conjoined, provide more information about the use and life of the pits. Stratigraphically, the pits are thought to have been dug in the 4th century. The date obtained from the upper layer of pit 6749 (Beta-287692), 1st – mid-3rd century, is from prior to the digging of the pits, which could indicate that the pits were filled with older material rather than material contemporary with their excavation. In addition, the radiocarbon dates closely match those provided by the pottery dating for these contexts. This would lend weight to the interpretation that the pits were back-filled with waste from other areas, therefore accounting for the earlier radiocarbon date.

However, some dumping/mixing that is contemporary with pits may also have been occurring as the second Roman date (Beta-290593) is from a later period (early 3rd century –mid-4th century), but was found stratigraphically *below* the earlier date (Beta-287692 of 1st –mid-3rd century).

Period 11 Late post-medieval (mid-18th–19th century) – Period 12 Modern (19th–20th centuries)

The erroneous result produced by material retrieved from the later Roman post-pad of the aisled building (BETA-288284) can only be logically attributed to recent contamination (ie a timber stake driven downwards), either associated with activities in the garden of Netherton House in the late 18th and 19th century, or in the Worcester City Council depot in the mid-20th century.

Archaeomagnetic dating

David Greenwood and Cathy Batt

The archaeomagnetic date ranges obtained from the two fired oven features sampled are:

- Context 6364 (CG 1019): AD 990–1250;
- Context 6365 (CG 1070): AD 110–560 or 1200–1324 or 1360–1608.

In archaeomagnetic dating it is sometimes necessary to give multiple date ranges as the earth's magnetic field has had the same direction at different times in the past. However, the available archaeological evidence is usually sufficient to select the most probable range and if both features were last in use at the same time and the magnetic directions are reliable, they can be combined to give a single date of use. Following those assumptions, the combined date for both ovens is AD1080–1260 or 1500–1550, which is a significant discrepancy between the results and the expected Roman date as indicated by the archaeological evidence.

The date produced for context 6364 indicates last heating in 11th to mid-13th century. Context 6365 could have been last used in 2nd to mid-6th century but a date of 13th century or later is also possible. Therefore, context 6365 could be Roman in date, but context 6364 appears to be significantly later. There are two main possibilities regarding these results: firstly, that both features record the magnetic direction accurately and the features are significantly later that the date indicated by the archaeological context; or possibly that context 6365 is Roman as expected but context 6364 has undergone significant post-firing disturbance which has rendered its magnetic direction inaccurate.

Table 86:

Context number and depth	**Laboratory code**	**Material**	***δ*13C (‰)**	**Conventional Age**	**OxCal calibrated age (95.4% probability)**
6908	Beta-287692	Leather	-23.8	1850 ± 40 BP	cal AD 60–250
6597	Beta-288284	Wood: *Acer* sp wood	-27.7	210 ± 40 BP	cal AD 1640–present
7050	Beta-290593	Charcoal: *Quercus/ Castanea* sp	-23.8	1760 ± 30 BP	cal AD 210–380
28115	SUERC-38442	Wood: *Quercus* sp	-28.3	1865 ± 30 BP	cal AD 70–230

Table 86: Radiocarbon results

Discussion

Geoarchaeology and topography

Suzi Richer, Nicholas Daffern and Richard Bradley

The geoarchaeological stratigraphy of the site falls into three categories, with the earliest deposits being sandstones and mudstones from the Triassic Sidmouth Mudstone Formation (formerly known as the Eldersfield Mudstone Formation) at between 16 and <7m OD. These are overlain by bedded sands, silts and cultural layers that are part of the late Quaternary Elmore Member (Severn Formation; Maddy 1999), the top of which can be found at between 14.5 and 11.7m OD. The upper layer is composed of 'made ground', deposits that have built-up during the historic period. Overall, the site now slopes gently downwards from east to west from 18 to 14.5m OD; the slope was originally far more distinct and also incorporated a north to south gradient, but deliberate infilling of the lower areas since Roman times has smoothed the topography.

This topography has been heavily influenced in the past by the River Severn, currently situated approximately 150m to the west of the site. Throughout the Quaternary period the river has down-cut at least 11m and migrated westwards by over 100m. The fact that the Severn has moved from its location on the 2nd Worcester Terrace to its present location is not unusual. It is generally accepted that terraces such as this were formed by a combination of processes, primarily the uplift of land throughout the Quaternary and the subsequent need of rivers to adjust to this movement by down-cutting (Maddy and Lewis 2005). The cumulative effect is the presence of old terraces, or river beds, located above present river systems.

From the Devensian Late Glacial (Upper Palaeolithic; *c* 13kya) and throughout the Holocene (Mesolithic to today; *c* 10kya onwards) the alluvial deposits of the Elmore Member formed the infill of a major channel. These deposits are comprised of both channel and floodplain facies, indicating that the channels of the river once flowed over the site and also that the area was subject to flooding. However, these deposits also become shallower sloping southwards, suggesting the presence of an east to west aligned channel in either Area 2 or the southern half of Area 1; a stream noted as running along the south and west of the site could have been responsible for reducing the depth of the Elmore deposits in this area (Miller *et al* 2008; as identified in Richardson 1956a, 50). Alternatively, another channel running closer to the main part of the site may have once existed. This depression may explain the demonstrable height change between the higher ground inside the city wall and that external to it.

Exact dating of the Elmore Member is problematic. The present report (Ecofacts and Appendix 2) has shown that the upper layers were still being laid down as flood deposits in the Roman period. Work in the wider Severn Valley, at Clifton Quarry (9km south of Worcester), has dated two layers of alluvial deposition to the middle of the first millennium BC and to the 8th century AD using optically stimulated luminescence (OSL) dating (Jackson *et al* 2011). This suggested that a major period of floodplain and river channel change occurred during the mid–late Holocene (*c* 4500–2500 BP) as a result of an increase in fine sediment supply, probably related to woodland clearance and cultivation. This correlates with other research that has indicated a general increase in flooding in river valleys across Britain, with consistent episodes at various points in the Iron Age attributed principally to worsening climatic conditions and probably exacerbated by changes in agriculture and land use (Macklin *et al* 2005, 939–42, table 1). Alluvium at Newport Street to the south also fits into this broad pattern of later prehistoric alluvial accumulation that may also have continued into the Roman period (Dalwood 2015a, 230–31). The first millennium BC date from the wider Severn valley is potentially relevant for The Hive, in that this is also likely to be the main period of channel incision, abandonment and alluviation on the site. The primary fill of a palaeochannel on the floodplain (CG 1000) contained artefacts from the early Roman period, suggesting that the channel was cut in the late prehistoric period or very early Roman period. The basal fill of this feature certainly suggested that the palaeochannel was active before recognisable human occupation on the floodplain.

The exact date when alluviation of the floodplain began at Worcester is, however, unknown. The earliest stratified date from the alluvium in Worcester is presently an early Neolithic date of 3640–3500 cal BC and 3440–3380 cal BC (Beta-281895; 4750±40 BP) from channels on the Worcester Arena site (Daffern 2016), located to the western side of the current River Severn, but firm evidence has been difficult to identify due to various reasons:

- The river is a dynamic landscape. Alternate flooding and channel cutting has caused alluvial deposits to accumulate and then to be eroded, meaning that deposits may no longer exist, be deeply buried or have been re-deposited;
- Engineering works for improvement of navigation in the 19th century, including canalisation of the river from 1842 and the construction of locks (eg Diglis in 1844), raised the river to a consistent level, so providing a connection to the canal network at Worcester and Stourport (Richardson 1964). It also allowed urban expansion over the floodplain which therefore both sealed and truncated earlier deposits. This is attested by the Worcester Arena site, where over 4m of post-medieval and modern overburden has been recorded (Daffern 2016);
- A lack of archaeological work on the floodplain, partly due to the limited number of opportunities for development-related investigation.

The combination of these factors has meant that ascertaining the history of the floodplain prior to the Roman period is problematic, but more information from borehole data potentially offers the best chance of refining the dating of the Elmore Member alluvial deposits and understanding the development of the prehistoric floodplain around Worcester in the future.

The site in its landscape context

Suzi Richer, Richard Bradley and Elizabeth Pearson

The river has played a major role in the landscape; whether as a means of transport, a boundary, a resource, a danger and disruption (when flooding occurred), or a constraining/ enabling factor on the type of vegetation that was able to grow close by. It is therefore important to understand how the river in the past differed from the river as it appears today.

As mentioned above, the modern form of the river is a product of Victorian canalisation. Before this, the Severn was described as a ‘free river’, where natural outcrops of rocks (rockbars) existed alongside sand and gravel shoals (Richardson 1964). In some areas just above Worcester the presence of these features, and the fact that river was less ‘contained,’ meant that the depth of water rarely exceeded 0.45m. These areas became natural crossing points, but also hindered river traffic. With industrialisation came the need to remove these river bed obstacles, channel the river to increase its depth and install locks to maintain a permanent depth of water.

The Roman landscape

The landscape close to The Hive site during the Roman period would have been dominated by the 'free river', and the presence of the possible mooring post (CG 1206; found in the Trench 28 *c* 20m from the river edge) indicates that the main channel of the Severn was probably in much the same position in the Roman period as it is today. The position of the river has been considered previously (eg Morris 1974) and it is thought that from the late Holocene the location of the channel was relatively stable and therefore a key factor in the establishment of the settlement at Worcester on the adjacent gravel terrace (Dalwood 2015a, 229). Given the shallow nature of the river at this time, navigation would have been difficult (but aided by tidal rises or in times of heavy rainfall in the catchment) and required knowledge of the waters and shallow-draught riverboats (Dalwood 2015a, 230).

Palaeochannels and Roman activity on the floodplain

Linsdale Richardson undertook and observed a range of geomorphological investigations in the city during the 1950s and 60s and suggested that a series of gullies and streams previously ran from the gravel terrace onto the floodplain (Worcester City Council 2007, 14). At The Hive, a network of palaeochannels has been seen running both towards and alongside the river and draining the eastern bank, seemingly supporting Richardson's observations.

This area of the floodplain was being used around or prior to the 2nd century, as evidenced by the presence of a series of pits located between the palaeochannels containing finds from the 2nd century (CG 1112; Structural analysis). It is possible that the alluvial clay was being 'quarried' on a small scale and then the pits were filled and levelled with sometimes substantial deposits of slag and waste material that included pottery. The top levels of the palaeochannels also contained large quantities of Roman material (from Periods 4–5), including distinctive beds of iron-working slag, and they appear to have been deliberately infilled in order to make this area accessible and therefore useable.

The work of Richardson (1965) also suggested that marshy conditions existed from Diglis to Sidbury Bridge, in the southern part of Worcester, which has been somewhat supported by a borehole survey at Diglis Docks (Champness 2006, 11). Findings from that study show that the area was subject to seasonal flooding, which would have rendered the area too wet for permanent settlement from the late Iron Age/Roman period. It can be inferred that the presence of small watercourses and areas of marshy ground would have made it difficult to move across the floodplain during the early Roman period. Indeed, the palaeochannels in Area 3 at The Hive remained open at this time and were up to 7.5m wide. Excavations at the Worcester College for Further Education in 1957, just off Copenhagen Street 200m south of the site (and less than 90m from the modern waterfront), found stakes and brushwood from the same level as Roman pottery and iron slag (Gelling 1958). The interpretation presented was that these were causeways for crossing a large ditch, although later observation in 1959 suggested that the ditch was actually a natural watercourse filled with alluvial silt (Richardson and Ewence 1963, 234).

It is amongst this growing body of evidence for Roman activity across the floodplain that the deliberate infilling of features and small-scale pit digging found in Area 3 sits, apparently reflecting an attempt to utilise the floodplain at this time. The implication is that it was not simply wet meadowland used for grazing livestock in the Roman period, but was the focus of a range of activities. How extensive these activities were, or even how successful the attempted management of the floodplain was, remains open to debate, as slag layers in Area

3 were seen to be overlain by flood deposits of alluvial clay containing Roman pottery. Similar evidence was observed at Newport Street, where continued alluviation was dated to the late 2nd to 3rd century (Dalwood 2015a, 230–31).

Slag dumping as land reclamation during the Roman period

That the eastern side of the Severn has been subject to flooding throughout the Holocene is undeniable, but it appears that the Roman period marks the first (known) attempt by people to overcome the marshiness and the network of palaeochannels that would have made the waterfront largely inaccessible. The control of wetland zones, through drainage and land reclamation, has been noted across the Roman world, eg Pontine Marshes, Italy (Walsh *et al* 2014); Somerset Levels (Rippon 2000) and observed on the lower lying areas of a number of riverine sites (eg the Thames at Southwark; Cowan *et al* 2009). In Worcester, the main form of wetland control appears to have been land reclamation through the deposition of layers of iron slag. This would have constituted a substantive landscape feature in the Roman period and fundamentally altered the way that people used and moved around the floodplain.

Layers of compacted iron slag have been seen extensively across the floodplain in Area 3 and also closer to the river (Trench 28), with thicknesses of up to 0.2m and 3m respectively. The deposits from Area 3 (Trench 15) appear have been used for levelling/raising the ground surface, which would have then allowed for use of the floodplain (Sworn 2009). It is likely that the slag deposits dating to the 2nd and early 3rd centuries and forming part of the river bank in Trench 28 also provided a stable and raised land surface. In the wider area, slag has been seen in a borehole from Worcester Arena, approximately 100m from the western bank of the river, with thicknesses of up to 0.27m (Daffern 2016). Land reclamation using slag also occurred at the City Campus site to the north, in this case enabling Roman occupation of the floodplain from the 3rd century onwards (Sworn *et al* 2014). In addition, similar late 2nd to early 3rd century deposits of metalworking slag are known from Newport Street 100m to the south (Davenport 2015, 234).

Historical records detail that this slag layer was extensive, extending to the north of The Hive onto Pitchcroft, where in 1796 it was still at least 5 feet (1.52m) deep and was visible in the river bank (Green 1796). More than a hundred years prior to this Andrew Yarranton was known to have exploited this resource (quoted in Richardson 1956b):

> …about twenty eight years since [ie about 1653] Mr Yarranton found out a vast quantity of Roman Cinder (near the Walls of the City of Worcester) from whence (he and others) carries away many thousand tunnes or loads up the River Severn,…and within one hundred yards of the Walls of the City of Worcester, there was dug up one of the Roman foot-blasts; it being then firm and in order, and was seven foot deep in the earth, and by the side of the work, there was found a pot of Roman Coine…

Furthermore, a Chamber Order dated 30th September 1653 was headed *Digging Synders in Little Pitchcroft*, which stated (quoted in Richardson 1956b): '…and they shall not dig or break up the Causeway leading from the Butts to St Clements Gate'.

The amount of slag (referred to above as 'Cinder' and 'Synders') within the vicinity of the site was enormous and supports the evidence from elsewhere suggesting that the northern suburb of Roman Worcester was dominated by the processes of iron production (Worcester City Council 2007, 21), although it is likely that the entire settlement was affected by this industry in some way. The deposits probably dominated the wider landscape and the extent of these alludes to a degree of organisation in their accumulated deposition. The decision to position the waste along the eastern bank of the Severn in the northern part of the city would require management, in terms of planning and controlling a workforce, rather than simply being allowed to organically develop through individual waste disposal. Given the scale of production (inferred from the amount of waste product), the industry as a whole, which undoubtedly involved numerous enterprises, may have been under some form of overarching control, potentially by a civic authority or a small social elite. Questions still remain as to the nature of mineral exploitation, social organisation in trade and industry, and how intensive and systematic this was in Worcester, across the wider midlands and throughout the ancient world (see Esmonde Cleary 2011, 129–44; Robinson 2005, 88–105), but this evidence may offer an important contribution towards producing a fuller understanding of resource mobilisation in this area in particular.

The Chamber Order quote is also of particular interest because it suggests that some of the slag (‘synders’) formed a ‘causeway’ around the area of The Butts, a term usually employed to mean a route built up to allow access over water or low-lying wet ground. A ‘causeway’ was present in the medieval period (Baker and Holt 2004, 193) and suggests that there was a raised surface to cross the wetland, perhaps having been built using readily available Roman slag. This later pathway is what is being referenced in the order, but it may indicate that it superseded the hypothesised Roman crossing across the river, perhaps located in the vicinity of the southern part of the site on the same alignment. Daffern (2013) has previously raised the possibility that slag deposits from the riverside area mark the location of a bridge crossing the Severn, supported by the observation of slag without any associated industrial working on the opposite side of the river. Given that this information from the west bank was only retrieved from limited borehole work ensures that this potentially significant discovery remains tentatively located and slightly speculative however. Evidence from Newport Street, where a metalled road was revealed leading towards the river and possibly a ford close to the medieval bridge, may be more convincing (Dalwood 2015b, 232). What can certainly be inferred, as with all riverside settlements, is that a river frontage would have been focused around any crossing point and that enterprises reliant on river transport would almost certainly wish to unload closest to such an arterial point for subsequent redistribution of goods.

The wider landscape

While the local landscape was dominated by the river and a vast expanse of slag, beyond this a relatively open landscape prevailed. Daffern (2016) has identified a period of clearance in the pollen data from Worcester Arena that is of a late Iron Age/Roman date. This sees an expansion of herbaceous meadow flora, similar to that seen in the pollen from Trench 28 at The Hive (Palynology) and also observed in the Roman period pollen sequence at Newport Street (Head 2015, 199–200). It is probable that few trees were growing in the vicinity, with the exception of occasional willow and alder in some of the wet flushes. From both the pollen and plant remains it seems unlikely that crops were being grown close by. This is unsurprising given that the area was subject to inundation, channelling and land reclamation. Instead, where the landscape was relatively stable, a flood meadow environment would have existed.

The post-Roman landscape

Despite Roman attempts to bring the landscape under control around The Hive by depositing vast layers of slag, this could not prevent the River Severn flooding, as evidenced by the presence of alluvial deposits overlying slag in Area 3. It is possible that this accumulation is of the same 8th century date as that identified at Clifton Quarry and dated using optically stimulated luminescence (OSL; Jackson *et al* 2011). Whilst the existence of the slag was still common knowledge, as in the historical accounts quoted above, it was no longer being added to in the post-Roman period. The landscape was being managed to a far lesser extent than in earlier centuries; the post-Roman pollen from Trench 28 suggests that there may have been some limited regeneration of woodland as the amount of tree and shrub pollen increases and the species diversity broadens.

Away from limited woodland regeneration, the landscape appears to have retained an open character, with some areas of disturbed wasteland. The presence of dung fungi both in Trench 28 and the city ditch would suggest that animal grazing was occurring locally, probably on the floodplain, in the very late Roman and/or post-Roman period. This was supported by the pollen from Newport Street, where grassland dominance was seen as potentially illustrative of livestock pasture from the later Roman period onwards (Head 2015, 200). Part of the pollen sequence there was also stratigraphically dated to the medieval period and suggested that the area developed a diverse herbaceous community, as well as patches of scrubland (Head 2015, 200). The overall picture is one of a wide floodmeadow used for the seasonal grazing of animals.

The area probably continued to suffer from periodic waterlogging, as suggested by the presence of the ‘Causeway’ in the area in 1653, although there was no indication of this flooding at The Hive comparable with the build-up of alluvial deposits dated to the 11th to 12th century seen at Newport Street (Dalwood 2015a, 231). Before the engineering works carried out to aid navigation in the 19th century, the river is thought to have been affected by tidal rises as far as Upton-on-Severn to the south of Worcester, which resulted in an increase of 0.45m at Worcester a few times in the year (Dalwood 2015a, 230). Moreover, at Newport Street, wild celery found in riverside deposits of medieval date suggests that at this time the river banks were affected by brackish water. Wild celery is generally found along coastlines and estuaries and its distribution regionally has been historically recorded along the Severn from Avonmouth, partly along the Avon, and, in particular, along the Droitwich Canal in an area of extensive brine deposits (Pearson 2015, 214). The Newport Street evidence therefore suggests that the river at Worcester has previously been affected by the tidal water reaching Upton-on-Severn.

The cartographic sources for the last 400 years give an impression of how the more recent landscape has developed. The Board of Health Inquiry report from 1849 describes the western side of the river as ‘…low, marshy and entirely undrained...’ (cited in Daffern 2016) and the first and subsequent editions of Ordnance Survey mapping label this area as liable to flooding. Doharty’s 1741 map and Young’s 1779 map appear to show the 17th century ditch found in Trench 15 (CG 1060) that was possibly a watercourse linked to the city ditch on the east side of the river. John Speed’s earlier map of the city (1610) does not show the detail from around The Hive, but it does show land use around the wider walled city. Arable fields are only marked to the east, which may explain why only low quantities of cereal pollen have been recorded from the 17th century ditch and city ditch. It also illustrates a line of trees on the western bank of the Severn, possibly following the line of a natural or cultural boundary, such as a small watercourse or track.

Prehistoric period

Richard Bradley

Limited prehistoric activity was mainly restricted to the floodplain and comprised the palaeochannels observed in Area 3, as well as a small number of lithics recovered as residual items within later contexts. The channels were broadly dated to the later prehistoric period by the presence of overlying Roman material. No other features could be assigned a prehistoric date and there was no direct evidence of prehistoric occupation.

The lithic assemblage was typologically characteristic of a broad Neolithic to early Bronze Age date (see Prehistoric lithics), similar to a small group from the City Campus to the north (Sworn *et al* 2014). Four of the lithics came from Roman pits across the main area of excavation (Area 1) and two were from the tillage soil. Such a small group of residual finds are difficult to interpret without associated features and give limited indication as to the origin of the material or the level of activity on site, but as they were relatively unabraded it does hint at prehistoric use of the area. It is likely that the low-lying area of the floodplain would have been used seasonally and that the river itself acted as a major resource throughout prehistory, attracting itinerant groups for hunting or temporary settlement. It is also possible that the material accumulated across the area during flooding episodes that transported material a short distance from earlier riverside sites further upstream. As discussed above, alluviation occurred on the west of the Severn from the early Neolithic onwards (eg at Worcester Arena; Daffern 2016) and dated sequences from elsewhere in the lower Severn valley (Jackson *et al* 2011) would suggest that major floodplain and channel change was occurring during the mid–late Holocene (*c* 4500–2500BP). This repeated inundation is demonstrated here by the primary fill of the eastern palaeochannel containing artefacts of early Roman date and appearing to have formed gradually, through natural processes, indicating channel formation and sediment accumulation during the first millennium BC and into the early Roman period in particular.

The prehistoric period in this part of Worcester was also reflected in the geoarchaeological analysis for the site, which supports the evidence elsewhere along the river. Alluvial deposits, comprised of both channel and floodplain facies, appeared to have infilled a major channel and indicated that earlier courses of the river and flooding episodes had occurred across the area from the Devensian Late Glacial and throughout the Holocene periods. Overall, therefore, and although there was limited evidence available, artefactual and environmental information have helped broadly characterise the floodplain throughout prehistory in this area.

Roman period

Richard Bradley, C Jane Evans, Elizabeth Pearson and Suzi Richer

Extensive Roman occupation and associated deposits comprised the majority of archaeological remains on the site. This was observed to have been of variable intensity across Areas 1 and 3, but was entirely absent to the south of The Butts (Area 2).

Occupation and land use

It is not clear how the area of the site was used before the mid-2nd century AD; there was no identifiable occupation dated prior to this, although an important factor in this apparent absence could be the controlled depth at which excavations ceased due the development impact level (over much but not all of the site). A small assemblage of finds from the roadside ditch (AU 501) hints at some early Roman activity in the vicinity however; the pottery was well preserved with high average sherd weights, suggesting deposition from nearby. Late 1st to early 2nd century AD pottery was also recovered from soils occasionally observed where the opportunity to excavate or record deeper deposits was presented. It is possible that these soils relate to agricultural use (AU 505).

The road

The main feature from the earlier Roman period was the 4m wide metalled surface (AU 550) with roadside ditch (AU 501) at the northern limit of excavation. The surface was aligned broadly east to west and is indicative of a road running down from the terrace towards the floodplain and the River Severn. The ditch was dated to the late 1st or early 2nd century AD and continued alongside the edge of the road, defining it on its southern side. It was one of the earliest features on site, with fills cut by and underlying later Roman features and deposits. Whilst only a limited extent was observed, the layered surface, overlain by material containing later 2nd century pottery and respected by an early Roman roadside ditch, appears to have been in use from the early to mid-2nd century onwards. Occupation alongside the road was particularly extensive from the mid- to late 2nd century into the early 4th century AD and suggests that it served as an important route leading to and from the riverside throughout the Roman period.

The alignment of this road can be traced through other archaeological fieldwork further east. Trench 2 of the original site evaluation (not included in the final fieldwork stage) located the edge of a cobbled surface in the far north-east corner of the site area (Sworn and Phear 2007); this was probably the same road as a surface found at 14–24 The Butts, which also exhibited an adjacent roadside ditch filled with 2nd century material (Butler and Cuttler 2011, 56–130). If the route did not divert from this alignment then it would continue to a potential junction with the main road leading to the north away from the settlement (found at Broad Street, Blackfriars and Farrier Street; see Barker 1969c, Mundy 1985, Dalwood *et al* 1994). This junction would probably be located towards the southern end of Infirmary Walk (see Figure 8).

The road is a newly identified aspect of the layout of Roman Worcester and important for understanding the development of the settlement. Whilst it is still difficult to identify a coherent layout for the road pattern, this may further demonstrate an identifiable and systematic construction methodology for the roads in the Roman town. The construction of the surface here, comprising earlier cobbles replaced or repaired with bedded iron slag, compares well with other examples of the road network in Worcester where iron slag is frequently used to replace cobbled surfaces during the later centuries of the Roman period (Worcester City Council 2007, 29–30). The road heading north was also cobbled in earlier phases, before being re-metalled with slag (Barker 1969c, Mundy 1985, Dalwood *et al* 1994). This is comparable to the sequence seen to the south-east during excavations at Sidbury, where the Roman road from Gloucester was formed of pebbles with overlying slag (Carver 1980a, 165–75; Darlington and Evans 1992), and small observations of the probable road from Droitwich found during work at Lowesmoor (WA 2014).

Secondary deposition of iron slag

It is becoming increasingly clear that social and economic organisation during the peak of occupation in Roman Worcester (probably financially and structurally linked to the prevalence of the iron working industry) was of a sufficient level as to be potentially co-ordinated by higher level decision making. This idea was postulated following the Deansway excavations, which had identified a regular 2nd century street pattern alongside occupation, and is perhaps suggestive of an expanding and increasingly complex settlement that required civic re-organisation (Dalwood and Edwards 2004, 47–48; see also Worcester City Council 2007 and Butler and Cuttler 2011). In this regard, it is well established that ordering of space was essential in the Roman world and civic planning in street and property boundaries was necessarily practical, hierarchical and enshrined in law (Perring 2002, 1).

Alongside the defined approach to road construction, further support for this assessment was found across the floodplain and down to the riverside. Firstly, as discussed above (The site in its landscape context), the quantity of the slag dumping on the floodplain likely dominated the landscape in this area and probably required planning and organisation in order to achieve this, rather than the material simply accumulating and being left in waste stockpiles adjacent to working areas. Secondly, the level of dumping along the eastern bank of the River Severn, incorporating iron slag deposits intermixed with stone rubble at least 3m thick, had been deliberately formed in this location (AU 551). Comparable build-up layers of slag material were also evident at Newport Street to the south (Davenport 2015, 234). This may explain the absence, other than being used for road construction, of large deposits of slag in the eastern areas of the town (eg at City Arcades, Sidbury and Lowesmoor), despite occupation and industrial processing there. Material could have been transported across the settlement to an area where it was required to develop the import and export elements of the industrial setup, such as the riverside, perhaps accessed by the east–west road. The slag at the riverside was used as a revetment or consolidation to create a stable area for off-loading goods or foodstuffs, possibly as a riverside jetty or quay, or purely as a firmer beaching area for vessels. This is also hinted at by the presence of the driven oak post, possibly for mooring, dated to the 2nd century. A location (or number of locations) would undoubtedly have been required for unloading iron ore, which probably originated in the Forest of Dean (although this is not proven; see Worcester City Council 2007, 41; Esmonde Cleary 2011, 129–130; Butler and Cuttler 2011, 81), and exporting pig iron and finished iron products, for which the River Severn would have been an obvious transportation highway.

Potentially, the evidence from The Hive may lend credence to the emerging hypothesis that organisational control, probably within a localised power base, dominated the decision-making processes in the town and forged a ‘Roman’ identity for the settlement as it grew in economic significance throughout the 2nd to 4th centuries AD. Perhaps parallels can be drawn with the Droitwich salt industry, where control of the economic output of the settlement was probably within the authority of a representative of the Emperor (Hurst 2006, 244). Although there has not been the discovery in Worcester of a clear high-status building comparable with Bays Meadow villa, there is some evidence for elite residences along the northern routes out of the settlement. It is likely that the wealth to support these properties came from the iron industry in Worcester.

Building along the roadside

The establishment of an accessible riverside area for industrial use could explain the extensive development of roadside occupation discovered on the site, with those working on the waterside perhaps providing a market for foodstuff products. The sealing of the early ditch running parallel to the road by Roman occupation also suggests that this was deliberately filled in so that the frontage could be built adjacent to the road, perhaps with occupants all vying for easier access to passing trade.

This occupation and associated activity to the south appears to have developed in a ribbon form, with the buildings fronting end-on towards the road. Surfaces with associated domestic and small-scale commerce and industry (wells, pits, waste dumping etc) were packed onto the land to the rear of the properties. In the earlier period of occupation (Periods 4 and 5), the buildings were small and rectangular in shape, built using clay and timber, with numerous internal ovens. Based on change in the form of these features, it is possible that, initially at least, the ovens or hearths in these structures served a more industrial purpose associated with ironworking, but that in a later form (mid-3rd century AD onwards) a new type was used for baking or smoking (AU 528, AU 503, AU 504, AU 518, AU 519 and AU 521).

The buildings are recognisable as small versions of 'strip buildings', which were commonly positioned along street frontages in Roman towns. Similar structures have been interpreted as commercial enterprises, traders or small workshops, probably with a domestic element to the rear or within internal sub-divisions (Todd 1970, 120–1; Rust 2006, 17). They are relatively typical of Roman 'small towns' and are often crowded closely together, suggesting that a high value was placed on the street frontage (Esmonde Cleary 1987, 182; Rust 2006, 17); the gaps between buildings are rarely more than 1m across (Perring 2002, 55). With the position of these buildings close to a road leading towards the river, and the frequency of clustered ovens or hearths within, the implication is that these were some form of small-scale commercial workshops supplying products to people either entering or leaving the town. The numerous coins from this site, the largest assemblage from Worcester and dating mainly to the later 3rd and 4th centuries, alongside the coins from the late Roman well at 1 The Butts may reflect a level of commerce in the vicinity (Napthan 2011a, 31). The significance of the later Roman coins from the Hive (and the well to some extent) is, however, uncertain; 33 coins came from two upper fills of the Period 6 quarry pits and may represent a dispersed hoard.

The construction of the buildings and the use of the ovens is explored in more detail below, but it is of considerable significance for the understanding of the Roman settlement that the morphology of this street frontage is indicative of a commercial function in this area. Given the known uses of similar structures from elsewhere in the Roman world, the buildings suggest that the adjacent road was an extensive thoroughfare, offering access to passing traffic and trade opportunities. There is, to date, no comparable zone known in Worcester (Worcester City Council 2007, 27). Limited evidence offered a suggestion that the road found at Sidbury, heading south towards Gloucester, also provided a focus for a possible strip building, but due to the extensive truncation of deposits associated with it this was a very cautious interpretation (Darlington and Evans 1992, 16). Thus, it can be argued that the Hive site has provided the evidence to transform the understanding of the character of occupation around the Roman town.

This can perhaps be considered alongside the vast amounts of smelting slag deposited in this area, the large number of ovens known to have been identified at the Magistrates' Court 330m to the north-east (unpublished; James Dinn pers comm), the identification of a barn where crop processing took place at the City Campus 130m to the north (Sworn *et al* 2014, 22), and the extensive amounts of charred cereal waste at both Farrier Street and 14–24 The Butts to the east (Dalwood *et al* 1994; Butler and Cuttler 2011), to develop a bigger picture as to the nature of occupation north of the main settlement. These sites suggest that a broad zone of commercial and small-scale industry developed in this area, probably as part of, and complementary to, the broad iron-working focus of the settlement (cf Barker 1969c; Jackson 2004a). It appears that this may have developed in a dispersed, piecemeal form, with pockets of more intensive occupation and other areas which were less developed. It is possible that in light of the inferred civic planning (represented by the use of iron slag in land management and road construction), that these areas were deliberately developed and located away from the main ‘urban core’ of the town because of the risk of fire from the numerous ovens and hearths.

The main use of the buildings was identified from the later 2nd into the early 4th century AD (Period 4–5). This is consistent with the dating of an increased density of occupation on surrounding sites and across the Roman town, when the settlement seems to have been at its peak (eg Deansway, Dalwood and Edwards 2004; City Campus, Sworn *et al* 2014). Outside the buildings, a series of surfaces surrounding the properties were laid down and repaired at various times during this period. To the rear, a cobbled layer (CG 1045) was probably linked to the east–west road by an alleyway between the buildings and to the east an area of hard standing formed from cobbles (CG 1041) was overlain with iron slag (CG 1098). External yards are a common feature on other sites that include possible strip buildings, generally to the rear (Burnham and Wacher 1990, 18). Numerous associated features, such as pits, small posthole clusters denoting insubstantial wooden constructions and a stone-lined well demonstrate the intensity of occupation in this area. The well probably serviced a number of properties and although not of the finest quality, considerable effort had been deployed in its construction. Alongside the sheer amount of object deposition, the repeated re-cutting of similar features in a localised area suggests a long-lived and well-used part of the Roman settlement. The extensive waste accumulation may suggest that there was also a disposal area further away from the roadside, behind the properties.

Roman land use probably also extended west and further towards the river than has previously been anticipated, with a series of intercutting pits identified on the floodplain and dated to the 2nd to 4th centuries. When these are considered in conjunction with the amount of slag dumping and levelling to create a useable area of land close to the riverside, it is clear that extensive activity took place across this floodplain area. Use of the floodplain in this way, alongside the possible quayside or landing area allowing trading river traffic to serve the settlement, may also suggest that an as yet undefined riverside industrial area once existed in close proximity. This supports findings from City Campus to the north (Sworn *et al* 2014) and Newport Street to the south (Davenport 2015). Archaeological evidence from the floodplain area widens understanding of the extent of Roman Worcester and the range of activities on the edge of and within the floodplain and the results are important contributions to that emerging picture.

Changing land use

The cumulative body of evidence from previous work in the northern area of the town suggests an uneven, piecemeal contraction of the settlement in the 4th century AD (Butler and Cuttler 2011, 5). This was, in broad terms, demonstrated here, perhaps with a short period of abandonment (reflected in a hiatus in coin and pottery dates during the first half of the 4th century AD), then a clear change in use during the mid-4th century AD. This was defined by the disuse of the original buildings and the redevelopment of the area in a different format, based around the aisled building. The artefacts also demonstrated later occupation on the site and in the surrounding area at this time, although there was considerably less 4th century pottery than that of earlier date from the preceding periods. As part of this changing landscape, there are also indications that the ‘dark earth’ surviving around the malting oven structure was accumulating towards the end of this period. The soil micromorphology suggests that domestic animals were managed or grazed on wastelands; it may have become a late Roman brownfield site (see Ecofacts).

There was a lower intensity of activity during the 4th century AD across the area, but the substantial size of the two conjoined pits shows that there was quarrying of marl on a considerable scale (AU 510). Exact dating for this was unclear, but it is plausible that this marl was used to pack the foundations of the large aisled building constructed during this period. The quarry pits cut through features that post-dated the early 4th century surface east of the earlier buildings, indicating that they were not dug out before this time and that the surface (and probably the commercial buildings adjacent) had ceased to function as originally intended. The artefacts, which were particularly mixed and varied in the lower deposits and of earlier origin than the excavation of the pits, suggest that the material used to infill these pits had probably come from excavation through earlier deposits and then been supplemented with material from pre-existing midden dumps. The environmental remains from these features correlate with this, being indicative of heavily mixed material probably from middens being redeposited into the pits. Also, the large dumps of iron slag found in this feature suggest that waste dumping from nearby production had been occurring.

The implications from this are numerous, but it is possible that disuse and abandonment of parts of the area had led to an accumulation of waste on the site and in the vicinity, probably during the early to mid-4th century AD. This may suggest that the iron industry had finished as a major economic component of the settlement by the mid-4th century, with the clearance of waste material related to this (possibly from earlier middens) necessary in order to redevelop the area and use it for more agricultural use. The recently-opened quarry pits probably offered an easily accessible feature for the disposal of this material. It may be of particular relevance that similar deposits of waste material in middens were noted at the City Campus site to the north, and at 14–24 The Butts to the east, where layers dated to before the mid-4th century AD, with high concentrations of Roman artefacts, were recorded stratified above earlier Roman features (Sworn *et al* 2014, 24; Cuttler *et al* 2011). These other areas were not redeveloped in later Roman times and so the midden material remained and was subsequently sealed beneath the later tillage soil. Similarly, there was also a considerable amount of domestic refuse strewn across the final phase surfaces at Deansway, sealed by the ‘dark earth’ found there (Jackson 2004b, 128–132).

The new format of development in the 4th century AD at The Hive was also demonstrated at the northern extent of the site area by the construction of the aisled building (AU 508), again fronting onto the same road that the earlier buildings respected. This building, considered more thoroughly below, probably originated in the latter half of the 4th century AD. The main footing post-dated a pit that had been cut into the stone-lined well positioned east of the earlier buildings, possibly used to rob out the stonework sometime in the mid- to late 4th century (CG 1015).

Aisled buildings are frequently associated with farms, or subsidiary to a larger establishment such as a town house or villa, as agricultural outbuildings (Todd 1970, 121; Morris 1979, 55–65). In small towns, their presence can be seen as defining an extra-mural farm space around which land was cultivated or used for pasture (Perring 2002, 55). At The Hive, environmental remains from a number of contexts were suggestive of grazing and stabling of domestic animals during this later period. The settlement alongside the road may have lost its more urban, commercial form of the late 2nd to early 4th centuries AD to become an agricultural area north of the city during the later years of the Roman period. Small-scale occupation debris was still identifiable, however. Dumps of later Roman and possibly post-Roman material were found in the upper parts of the quarry pit (AU 510), and in the partially excavated timber well (AU 524) south-east of the aisled building, which included later Roman coins and small finds.

This is consistent with other evidence from around the periphery of the town that points towards a cessation of urban form and a return to agricultural use at Worcester in late Roman times (despite the extent of this changing layout remaining uncertain; see Worcester City Council 2007, 97–98). Further features associated with the aisled building include the malting oven or corn drier (CG 1049) which was probably constructed as the dark earth was forming during the 4th century. These structures are common and easily identifiable on rural Roman sites, commonly of 3rd to 4th century date, and often found adjacent to an aisled building or villa for use in the processing of agricultural surplus (Morris 1979, 9; Brears *et al* 1993, 74; Perring 2002, 196–7). A late Roman stone structure, possibly an aisled building or part of a villa, with an in-built corn drier, was recorded at Wellington Quarry (Jackson and Miller 2011, 115–119) and a corn drier was inserted through a wall in the winged corridor villa close to Kenchester (Wilmott and Rahtz 1985, 94), both in Herefordshire. Other examples are found across the length of the country. For instance, an association between a late Roman aisled building, a corn drier and a villa building was revealed at a multi-period site in Monk Sherborne, Hampshire (Teague 2001) and at the site of a Roman villa at Ingleby Barwick, Stockton-on-Tees (Archaeological Services, Durham University 2008).

The reduced intensity of occupation and the change in urban morphology on this site can be considered in the wider context of the demonstrated contraction and abandonment of the settlement at Worcester, which in some ways may reflect the ending of Roman control in Britain more widely. Work at Deansway showed that animal pens and a small cemetery occupied the area of previous industrial buildings by the mid-4th century AD and at Sidbury, occupation appears to have ceased around AD 320 with a build-up of flood and waste deposits across the road surface (Dalwood 2004b, 48–51; Darlington and Evans 1992). Elsewhere, such as at City Campus, the absence of diagnostic later 4th century artefacts has suggested abandonment and disuse of certain areas (Sworn *et al* 2014, 75–8), though this may not represent absolute desertion, rather a reversion to less intensive agricultural uses. Urban breakdown during the last quarter of the 4th century AD on the fringes of a settlement has been noted for many towns, preceding the main collapse of urban form, recession and loss of larger scale industry following the withdrawal of the legions from Roman Britain (Esmonde Cleary 1989, 131–61). At Alcester, for instance, the northern suburb was replaced by a cemetery in the 4th century AD, probably as the population moved within newly constructed defences (Booth and Evans 2001, 305). At Kenchester in Herefordshire excavation has demonstrated the abandonment of the eastern suburb after the mid-4th century AD (Webster and Jackson forthcoming).

Continuing activity at The Hive in the later 4th century AD, with the construction of a post-AD 350 aisled building (albeit in a very different form to the urban, commercial street of earlier centuries) is, therefore, partly at odds with the evidence for decline of the settlement overall and in the wider region. The area of The Butts has, however, previously provided further indications of continuity of settlement into the later Roman period. A late 4th century well backfill at 1 The Butts contained building rubble, including tesserae, painted plaster, ceramic building material, stone roofing tiles, and a fragment of limestone column, interpreted as demolition debris from a public or high status domestic building (Napthan 2011a). As noted above, similar material has also been found on sites in the wider northern area of the Roman town, at Sanctuary House on Farrier Street (Mann 2009; Daffern and Arnold 2010) and at the Conder Building, Infirmary Walk (Pikes and Sherlock 2003). It is also of potential significance that ceramic building material found in waste deposits at The Hive was of the same fabric as that from the well at 1 The Butts, including box-flue tile, slipped tegula and an antefix, probably brought from close by for disposal. It is possible that high-status Roman buildings, perhaps public in function or owned by an elite group supported by the economic wealth of the iron industry, existed in the northern suburb of the town, and that these were potentially extant and in use until the end of the 4th century. Whilst there was no clear demonstration of continuity of occupation on The Hive site through the 5th to 12th centuries AD, the aisled building does represent a relatively rare occurrence of late 4th century activity in the town. As this building was found in an area adjacent to known discoveries of high-status material, it may add further support for the presence of an associated town house or villa building on the more rural periphery of the settlement throughout the late Roman period.

Buildings and construction

Evidence of Roman building forms and construction elements is, in broad terms, rather scant for Worcester, though a range of building types are known (Worcester City Council 2007, 38). For masonry construction much of this evidence is fragmentary and consists of discarded building materials (as with the well at 1 The Butts; Napthan 2011a) or enigmatic antiquarian descriptions coupled with observations from watching briefs (Barker 1969a, 15–18; Worcester City Council 2007, 39; Wainwright 2010). Other sites have identified post-built timber structures, probably for agricultural or craft/light industrial use, in a number of locations throughout the settlement, including at Sidbury (Darlington and Evans 1992, 16–23), Deansway (Dalwood 2004c, 81–3), and at City Campus (Sworn *et al* 2014, 21–2). At The Hive, the buildings were similar (built using clay and timber and possibly being small strip buildings), but also offered new insights into building forms not previously seen in the settlement (the aisled building). Individually, and as a group, the evidence is exceptionally important for furthering understanding of the character of Roman Worcester.

The earlier buildings

Of the buildings along the street frontage, Buildings 2 and 3 (AU 503, 504, 518, 519 and AU 521, although this was largely disturbed by the later aisled building) probably offered the most information regarding construction and development. Building 1 (AU 528) was not excavated, though it was still possible to determine that it was constructed with a packed clay floor and possible posts at its northern end. Whilst the buildings had a common form of construction (clay floors with timber frames), their size as observed (*c* 9x6m) was considerably smaller than that expected for strip building type structures found in Roman Britain; these are commonly 20–28m long and 8–9m wide (Perring 2002, 55). This may be due to later truncation and disturbance of deposits, or perhaps reflects the size and status of the settlement at Worcester in the Roman period. It is also possible that the buildings are not true ‘strip buildings’ and that these smaller buildings served only one purpose, such as a single small shop or workshop, rather than combining a series of working and living areas with internal divisions as is seen elsewhere, or that the row of buildings formed a single property (Perring 2002, 55–6). The floor areas are not dissimilar to the postulated strip building found at Sidbury, which, based on parallel spaced beam slots, was thought to be 15m long and 5.5m wide (Darlington and Evans 1992, 16). Being positioned ‘end-on’ and adjacent to a road is common for buildings of this type, which were normally entered directly from the street. They may have had an open counter or portico at this end, though the evidence for this comes mainly from the continent (Perring 2002, 59; Rust 2006, 17).

The construction form of each building suggested continual occupation with slight re-modelling or repair, rather than clear phases of use, disuse, collapse, and rebuilding. This included repeated re-laying of packed clay floors within a similar footprint, some of which sealed earlier pits and ovens, and which produced dating evidence through the 2nd and 3rd centuries AD. The inference is that wear and tear on the floors and ovens, or perhaps slumping of material into pits, led to the need for periodic reconstruction or refurbishment of the buildings, but it is also possible that these changes reflect changing ownership or slight changes in purpose over time. This is hinted at by the change of oven typology, from possible small-scale smelting hearths to circular pre-formed ovens for baking or smoking. A lack of masonry footings indicates that both the foundation and superstructure of the buildings was of timber, a simple and cost-effective technique common to Roman 'small towns' (Burnham and Wacher 1990, 17; Rust 2006, 19). Perring (2002, 83) suggests that unseasoned oak was preferred for construction. It has also been proposed that a lack of masonry buildings in settlements was not linked to a lack of Roman identity, but demonstrates the lack of local building stone for very few structures other than central public buildings (Rust 2006, 123). This was noted at Alcester, for instance, and seems to have been the case in Worcester, with only the limited indications from building rubble mentioned above.

A number of sandstone building blocks were recovered on the site, including a socketed block found *in situ* within a shallow cut, acting as a post-pad or as a base for a horizontal base-plate. The evidence for the construction of the walls was actually rather limited, in that only a few postholes, post-pads and a possible beam slot were noted. This is interpreted as a timber frame superstructure constructed using either base-plates levelled on stone pads, with vertical elements of the frame built off this, or earthfast upright posts used with cross beams linking them together. Perhaps different techniques were used throughout the life of the buildings, particularly as there was re-laying of floors and wood rapidly decomposes if placed in the ground, although the ephemeral nature of the buildings makes this difficult to be certain. The numerous joiners' nails may also attest to the timber construction of these structures, being used for internal floor or wall fittings rather than the frame, but they could also be from roofs for fixing tiles.

The amount of lime mortar and plaster from dumped deposits on the surfaces to the rear of the buildings, and similar material which was deposited in the large quarry pits in the 4th century, suggests that it came from the disuse and collapse of nearby properties. In the absence of evidence for mud or clay daub or cob walling, the fragments of mortar with lath impressions may suggest that close-studded timber cladding of horizontal planks or wattling formed the infill between timber uprights, and that the buildings were of sufficient quality to be mortared and have a plaster finish applied. Examples of re-layering on the mortar were noted, supporting the evidence of the clay floors that continual repairs took place, rather than demolition and rebuilding. The finish and status of the buildings is also hinted at by the presence of 2nd century AD *tegulae* in various contexts which correlate with the initial construction date for the properties. It is often assumed that thatching or timber planks were used on lower status sites, but ceramic tile has been found associated with timber-framed wattle and daub buildings elsewhere in the country (Crummy 1984, 22) and therefore it is possible that this was also the case here. The number of ceramic tile fragments from the site is large for Worcester, far more than Deansway (cf Dalwood and Edwards 2004) but comparable to Sidbury (cf Darlington and Evans 1992) and 14–24 The Butts (cf Butler and Cuttler 2011), and suggests that there may have been tiled roofing on buildings in this part of the settlement.

The aisled building

Later activity was focused around the construction of the aisled building. This structure is of a new form compared to buildings previously identified in Worcester. Aisled buildings are not uncommon in Roman settlements more generally however, being found on many sites after the 2nd century AD and potentially developing as a characteristic architectural form of Roman

Britain (Perring 2002, 53; Rust 2006, 17). It has already been noted that the proportions and size are typical of aisled buildings and that structures such as these are often found in agricultural contexts, frequently in the vicinity of an elite building. At Bays Meadow in Droitwich, for instance, an aisled building of almost exactly the same size (20x11m) was found ancillary to the main villa (Barfield 2006a, 115).

The shorter sides of the building exhibited deeper foundations than the longer sides, particularly at the northern end where deeper post-pad footings were present. This suggests that extra support was required as the end walls took the majority of the load for roof construction (Morris 1979, 55–65; Perring 2002, 111–12), or, perhaps, a more monumental gable end. It is also possible that at the northern end, where the post-pads were paired, an upper floor was in place that required additional support. Several aisled buildings in Roman Britain have been shown to be tall enough to include an upper storey (Perring 2002, 111). This could have allowed estate workers or short-occupancy travellers to occupy the building and may be supported in this instance by the presence of a single oven in this area of the building. Although there was a lack of occupation deposits from within, it is fairly common for basic living arrangements for farm servants to exist in aisled buildings of the 3rd and 4th century AD (Morris 1979, 61).

Wide entrances to these structures, probably for the access of carts, and internal post-pads, creating an open aisled form allowing space for agricultural working and storage as well as possible internal divisions, are also notable characteristics found on many sites (Morris 1979, 55–65). In agricultural contexts, aisled buildings frequently exhibit entrance doorways on the long sides, but rarely in the gable ends, perhaps reflecting the layout of the farmyard or due to the internal layout of the building (Morris 1979, 67; *cf* the roadside barn at Water Newton, Cambridgeshire in Perrin 1999). At Monk Sherborne, Hampshire, the villa and the associated aisled building appeared to enclose a central courtyard (Teague 2001, 33). Thus, it is of particular interest that there were no post-pads for part of the length of the east side of the building here at The Hive (although truncation could have been a factor). This may suggest that more space was required close to a doorway for unloading, which fronted onto a yard. The space for entry into the building was 2.75m, easily large enough for a cart to access the structure, and this compares well with the 2.5m wide entranceway identified in the aisled building at Kenchester, Hereford, which was perpendicular to a roadway leading from the main town (Webster and Jackson forthcoming).

The use of rammed marl (sometimes layered with sand) in the foundation trenches and post-pads of this building suggests that the construction used timber sill beams placed on this firm foundation to support a timber superstructure. No evidence of this upper structure or of any internal floor surfaces survived, but it was probably built using cob or wattle and daub between timber uprights. Truncation and disturbance during the formation of the tillage soils and later activity on the site could have removed much of these organic materials, although any substantial timbers and roofing would probably have been dismantled and taken away for re-use in the post-Roman period. Because of the absence of evidence for the structure, the possibility that the building was never completed has been considered; however, most aisled buildings appear to be utilitarian in nature without floors or much decoration so rarely show clear occupation deposits (Morris 1979, 59). The oven within the footprint of the building was certainly fired, so does suggest that the surrounding building was completed and in use. A large aisled building found during part of the M6 toll road construction north-east of Birmingham exhibited a similar lack of floor layers or other occupation-related features (Simmonds 2008, 65), and four aisled barns at Orton Hall Farm, Peterborough, contained little internal remains beyond stone-built driers (Mackreth 1996, 55–74). Conversely, the aisled building at Bays Meadow in Droitwich became the main residence in the 4th century, with clear occupation (Barfield 2006a). Bays Meadow may be the exception to the trend however, in that the main villa building had burnt down before this and the occupants were making use of the building only *in extremis*.

It may be of significance that a number of later 4th century Roman contexts on site (including the upper quarry pit fills and possible 4th to 5th century pits; CG 1090) included substantial numbers of stone roof tiles. Stone roofing is a later Roman period characteristic (Perring 2002, 120; Barfield 2006b, 166) and was particularly associated with the aisled building at Bays Meadow (Roe and Barfield 2006, 167). This material could be linked to the evidence for nearby high-status masonry structures in the vicinity or, feasibly, represent the remains of worn out/broken elements discarded from the roof of the aisled building here. This supports the idea of a large, imposing and monumental construction dominating this part of the settlement. Purely through its size, an aisled building may reflect a desire to demonstrate Roman control and power in this area. Roman society used buildings as a statement or illustration of elite control, reflecting the domination of people and nature (Perring 2002, 2). As aisled buildings may have been used for storage of agricultural surplus, they can be seen as an expression of control of the natural landscape and the wealth it provides, having parallels with medieval tithe barns (Hingley 1989, 39; Perring 2002, 2 and 53–4).

The ovens

As detailed above, numerous ovens were identified on the site, particularly inside or in association with the buildings in use from the later 2nd and into the early 4th centuries AD. Ovens found in association with strip buildings have often been found positioned along the internal sides, close to doorways from adjacent alleyways, which was probably to allow ventilation (Perring 2002, 56). Unfortunately, there was no evidence of where doorways into the properties were located here at The Hive to assess this possibility. Of particular importance is the evidence provided for the use of pre-formed oven superstructures and baking plates, particularly where these are *in situ* (see Artefacts). These structures mainly dated from the early to mid-3rd century AD and later and have no known exact parallels elsewhere in Roman Britain. They are therefore of considerable significance.

A range of types were recorded, including some earlier examples that may represent smelting hearths rather than ovens, and are thought to date to the later 2nd and early 3rd century AD (Period 4). Although truncated, which precludes definitive interpretation, these lacked pre-formed oven material, had cobble layers forming solid support beneath clay packing, and showed evidence of high temperature use and extensive heat-affected areas in the surrounds (CG 1007; CG 1012; CG1102; CG 1109). They survived within or around the earlier elements of Building 2 (Phase 2A and 2B) and what may have been earlier parts of Building 3. The presence of hammerscale, vitrified clay, and smelting slag in these contexts and in a few pits to the rear of the properties, although not extensive, may hint at the use of this type for more industrial working than those of later date. This would partly account for the slag dumping noted on site, which did include hearth bases, although the relative proportions of tap slag and the lack of extensive *in situ* industrial residues still suggest that major industrial-scale smelting of slag was not taking place in the properties here, but in the wider area.

More prevalent than those thought to be of earlier type were oven features within or associated with the main surviving elements of the buildings from the early to mid-3rd century AD onwards (Period 5). These exhibited a common circular or sub-circular shape (eg CG 1069; CG 1070;

CG 1083; CG 1019) that included a baked clay floor, often embedded with pottery, reused oven material and/or tile and with a thick clay packing surround. Ovens of this type included the remnants of the pre-formed oven superstructures, which appeared to date to the latter half of the 3rd century AD. In a number of cases, levelling and re-use was possible, as well as depressions denoting areas of wear adjacent to possible flues, suggesting some longevity of use. This also pointed toward an element of disposability to the process, in terms of dismantling and recycling the pre-formed oven material. The flue orientation was commonly towards the east; although one faced north and another south, none faced west (the prevailing wind at Worcester comes from the west). One oven was unusual compared to the others. This was shaped as an elongated rectangle and built using ceramic oven plates set as an oven base, but unfortunately was too fragile and fragmentary to be reconstructed after excavation (CG 1075). It was sealed beneath the latest floor of Building 3, dating to around AD 300, and is a variant on the group here, perhaps representing the only survivial showing use of the 'platters' *in situ*.

With regard to the pre-formed ovens, evidence from other sites has suggested a link between this material and bread making. Excavation at a rural site near Worcester, at Hindlip, provided associated evidence for bread making alongside a relatively large assemblage of ceramic oven material (Griffin 2015). This evidence included querns. At The Hive, at least four quern fragments were found in contexts from the possible strip buildings. Only limited charred cereal crop remains were associated with the Roman ovens. There was no evidence that cereal crop waste was a significant fuel and no evidence that the ovens were used to parch cereal grain prior to processing or for use in cooking or brewing. The number of ovens does suggest localised domestic and possibly small-scale commercial production however. The lack of environmental indicators for this could be explained by the more abundant cereal crop processing waste on the adjacent City Campus site, and/or some importation of grain in the form of milled flour ready for baking. Well-preserved oak charcoal was found in oven contexts, suggesting the fuel supply for the ovens was very selective and oak preferred because it burns well and at a high temperature (Taylor 1981, 52–3). Large round wood charcoal, which has the appearance of wood converted to charcoal fuel, was found in quarry pit contexts containing abundant ceramic oven material. It is possible that this may be contextual with the ceramic ovens, but the extensive amounts of smelting slag in the quarry pits suggests that much of the charcoal relates to this. It is likely, therefore, that the ovens used mainly oak wood or wood converted to charcoal because it was preferred, but that this was a more opportunistic acquisition after considerable effort and organisation went into producing oak charcoal for the smelting industry. There are indications that the wood was collected from un-managed woodland, but it is difficult to determine whether wood of a particular diameter was selected. The well-preserved and abundant charcoal in the pits contrasts with the low levels of oak pollen from Roman deposits on the floodplain at The Hive and on other Worcester sites. It is possible that the charcoal was brought in from some distance away (the Forest of Dean) (Evidence for craft and industry).

A recent study (Darling 2012) has discussed the association of portable ovens with sites where bread would have been supplied to large numbers of people: for example, sites associated with salt making and/or farming, sites by major roads, temples, and, at Chester, the amphitheatre. The larger assemblages from Worcestershire seem consistent with this model. The ovens at Droitwich may have been associated with the salt production industry and the workers there (Hurst and Woodiwiss 1992). The ovens at Hindlip were associated with large enclosures, thought to be where animals were brought and corralled before being taken to market (Wainwright 2015). On present evidence, they do not seem to be associated with the higher status settlements; for instance, none existed at the late Roman villa at Bays Meadow, Droitwich (Barfield 2006a), and the early Roman oven from the Childswickham villa site is a distinctly different type, with a flat, perforated top (Hurst 2004). The ovens at The Hive are restricted to the area along the road and inside or in the vicinity of the buildings. The road potentially led down to the riverside, and perhaps the Campus site is near enough for the large group of similar material found there to have derived from the same or related ovens. The combined evidence implies that small-scale commercial production was taking place across this area, probably for the baking or smoking of foodstuffs, alongside industrial processing. This was beyond the assumed core of the settlement, perhaps to ensure fires did not threaten major buildings and could be brought under control more easily (Cool 2006b, 51).

The existing evidence from other sites suggests that the oven superstructures and the baking plates were not necessarily used in conjunction with each other (Artefacts), but there have been issues with this material not being recognised which hopefully publication of this assemblage will resolve. The exact function of the pre-formed ‘ovens’ and oven ‘platters’ remains open to debate; they could have been used for smoking rather than (or as well as) baking, an interesting possibility given that local river eels were being consumed (Ecofacts). The small quantities of fish bone recovered preclude a definitive interpretation of this, but it could be the case that the later ovens provided ‘takeaway’ products, so little evidence of the consumed produce was deposited on site. There was no evidence that this type of oven represented high temperature industrial processing, being of relatively small size and with no vitrification or industrial residues present. As noted above however, it is clear that very little of the pre-formed oven material came from Period 4 deposits, suggesting that the oven superstructures associated with earlier occupation were of a different type. These earlier structures were potentially constructed for use in more industrial processes, so it may be that ovens inside the buildings all served different functions, or that the function of the ovens changed over the decades.

During Period 6 the aisled building was the only building present on site, although there may have been larger buildings (domestic or otherwise) in association with agriculture in the wider area. It is possible that the circular oven in the aisled building (CG 1019) was the only source of baked food for nearby workers, as it is considered that most people would not have had a room that specifically functioned as a kitchen. The majority of houses (away from villas and other large, high status buildings) probably functioned with a small central fire; as Alcock (2001) has pointed out, in some areas of Roman Britain little would have changed since pre-Roman times. Although these were multi-functional and ensured that food could be cooked by pot boiling or spit roasting, they are unlikely to have been suitable for baking. With this in mind it has been questioned as to what extent oven cooking was practised by the majority of the population, especially in towns (Cool 2006b, 51). Where rooms recognisable as kitchens have been found they are often part of large houses which are thought to be associated with high status residents (Cool 2006b, 51). The oven in the aisled building may, therefore, have served the purpose of being a communal hub to which prepared food could have been brought for baking during the day, or perhaps was used to prepare bread or other food products for multiple people working on agricultural land in the surrounds.

Trade

Much of the evidence for trade comes from the pottery. The vast majority of the assemblage was locally produced Severn Valley ware, which, like the handmade and wheelmade Malvernian wares, probably originates from production sites in the Malvern area. This is consistent with other sites in Worcestershire. Chronological changes in patterns of supply were evident, some reflecting known trends and some providing new insights. The very small Period 3 assemblage, dated broadly to *c* AD 69–140, was dominated by local wares. The Period 4 assemblage, dated to *c* AD 140–225 included a wider range of fabrics and sources, though this might in part reflect the larger assemblage size. Mortaria used on the site included products from the Mancetter-Hartshill industry, but also from Wroxeter and various west midlands producers. The latter included a local potter, working in the 2nd century and stamping vessels 'ASILA'. Most of the imported samian dated to this period, even though some of it was found in later deposits. The vast majority of this came from factories in Lezoux in Central Gaul and Rheinzabern in East Gaul. Imported Dressel 20 amphorae, containing olive oil from southern Spain, were also more common in this period. A stamped amphora handle, dated to the late 2nd to 3rd century but found in a Period 6 deposit, was attributed to a workshop at La Delicias on the eastern bank of the River Genil. Malvernian cooking wares continued to be an important element of the vessel repertoire, mainly handmade but with wheelmade vessels first appearing.

Further changes in patterns of supply were apparent in Period 5, dated *c* AD 225–320. The supply of mortaria now consisted mainly of Mancetter Hartshill products, though mortaria from the Oxfordshire kilns were also reaching the site and Oxfordshire tablewares first appear at this time. A mortarium from Wanborough, Wiltshire also dates to this period, though found in a Period 6 deposit. Imports included samian, from Lezoux and Rheinzabern, colour-coated ware from Cologne, and Dressel 20 amphora. The latter was again relatively common, with sherds being dated broadly to the 3rd century. Oxfordshire producers dominated the supply of mortaria in Period 6, dated *c* AD 320–400. Oxfordshire tablewares were also more common, as were colour-coated vessels from the Nene Valley.

More subtle trends were apparent in the supply of cooking wares. Overall, Malvernian wares were slightly more common than those of Dorset Black-burnished ware (BB1 fabric). As the supply of handmade Malvernian wares declined, the supply of wheelmade Malvernian wares increased. The supply of Dorset BB1 increased steadily through time. These proportions of BB1 and Malvernian wares can be compared with evidence from rural sites in the county and suggest that the relative proportions of Malvernian ware and BB1 vary depending on the proximity of sites to Malvern (Griffin, forthcoming b). More detailed analysis of the forms showed that cooking pots were predominantly supplied by the local producers, while bowls and dishes were in BB1. The reason for this is uncertain. In the 4th century, Period 6, new Malvernian dish types appeared, imitating BB1 forms. This might suggest that supplies of BB1 were getting harder to obtain.

The small finds assemblage was comparable to groups further south, along the Severn Valley and estuary area (Artefacts). Similarities were seen in a range of traits; for example, the use of penannular bracelets in the 2nd and 3rd centuries, the preference for styli made of copper alloy, and possibly the adoption of belts by males in the 4th century. This southern emphasis in style has also been noted in material from other Worcester sites, such as Deansway and City Campus (Dalwood and Edwards 2004; Sworn *et al* 2014). This could well indicate fashions travelling to Worcester through trade up the river Severn, though cultural choices might also be a factor (discussed below).

The worked stone assemblage provided further evidence for trade, with a range of sources represented. Querns came from the Wye Valley in the Forest of Dean, probably having been transported by river. This was the most common source for querns in Roman Worcester. Roof tile was brought from eastern Herefordshire, possibly around Wellington Heath (Lower Old

Red Sandstone) and another, more local source north of Worcester (Triassic Bromsgrove sandstone). Other building materials came from the Cotswolds (oolitic limestone) and another more local source (Jurassic Blue Lias).

There is only tentative evidence for trade in foodstuffs, despite the proximity of waterlogged deposits at the margins of urban settlement which enhances the potential for recovering such evidence. Fig was probably imported, but other non-staple crops may also have been imported, or perhaps grown in garden cultivation plots. Dwarf and toy dogs (Animal bone) may imply some trade in small animal breeds.

Two lines of evidence, the animal bone and isotope analyses, suggest diverse and unrelated cattle stock, presumably resulting from trade and movement of cattle to Worcester, possibly from either Wales and the Marches or land on the Malverns. The bone assemblage indicates a varied population of unrelated stock derived from multiple localities, based on morphology of the posterior cranium, and that some of these shared a genetic relationship. Strontium, oxygen and carbon isotope analysis of cattle teeth and bone further supports this interpretation as the results show that none of the six individuals included in the isotope ratio analysis were raised or grazed in the vicinity of Worcester during the early part of their life (Fish and other small bones). Two are likely to originate from Herefordshire, south-west England or southern Wales, and the remaining four from areas of granite or ancient rocks (Proterozoic and Archaean) principally found in Wales, the Lake District, northern Scotland or outcrops such as the Malverns. Of these areas, Wales is thought to be the most likely location for the origin of the cattle, potentially with a period of management on the foothills of granite/gravel deposits on the Malverns before droving to Worcester.

The presence of stock enclosures at Deansway raised the suggestion that in the 4th century Worcester functioned as a cattle market, where cattle in the west of the region or Wales were corralled and held prior to droving to towns and forts further east in the midlands and beyond (Dalwood and Edwards 2004, 46–8). The evidence from The Hive compares particularly well with this; it now appears more possible that specialised livestock management was undertaken within the town and that cattle trading formed a significant part of both the economy of the settlement and the wider regional economic network. This would feed into other ideas regarding the character of the west midlands as a resource explotation zone throughout the Roman period (eg Esmonde Cleary 2011). Perhaps cattle trading and management can be added to list of products and supplies associated with the other large-scale industries throughout Roman Worcestershire: pottery in the Malvern area; iron smelting in Worcester; and salt extraction at Droitwich.

The dating

The pottery provided the bulk of the dating evidence, described in detail in the summary of pottery by period above (Summary of pottery by period). Further key dating was provided by coins, particularly associated with later Roman features, and other small finds and glass, predominantly 2nd to 3rd century. Scientific analysis of two samples, both from quarry pit (CG 1108), provided dates of *c* AD 220–350 and AD 70–250 (with the earlier date stratigraphically above the later one), reflecting the high levels of residuality in this feature. The best pottery dating evidence came from the imported and traded wares; samian for 1st to mid-3rd century, Dorset BB1 for 2nd to 4th century, Oxfordshire colour coated ware for 3rd and 4th century, and mortaria. Some Severn Valley ware forms, for example tankards, and coarse ware copies of BB1 forms, also provided reliable dating.

There was limited evidence for definitive 1st century occupation in the vicinity of the site, and this came mainly from residual finds. Four 1st century coins were recovered. The only stratified example was an *As* or *Dupondius* of Vespasian, dated AD 69–79, found in the primary fill of the Period 3 east–west ditch (CG 1003). There were also two, residual, 1st century brooches (Roman small finds and glass; cat. 1; cat 6). Only a handful of South Gaulish sherds were included amongst the samian, dated AD 60–110 and 70–110. There was also only slight evidence for activity dating diagnostically to the first couple of decades of the 2nd century.

A few of the small finds dated broadly to the mid-1st to mid-2nd century: a trumpet brooch (Roman small finds and glass, cat. 8), and two glass vessels (Roman small finds and glass, cat. 115 and 116). Some of the coarse ware fabrics and forms also dated broadly to this period, present in relatively small quantities and often residual in later contexts. These included early Severn Valley ware variants, and forms such as upright walled tankards and carinated bowls; Malvernian tubby cooking pots; early micaceous ware; and a sherd of Savernake ware.

There were more finds dating from *c* AD 120, the start date for production of Lezoux samian and the date from which Black-burnished 1 became more widely marketed, up to the mid-2nd century. The pottery included samian dating to the first half of the 2nd century, and a couple of sherds of Mancetter Hartshill mortaria with mixed grits typical of vessels produced *c* AD 100–140/50. Two coins dated to AD 117–38, one from a Period 5 pit and the other unstratified, and an *As/Dupondius* was dated AD 138–61, the latter from quarry pit (CG 1057).

The great majority of the finds and pottery, where closely datable, dated to the latter half of the 2nd century and through the 3rd century, with some continuing into the early 4th century. Taking this and the stratigraphic evidence into account, the main period of occupation on the site has been attributed to this period. Finds included a *sestertius* dated AD 180–92, two coins dated 193–253, a mid-2nd to 3rd century brooch (Roman small finds and glass, cat. 11) and other metal and glass finds dated to the 2nd century (Roman small finds and glass, cat. 10, 47). The majority of the Lezoux samian was mid- to late Antonine. Other imported wares included Central Gaulish Black-slipped ware dating from the mid-2nd to early 3rd century, 'Moselkeramic' Rhenish ware, exported from the late 2nd to mid-3rd century, Cologne Colour-Coated ware, broadly dating to the 1st to mid-3rd century, and the handle of a Dressel 20 amphora dated to the late 2nd–3rd century. Forms in Nene Valley ware, decorated with barbotine under slip, were also consistent with a late 2nd to 3rd century date and Black-burnished ware forms included a range of mid- to late 2nd century, and late 2nd to early/mid-3rd century types. Many of the vessels in Severn Valley ware had parallels at the Newland Hopfield kiln site (Malvern, Worcestershire), where the main period of production dated to the latter half of the 2nd century to the early/mid-3rd century (Evans *et al* 2000, 56). The Wheelmade Malvernian ware forms and south-west oxidised ware are also consistent with this date.

The pottery also included a significant quantity of mid-3rd century or later material. The majority of Black-burnished 1 jars were decorated with obtuse cross hatch, followed by 2nd century acute lattice and then right angle cross hatch. Obtuse cross hatch first appears at *Vindolanda c* AD 223–5 and is then typical of 3rd and 4th century assemblages (Bidwell 1985, 175). There were 158 sherds of Oxfordshire Red Colour Coated ware. This fabric has a *tpq* of *c* AD 240+, though may arrive a little later in this region. Sherds of Nene Valley Colour Coated ware with barbotine decoration over the slip are also characteristic of mid-3rd century or later assemblages, and many of the coins dated to the latter half of the 3rd or late 3rd to early 4th century.

There was definite evidence for 4th century land use at The Hive, though on a less intensive scale. The latest coin dated to AD 378–88 and others dated broadly to the mid- to late 4th century, while small finds included typically 4th century bracelets (Roman small finds and glass, cat. 37–44). The latest pottery included twelve sherds of shell tempered ware (Roman pottery Fabric 23), most from the upper fills of quarry pit CG 1057, with individual sherds from pit CG 1072 and the upper backfill of well pit CG 1089. Elsewhere in the region this is associated with late 4th century activity.

There were a number of 4th century Black-burnished 1 types, including splayed rim jars, drop flange bowls, dishes with splayed walls, and fish dishes (Roman pottery Fabric 22). Some bowls and dishes displayed characteristically 4th century 'scratched' surfaces, and seven sherds from BB1 jars were decorated with oblique lines, common elsewhere in late 4th century assemblages. Oxfordshire wares included bowls dated AD 340–400+ and 325–400+ (Young 2000 forms C63 and C75.2 respectively), and a mortarium type that is most common in 4th century assemblages (Young 2000 form C97). Other characteristically 4th century types included Nene Valley, pentice-moulded beakers (Howe *et al* 1980, fig 5, 55–7), some Mancetter Hartshill mortaria and pink-grog tempered ware. A number of contexts were given a 4th century date based on the presence of Severn Valley ware tankards with markedly splayed walls (Webster 1976, E44). Various other broadly later 3rd to 4th century forms were also present amongst the Severn Valley ware and Wheelmade Malvernian ware.

Craft and industry

While there was no evidence that extensive heavy industrial processing actually took place on the site, the substantial secondary deposits of dumped slag suggest that this must have been occurring in the vicinity. As noted above, the possibility that the ovens within earlier phases of the buildings (although truncated and difficult to define) were in fact small-scale smelting hearths that contributed to the accumulation of industrial waste should not be discounted. A few pit features to the rear of the properties produced quantities of charred cereal crop alongside hammerscale and smelting slag, which potentially relates to this earlier use. Given the overall amount of slag found however, particularly the quantities from just a few waste dumping contexts in the later Roman marl pits, it is probable that there was large-scale iron smelting in the direct surrounds. Excavations in the wider area defined as the northern suburbs of the Roman settlement have produced large amounts of ironworking waste and therefore, by extension, are thought to have contained industrial working. Furnaces have been identified on a few sites in this area of Worcester; a 3rd to 4th century smelting hearth was recorded at Broad Street (Barker 1969c, 64) and significant evidence for smelting was recorded at the Conder Building site (Pikes and Sherlock 2003). The latter produced a hearth with an archaeomagnetic date of *c* AD 288–357, and two large jars containing hammerscale, thought to have been used for quenching. It is possible that the small pit containing a near complete jar (CG 1010) in Building 2 phase B here at The Hive may have served a similar purpose, although hammerscale was not identified in this case and it was considerably smaller than that seen at the Conder Building, so a parallel is not obvious. Most of the slag from The Hive was associated with late 3rd and 4th century deposits from Periods 5 and 6. Although this is consistent with previous suggestions that iron working moved to the north side of the settlement at this time (Jackson 2004a, 102), some of this material may have accumulated during small-scale working on the site itself and therefore be residual and part of the clearance of earlier waste.

The majority of the slag was typically of the type found as a product of iron smelting. There was a little evidence of slag from subsequent smithing processes, identified as 'occasional' spheroidal hammerscale in samples from a number of features. Hammerscale is generally a good indicator of smithing, but the small amounts noted, and the absence of *in situ* evidence for smithing, suggest that this was perhaps brought onto the site when midden material was being dumped. There was no evidence for high temperature processes associated with the pre-formed ovens, but some of the dumped fired clay was vitrified, occasionally with slag attached, probably from nearby smelting (Roman fired clay above). The largest assemblage of fired clay came from the Period 6 quarry pits and was associated with substantial quantities of smelting slag. Occasional fragments of iron ore were also recorded. Environmental analysis noted the presence of possible fuel waste in the form of charred cereal, associated with spheroidal hammerscale in a Period 5 pit (CG 1095). Spheroidal hammerscale could indicate that bar smithing was taking place, and it may therefore be significant that a possible billet was recorded amongst the finds. Perhaps opportunistic working of small items took place in the buildings as and when required; there was a small amount of evidence for the working of copper alloys in the form of a few pieces of casting waste and slag, though the likelihood is that this was imported during waste dumping. Additionally, misshapen copper alloy spoons were possibly pieces of scrap metal intended for re-melting. Despite the rather limited information, this does add a little more substance to the idea that Roman Worcester produced finished iron products alongside bar iron.

There are also hints of leatherworking in the vicinity; metal finds included a slicker, used in leatherworking to scrape tanned hides; a flesh hook, used for pulling meat out of a pot or hides from a pit; and an iron needle, used for textiles or leather. A fragment of cattle hide was also found in one of the Period 6 quarry pits. Other tools included a carpenter's gouge and items used by carpenters or smiths.

Animal bone remains provided limited evidence for crafts using cattle horn and cattle bone, in the form of waste such as a horn core showing cut marks at the base. There was also a little evidence of butchery; a cattle frontal bone showing a depression from poll axing, and cut marks on sheep and red deer bones. In Period 6 quarry pit deposits (AU 510) fairy flax and perennial flax, although grassland plants, are often associated with cultivated flax and may hint at flax cultivation nearby. As no cultivated flax remains were identified, flax retting or disposal of flax processing waste *in situ* is less likely.

Charcoal within the Period 6 quarry pit (AU 510) suggests that oak wood converted to charcoal was used as a specialised fuel, perhaps for baking or, more likely, brought in for nearby industrial use during the mid- to late Roman period and then used when available for the ovens (Roman period 'The Ovens'). Similar association of dumped slag and charcoal was noted at St Martin's Gate Lowesmoor, on the east of the settlement (Butler and Cuttler 2011, 132). The charcoal appears to have been collected from un-managed woodland, although this interpretation is based on a small data set. The scale at which this was carried out, and whether this was a locally produced or imported over long distances, is uncertain. The pollen evidence from here and from other nearby areas (eg Diglis Basin, Champness 2006; Worcester Arena, Daffern 2016; Newport Street, Head 2015) suggests a relatively open landscape with alder and hazel occasionally growing in damp areas, with oak and elm growing at some distance from the city. If nearby oak coppicing was undertaken however, it could result in a low pollen signal as the trees may not have reached maturity and therefore would not necessarily have been producing pollen (see Palynology). Oak pollen would therefore be under-represented in the pollen sequence, but given that the charcoal analysis suggested a source from un-managed woodland, the possibility that a local source of oak within the river valley was used, on balance, seems unlikely. Charcoal, although bulky, is light so could have easily been transported from some distance away, perhaps along with iron ore from the Forest of Dean on boats via the River Severn. It is thought that the Forest of Dean is the most likely source of ore for smelting sites in Worcester (Blakelock 2011, Jackson 2004a), and although the source remains unresolved, the potential for both charcoal and ore to be transported together from this location is one that merits consideration. The fungal spores on the oak stake from the waterfront (Period 4) do suggest that some form of woodland management may have been occurring, not necessarily locally, as the post was shown to have been seasoning for at least a year prior to its use.

Roman rubbish disposal

Disposal of waste in pits to the rear of the buildings may reflect the use of these structures, although such interpretations can be problematic in that the exact origin of 'rubbish' deposited on a site is often difficult to determine (eg Buteux and Jackson 2000). For example, abundant crop processing waste was present in two pits at the rear of Building 2, which may be spent fuel from iron smithing, and possibly bar-smithing, as spheroidal hammerscale with smelting slag was found alongside it. The indications are that any industrial processing on site was small scale and related to smelting however, so it is more likely that this material originated away from the excavated area, slightly to the west, or, as mentioned above, that it was purely the product of short-term itinerant smithing work. A number of Period 4 and 5 pits produced domestic pottery, including cooking wares, storage jars, and other vessels associated with food preparation and consumption. The condition of this pottery varied; in some pits the pottery was quite fragmentary, indicating that it was redeposited, possibly from a variety of sources. Other pits, however, produced larger sherds, suggesting that these were primary dumps associated with the nearby buildings, or that they served specific purposes. One of the pits associated with Building 2 phase B, for example, contained a near complete Severn Valley ware jar (CG 1010).

The combined environmental and artefactual evidence suggests that large mixed deposits of waste were dumped on the site, either as landscaping or perhaps during a period of abandonment prior to redevelopment in the mid to late 4th century. Some of this material may be derived from earlier remains, which were disturbed during building and pit digging. This idea is supported by cross joins noted in the samian between, for example, vessels in Period 4 and Period 6–7 deposits. The bulk of this material, however, is thought to have come from middens, either on the site or nearby, that were cleared into available holes, particularly the large quarry pit (AU 510). It is notable that the samian vessels from the quarry pits are considered to be quite distinct from the assemblage as a whole, with a greater emphasis on plain bowls and mortaria. This material is possibly derived from elsewhere. Different patterns of deposition were apparent even within the quarry pits. Pit CG 1108 had fewer fills and a higher average sherd weight than pit CG 1057 and while the majority of the samian mortaria came from pit CG 1108, the majority of the plain bowls came from pit CG 1057. The upper fills of both the pits (fills 6745, 6491, 6520) were also very different in character from the fills below, producing the bulk of the coins, small finds and building debris and may represent a separate phase of dumping, perhaps when the initial infilling had slumped down creating a hollow. Excavation at 1 The Butts indicated at least two phases of demolition in that area (Napthan 2011); the well, constructed in the late 3rd to 4th century, was lined with re-used building stone from another structure, and the infilling of the well, dated to c AD 370–390, included significant quantities of demolition material.

This occurrence of rubbish dumping with tillage soils forming above has been noted elsewhere in the settlement, particularly in the northern areas of the town; at City Campus (Sworn *et al* 2014), 14–24 The Butts (Cuttler *et al* 2011), Farrier Street (Dalwood *et al* 1994) and Deansway (Dalwood and Edwards 2004). It is probable that areas of land to the rear of properties were used as convenient places for dumping waste and the edge of the settlement focus, away from roadside development, was a useful location for this. It could also be related to and perhaps combined with the later Roman evidence for contraction of zones of occupation, whereby individual properties became vacant these newly abandoned areas were utilised for waste deposition.

As discussed above, and despite only limited indications of iron smelting and production on site, extensive dumping of smelting slag occurred primarily in later deposits and probably from heavy industry in the surrounding area. Up to the early 4th century and probably related to the disuse of the buildings, smaller deposits of smelting slag accumulated in layers above the surrounding cobbled surfaces throughout the late phases of the buildings themselves and in pits associated with their use. An enormous amount of smelting slag (3665.851kg) was also recovered from the large quarry pit (AU 510), suggesting that the dumping of waste from nearby production sites was occurring in the 4th century. Although some of this could be residual, as noted above, it potentially represents the shift in iron smelting to the northern area of settlement in the 3rd and 4th century (Jackson 2004a, 102). This may also be reflected in the consolidation and land reclamation seen at the riverside and across the floodplain in this area.

Charred cereal crop debris was thinly spread across the site, with concentrations of material present in only a small number of features. There was, therefore, only limited disposal of cereal crop processing waste and no evidence for spoiled grain products. Given the abundance of charred cereal crop waste in pits and possible winnowing or threshing waste in a building at the adjacent City Campus site however, it is possible that crop processing or disposal of cereal crop products (grain or chaff waste) may be concentrated in the Castle Street area (Sworn *et al* 2014). Pollen, parasite ova and fungal spores from a layer from the Period 6 quarry pits (AU 510) suggest that stabling material was being disposed of. This included the presence of species indicative of floodplain grassland or hay meadow alongside cereal pollen, spores from herbivore dung and whipworm eggs, likely to be from pigs. Disposal of similar waste material has previously been identified at Sanctuary House, Worcester, less than 300m to the north-east, where a plant macrofossil assemblage indicating a charred hay deposit was recovered (Clapham 2010). In this case, the rest of the sequence did not include high numbers of dung fungal spores or parasite ova, indicating that different types of waste may have been deposited in discrete loads.

Occupation continued, on and in proximity to the site in the later 4th century, but this was in a different form and on a far less intensive scale; the area may have become part of a farmstead. This may be noticeable with the decrease in disposal of diagnostically later pottery and small finds on site, particularly the absence of light bangle bracelets, beads and 4th century vessel glass, although 4th century coins were still present. A similar pattern has been seen elsewhere in Worcester, at Deansway, where changing land use was reflected in a much lower level of rubbish deposition after the mid-4th century (Dalwood 2004b, 48). An absence of Roman vessel glass was also noted at City Campus (Sworn *et al* 2014). It is possible that glass was recycled or reshaped for secondary use in urban environments however, leaving little trace in rubbish dumping (Price and Cottam 1998, 7–9). Although large scale glass concentrations have been noted in London, for instance, these may actually reflect accumulation prior to recycling, or perhaps collection in periods when recycling was not possible (Cowan *et al* 2009, 119).

Dark earth and tillage soil deposits were observed across the main part of the site (Area 1), though the former were solely from around the malting oven (CG 1049). This soil generally forms over derelict Roman buildings from debris derived from such buildings and deposits associated with the most recent land use (Macphail *et al* 2003, 353). Micromorphological studies have revealed that these deposits are not necessarily associated with abandonment, and can include important information on activities such as middening, cultivation/gardening, disposal of animal waste, and building debris (Macphail *et al* 2003; Macphail and Linderholm 2004). Detailed analysis of the micromorphology has shown that two phases of dark earth formation occurred in the area around the malting oven (CG 1049), both revealing evidence of waste disposal. The first phase, dating to the end of Period 5, contained settlement waste (latrine waste, settlement debris and charcoal) and industrial waste (iron processing debris). This is typical of the Roman dark earth from Deansway (Macphail 2004). A second phase of middening in Period 6 was of a slightly different nature and included small pieces of iron slag, and burnt material, including clay daub. This layer is comparable to that from Farrier Street (Macphail 1994b), in that there was evidence of both industrial and domestic waste. Farrier Street showed more direct evidence of local industry however, particularly iron working, suggesting that it was closer to the centre of production.

The Roman population

One of the most engaging aspects of archaeological investigation is the information provided on the lives of individual people. The presence of a neonatal burial, plus the disarticulated bone from neonates and a child in waste and soil deposits, provides a small insight into the local population and the treatment of the dead. The oven material included a fragment with the maker's finger print and a textile impression. Two pottery vessels had graffiti, marking the owner's name, and a stylus provided further evidence for literacy amongst at least some of the population. The small finds hinted at the cultural identity of the people of Worcester, with a number of finds having parallels around the Severn estuary to the south, and demonstrated fashions in hairpins, and by extension, hairstyles. There was some evidence for religious or ritual beliefs; the antefix would probably have been intended to protect a building and its inhabitants. Two face pots were recovered; these have been associated with iron-working sites, one suggestion being that they were intended to ward off the very real danger of fire associated with such activities (Braithwaite 2007, 393). One of these had an eyebrow representing a snake, which is likely to have cult associations. Ritual items such as these are unusual finds from Roman Worcester, though a fragment from an altar and part of a Venus figurine were found nearby at the Magistrates Court site (unpublished; James Dinn pers comm). Evidence for leisure activities was provided by the large number of gaming counters, many from the Period 6 quarry pits (AU 510). The bulk of the pottery was utilitarian, including a range of vessels associated with cooking and food preparation, but finer tablewares were also present. The Period 4 roadside ditch (AU 502) produced a significant proportion of decorated samian, which may reflect the status of nearby occupation at this time. The ceramic building material provided clear evidence for high status buildings somewhere in the vicinity, adding to that from 1 The Butts (Napthan 2011a). In contrast, a number of parasite ova from the large quarry pits may suggest poor hygiene conditions in the local area, or at least a quantity of animal faecal matter, probably reflective of the amount of rubbish dumping on or near to the site.

Roman cultivation and animal husbandry

Apart from structural features such as wells, surfaces and ovens associated with buildings, most of the archaeological evidence came from secondary depositional contexts, such as mixed waste discarded in layers, small rubbish pits or through clearance of middens into the large quarry pits (AU 510). Analysis of ecofacts from these contexts provided evidence of cultivation practice and animal husbandry.

Use of spelt wheat (with occasional use of hulled barley and rye) is evident, as would be expected for an urban centre of this date, but evidence of cultivation close to the settlement is lacking. There is also no indication of large-scale storage of grain or crop processing by-products at The Hive, although processing waste was evident at the adjacent City Campus to the north, as stated above. This may imply that use of cereals was limited to the needs of those living and working here, brought in as and when needed, and that there was no long-term storage or trade and re-distribution at this location.

Waterlogged remains from the Period 6 quarry pits provide some indication of the use of non-staple crops, such as coriander and summer savory, fig and possibly of carrot and cabbage crops. Whether these remains represent imported foodstuffs or local cultivation is uncertain, although the associated weed flora could have arisen from manured or composted garden plots. Also within the Period 6 quarry pits, as mentioned above, fungal spores associated with herbivore dung formed a discrete layer which has been interpreted as being from waste stabling material, indicating that animals were probably being kept close by. Similarly, the micromorphology revealed that domestic animals were managed or grazed on waste land during Period 6, in the area around the malting oven. Further evidence for herbivore grazing comes from the dung fungal spores on the floodplain, which were noted in large quantities and indicated that animal grazing/gathering occurred in the very late Roman and/or post-Roman period.

The animal bone assemblage from The Hive is dominated by the remains of the main domestic mammals; cattle, sheep, pig and horse, although pig and horse are noticeably less common than at City Campus and Deansway (Baxter 2014; Nicholson and Scott 2004b). The cattle found at The Hive belong to small horned and short horned types, which may suggest a continuation of Iron Age practices. The cattle show some limited breed improvement during the Roman period, and a new breed was identified from Period 6 deposits. This was also noted during the 4th century in Cambridgeshire (Baxter forthcoming a and b). The cattle assemblage may be an indication of an increasing Roman cultural identity throughout the development of the settlement. This is commonly exhibited by improvements in size of animal breeds and the presence of exotic or imported species, and also suggests possible specialisation in use (probably in craft or industry) such as would be expected in an urban situation. Most cattle found on the site survived until adulthood and there is evidence for the employment of cattle for traction, which is potentially reflected in the slightly higher proportion of larger animals in the later Roman period and the use of cattle horn in craft production.

Although sheep were the second most common domesticated animal in the assemblage, there is no clear evidence for improvement or significant changes to the sheep during the Roman period. Domestic dogs included a mandible of a midget or toy dog comparable to the Maltese type. Dwarf (or brachymel) dogs are now more commonly recognised as being a feature of Roman sites, bred either as specialist working dogs or as lapdogs, and are potentially an indicator of a 'Romanised' environment. A bone from a very large dog was also identified in the backfill of the quarry pit. Of the small assemblage of fish remains the majority were from small fish that would have come from local streams and rivers, but larger migrating species were also identified. The location of Worcester gives ready access to both freshwater and marine taxa but the exploitation of fish appears, in general, to be rather limited throughout the Roman period.

Medieval to late-medieval period

Richard Bradley

The majority of the site was located outside and away from the city wall and some distance from the medieval suburbs leading from the city along Foregate and The Tything. Cartographic sources (eg Speed's 1610 map of Worcester) suggest that there was no settlement or extensive use of the land prior to the Civil War and Doharty's plan, a century later (1741), shows the land on the north side of the city being used as a tenter yard. This use of the area could already have been well established, with the cloth industry the mainstay of Worcester's economy in the later 15th to 16th centuries (Dyer 1973, 81). Tenter racks (for drying, stretching and shaping cloth) required considerable open space, often located on the edge of towns where land was available in paddocks and other pasture fields.

At City Campus to the north, land use was primarily related to pasture and minor craft industry between the early medieval period and the late post-medieval period (Sworn *et al* 2014). The Hive was consistent with this; only a few features were assigned a medieval date (Period 9), reflecting low-level agricultural use. Seven small pits were found to contain pottery dating to the 13th–15th centuries, but little indication was available as to the purpose of these (CG 1054). In a number of cases, the features appeared later in date and the medieval pottery within them was likely to be residual. The medieval period was also characterised by the continual formation of a thick deposit of tillage soil (CG 1056), which sealed Roman features. This contained a range of artefacts dated from Roman to the late post-medieval period, indicating a constant re-working of the soils. Organic waste was also present, possibly from dung, suggesting that domestic animals may have been managed on grazing land.

It is possible that the lack of medieval features in this area could be attributed to Civil War levelling/clearance (known to have occurred in some suburbs; see Atkin 1995, 58–9), or substantial ground reduction. This has previously been suggested as a reason for the discrepancy for the level of the ground external to the defended city compared to within it, as post-medieval deposits have been found directly above the natural (eg Jackson 1992, 7–8). Earlier material could have been terraced away from the area in front of the city wall during the Civil War in order to achieve maximum possible elevation (Jackson 1992, 7–8).

On balance, in the total absence of any remains of structures, deposits or extensive residual medieval finds, but given the survival of earlier Roman features, it is probable that the main part of the site remained unoccupied during the medieval period. A similar situation was evident to the east, at the adjacent 14–24 The Butts (Butler and Cuttler 2011, 129).

The late medieval city ditch

A major feature of the medieval and later landscape in this area was undoubtedly the city wall with associated ditch. The observation of the ditch in Area 2 was the first near-complete profile exposed from anywhere around the city for many decades, and was the most extensive section ever recorded on the north side of the city. Although it was re-cut in the Civil War period (see below), an earlier 10m wide and 4.9m deep feature with a steep, V-shaped profile could be identified (CG 1035). This was separated from the wall by a 5m wide berm. Pottery recovered from the lowest fill was of 15th–16th century date, pre-dating the re-modelling of the ditch in the mid-17th century. It might be that this represents part of the infilling of the original 12th–13th century ditch, but because this survived at the base without any earlier material, and there is known clearance and enlargement of the feature in 1588 due to the threat of invasion (Beardsmore 1980, 63; Jackson 1992, 3), it is more likely to be part of the late medieval version. It has been noted that numerous documentary references to the ditch relate to the need to continually clean it out (Jackson 1992, 3), so the survival of anything prior to the late medieval period would be extremely fortuitous. Reflecting this, the investigation here is therefore the first dating evidence from an earlier fill on this side of the city. Previous investigations on the line of the ditch slightly to the east along The Butts road (Jackson 1992; Napthan 2011a) have only seen the upper deposits that relate to the Civil War phase, with augering used to record the profile and identify the full depth. These were unable to retrieve artefacts from lower deposits, although one undated primary fill was suggested to be of pre-Civil War date in a watching brief at 3–5 The Butts (Bretherton and Pearson 1998).

As the profile of city ditch was more visible here at The Hive than elsewhere, it is interesting to note the variation between this deeper, steeply sloped V-shaped ditch and that identified through the augering further along The Butts, around 40m to the east. With these investigations, all in relatively close proximity to each other, a slightly shallower, wider, more moderately sloping U-shaped ditch with a concave base was consistently recorded (eg Jackson 1992, figure 4; Napthan 2011a, 30). Why there is such a change is unclear, but it is possible that the ditch became narrower and deeper further downslope due to water catchment from the higher ground increasing in velocity and eroding the base as it reached this area. As mentioned above (Geoarchaeology and topography), Richardson identified a stream bed lying beneath The Butts (1956a, 50) and a change in the deposits in this part of the site was also highlighted through the geoarchaeolgical work at The Hive. The stream could have continued along the ditch, in which the early fills did appear fluvially reworked (Geoarchaeology: cores and monoliths), and thus incised a deeper channel at this point.

The ditch profile here, and the sequence of fills and visible re-cuts, is also notably different to the ditch where it has been observed to the east side of the city. As part of the survey prior to the construction of City Walls Road, the ditch was recorded in a number of locations. It was about 10m wide and 3–4.5m deep with a flat base, without a berm separating it from the city wall (Barker 1969d, 103; Bennett 1980, 70). Medieval pottery was recovered yet there was no evidence that the ditch had been re-cut or cleared out at any point, as if Civil War period strengthening was not undertaken in this area. The fills appeared waterlogged, so it is possible that in the east of the city the medieval ditch continued to be maintained until it eventually filled up with waterborne silts and was not then re-excavated.

The Civil War period

Richard Bradley, Elizabeth Pearson and Suzi Richer

Worcester has long been recognised as an important site during the period of the English Civil War, particularly as it was the site of (or close to) the first skirmish (Powick Bridge 1642) and the final battle in 1651, as well as being under siege in 1643 and 1646. As elsewhere, this period has received little archaeological consideration until recent times. However, modern work has begun to combine documentary, cartographic and archaeological evidence to build up a coherent picture of the defences of the city and the effect of the conflict on Worcester throughout this period (eg Atkin 1995; 1998; 2004; Dinn 2012; 2014).

Documentary sources record that the defences of the city were improved throughout the Civil War, with the medieval masonry city wall strengthened, internal and external earthwork ramparts added, suburban housing cleared to create clear fields of fire, earthen bastions constructed, the city ditch scoured out and additional lines of defensive ditches created (Atkin 1995, 56–64; Dinn 2012, 68–70). Similar schemes were undertaken at cities across the midlands and elsewhere (eg Gloucester, Leicester, Newark, Oxford), generally adopting a model of defence on principles established by Dutch military engineers (Courtney and Courtney 1992, 60). The defensive programme at Worcester initially began in 1641, but additional periods of work took place in 1642, 1643, 1644–5 and 1646, when internal 'last ditch' defences were built inside the walls, and in 1651, when re-establishment of the defences was required following possible levelling after 1646 (Dinn 2014, 173). Many of these works can be identified on the Vaughan map, published in 1660, showing an elaborate defensive circuit around the city. Questions were raised at the time, and have been since, regarding the completeness of these works or, conversely, if the mapped extent of these has been understated (Atkin 1995, 56–64; Dinn 2014, 68). Recent archaeological work has established that many of these defences were cohesive and substantial, with the findings from the excavations and watching brief at The Hive contributing to the discussion of this topic and helping to develop understanding of this period.

Archaeological evidence that can be attributed to the period of the Civil War was identified in all areas of the excavation, but was particularly prevalent close to the city wall. The associated finds did not demonstrate a military presence however, nor were they clearly related to use during the Civil War; they represented disuse and infilling over the following decades and centuries following post-war slighting and abandonment. The problems inherent with identifying remains that existed or were in use for a short period is a well-recognised hindrance to understanding the archaeology of the Civil War, as the archaeological dating cannot differentiate between near-contemporary activities (Atkin and Howes 1993, 21).

The city wall

Despite the problems with dating features more tightly, the strengthening elements to the rear of the city wall, including sandstone buttress and internal revetment deposits (CG 1207 and CG 1208), are thought to represent Civil War refurbishment in this area. These works probably relate to the earlier period of conflict, when extensive and organised preparations for siege were undertaken (particularly during 1646), rather than prior to the 1651 battle, when time was more limited (Atkin 1995, 62–4). Documentary evidence for additional defences within the walls on the north of the city is known, where a 'last-ditch' defence was in place in 1646 (probably a 6m wide ditch found during 1985 excavations at Blackfriars, adjacent to the watching brief work here) and aligned north to south behind the wall (Atkin 1995, 62–4). Similar revetment deposits to the layered sand and gravel ones exposed at The Hive, intended to support the walls against the impact of artillery shot, have also been noted further along the north side of the city in this area. For example, 120m to the east, layers identified as ramparts constructed from clean sand and gravel were recorded at the Angel Hotel (Dinn 2012, 69).

The city ditch

The clearest evidence of the Civil War period at The Hive was the city ditch which provided, as with elsewhere around Worcester, the most dramatic indication of the physical impact of the defences. As noted above, previous investigations along The Butts have recorded this feature, though excavation has tended to be limited (eg Napthan 2011a). Evaluation trenching to the east (Jackson 1992) saw the first observation of the Civil War ditch on the north side of city and recorded a feature 3.5m deep and 16m wide with a complex series of fills tipping into it (Jackson 1992, 6, and fig 4). The earliest of these was dated to the late 17th century by pottery and clay pipes (Jackson 1992, 17). Other work nearby found the same Civil War ditch, the fills of which were dated by pottery to mid- to late 17th century (Bretherton and Pearson 1998, 6). A 5.5m berm separating the ditch from the city wall, with a revetment of up to 4m of sand and gravel behind, was also recorded (Jackson 1992, 9).

Civil war city ditch

The Civil War period ditch at The Hive, as with the late medieval ditch, was again around 5m north of the wall but was slightly smaller in size than the earlier phase, being close to 9m wide and 4.5m deep. This observation is the first example of a clear sequence of cuts and deposits that can be interpreted in detail and, similar to the late-medieval cut, is substantially different from the simple single cut silted-up feature identified to the east of the city (Barker 1969d; Bennett 1980).

There was a steep but regular profile on the south and a gradual slope that dropped to a steep slope on the northern side, resolving into a broadly concave base (CG 1036). Artefacts from the fills demonstrated that this was a substantial re-cutting of the city ditch during the mid-17th century, and included a clay pipe fragment dated *c* 1640–60/80. Plant remains in this part of the sequence denoted a consistently wet environment, with at least some nitrogen-rich stagnant water, and possibly slow-flowing water. The presence of alder suggests more mature wet vegetation at this time. The pollen assemblage correlates well and also shows that slow-flowing water was initially present early in the sequence, through the presence of *Potamogeton natans*-type. Grazing was occurring close by, and run-off from the grazing land was entering the ditch, causing low levels of spores from dung fungi and *Glomus* (an indicator of soil erosion). Whereas the plant remains show a strong presence of alder, the pollen only shows a slight presence. This could suggest that the alder cones were being washed in from a little further away, or that the prevailing wind direction blew the pollen away from the ditch; the first hypothesis is more likely. Although the plant remains indicate more consistently wet conditions than the other environmental evidence, this may derive from plants living in sporadic pools of water or that were washed into an otherwise damp feature in occasional flash flooding events. The organic plant and insect remains are unlikely to have survived unless this deposit built up relatively quickly and was rapidly sealed.

Throughout the profile, settlement debris in the form of human domestic and craft or industrial refuse of a similar composition to that recorded for ditch deposits of Civil War date at 3–5 The Butts was found (Bretherton and Pearson 1998). Textile processing, such as the processing of flax and hemp for making rope, sacking and linen fabric and the dyeing of cloth evidently took place nearby, as flax, hemp and dyers rocket were all recorded from the ditch at this site and at 3–5 The Butts (Bretherton and Pearson 1998). The food waste (for example, plum, sour cherry, apple or pear, fig, and herbs, coriander and summer savoury) appears to have come from latrine or cess waste as several insect species present (*Thoracochaeta zosterae*, *Sepsis* flies and the *Eristalis tenax* maggot) are commonly associated with cess. Phosphate concretions and mineralised plant remains, normally associated with cess waste, were not common however, possibly as a result of slow-flowing water counteracting the mineralisation process.

Secondary re-cut

The stratigraphic sequence, alongside the environmental remains, provided evidence to suggest that a later clearing out of the Civil War ditch took place, also in the 17th century, which removed the mid-17th century fills (CG 1037). This was still around 9m wide, but shallower than the first re-cut, and included late 17th to 18th century pottery in a noticeably darker and more organic clay fill (2543). This has not previously been identified in other investigations along the northern stretch of the city ditch, but these have not exposed a sequence for detailed observation. However, it is perhaps of relevance that the augered profile of the ditch at 1 The Butts shows a brick or tile horizon approximately 3m down which could feasibly denote a deposit horizon in the lower portion of this later re-cut (Napthan 2011a, 30).

Plant, insect and mollusc remains were well preserved within this part of the city ditch, and showed differing environmental conditions, including a distinct change. The insect assemblage suggested that little standing water accumulated in the feature after it was re-cut for the second time. Dung beetles and a weevil associated with clover hinted at some grazing nearby. Molluscan remains similarly suggest a sharp change in conditions at just before the level of the latest re-cut of the ditch (2560). Here, there is evidence for an increase in periods of drying out, with only pools of water remaining, and, moreover, the upper fill shows evidence of much drier and more stable conditions. At the top of the ditch *Sitophilus granarius* 'the granary weevil' indicates dumping of spoilt grain. The pollen also suggests that periods of dumping may have occurred, seen through the presence of fungal spores relating to decaying stems or plant pathogens (*Tilletia* sp and *Ustilago* sp). These may be indicative of the dumping of waste cereal stems. The uppermost part of the whole sequence appears to have developed in open conditions.

There is a suggestion that the city defences were levelled after the siege of 1646 (Dinn 2014, 173), but were known to have been left open for some time and used as convenient refuse tips following the 1651 battle without being cleared out (constituting a health hazard in city records; Atkin 1995, 66). It is possible that at The Hive the later re-cut represents a quick clear out of an infilled and overgrown, wet ditch for strengthening in this area during the frantic renovation of the city defences prior to the 1651 battle. This was then left open in more clear conditions, to accumulate later 17th and 18th century refuse. Of course, this suggestion must remain provisional without extremely specific dating information differentiating the two construction phases, but it is possible that the section through the ditch here has captured a short moment of activity during the Civil War period that reflects the historical record.

External defences

A number of ditch segments were encountered that in some cases are in alignment. These probably represent Civil War defensive features surrounding the city that are additional to the mapped bastions shown on the Vaughan map of 1660, although, as ever, exact mid-17th century dating was not established. A steep-sided ditch with a flattened base (CG 1058), 3.90m wide and 1.14m deep and containing 16th to 17th century clay pipe and pottery, potentially aligns with a 5.40m wide ditch with a steep profile recorded around 90m to the east during work at 14–24 The Butts (Butler and Cuttler 2011, 67). This could have acted as a secondary defence behind a primary obstacle defined by a 3m wide ditch running east to west across the north of the site that probably turned onto the floodplain (CG 1059, CG 1209 and CG 1060). These would both have been supplementary to projecting bastions to the east and west and the main ditch in front of the city wall. The bastion mapped to the east was thought to have been encountered as a 17th century stepped ditch during excavations of a lift shaft at Farrier Street 220m east of the site (Dalwood *et al* 1994, 82 and 104), and at 8–12 The Butts (Napthan 2011b, 7).

When this evidence from the north side of the city is combined, a picture begins to emerge of an extra-mural defensive system for the city that appears to have been rather extensive and substantial. As only the bastions are marked on the 1660 map, which claims to show ‘An exact ground plot of the City of Worcester, as it stood fortified 3 Sep 1651’, the possibility is raised that these additional ditch features are remnants of the siege defences from the early part of the Civil War, levelled after 1646 and not re-established at the time of the 1651 battle. Features such as this could represent a number of earthworks associated with sieges, such as small defensive enclosed fortified areas or artillery emplacements, or, perhaps less likely, offensive ditches used in circumvallation of a city (Atkin 1995, 65). These types of feature may not have been present in the landscape during the compilation of the Vaughan map but could have been very extensive, as seen on siege plans for other towns and cities which were prepared during the conflict (Dinn 2012, 68; Dinn 2014, 174).

17th to 18th century

Richard Bradley

After the disturbance of the Civil War, the ditches across the site and the city defences appear to have been infilled with waste material. As with the medieval period, there was limited other 17th and 18th century activity in this area beyond the city ditch. The landscape of this part of Worcester was still fields and open land in the mid-18th century, west of the large Netherton House, and probably mainly used for pasture until the late 18th or early 19th century. Cartographic sources indicate a tenter yard in this area and, as with the City Campus site to the north, there may have been minor craft industries occupying small parts of the site. There was no archaeological evidence for this however.

In Trench 15, Area 3, a series of layers and a pit containing a large amount of fired clay ceramic mould fragments was dated to the 17th century (CG1082). The circular pit had been dug into the alluvial clays of the floodplain, perhaps having been used for the extraction of clay for use in the casting process, although as it is unclear from where the material originated it could be coincidental that the pit was used for disposal of the waste from vessel founding. This group of mould fragments, identified as resulting from the manufacture of vessels such as cauldrons and skillets, was isolated, with no similar features or deposits observed elsewhere on the site. There are some indications that medieval and post-medieval dumping on ‘miskins’ (middens) occurred in this area, so the material may have been part of this wider waste disposal (see Bryant 2011, fig 1). It is still unlikely to have been transported far from the site of its original use however, probably coming from a foundry such as the one identified at Deansway, 300m to the south-east (Dalwood and Edwards 2004, 106–110).

The only other feature securely dated to this period was the group of hollowed-out elm timbers joined together to form a water pipe, also found on the floodplain (CG 1052). Dating of pottery from the backfill would suggest a later 18th century date for the construction of this, possibly indicating that it was associated with either the house itself or the more formalised gardens of Netherton House, which supplanted the area of pasture on maps from the early 19th century onwards. Similar hollowed elm trunks have been found in waterlogged deposits in Droitwich (Hurst and Hemingway 1997, 65), where they were used as pipes associated with pumping at a salt works, and also dated to the late 18th century.

19th and 20th century

Richard Bradley

Further comprehensive information on the structural remains from this period is detailed within the historic building analysis for the site (see Robson-Glyde 2016), but a short summary is presented here for ease of reference.

After 1826 the area took on a more urban character with the establishment of the cattle market on the floodplain and the construction of buildings forming Joseph Wood’s timber yard and Nash’s Almshouses. This later development, whilst not spanning a great length of time, was intensive. The first phase of construction took place around 200 years ago with the early 19th century buildings to the south of The Butts. Portions of these buildings survived until demolition in 2008. In the mid-19th century development of pasture land and gardens west of Netherton House took place for new industrial use, namely a timber yard. Prior to this, the 1824 Corporation Plan shows that The Butts was already becoming an industrial suburb of the city, with timber yards, a blacksmith, wheelwright, carpenter, bricklayer and stables in residence. Following the planning and the eventual building of the railway in 1859, the status of the land further reduced.

Although a timber yard was present on the site by the 1840s, there was further development once Joseph Wood took over the yard in the 1850s. A partial rebuilding of the eastern range, the demolition of the central range and the construction of a southern range all took place between 1857 and 1878. It is possible that Joseph Wood and his sons were consolidating the processes used and producing a more efficient layout. Little change in the Joseph Wood site was seen in the early part of the 20th century before the company moved out of The Butts and into new accommodation elsewhere. With the use of the buildings by the City Corporation from the 1940s and 1950s onwards, the vast majority of the earlier historic fabric survived, at least until the 1970s and up to 2009 for other parts.

Archaeology and the future: a retrospective view

Simon Woodiwiss

It is a rare circumstance where an archaeological organisation is as totally immersed in such a project as that which became The Hive. Worcestershire Archive and Archaeology Service provided design advice to the development partnership (Worcestershire County Council, University of Worcester, and Worcester City Council), undertook the archaeological works associated with construction, and became an occupant of the multi-award winning building. All this was undertaken in a contemporary context where the project was carried through as a vestige of the late 2000's pre-recession United Kingdom.

The past informing the future

Right from the start the Joint Project Team were aware of the importance of the past, how it provided opportunities to add value to the project, as well as how it could be an issue to be resolved. The Joint Project Team produced a Design Statement, and this included the aspiration for the use of the building with regard to heritage. It also included a section specifically on archaeology identifying the known features that could inform design at a broad level (such as Roman roads, and the medieval city defences).

In some sense the results of the archaeological work presented in this report have merely scratched the surface of what actually exists on this site. The level at which archaeological excavation stopped was designed to be just below the base of the major groundworks necessary for construction (the base levels of pile caps and beams supporting the lowest floor level). Significant archaeological deposits below this level have been affected by piling, but overall this will have affected a small proportion of the site area. Where there were particular features that were likely to be damaged by piling (the stone lined Roman well, for example) the design was changed to preserve features *in situ*. The natural topography of the site slopes from east, down to the west and the construction impact levels varied across the site. To the east almost all archaeological deposits were removed as the significant horizons were thinner and higher. In a band just to the west almost all the impact levels were at or close to the more significant deposits (those of Roman date) and the deposits themselves had a greater depth. Here, where significant deposits were exposed there was little more requirement than cleaning and recording the exposed surface. Further to the west, with the exception of two evaluation trenches, significant deposits were well below impact levels, and no archaeological works took place.

Design works continued alongside archaeological fieldwork, such that there were a few design details that necessitated later excavation of smaller areas after the main archaeological works had completed, such as the area of services parallel to the viaduct, the riverside water supply, 'Story Island' foundations and the City Wall. Aside from these there was little significant archaeological recording resulting from the watching brief. An attenuation tank was also a late feature for detailed design, but on archaeological advice this was located within one of the large evaluation trenches; a solution that saved a considerable sum. The presence of ground water at a high level in the area within the floodplain meant that there was the potential for the preservation of organic materials, but both the design to avoid impact and where there was impact (some of the westernmost piling) a case was made that the impact was very unlikely to include significant changes to burial environments.

Overall, The Hive has had a moderate impact, and careful working with all the partners in the project has taken advantage of opportunities where archaeological excavation was necessary to involve the wider community. This left a lasting impression on many local and non-local people. The results presented above are substantial enough, but when it is considered what still lies beneath, such as deeper deposits associated with the Roman road, and that these are likely to include waterlogged deposits and their organic remains, this legacy for the future is considerably enhanced.

Conclusions

Richard Bradley

The archaeological fieldwork undertaken at The Hive was focused on a part of modern Worcester that had only been extensively developed since the early 19th century. The area excavations, trenching, building recording and watching brief observations successfully retrieved a range of evidence relating to earlier settlement, particularly of Roman date, Civil War defensive features (including later re-cutting of the medieval city ditch) and to less intensive land use during later periods before 19th century buildings were constructed. The wider landscape was also investigated and interpreted, mainly through ecofactual and geoarchaeological evidence, but continuity of occupation from the prehistoric period could not be demonstrated. The survival of Roman deposits in a developed area of the modern city was due to the masking effect of the late Roman to post-medieval 'tillage soil' which formed the ground surface for new buildings in the 18th and 19th century. Overall, the results of the work at The Hive will make a significant contribution to the understanding of the archaeology of Worcester, and the evidence for Roman occupation will inform local, regional and potentially national research agendas.

Roman Worcester

Modern archaeological fieldwork in the area north of the medieval city wall has led to the understanding that this area is a significant part of the Roman settlement at Worcester, rather than a purely peripheral area. Excavation along The Butts and Farrier Street (eg Butler and Cuttler 2011; Dalwood *et al* 1994), Castle Street (eg Edwards *et al* 2002) and at City Campus (Sworn *et al* 2014) has demonstrated variable Roman occupation, including domestic and agricultural activity, timber buildings, surfaces and quarrying, as well as extensive domestic and industrial rubbish disposal.

It is alongside this expanding knowledge that the evidence from The Hive has been considered, and it is apparent that the site articulates and informs understanding of this area during the peak of Roman occupation at Worcester. The project also adds many new insights into the character and development of the 'small town' and for this reason can be viewed as an accumulation of archaeological evidence that is nationally important. The significance of the archaeology is clear in relation to the published resource assessments and research frameworks for the Roman town and the overall character of excavated evidence to date (Dalwood 2004b, 39–52; Worcester City Council 2007, 21–46). It certainly provides the largest and most important group of Roman features and artefacts since the excavations at Deansway in the late 1980s and as such, is now integral to any synthetic understanding of the settlement morphology between the 2nd and 4th centuries AD.

There was a range of evidence for the town's organisation and development, particularly in terms of the layout of a street frontage and the type of buildings constructed, plus secondary deposition indicating the economic base for the settlement and the cultural character of the inhabitants. Roman activity was recorded on the edge of the 2nd Worcester terrace and the terrace slope, and down across the historic floodplain of the River Severn, where extensive dumping of slag demonstrated that large scale, managed land reclamation was occurring. Structural and occupation evidence was focused along the northern edge of the excavated area, where the gable end of the properties fronted onto a road aligned east to west, probably leading to the river frontage. This road informs understanding of the Roman road network and perhaps points towards a degree of civic planning and organisation in the settlement layout, as well demonstrating the growing morphological complexity of the town between the 2nd and 4th centuries. The buildings may have been small 'strip-buildings', housing numerous ovens that were probably used for small-scale commercial or industrial production. It is possible that earlier forms were used for iron smelting, but during the 3rd century and into the early 4th century a clear typology of circular pre-formed superstructures suggest they involved a baking and/or smoking function. It is considered that the area developed as a small-scale trading district that serviced wider riverside and roadside industrial working, situated in a suburb away from the main settlement core.

Overall, occupation was dated between the 1st century and into the late 4th century AD, potentially even beyond this, but, following a period of mainly agricultural use in the area, was most intensive between the mid to late 2nd century and the early 4th century. In this period the Roman settlement at Worcester was at the height of its economic development and highest population, during which ironworking appears to have been a major focus, potentially alongside cattle trading. A subsequent period of disuse and abandonment (or possibly just large-scale dumping) led to an accumulation of waste on the site and the vicinity during the early to mid-4th century, likely in midden form, before being cleared into accessible pits in order to facilitate redevelopment. This later change of land use included construction of an aisled building, evidently on the same alignment as earlier occupation, and the suggestion is made that this was related to a suburban property associated with, or subsidiary to, a larger established town house or villa that once existed in close proximity. High status building material has been recovered from a number of features in this area of the settlement, and later finds from this site, including stone roof tile, box flue tiles, an antefix, slipped tegula, plus the presence of the aisled building, are consistent with this localised evidence.

The range and significance of the Roman occupation in the areas investigated added considerable information as to the character and layout of the settlement. Roman Worcester has always been characterised as an industrial town, full of ironworking sites, probably controlled by a local elite residing in a few isolated townhouses. Although the evidence for the production of iron on this site was limited, beyond extensive disposal from the surrounding area, findings from the excavation both supported this interpretation and demonstrated new insights, indicating that Roman Worcester had a workshop-based commercial area focused along an east–west road. The properties here were built of timber and clay but evidence of quality finishing was noted, and the road probably led down to a riverside area of land deliberately reclaimed for industrial working and off-loading of goods and raw materials. The excavation is crucially important to understanding the character of the northern area of the Roman town and its development through time, and will inform any future work in this part of the settlement. The design for construction of The Hive building has also ensured that a number of partially excavated features and earlier archaeology has been preserved *in situ*, offering the potential for rewarding archaeological work on the site during any future development.

Later development

Accumulation of tillage soil occurred from the late Roman period onwards. This soil constituted a substantial layer of plough soil, containing residual Roman pottery, but aside from this there was little post-Roman or early medieval activity. This is consistent with adjacent sites and much of the modern suburban area, suggesting that the Roman town covered a far more extensive area than later medieval occupation. Throughout the medieval and earlier post-medieval periods the area was open land, lying immediately beyond the city wall and dominated by gardens and pasture on which domestic animals were managed or grazed, and was probably used as space for tenter racks. A section through the city ditch was excavated, the first near complete profile exposed for many decades, and shown to have been entirely re-cut in the late medieval period, as well as in the mid-17th century and later. This was indicative of strengthening of defences during the Civil War. Further information on the character of the city wall itself, particularly the strengthening elements added at the rear, can be combined with other evidence contributing to better knowledge of the city defences, and as such is of national importance.

Further out from the main defences, activity was very limited, although a few pits contained medieval pottery, and on the floodplain a 17th century pit containing a dump of casting moulds provided evidence for post-medieval cauldron manufacture in Worcester. Ditches transecting the main part of the site may have dated to the Civil War period and relate to extra-mural defensive circuits associated with the siege of the city, correlating well with nearby excavations at 14–24 The Butts, 8–12 The Butts (Butler and Cuttler 2011) and at Farrier Street (Dalwood *et al* 1994). This information improves understanding of the layout of the defences during this period and contributes to expanding discourse on the city during the Civil War and wider projects considering siege sites across the country.

In summary, the later period archaeological evidence from the excavation highlighted that, in broad terms, medieval and post-medieval land use for areas of Worcester is well understood and that the nature and character of medieval and post-medieval archaeological deposits across the historic city are able to be projected with some confidence.

Acknowledgements

Worcestershire County Council, the University of Worcester, Worcester City Council and Advantage West Midlands worked together to create The Hive, a combined facility open and available to the whole community. Funding for the project came from the University of Worcester and Worcestershire County Council, with additional support from the National Lottery, the Department for Culture, Media and Sport and the Department for Education. The project architects were Feilden Clegg Bradley Studios, Max Fordham LLP were the mechanical and electrical engineers and Atelier One with Hyder Consulting Ltd the structural engineers.

Worcestershire Archive and Archaeology Service would like to thank the following individuals for their kind assistance in the successful conclusion of this project:

Iain Paul (Architect, Worcestershire County Council) was instrumental in ensuring the final design of The Hive met the needs of all users, including Worcestershire Archive and Archaeology Service, and his leadership and drive were essential for the successful completion of the project. Thanks also go to Peter Parkes and Nick Hughes (Worcestershire County Council), Simon Courtney and Malcolm Saxby (Galliford Try), and Jim Hunter and Jennifer Wylie (Hyder Consulting).

Additional thanks are given to James Dinn (Worcester City Council) for monitoring and guiding the fieldwork stages and post-excavation focus of the project and, alongside Lisa Moffett (Historic England), for assistance, challenging questions and insightful comments on earlier drafts of this work.

In addition, David Starley and Fiona Roe visited the site and advised on selection, retention and discard for slag and building stone respectively, alongside James Dinn and Deborah Fox (Museums Worcestershire). Adam Stamford (Aerial-Cam) undertook the aerial photography.

Jane Evans would specifically like to thank Maggie Darling, Jeremy Evans, Sally Grainger, Laura Griffin, Alison Heke, Derek Hurst, Ed McSloy and Phil Mills for their helpful comments and advice regarding the pottery and oven material, and Sam Moorhead (Department of Coins and Medals, The Brtitish Museum) for his comments on the Roman coin assemblage. Further acknowledgment goes to Angus Crawford, who originally identified the Roman oven material during fieldwork and finds processing.

Jo Mills would like to thank Brenda Dickinson, Joanna Bird, and Gwladys Monteil for their advice and assistance in identifying some of the samian pottery.

Project personnel

The compilation of the final report has been led by Richard Bradley, Jane Evans, Elizabeth Pearson and Suzi Richer, working from draft documents produced and edited by Simon Sworn and Hal Dalwood. Illustration was co-ordinated by Laura Templeton. Editing and comments on the final report were undertaken by Victoria Bryant, Derek Hurst, Robin Jackson and Simon Woodiwiss (all Worcestershire Archive and Archaeology Service). Copy editing and final review was completed by Rachel Edwards (Arboretum Archaeological Consultancy). Specialist reports and sections of reports are attributed to the original authors throughout the main text.

The production of the assessment report was led by Simon Sworn and Hal Dalwood.
The project managers responsible for the quality of the project were Hal Dalwood, Simon Woodiwiss and Victoria Bryant.

Excavation fieldwork was led by Simon Sworn with a site team involving Emily Beales, Richard Bradley, Claire Christiansen, Tegan Cole, Tim Cornah, Angus Crawford, Des O'Donoghue, Christine Elgy, Marge Feryok, Simon Holyoak, Ruth Humphreys, Cheralynne Hyde, Chris Gibbs, Andy Mann, Darren Miller, Adam Lee, Mike Nicholson, Alessandra Parsons, Stephen Potten, Sean Rice, Rebecca Riley, Richard Shakles, Matt Simmonds, Claire Smith, Tom Vaughan, Jo Wainwright, Alex Wilkinson, Steve Woodhouse and Steve Yeates.

Finds processing and initial identification and recording was undertaken on and off site under the supervision of Angus Crawford, with assistance from Dennis Williams and Claire Christiansen, and environmental processing and scanning was completed by Emily Beales, Richard Axe and Adrian Robins. Andrew Mann and Nicholas Daffern assisted with the initial environmental assessment. Site plans were digitised for illustration by Christine Elgy and Laura Templeton.

Volunteer and educational excavations were led by Justin Hughes, Darren Miller, Deborah Overton and Angus Crawford. Building recording and survey was undertaken by Shona Robson-Glyde. Site survey was by Andrew Mann.

The volunteer team consisted of: David Appleton, Rebecca Arnott, Simon Avery, Sarah Ball, Shirley Barlow, Mr Bartle, Rob Baston, Carol Brook, Hilary Burton, L Byng, J M Carter, Sarah-Louise Cleaver, Simon and Annette Clews, Carol Cole, Edward Cullerne, E Curry, Len and Betty Daniels, Dan Davidson, Nicola Davis, Rona Davis, Erica Dyde, Elaine Edwards, Mike Ellison, Elizabeth Evans, Lynda Evans, Lyndsey Fairweather, Deb Fox, Tim Gaylard, Sally Gleaves, Marilyn Griffiths, Kerry Gwilliam, Paul Harding, Maureen Hart, Alison Hill, William Holliday, Paul Hudson, Gail Jacovon, Rosalind Jefferies, Tony Jennings, Neal Johnson, Carla Jones, Lynne Kellow, Helen Kirkup, Emily Knight, Alethea Law, Helen Lee, Patricia Lloyd, Tom and Jean Longshaw, Nicola Marshall, Debbie McEvoy, Michael and Susan McCurdy, Giovanna Mercer, Jo Mildren, Thomas Moffitt, Angharrad Morgan, Bruce Officer, David Orr, Ceria Park, Phoebe Perkins, Georgina Pickett, Celia Philipps, Patrica Powell, Steve Quick, Amanda Quick, Andrew Quinn, David Rastall, Richard Rammell, Paul Richardson, Andrew Rowley, Gareth Sanders, Dilip Sarkar, Zarena Scott, Gemma Lea Shaw, Karen Shorey, Christine Silvester, John Stafford, Eric Steed, Thomas Stewart, Tom Stokes, Valerie Strassman, Chantel Summerfield, Julian Swinbourne, Linda Talbot, Tammy Thornhill, Richard Thornton, Nina Marie Watkins, Andie Webley and Hazel Whitefoot.

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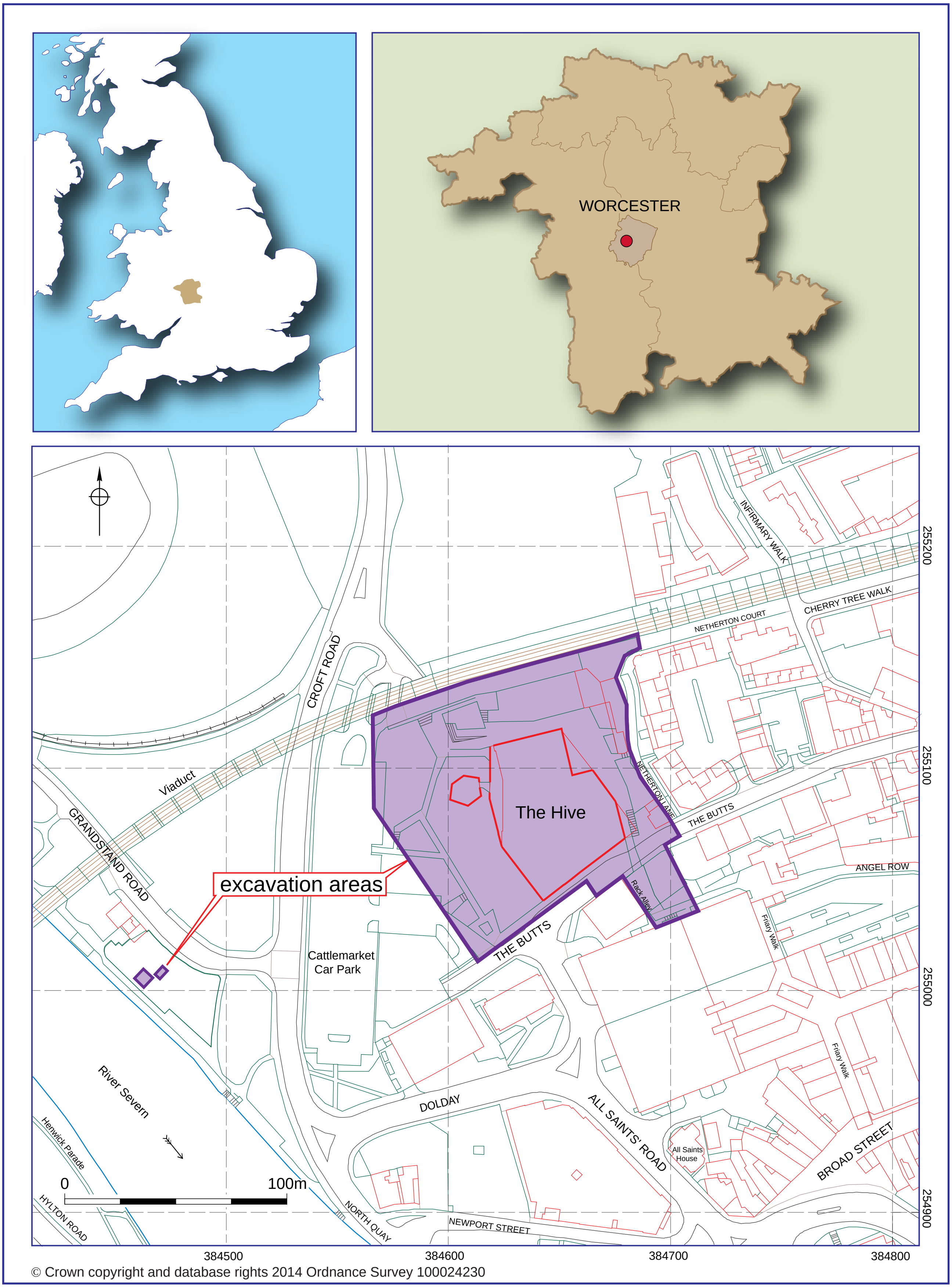


Figure1: Overall site location within Worcester

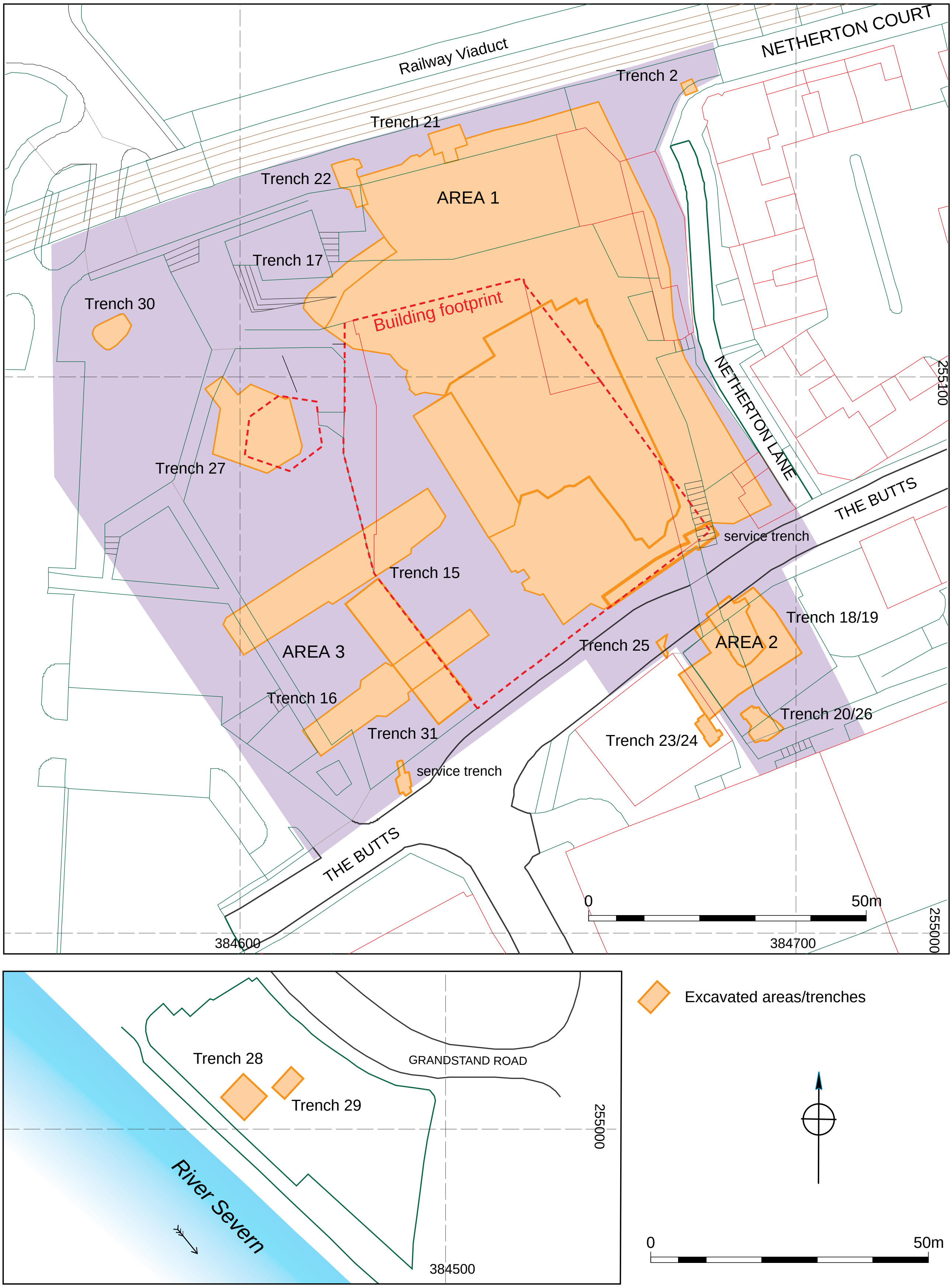
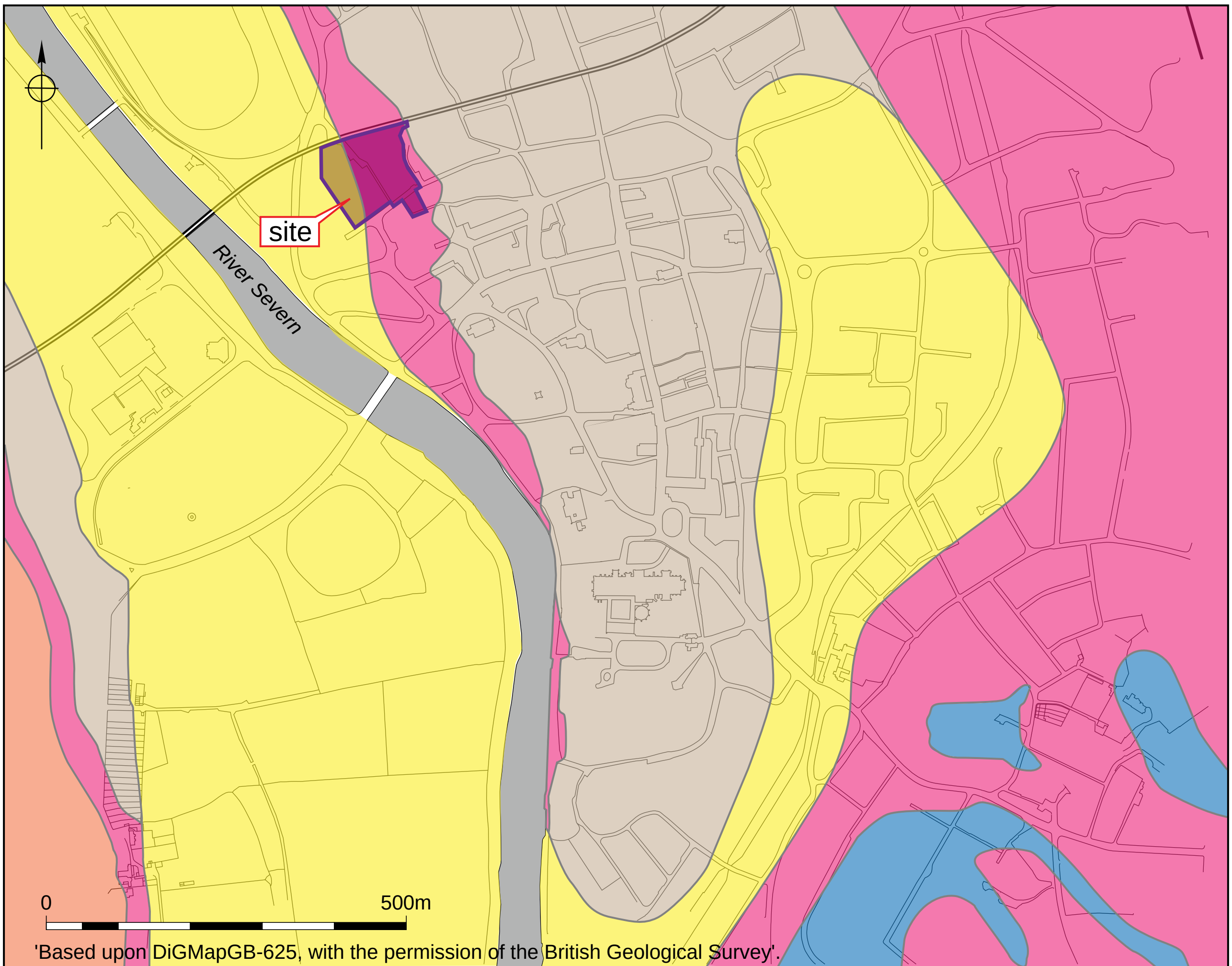


Figure 2: Detail of excavated areas/trenches

Figure 3: Overall view of the northern part of Area 1 under excavation, facing east (Aerial-Cam)

Figure 4: Overview showing the city ditch in Area 2 (bottom right) with view north across Area 1

Figure 5: Working shot of Trench 15 on the floodplain



Holt Heath Sand And Gravel Member - Sand And Gravel
Sidmouth Mudstone Formation - Mudstone.
Worcester Member - Sand And Gravel
Alluvium - Clay, Silt, Sand And Gravel
Sidmouth Mudstone Formation - Siltstone, Dolomitic.

Figure 6: Geology of Worcester

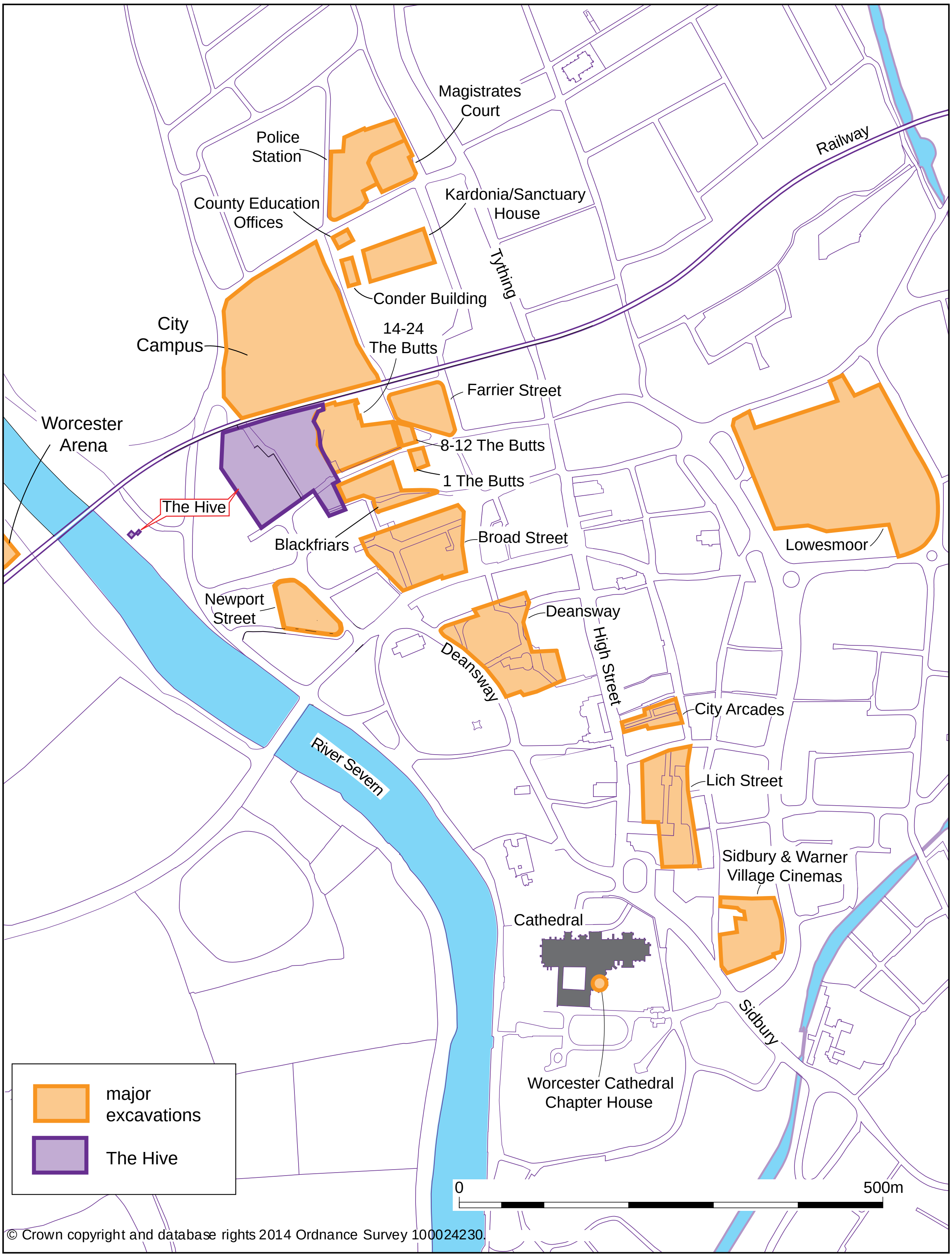


Figure 7: Major adjacent sites

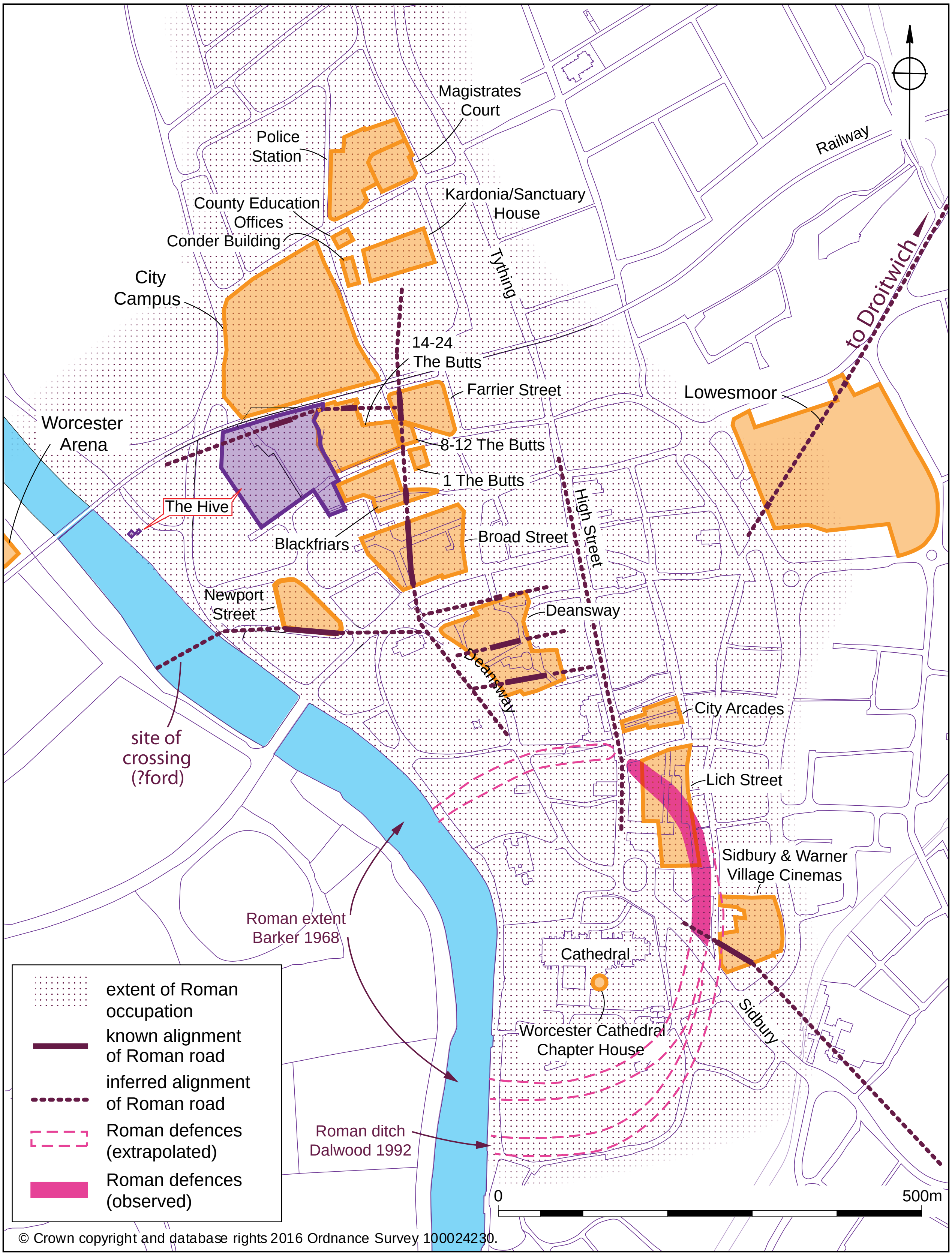


Figure 8: Roman Worcester

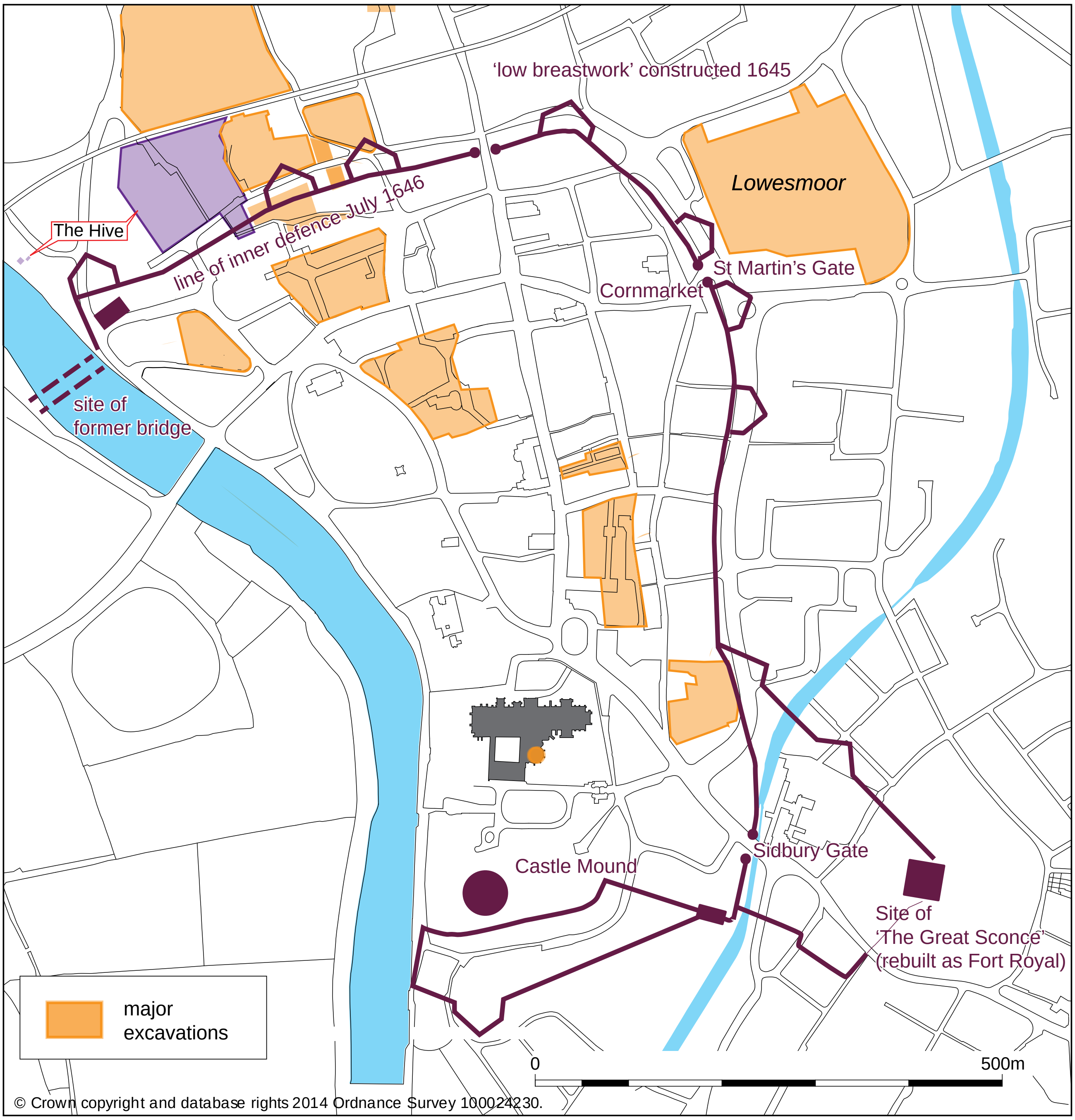
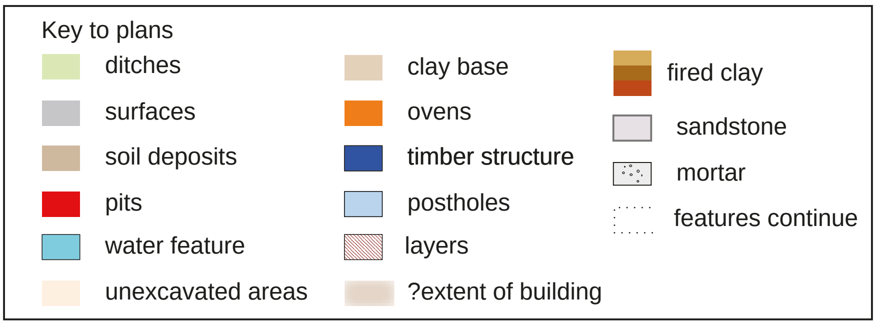


Figure 9: Civil War defences



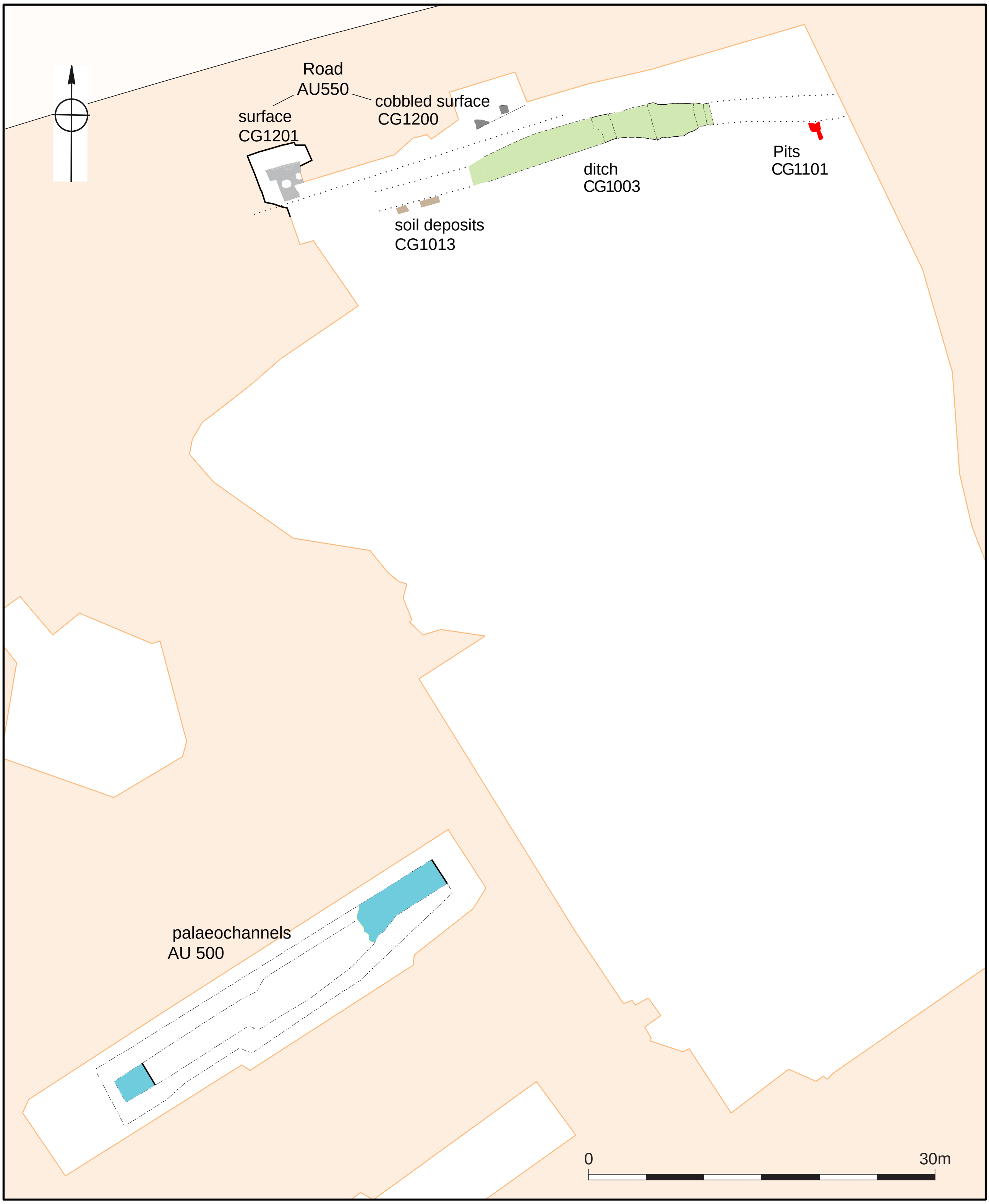


Figure 10: Site period 2-3

Figure 11: East–west road (AU 550), with cobbles overlain by slag (1m scale)

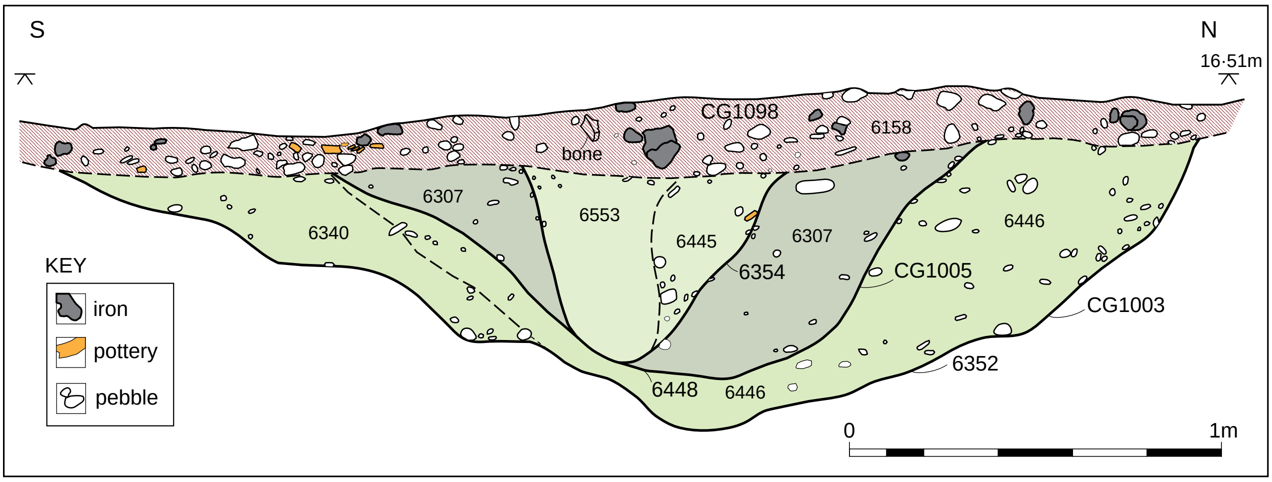


Figure 12: Roadside ditch

Figure 13: Roadside ditch (AU 501) and recut (AU 502), facing west (2m scale)

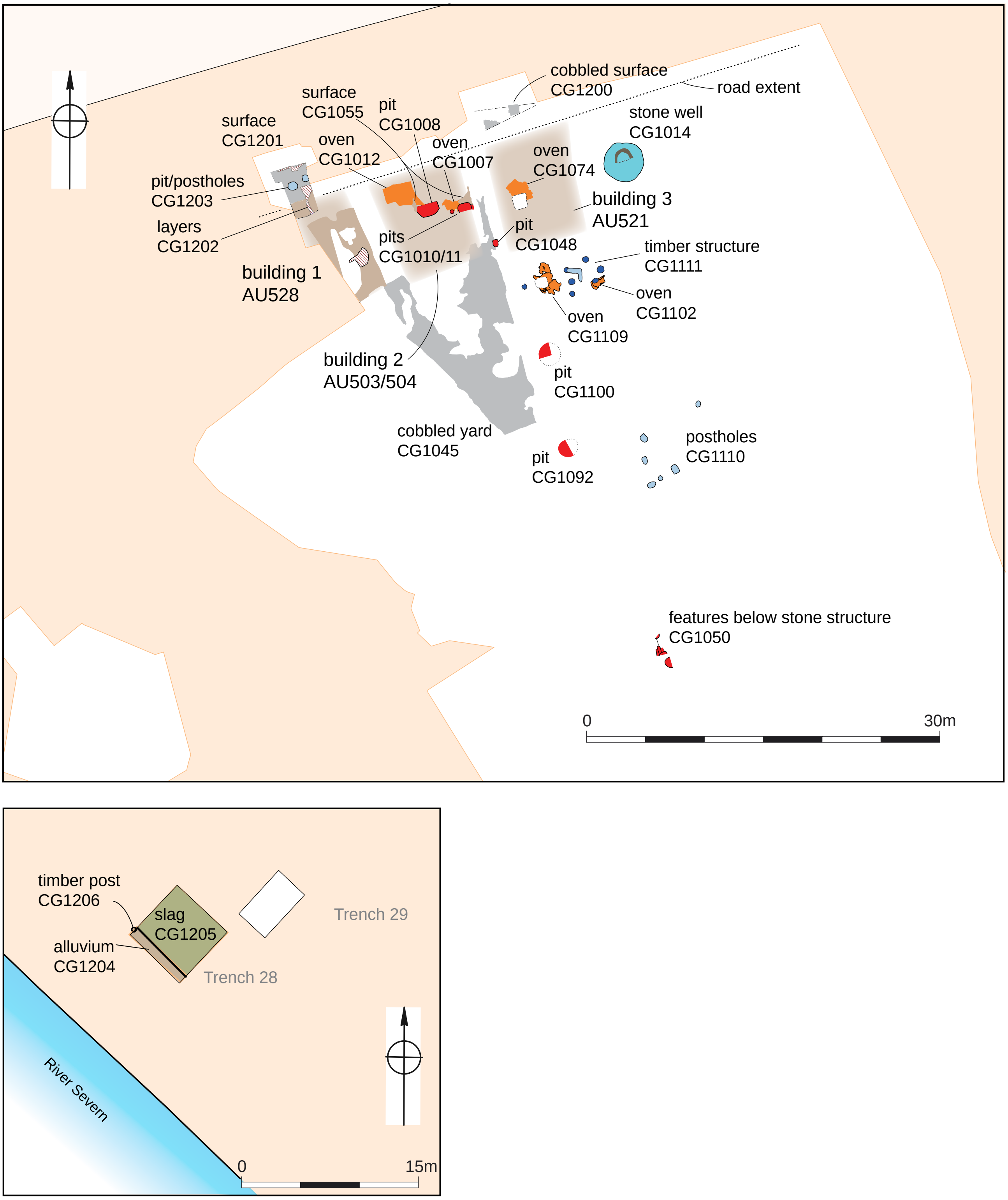


Figure 14: Site period 4

Figure 15: Vertical view of clay floors and cobbled yard (light brownish-grey lower half of photo), Buildings 1 and 2 (AU 528, 503, 504, 518, 519) (Aerial-Cam)

Figure 16: Building 3 surfaces and oven (AU 521), cut by later aisled building foundations

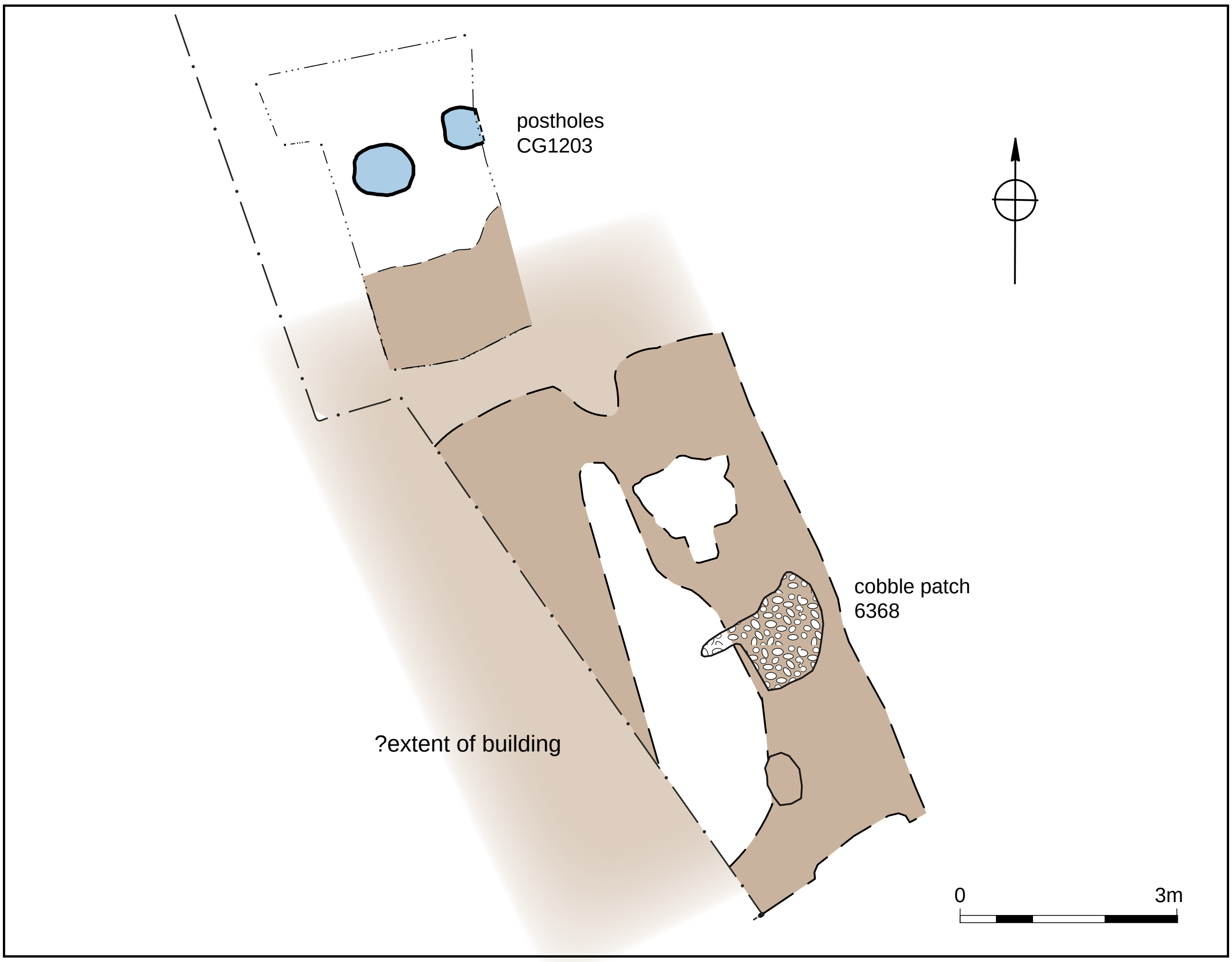


Figure 17: Building 1

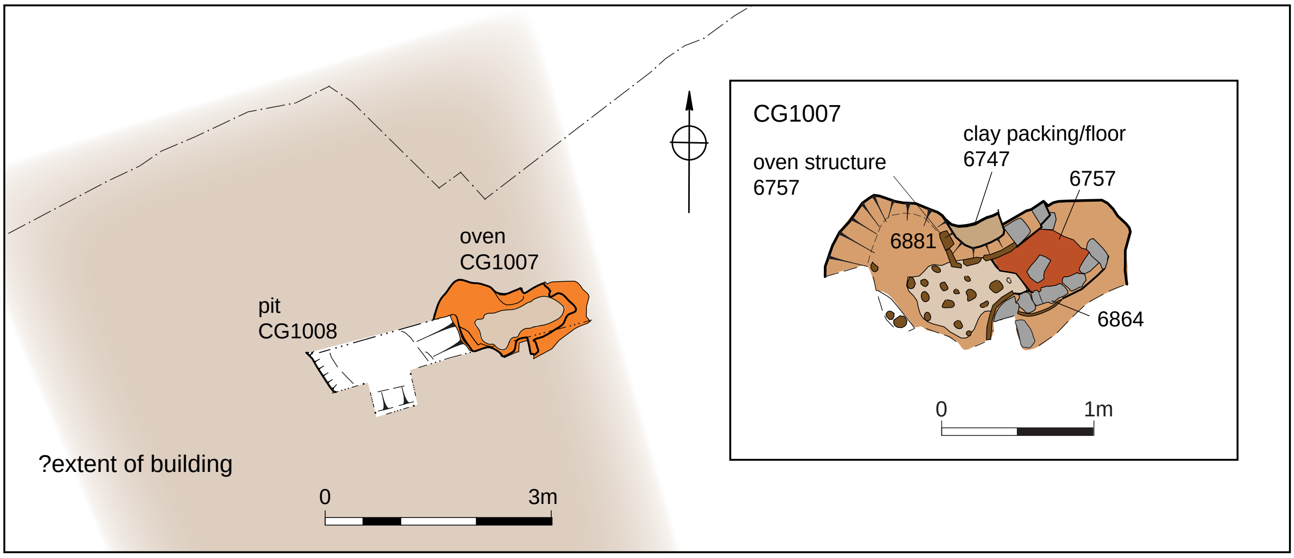


Figure 18: Building 2A

Figure 19: Period 4 oven or hearth
(CG 1007, right, facing west, scale 1m) showing sandstone lining. This feature exhibited more evidence for iron working than the other ovens/hearths

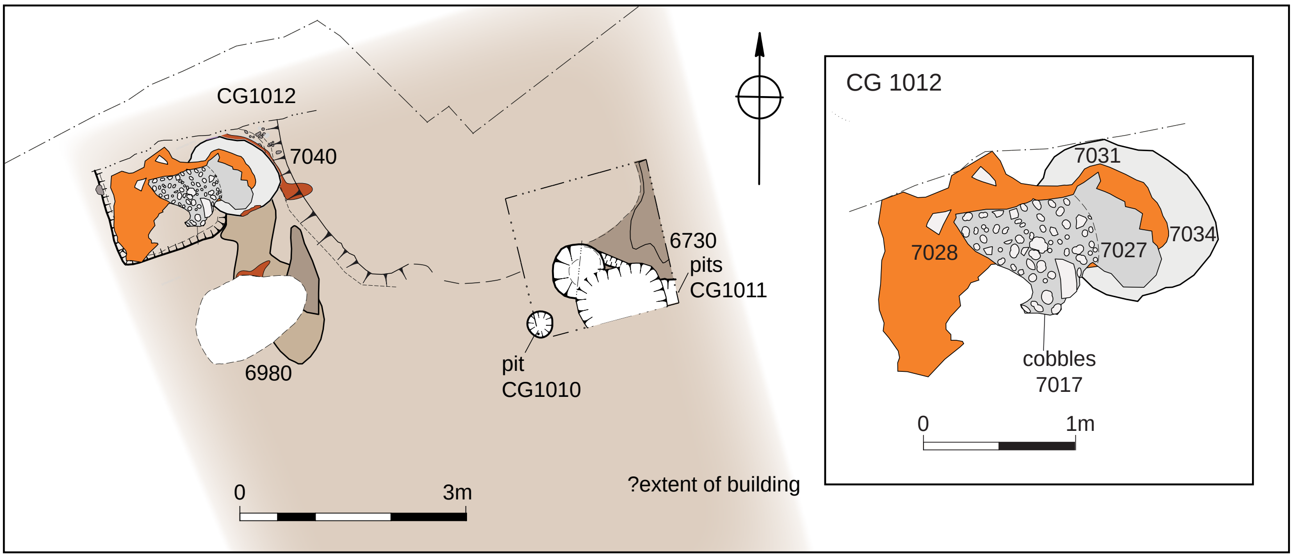


Figure 20: Building 2B

Figure 21: Small pit (CG 1010) including near complete Severn Valley Ware jar, with yellow clay floor layer (CG 1061) above (scale 0.5m)

Figure 22: Part of yard surface (CG 1045) at the rear of the buildings, facing east (2m scale)

Figure 23: Period 4 oven or hearth base (CG 1102, facing north, scale 0.5m)

Figure 24: Possible oven or hearth base (CG 1109, facing north, scale 0.5m)

Figure 25: L-shaped slot and posthole, part of possible timber buidling CG 1111 (0.3m scale)

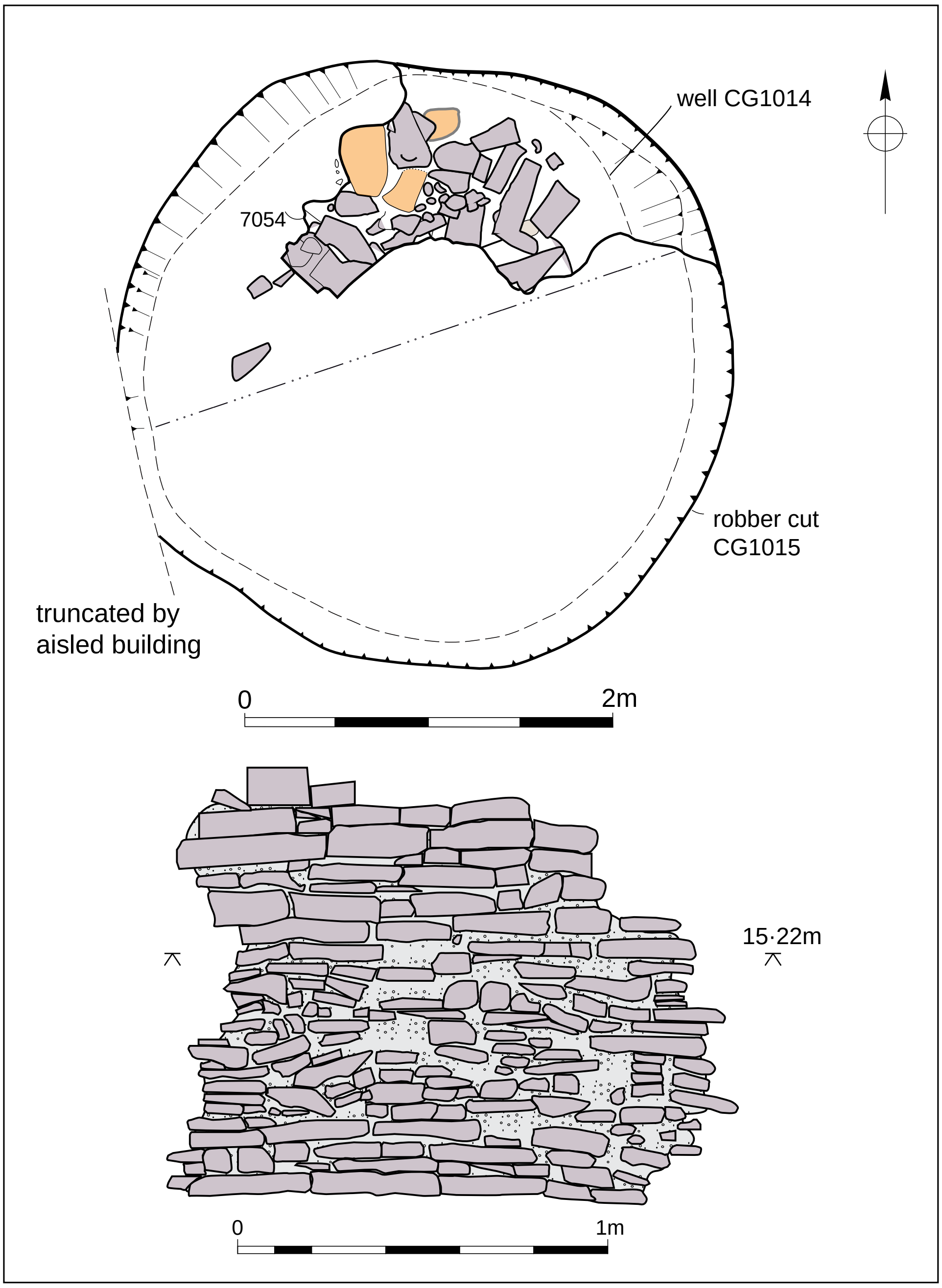


Figure 26: Stone lined well

Figure 27: Upper part of stone well (AU 506), partly removed by later pit (1m scale)

Figure 28: Stone well (AU 506) at limit of excavation (1m scale)

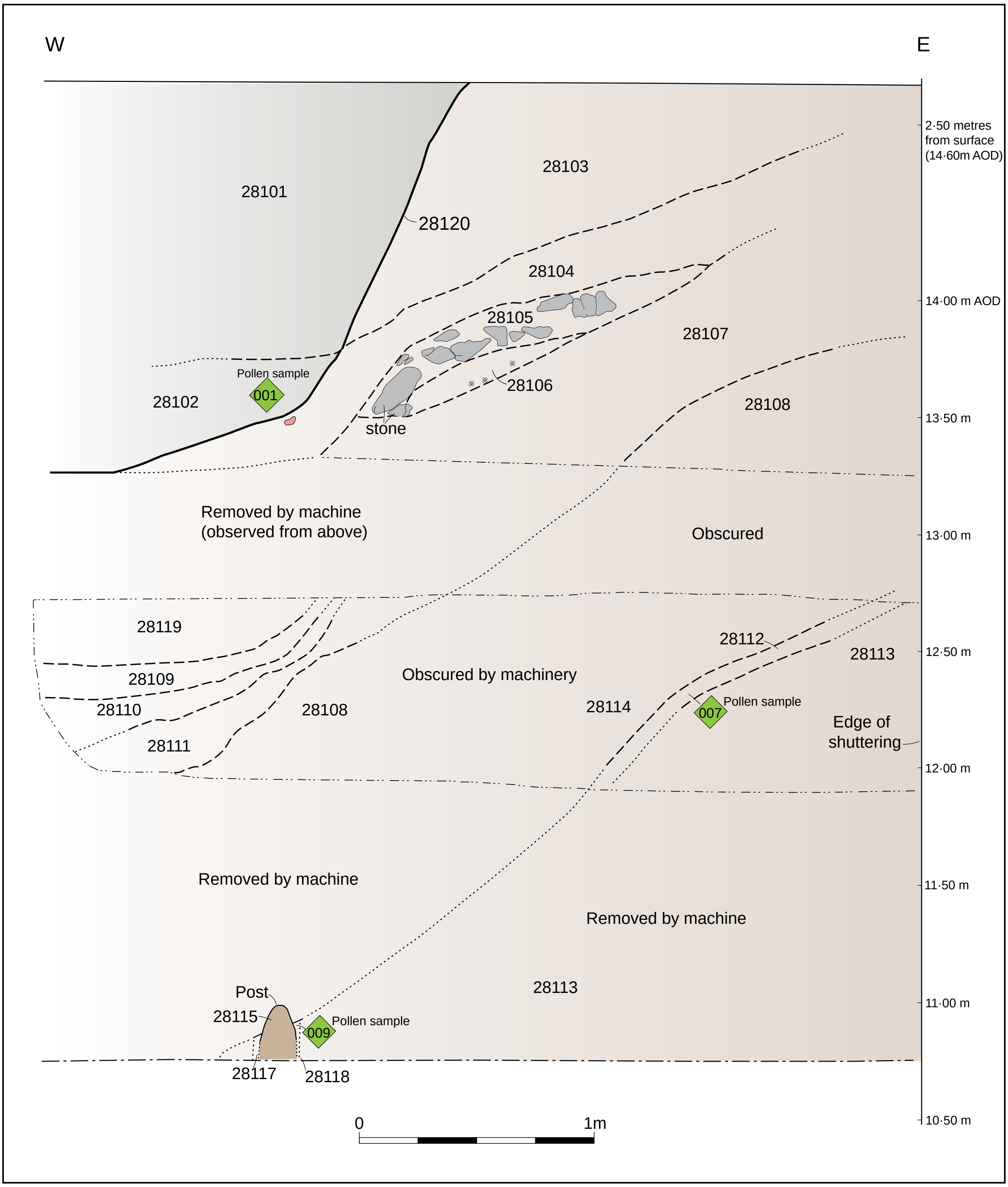


Figure 29: Trench 28 slag deposits

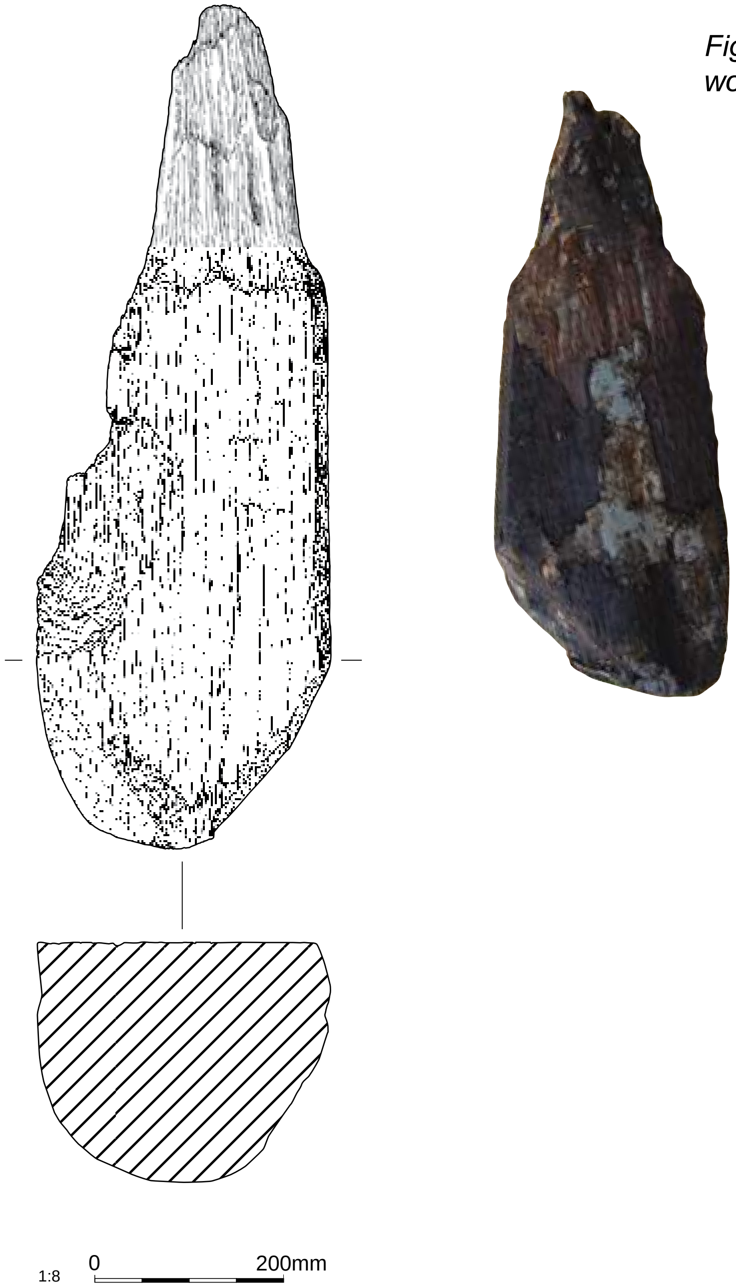


Figure 30: Illustration of Roman wooden post

Figure 31: Dumped slag deposits on the riverside (CG 1205; scales 1m)

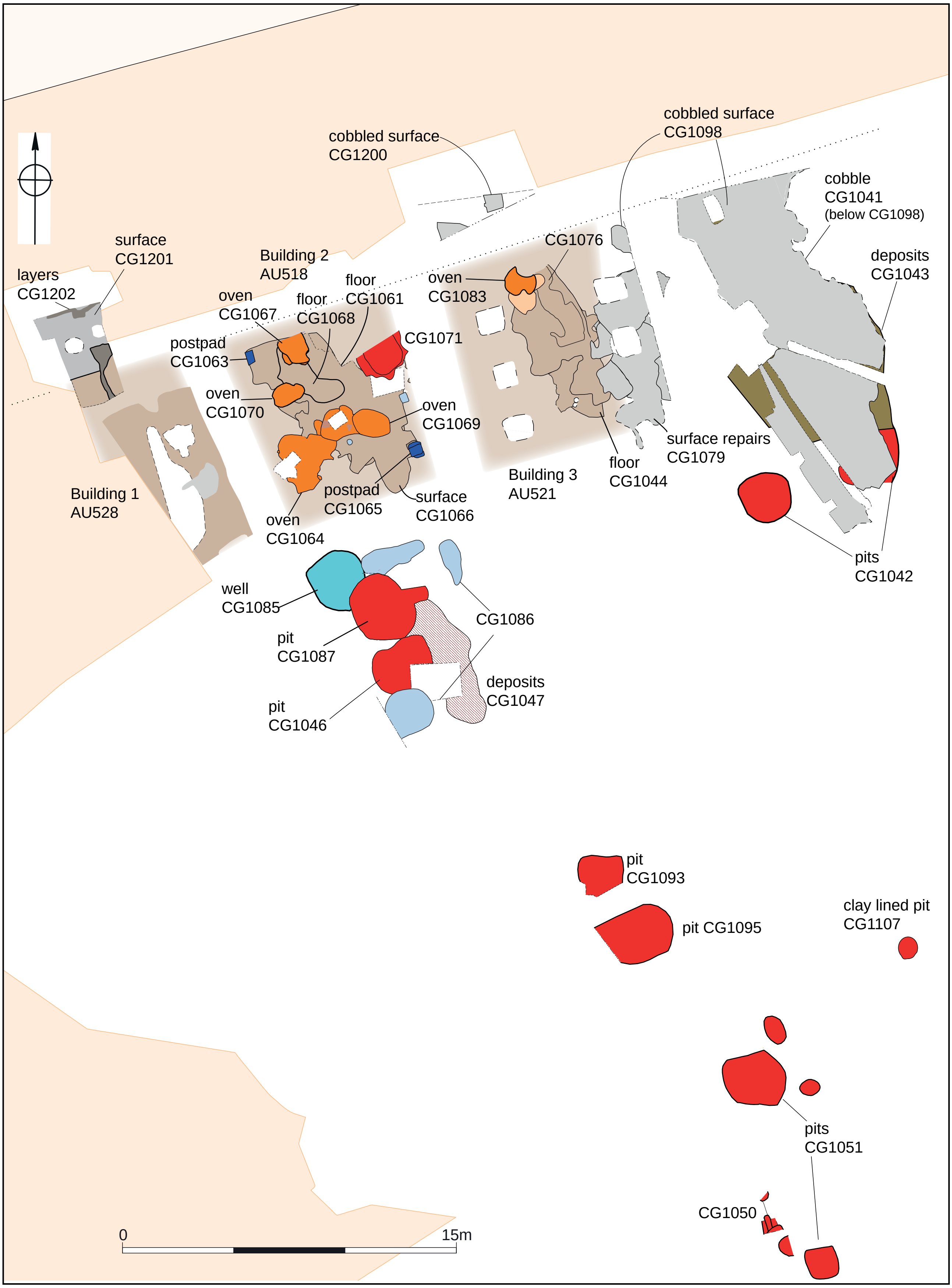


Figure 32: Site period 5

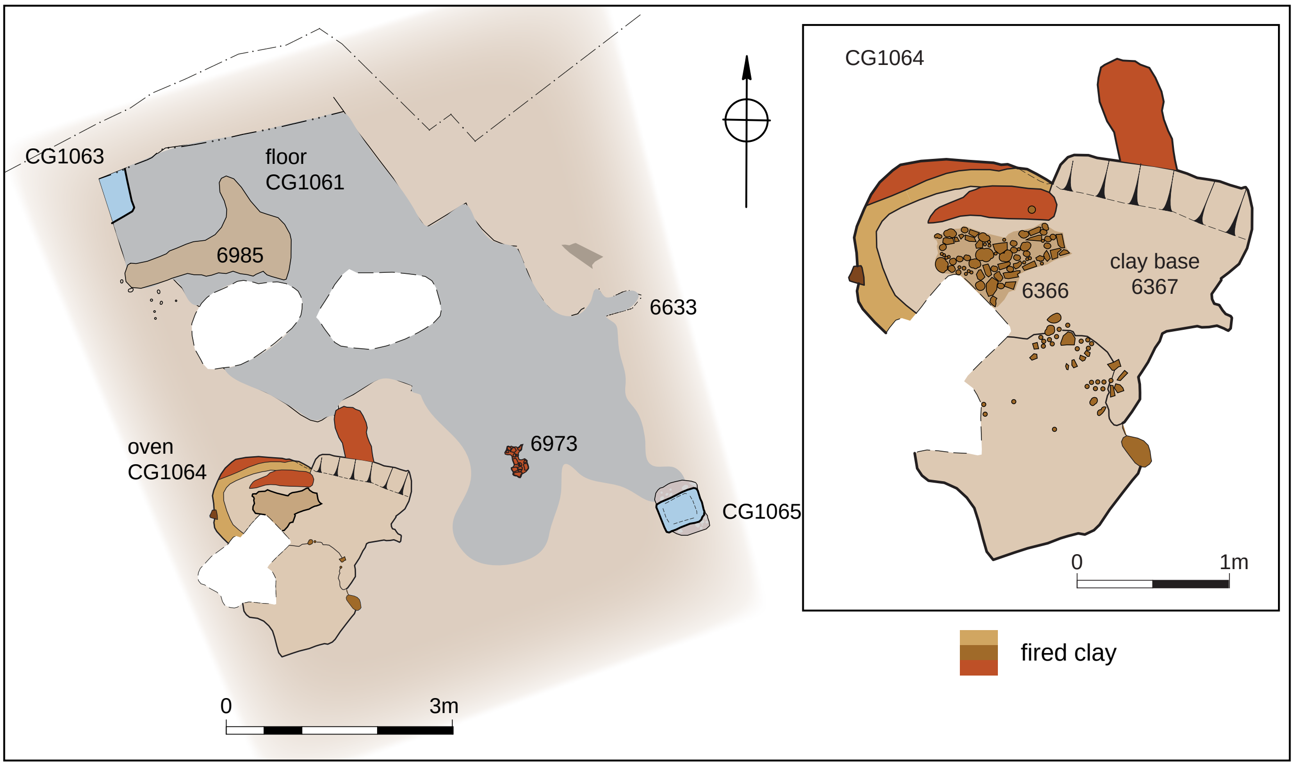


Figure 33: Building 2C

Figure 34: Sandstone post pad (CG 1065), facing west (scale 0.3m)

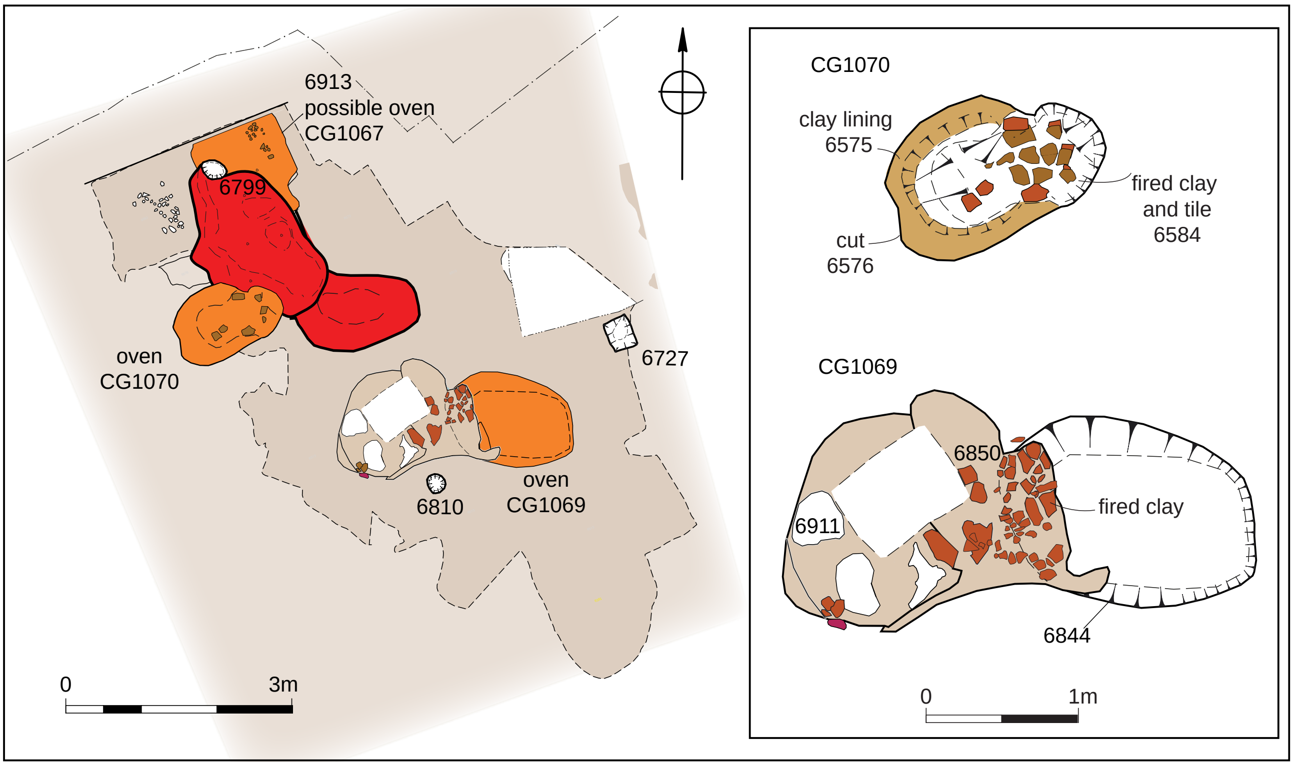


Figure 35: Building 2D

Figure 36: Oven (CG 1070, facing south, scale 0.5m) showing clay lining and circular/sub-circular shape of main oven area

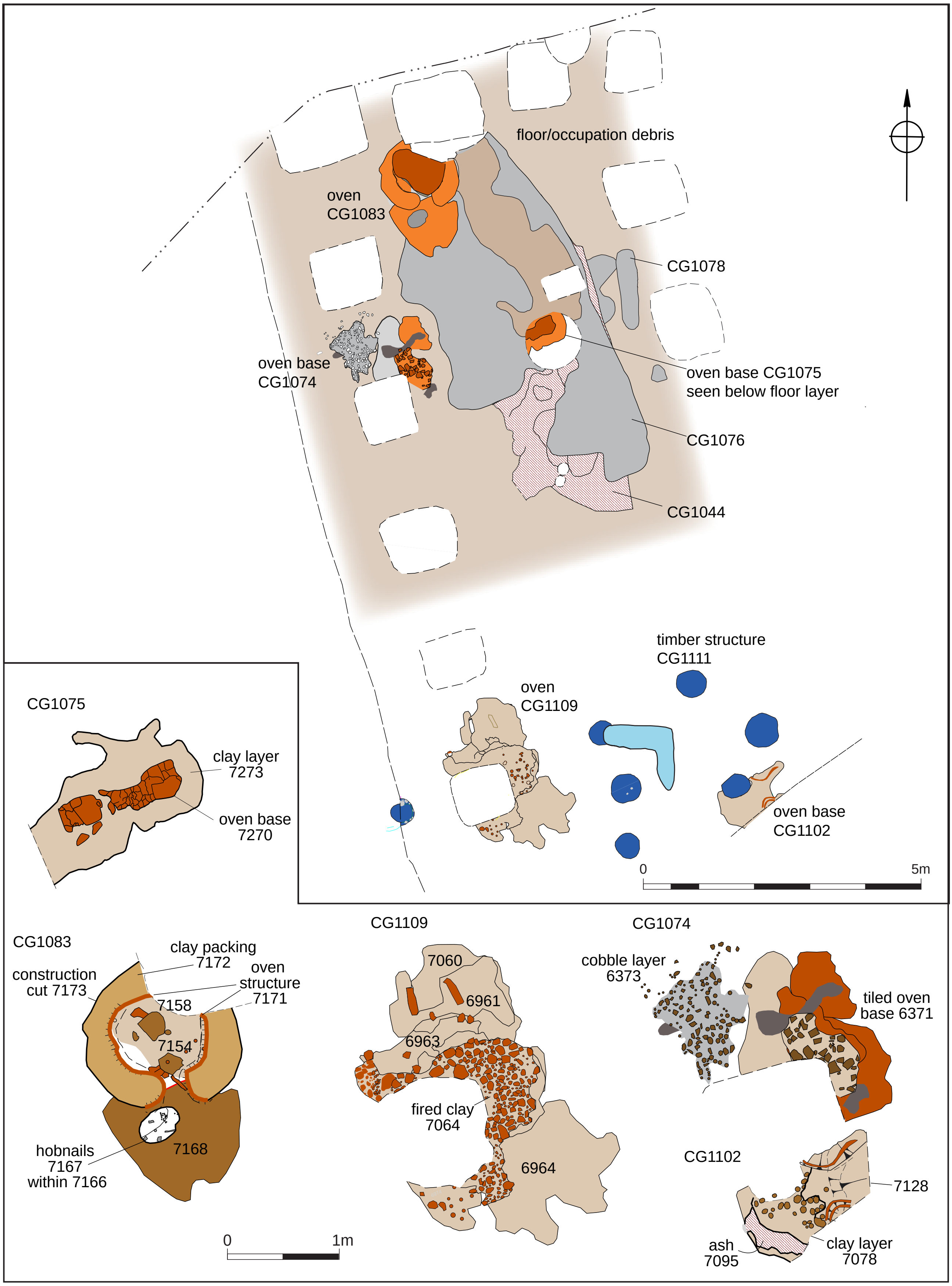


Figure 37: Building 3

Figure 38: Period 5 oven with 'platter base'
(CG 1075, facing south, scale 1m)

Figure 39: Period 5 oven
(CG 1083, facing north, scale 1m)

Figure 40: Area of surface (CG 1098) to the east of the buildings, facing south (2m scales)

Figure 41: Pottery and amphora on surface (CG 1045) at the rear of the buildings (1m scale)

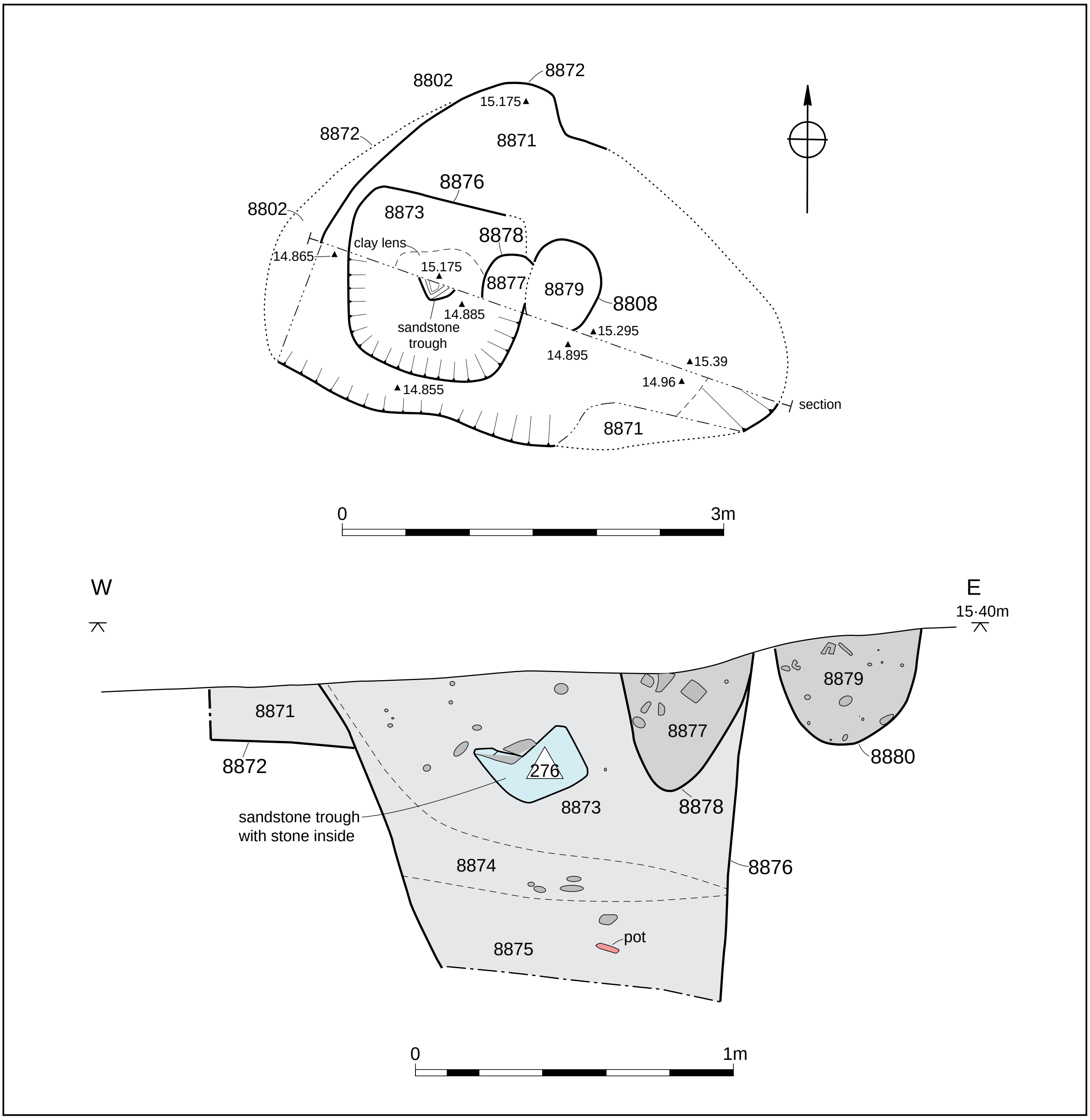


Figure 42: Pit with water trough

Figure 43: Pit 8876 (CG 1051) with sandstone trough, facing north (scale 2m)

Figure 44: Clay lined pit (CG 1107), facing south (scale 0.5m)

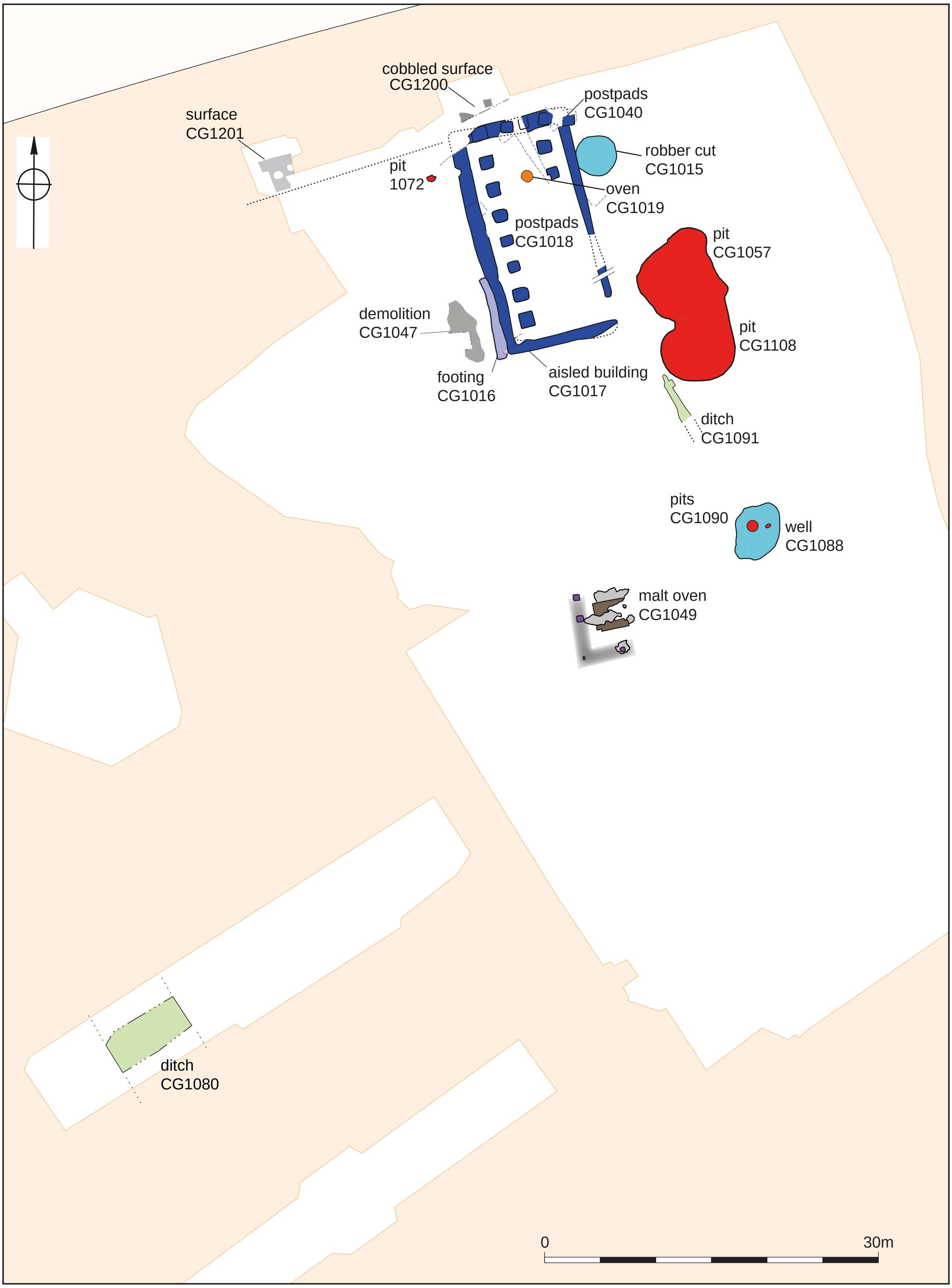


Figure 45: Site period 6

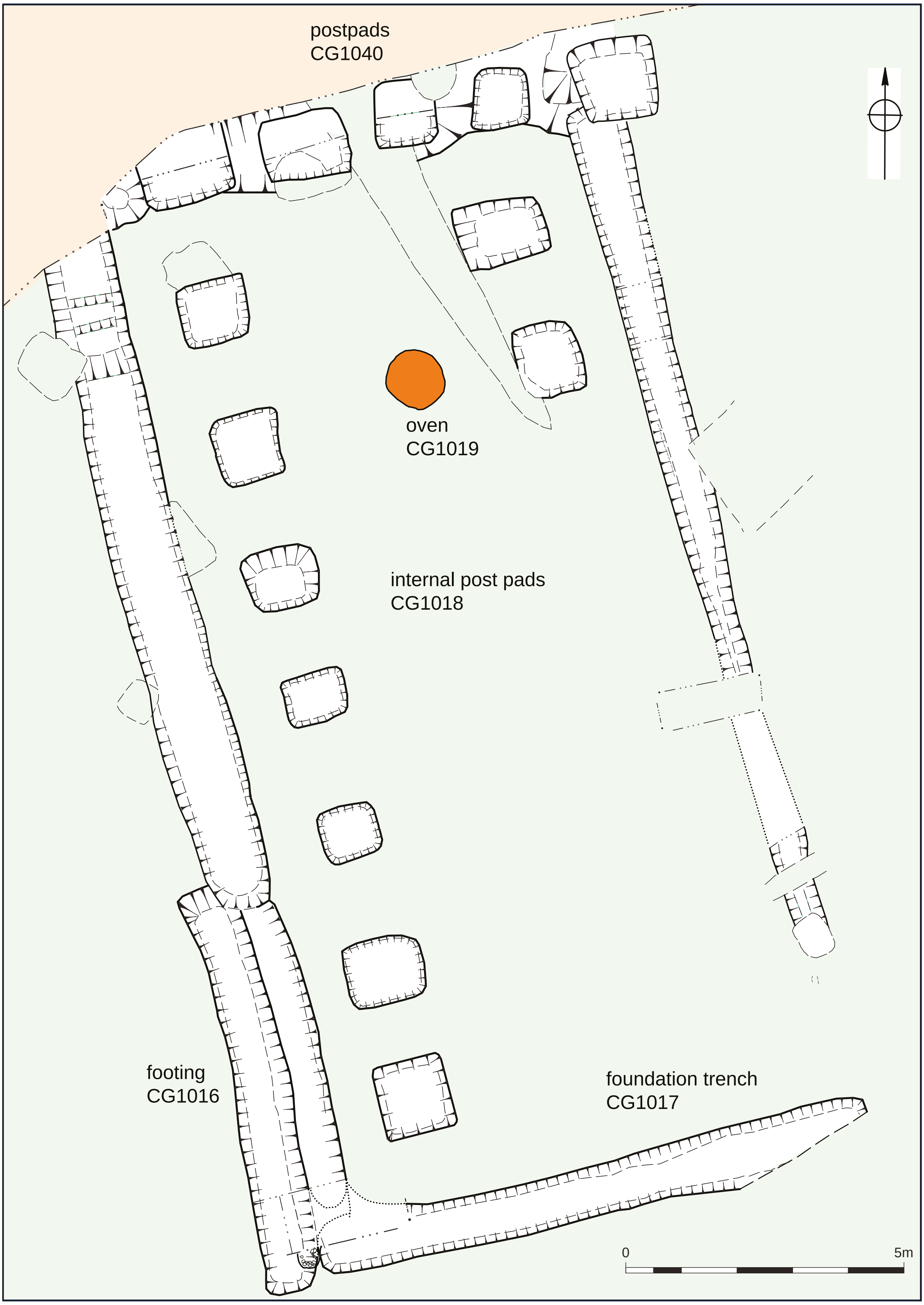


Figure 46: Aisled building

Figure 47: Aerial view of the aisled building (AU 508), facing south (2m scales) (Aerial-Cam)

Figure 48: Eastern side of aisled building foundations (CG 1017) and post pads (CG 1018)

Figure 49: Example of northern footings of aisled building foundations (CG 1040)

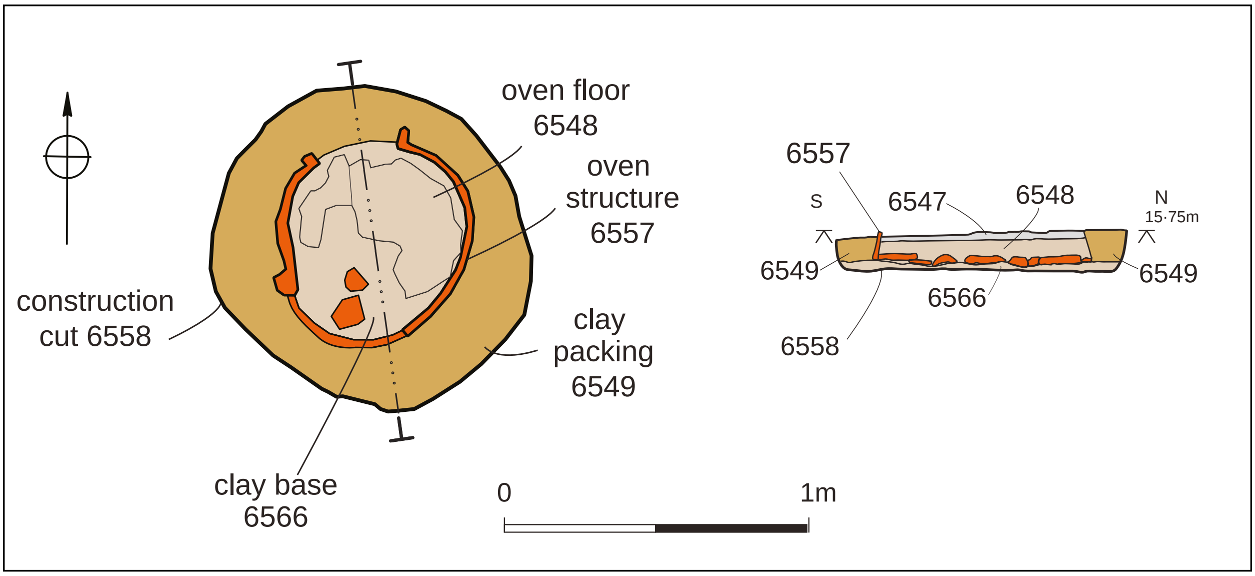


Figure 50: Oven, in aisled building

Figure 51: Period 6 oven (CG 1019) with clay base and outline of in situ oven (left, facing east, scale 0.5m)

Figure 52: Period 6 oven (CG 1019) with clay removed showing pottery and oven material packing (right, facing south)

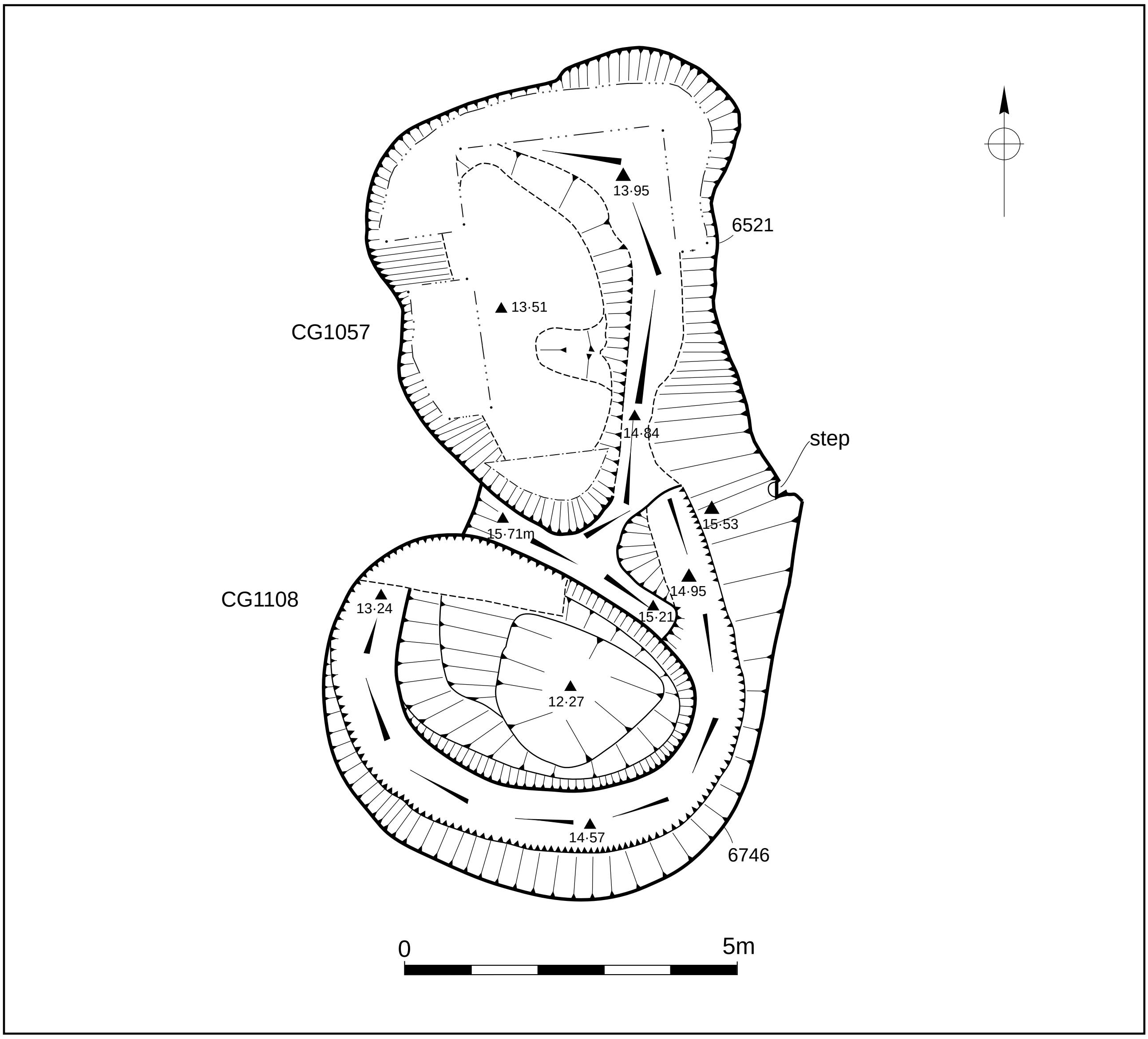


Figure 53: Quarry pits

Figure 54: Large conjoined quarry pit (AU 510), with spiral ramp (2m scales) (Aerial-Cam)

Figure 55: Samples being taken in the large conjoined quarry pit (AU 510)

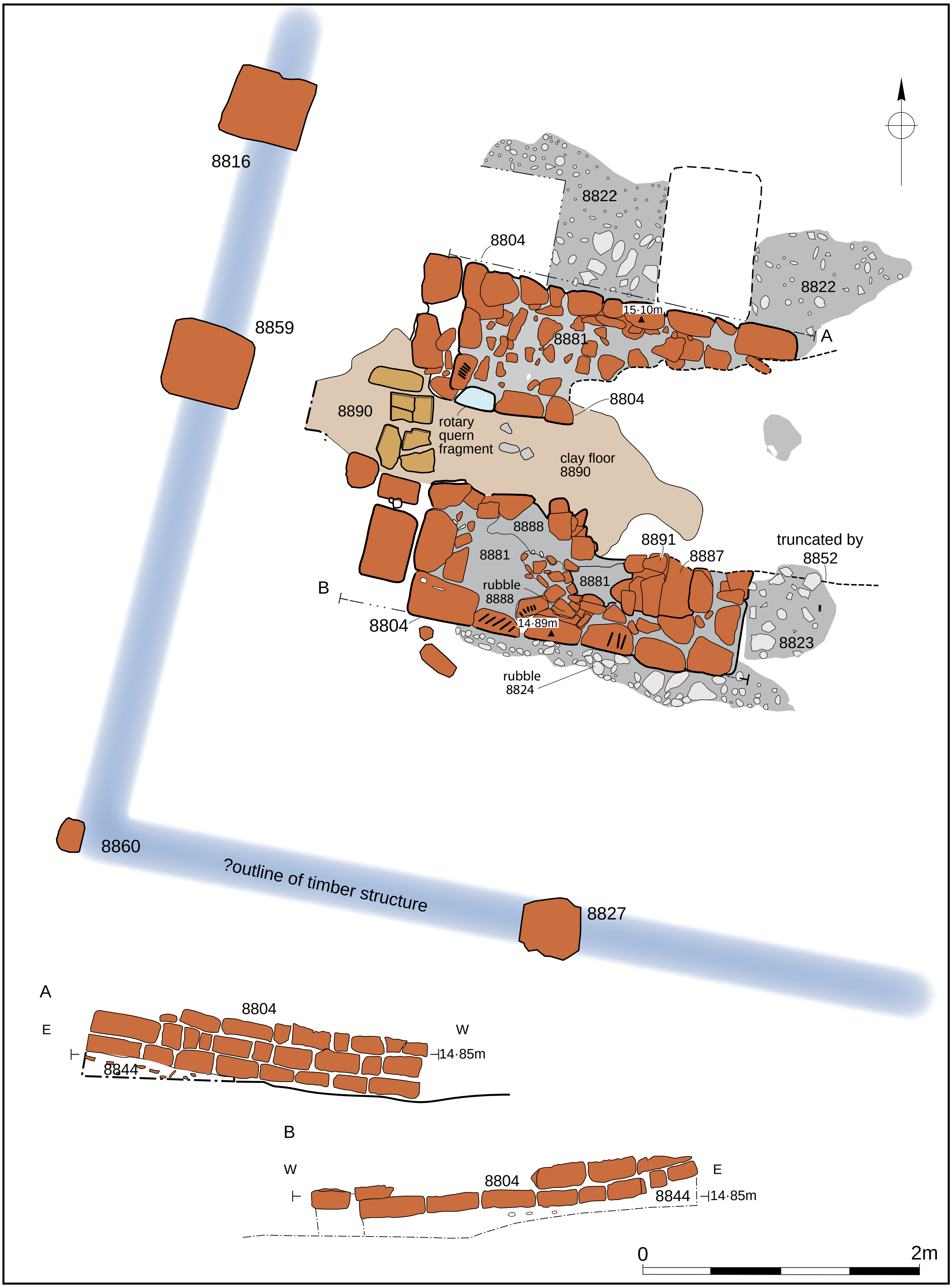


Figure 56: Stone built oven

Figure 57: Pre-excavation view of malting oven (CG 1049) facing east (scale 2m)

Figure 58: Fully exposed malting oven (CG 1049) with flue entrance (scale 2m)

Figure 59: Elevation of stone malting oven (CG 1049), facing south (scales 1m)

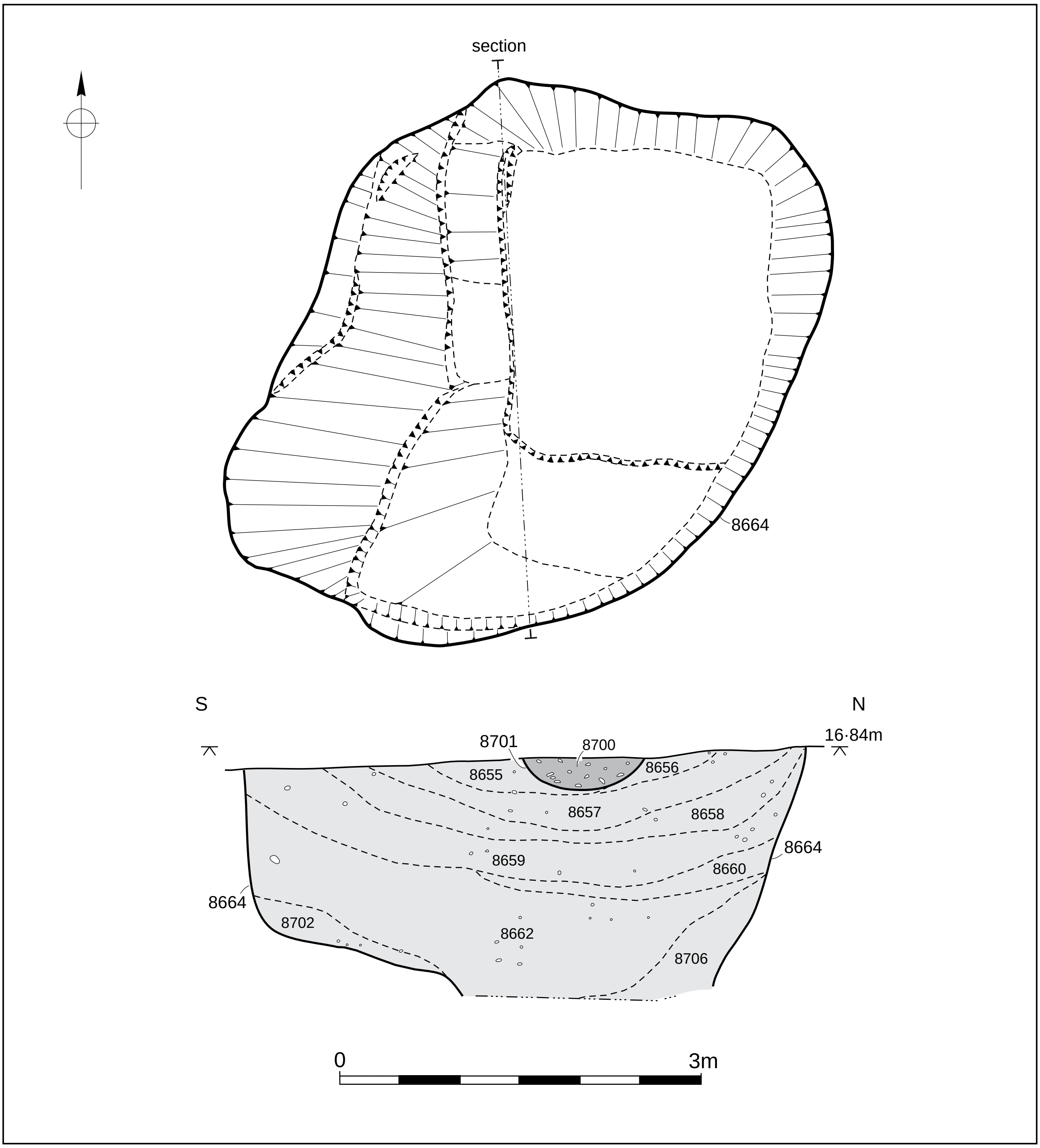


Figure 60: Well pit

Figure 61: Large well pit (AU 524), with scramble slope (2m and 1m scales)

Figure 62: Well pit (AU 524), with dark stain of timber well at base (1m scale)

Figure 63: Articulated remains of human neonate (8853)

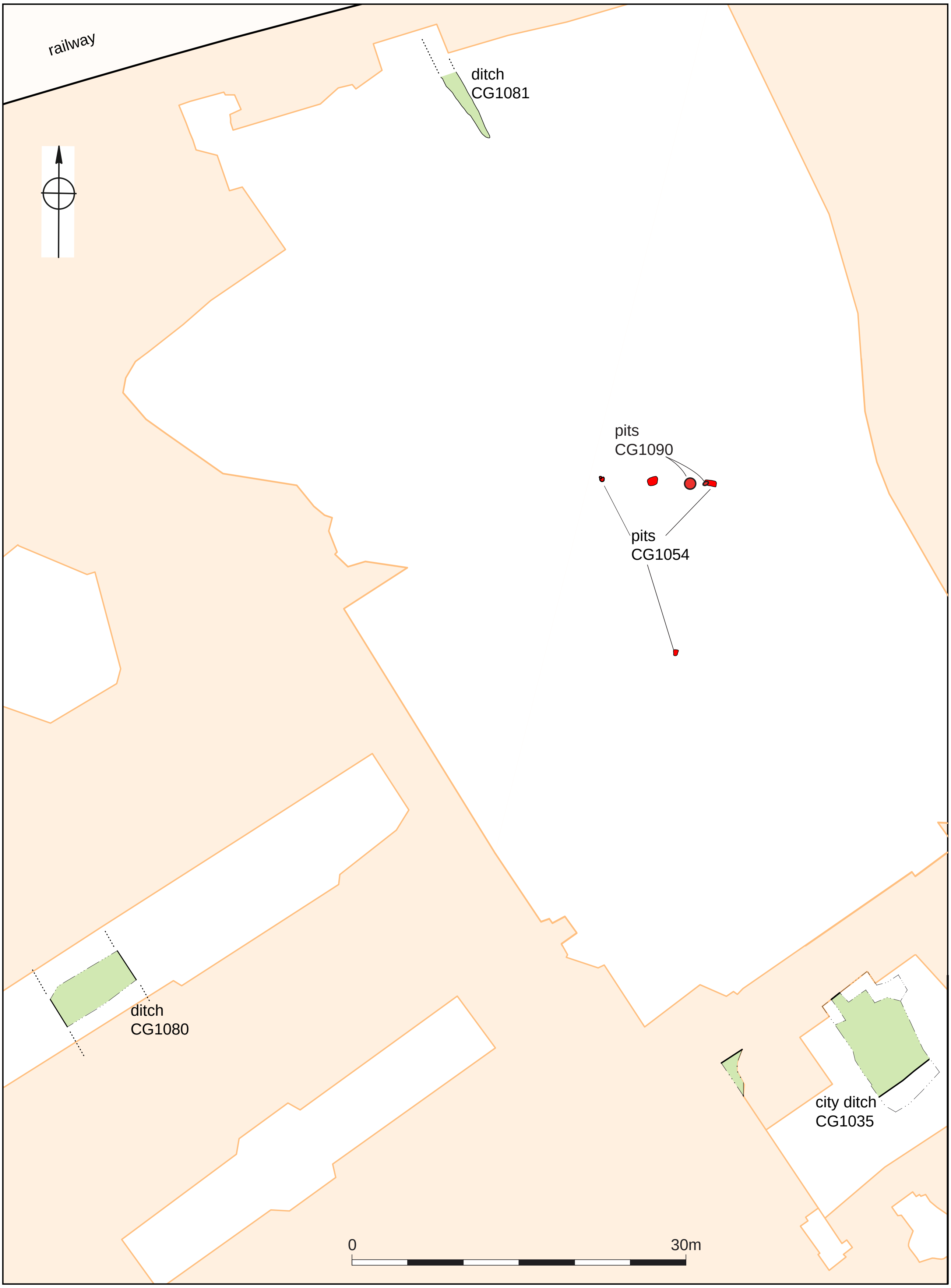


Figure 64: Site periods 7-9

Figure 65: Site period 10

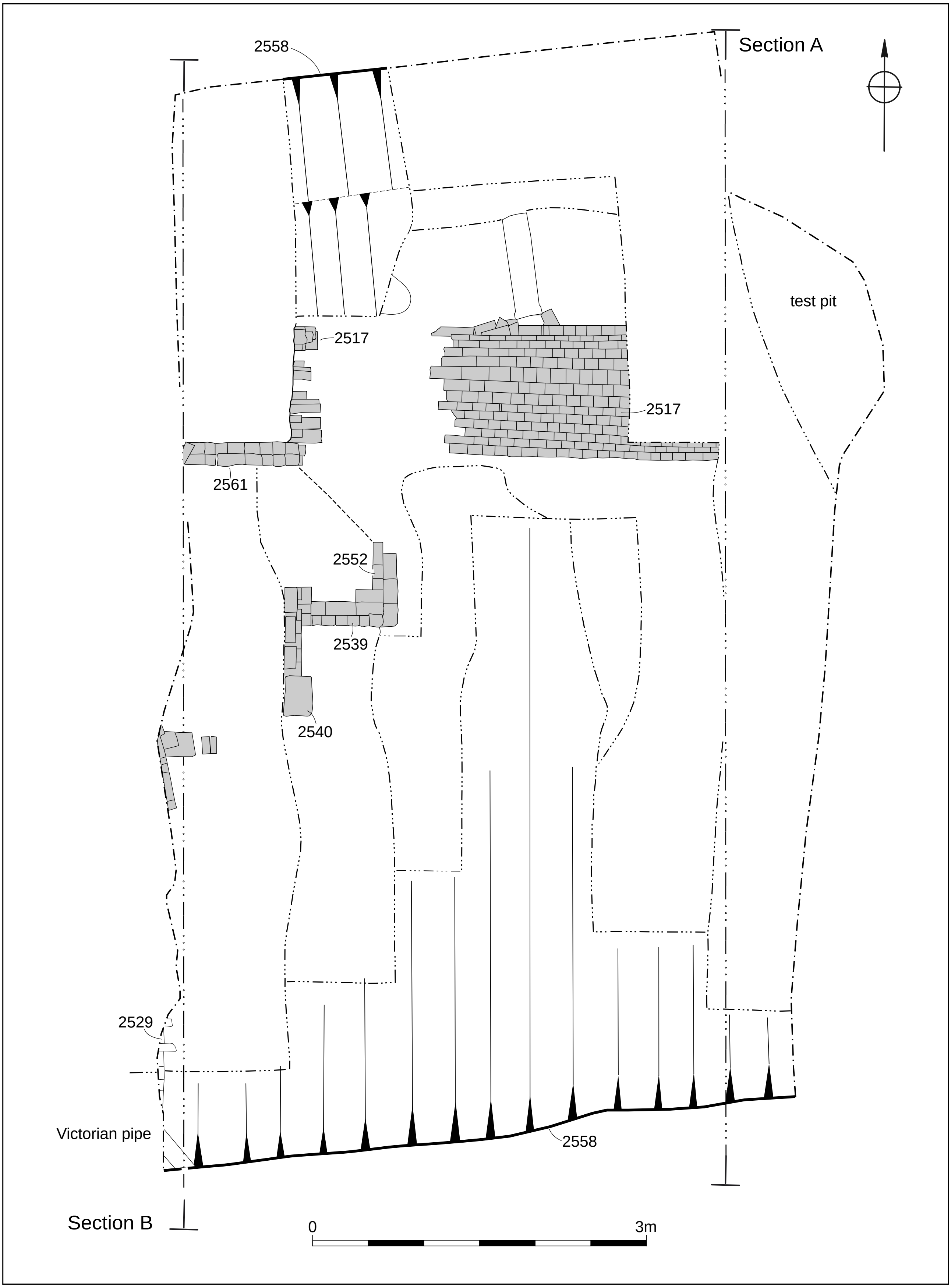


Figure 66: Detailed plan city ditch

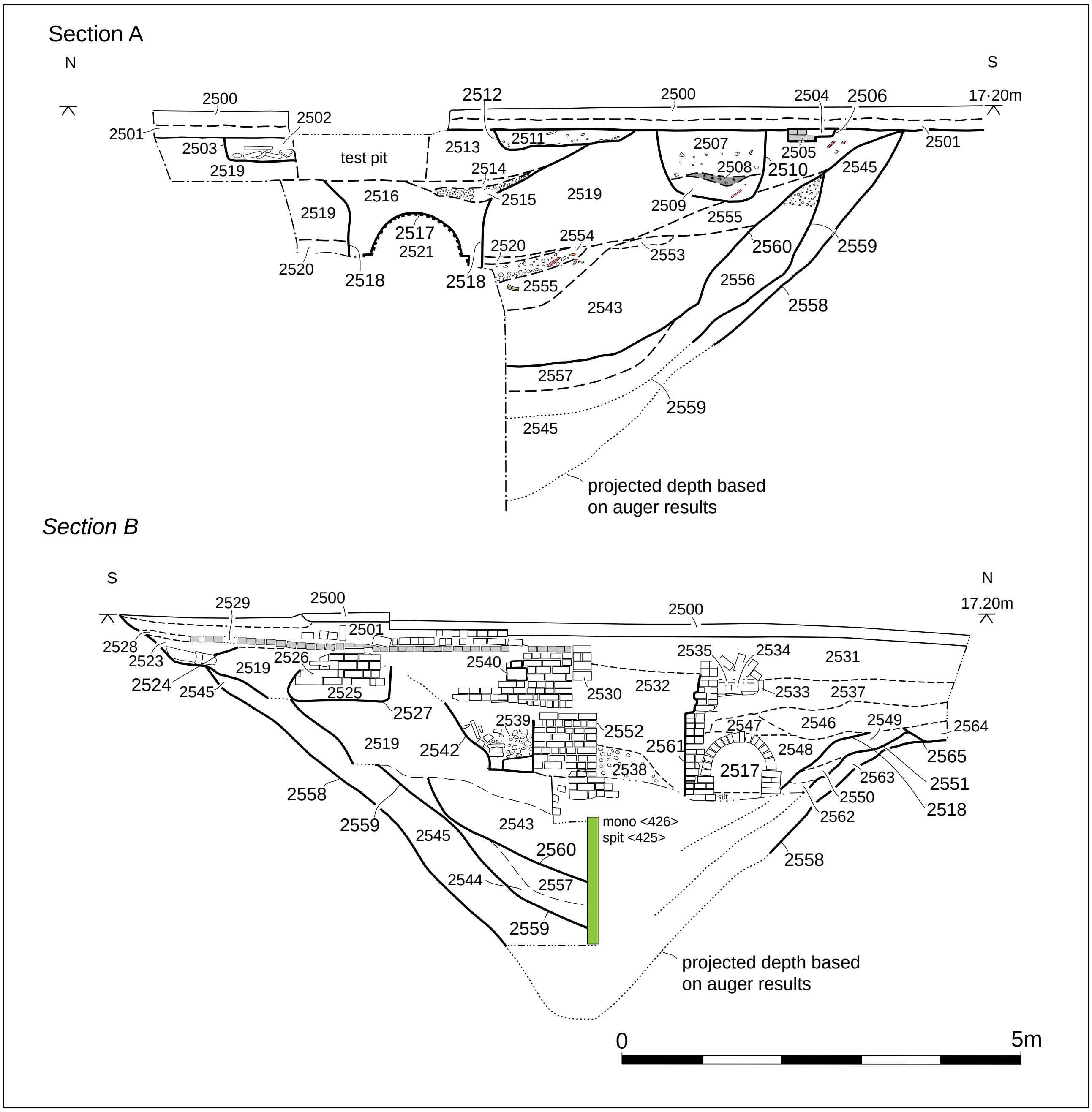


Figure 67: City ditch sections

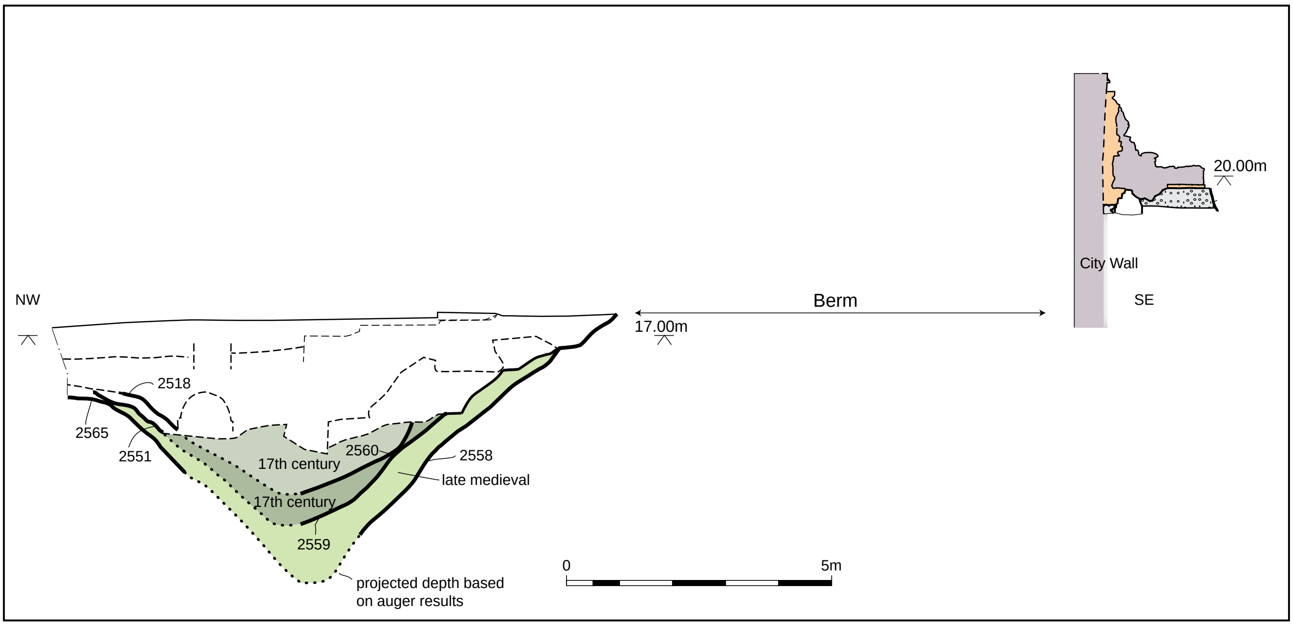


Figure 68: City wall and city ditch

Figure 69: Profile of the city ditch (AU 512; AU 513), facing east (scales 2m and 1m)

Figure 70: Detail of the city ditch (AU 512; AU 513), showing recuts (scale 2m)

Figure 71: Working shot in the city ditch (AU 512; AU 513), facing west (scales 1m)

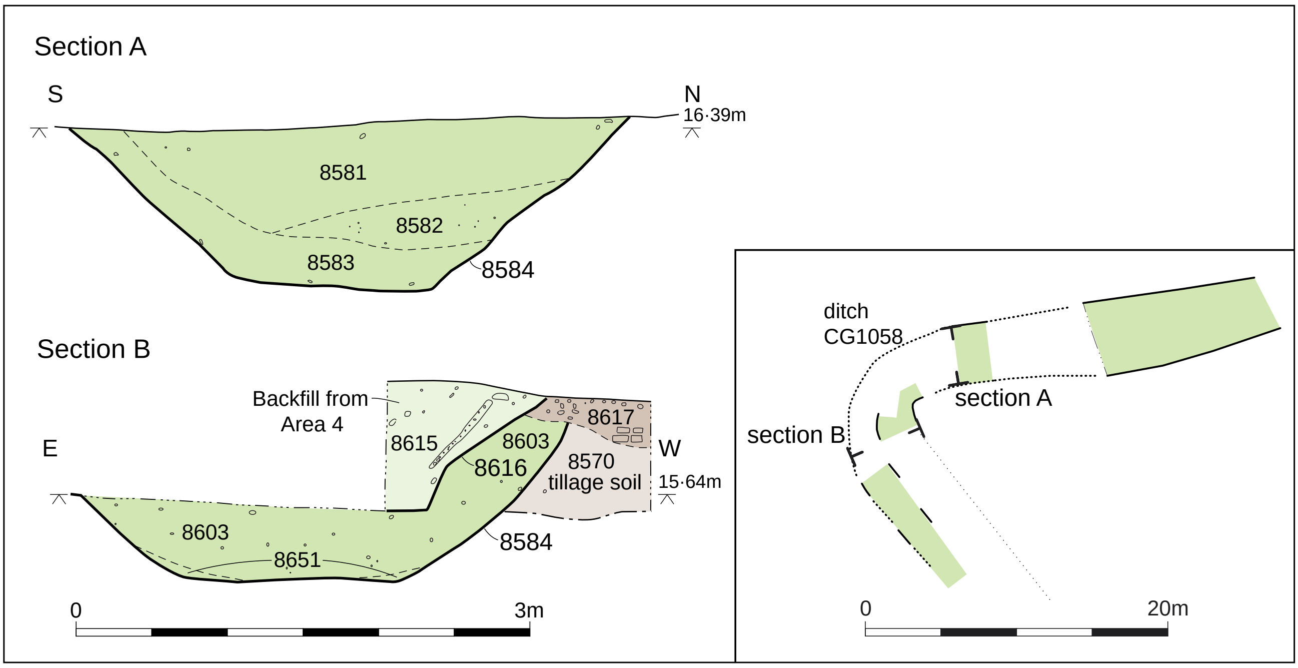


Figure 72: Civil war ditch

Figure 73: Profile of Civil War period defensive ditch (CG 1058), facing east (scale 2m)

Figure 74: Further section of Civil War period defensive ditch (CG 1058) (scale 2m)

Figure 75: Profile of Civil War period defensive ditch (CG 1059), facing west (scale 1m)

Figure 76: Overview of Civil War period defensive ditch (CG 1059), facing east (scale 2m)

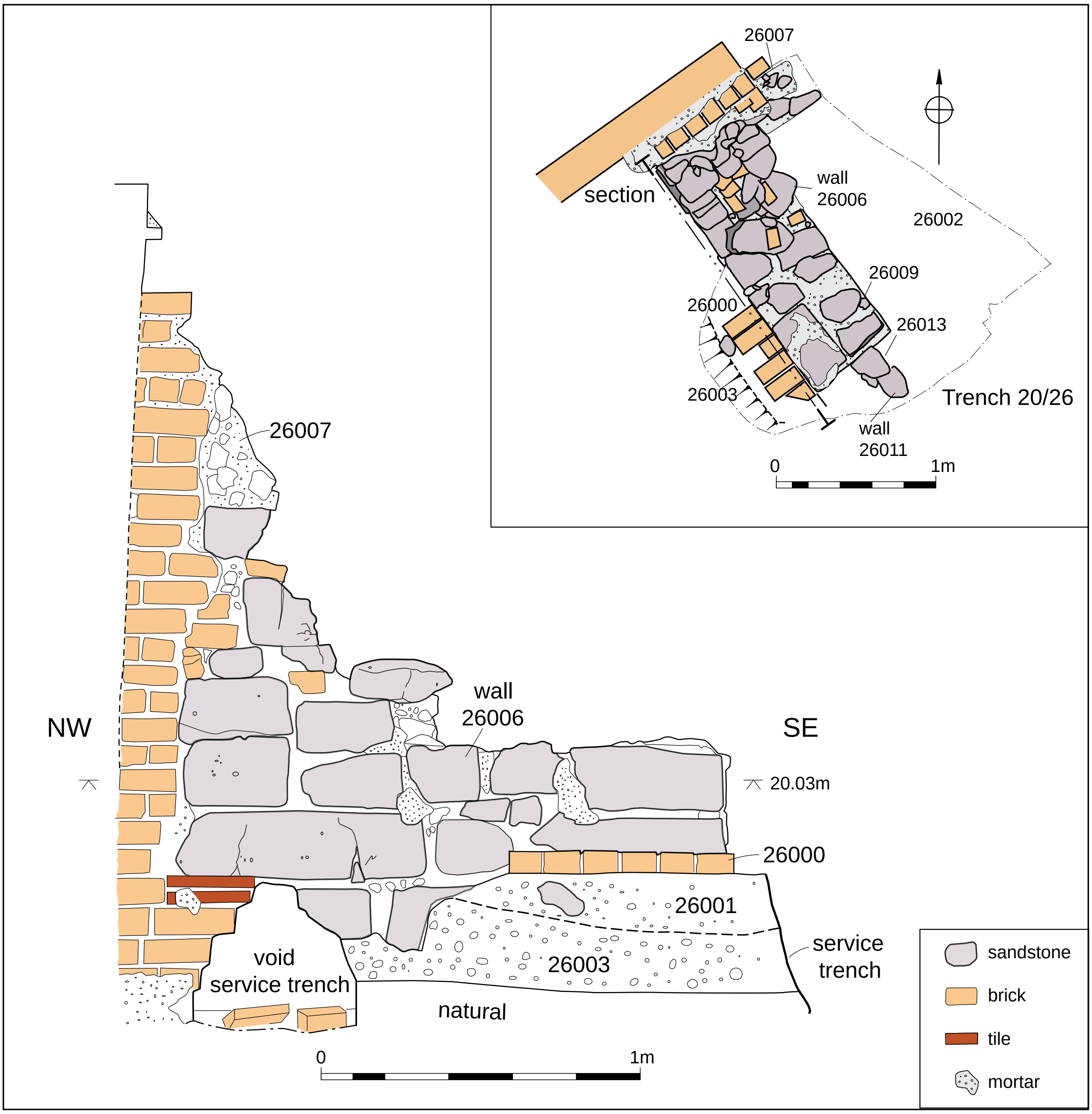


Figure 77: City Wall buttress

Figure 78: Sandstone buttress behind city wall (CG 1208) scale 1m

Figure 79: Rampart deposits behind the city wall (CG 1207) scale 1m

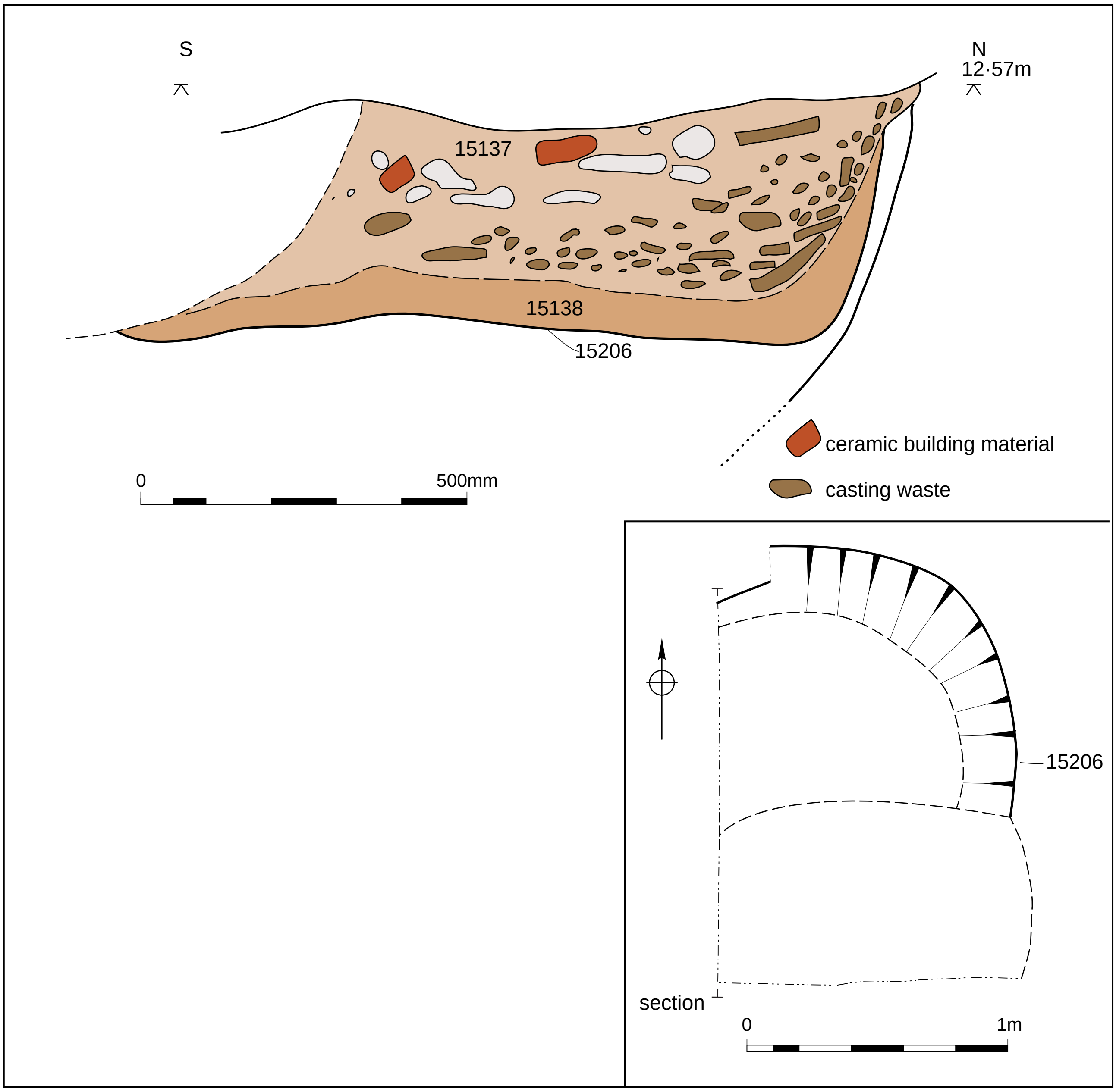


Figure 80: Pit with casting waste

Figure 81: Pit containing dumped casting waste material (CG 1082) scale 1m

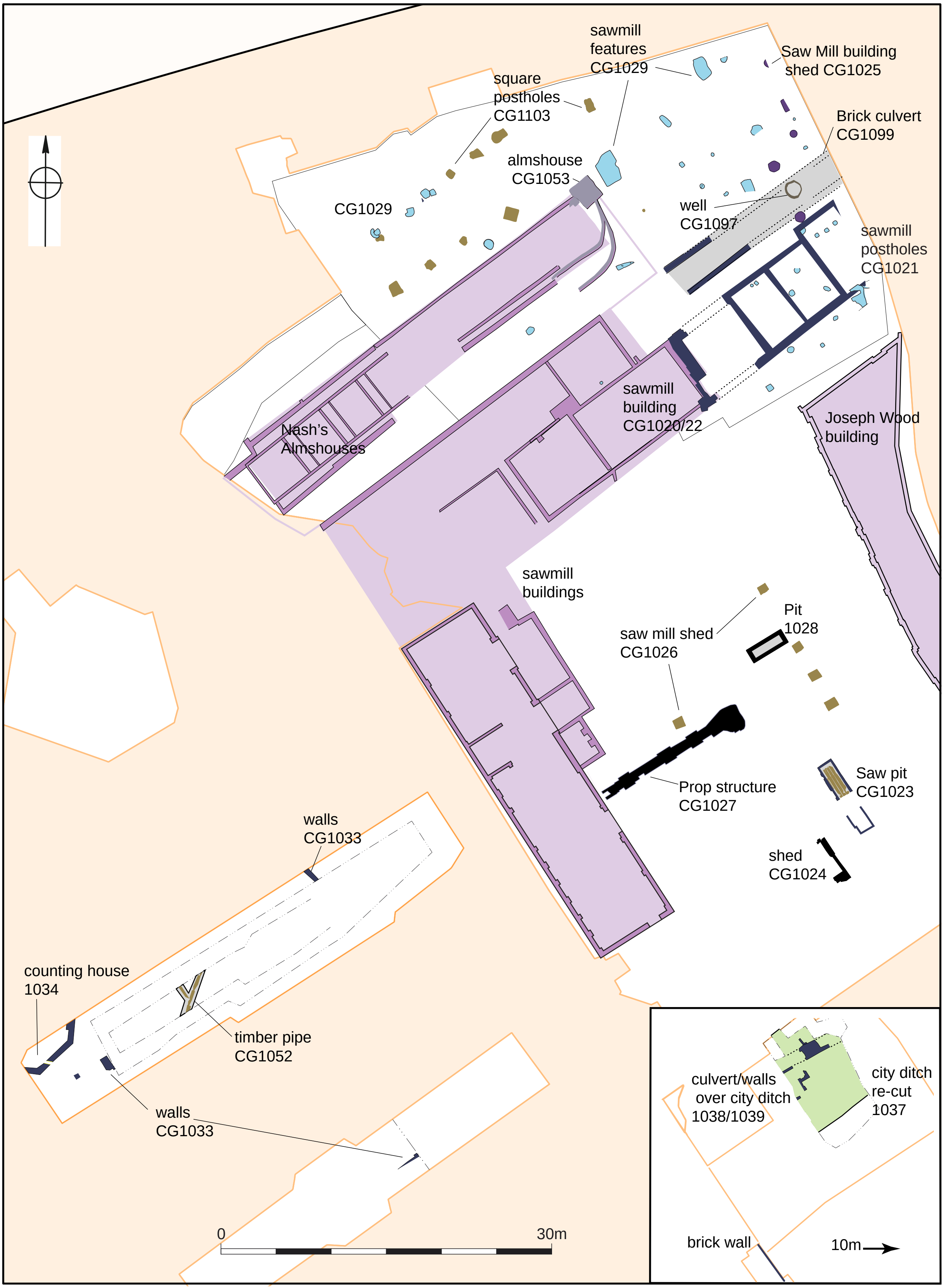
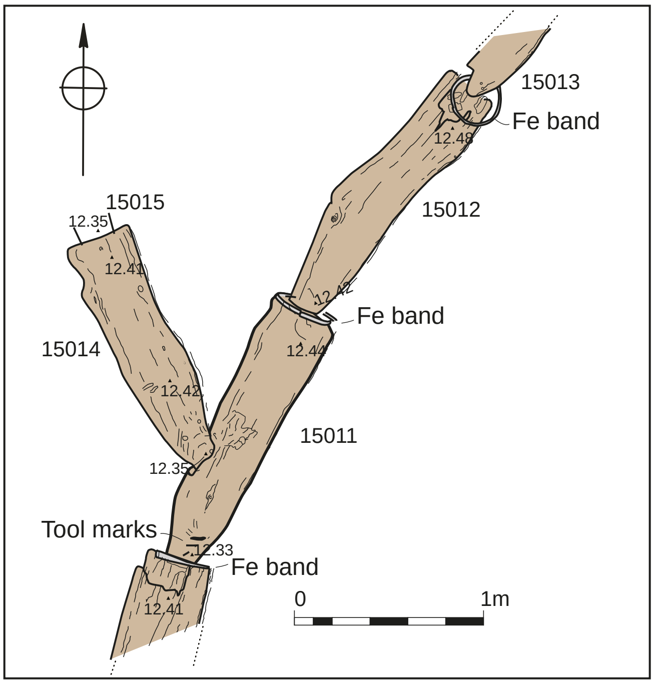


Figure 82: Site period 11-12



a: Plan of timber water pipes

b: Hollowed out elm trunk water pipes (CG 1052), facing south (scale 2m)

c: Working shot during recording of wooden drain pipes (CG 1052)

Figure 83: Timber water pipes

Figure 84: Foundations of cattle market counting house (CG 1034), facing east (scale 2m)

Figure 85: Northern part of sawmill range (CG 1020), facing west (scales 1m)

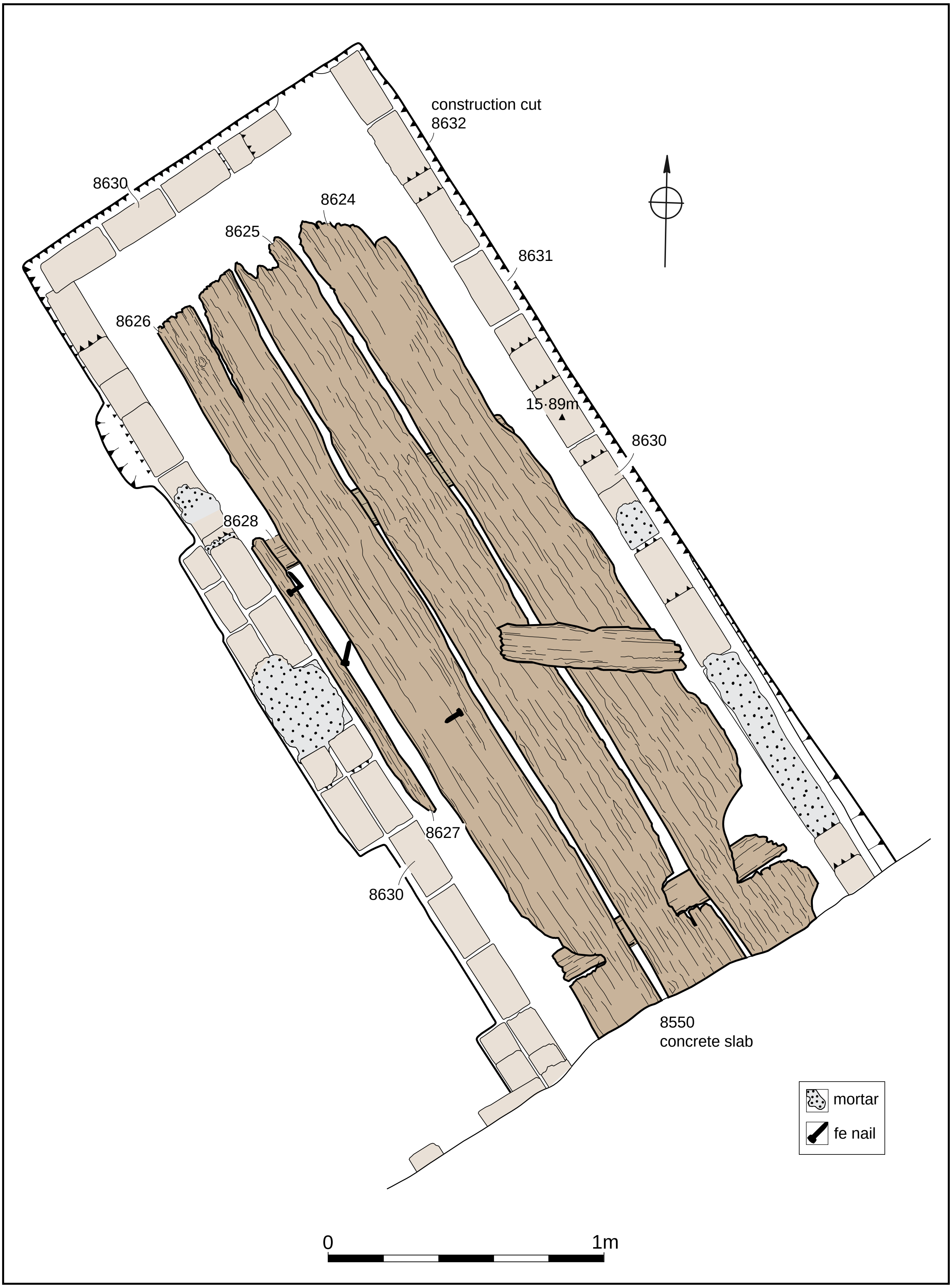


Figure 86: Saw Pit

Figure 87: Northern half of saw pit (CG 1023) facing south (scale 1m)

Figure 88: Saw mill prop structure (CG 1027), facing east (scale 2m)

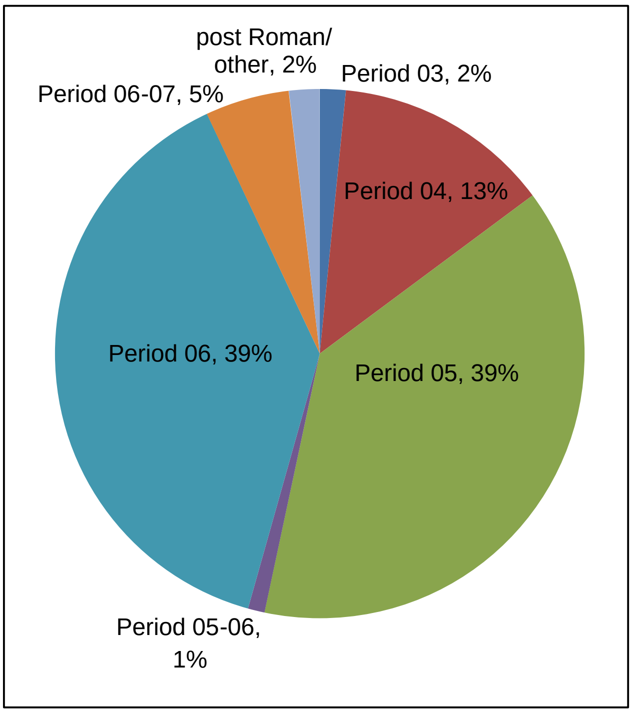


Figure 89: Pottery studied by period (% weight)

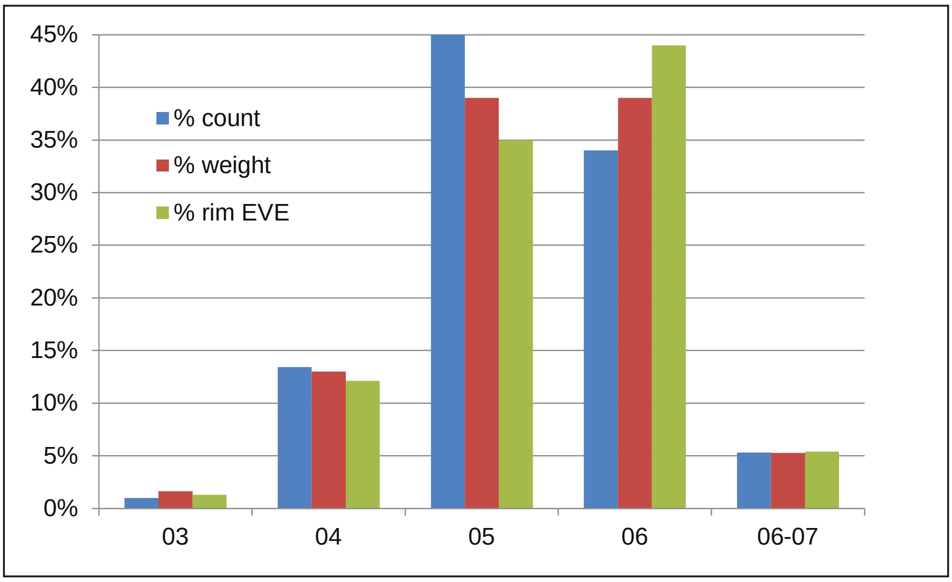


Figure 90: Pottery, main periods studied (% count, weight and rim EVE)

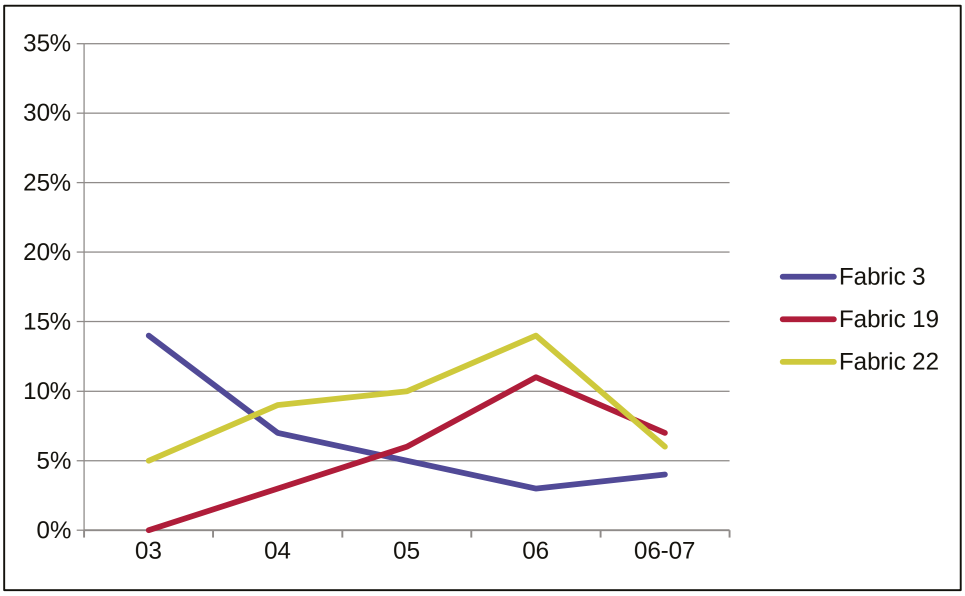


Figure 91: Cooking wares by period (% rim EVE)

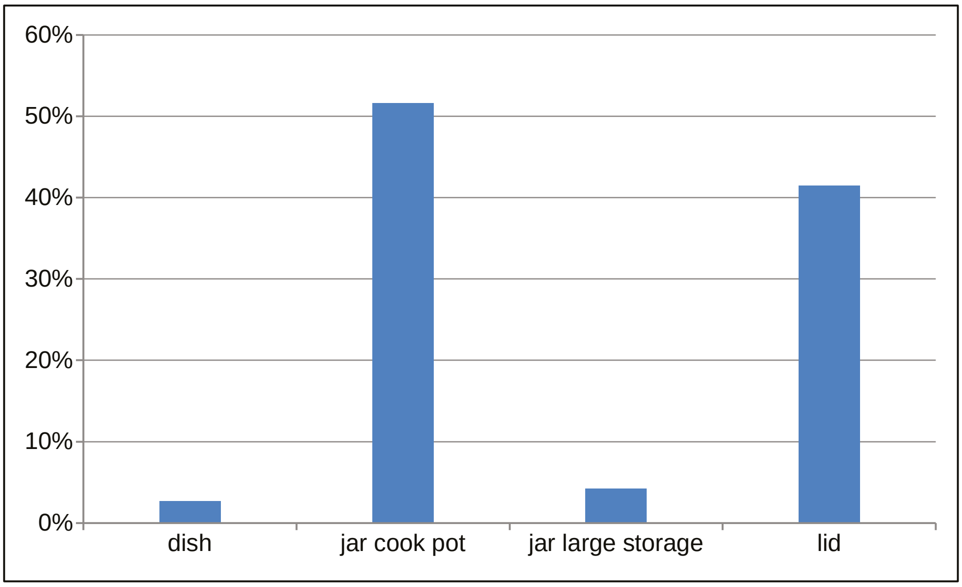


Figure 92: Handmade Malvernian ware, form types (% rim EVE)

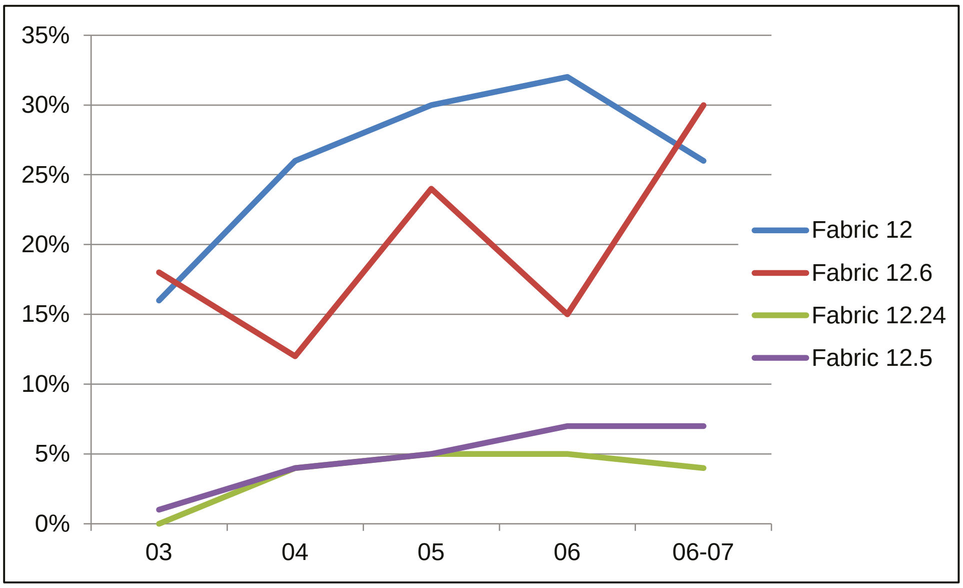


Figure 93: Severn Valley ware variants 12, 12.6, 12.24, 12.5 by period (% rim EVE)

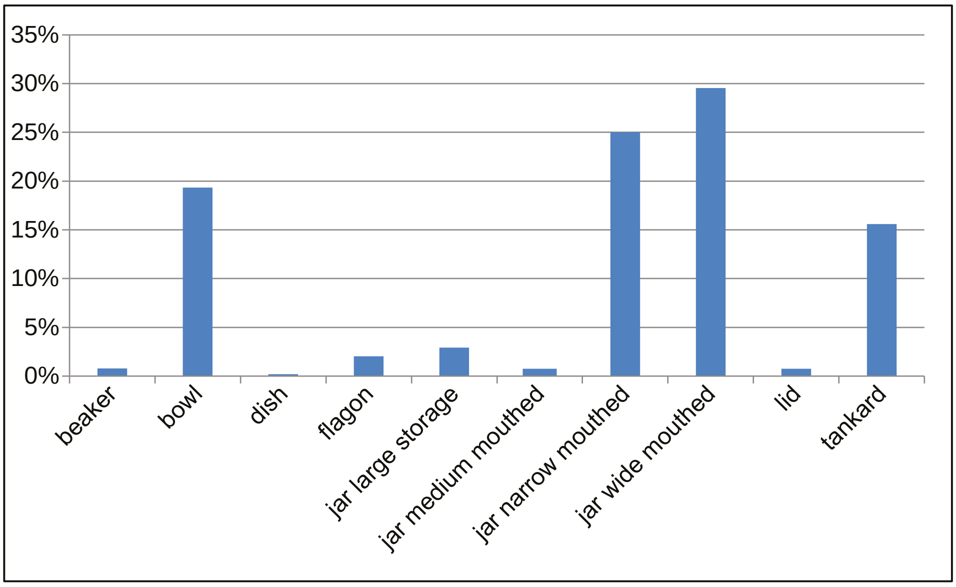


Figure 94: Severn Valley ware fabric 12, form types (% rim EVE)

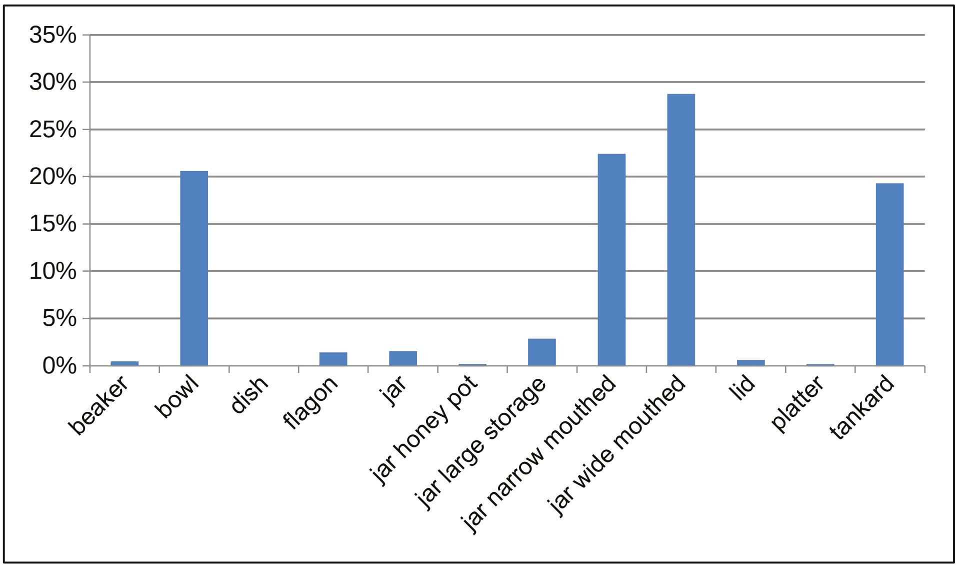


Figure 95: Severn Valley ware fabric 12.6, form types (% rim EVE)

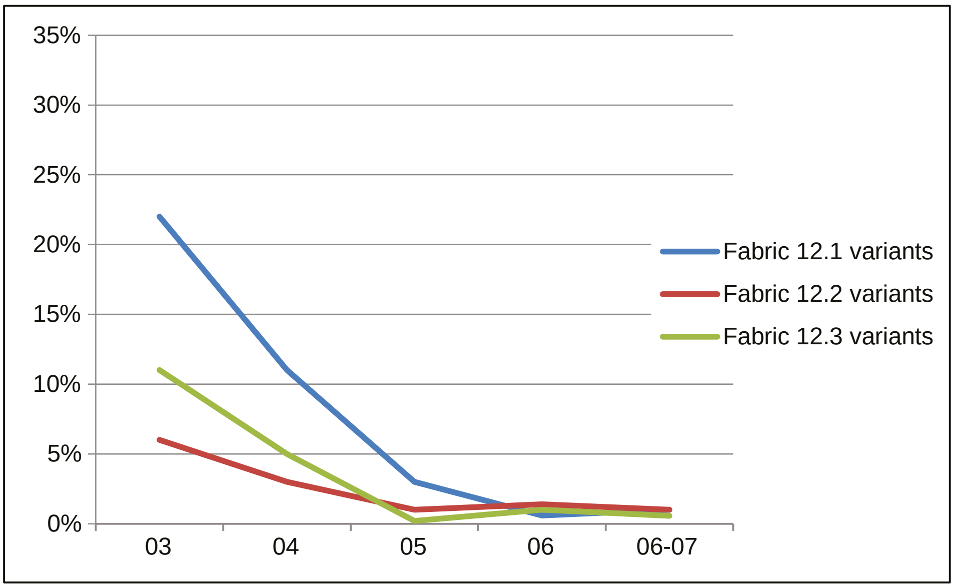


Figure 96: Severn Valley ware variants 12.1, 12.2 (excluding Fabric 12.24) and 12.3 by period (% rim EVE)

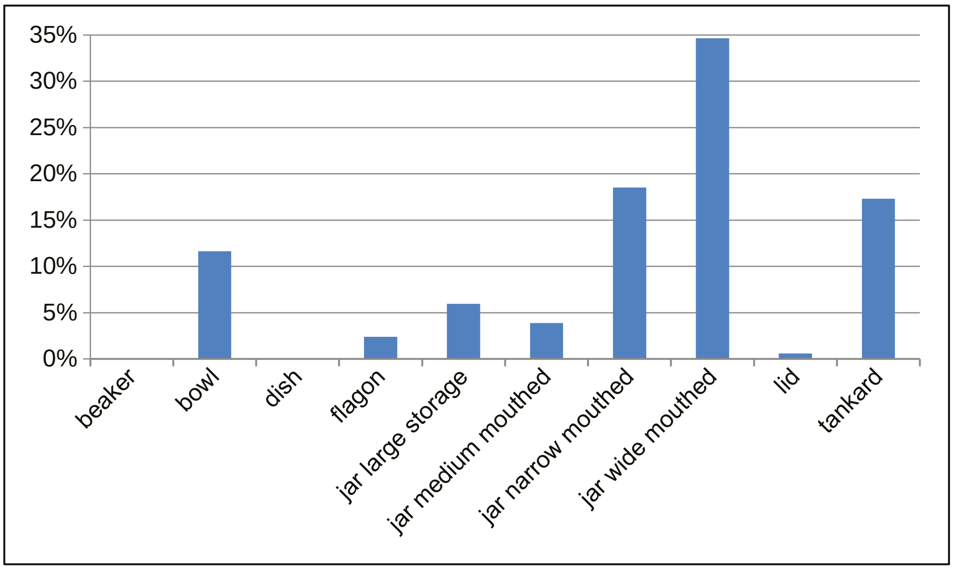


Figure 97: Severn Valley ware fabric 12.2 variants (excluding Fabric 12.24), form types (% rim EVE)

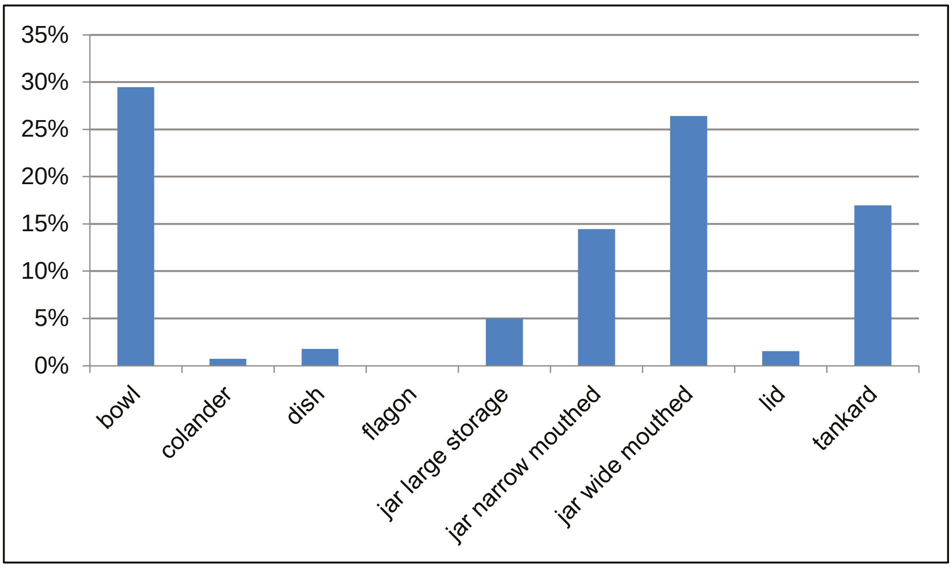


Figure 98: Severn Valley ware fabric 12.24, form types (% rim EVE)

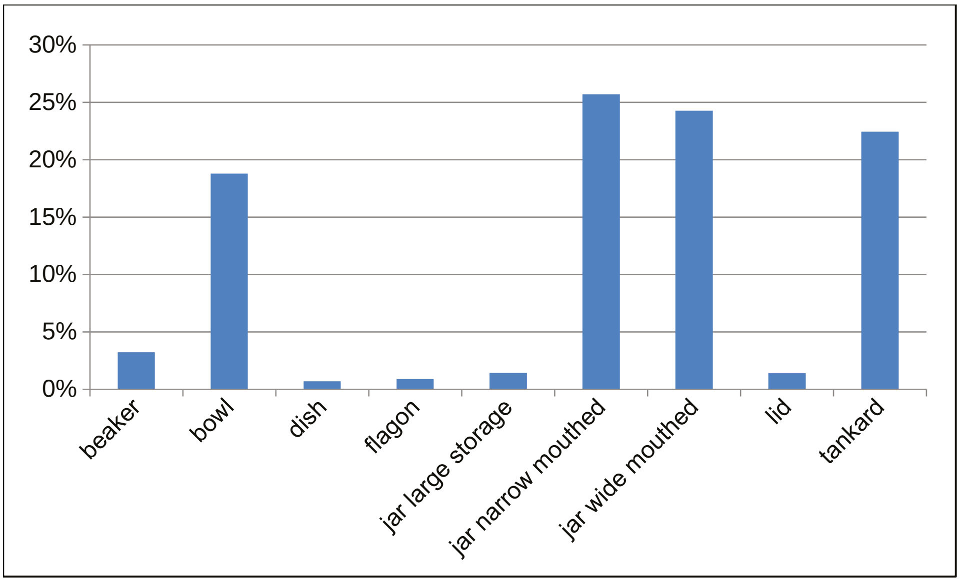


Figure 99: Severn Valley ware fabric 12.5 variants, form types (% rim EVE)

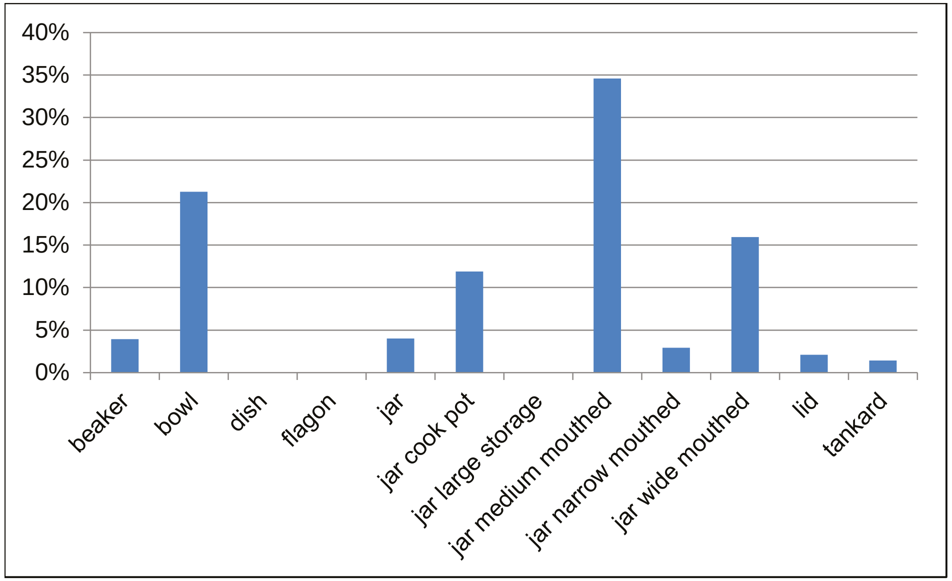


Figure 100: Severn Valley ware fabric 12.1 variants, form types (% rim EVE)

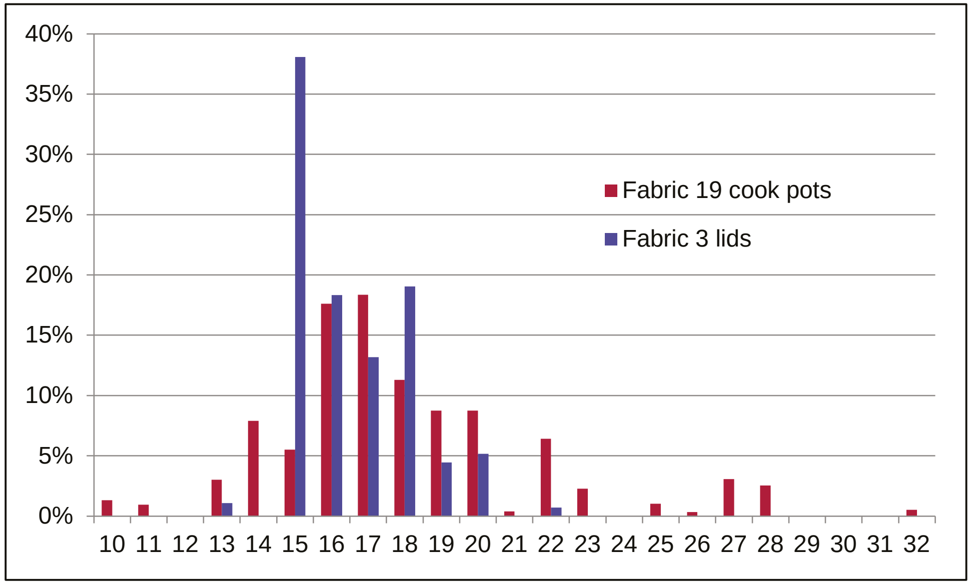


Figure 102: Comparison of rim diameters for Fabric 19 cook pots (total rim EVE 21.24) and Fabric 3 lids (total rim EVE 5.62)

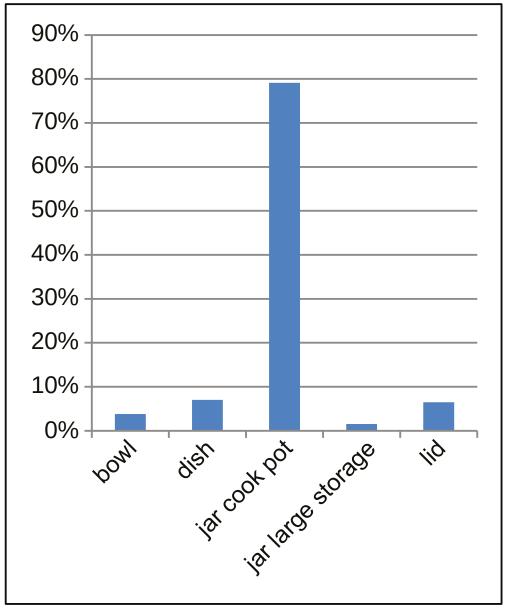


Figure 101: Wheelmade Malvernian ware by period (% rim EVE)

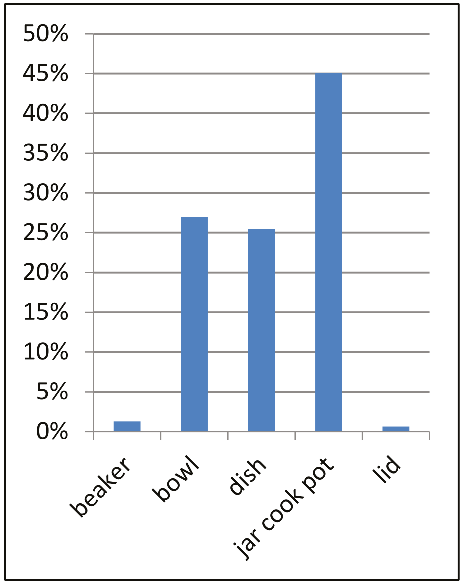


Figure 103: BB1, form types (% rim EVE)

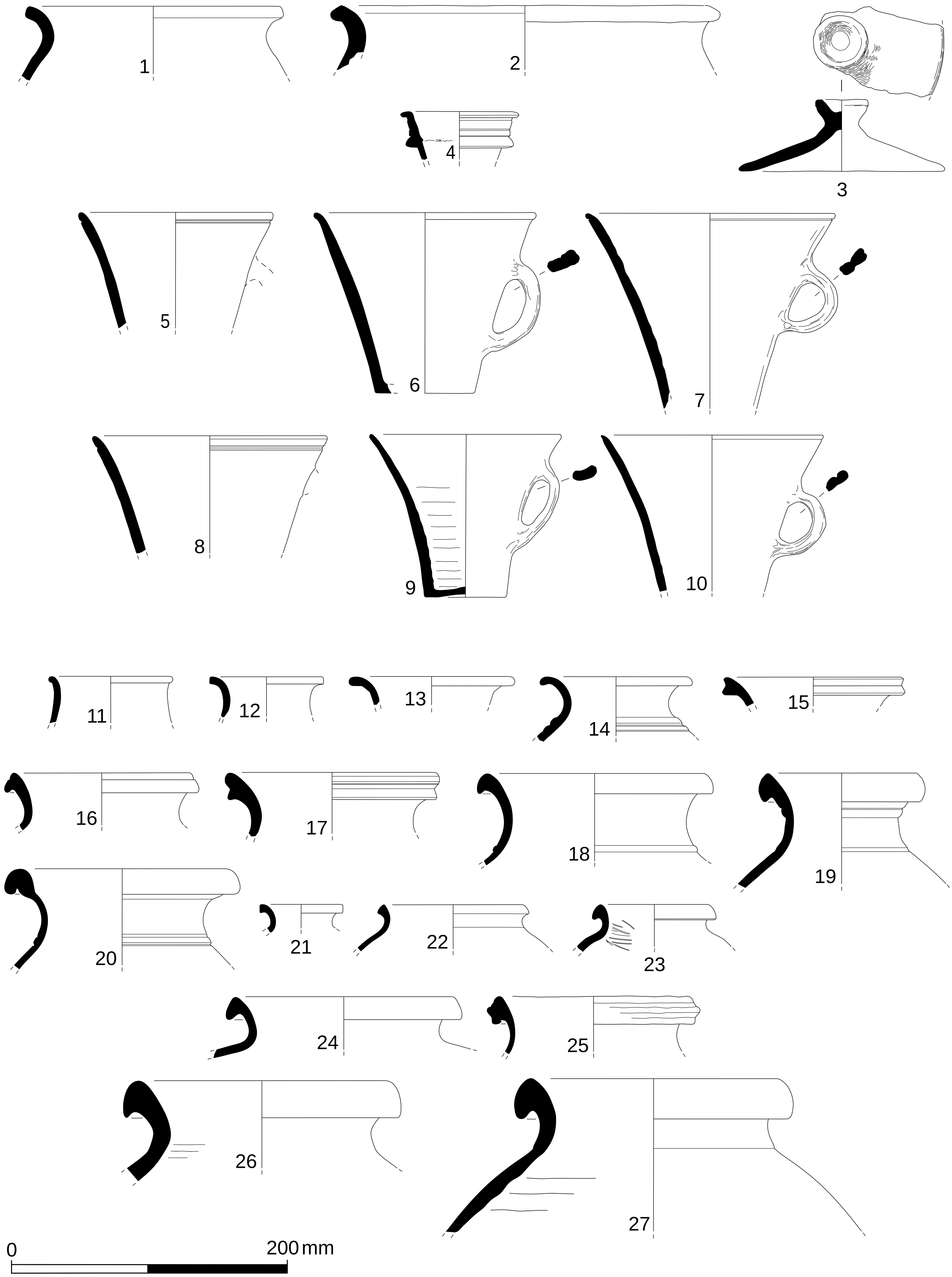


Figure 104: Pottery from the Period 6 quarry pit; Fabric 3, 1–3; Severn Valley wares (Fabric 12 etc.), 4–27

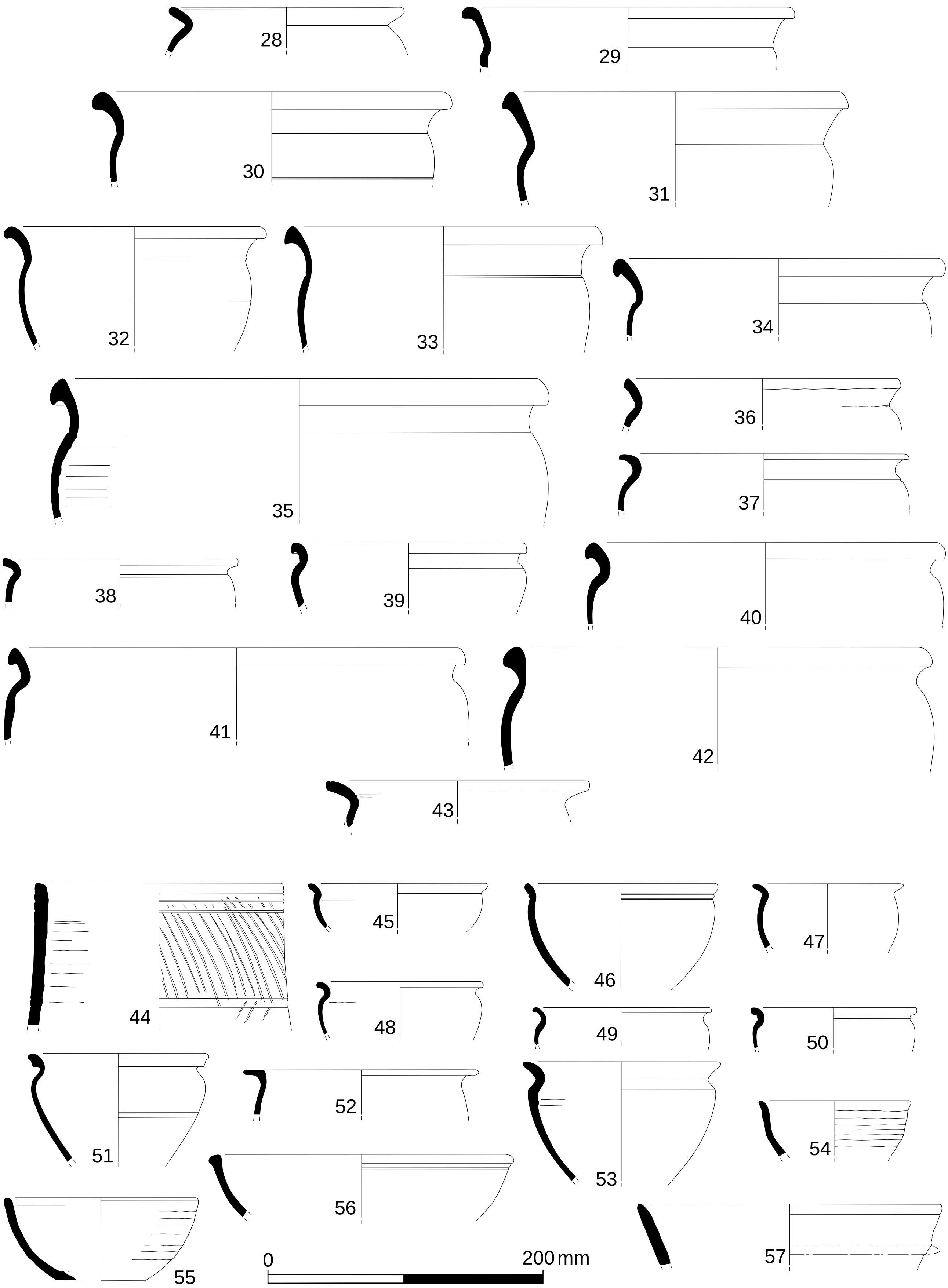


Figure 105: Pottery from the Period 6 quarry pit; Severn Valley wares (Fabric 12 etc.) 28-57

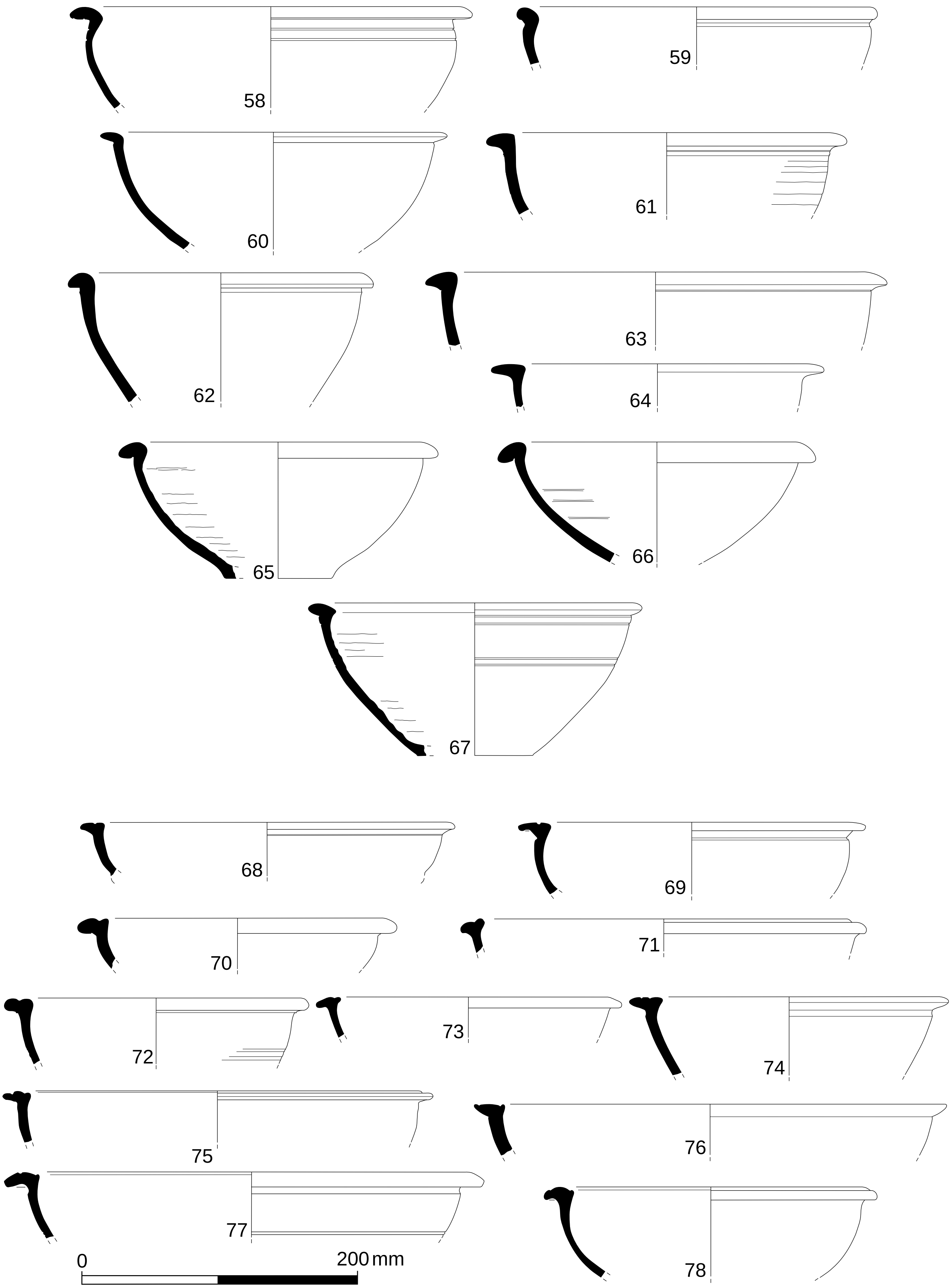


Figure 106: Pottery from the Period 6 quarry pit; Severn Valley wares (Fabric 12 etc.) 58-78

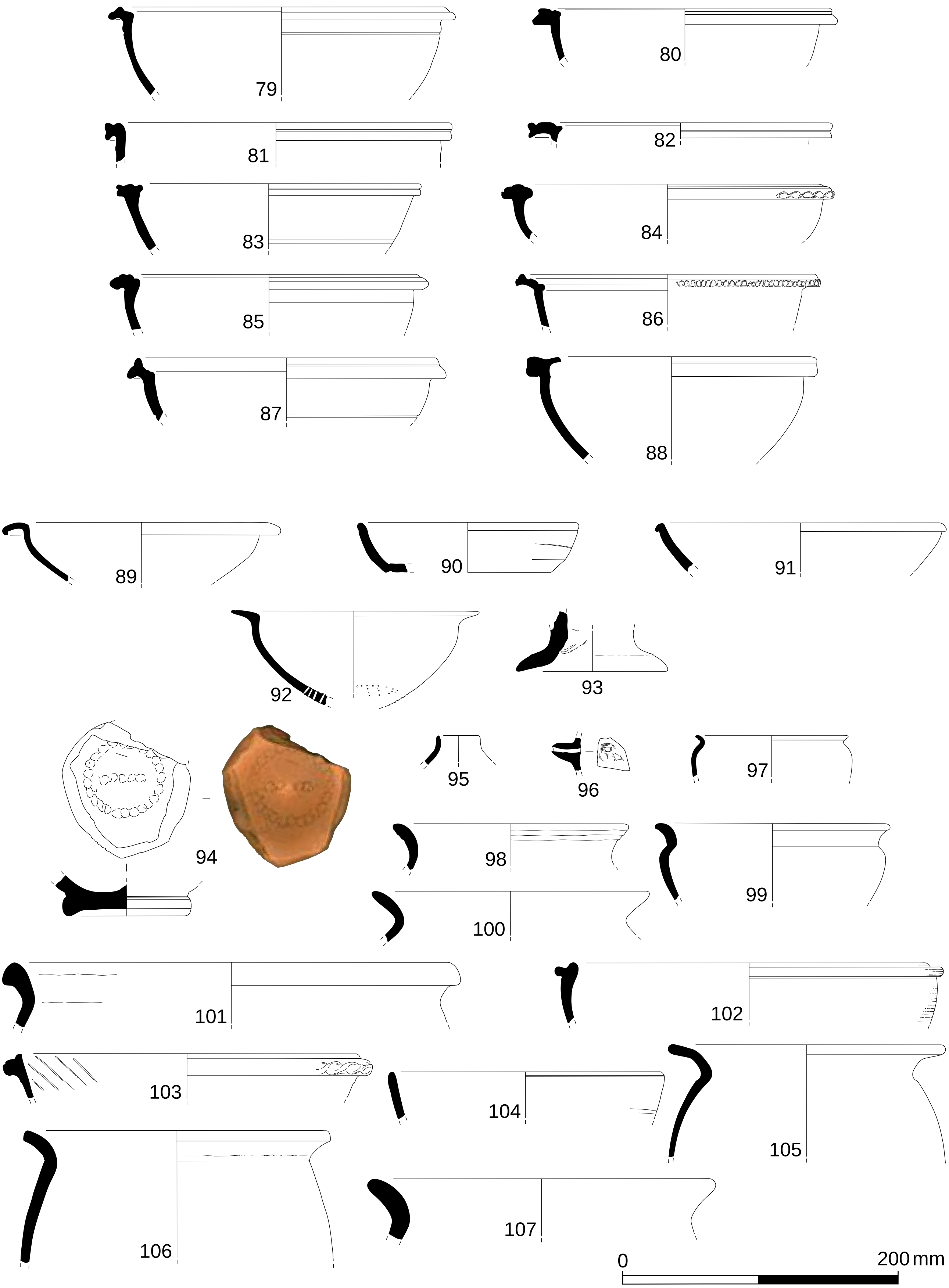


Figure 107: Pottery from the Period 6 quarry pit; Severn Valley wares (Fabric 12 etc.) 79–95, Fabric 13, 96–99; Fabric 14, 100–104;Fabric 19,105–107

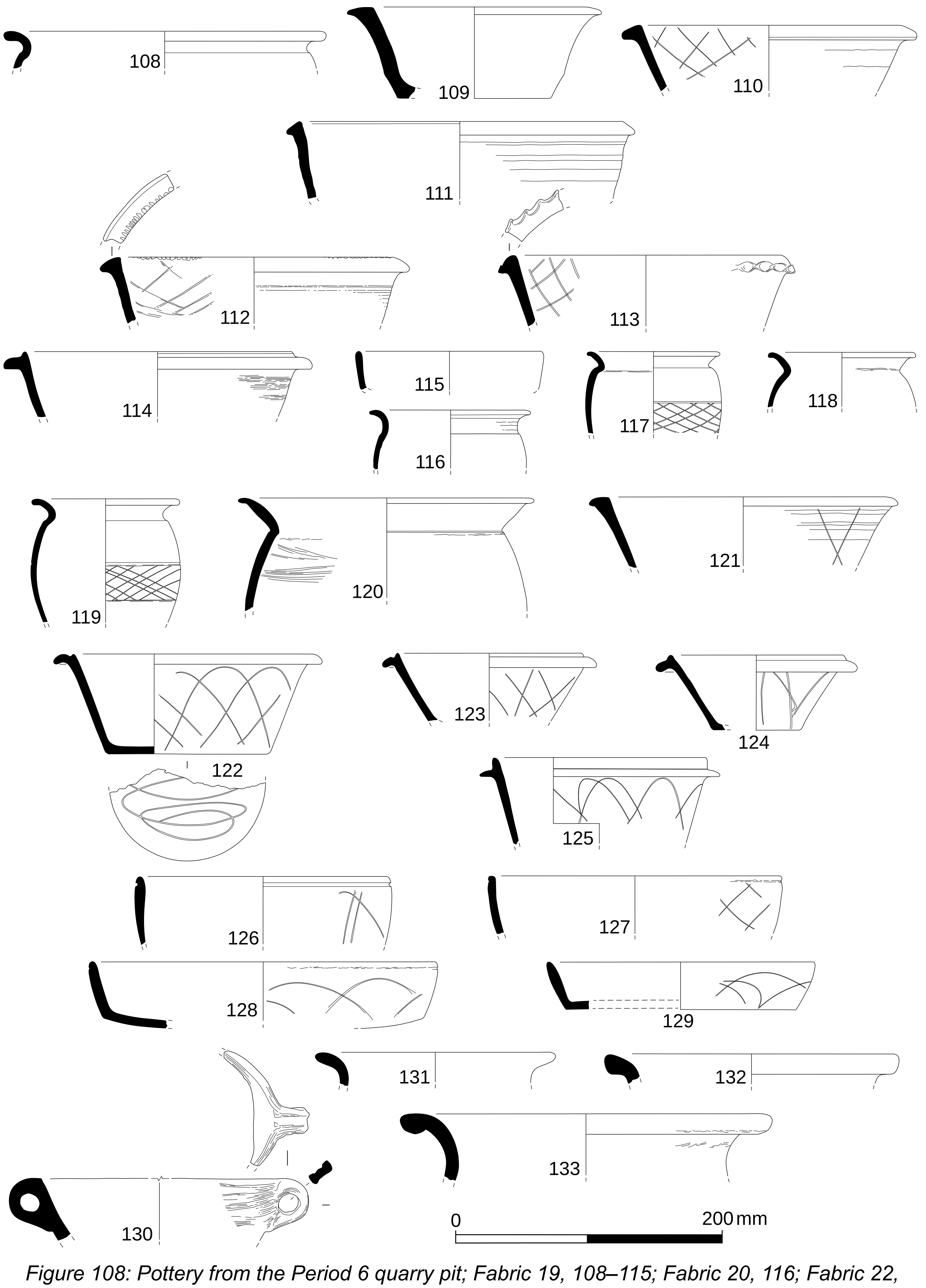


Figure 108: Pottery from the Period 6 quarry pit; Fabric 19, 108–115; Fabric 20, 116; Fabric 22, 117–130; Fabric 23, 131–133

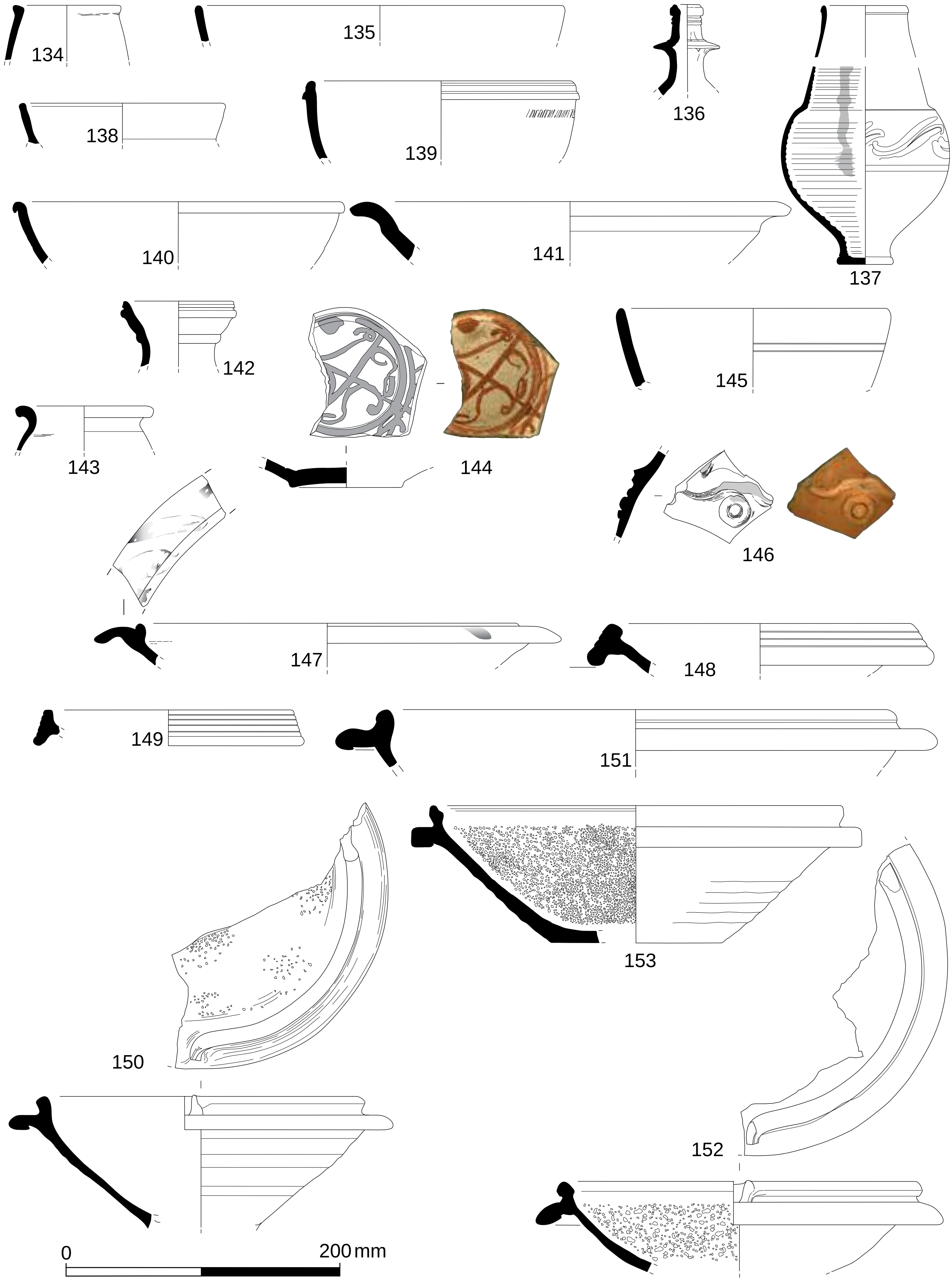


Figure 109: Pottery from the Period 6 quarry pit; Fabric 28/28.1, 134–5; Fabric 29, 136–141; Fabric 38, 142; fabric 39, 143; Fabric 40.1, Fabric 144; Fabric 149, 145; Fabric 98.12, 146; Fabric 32, 147–149; Fabric 33.1, 150–153

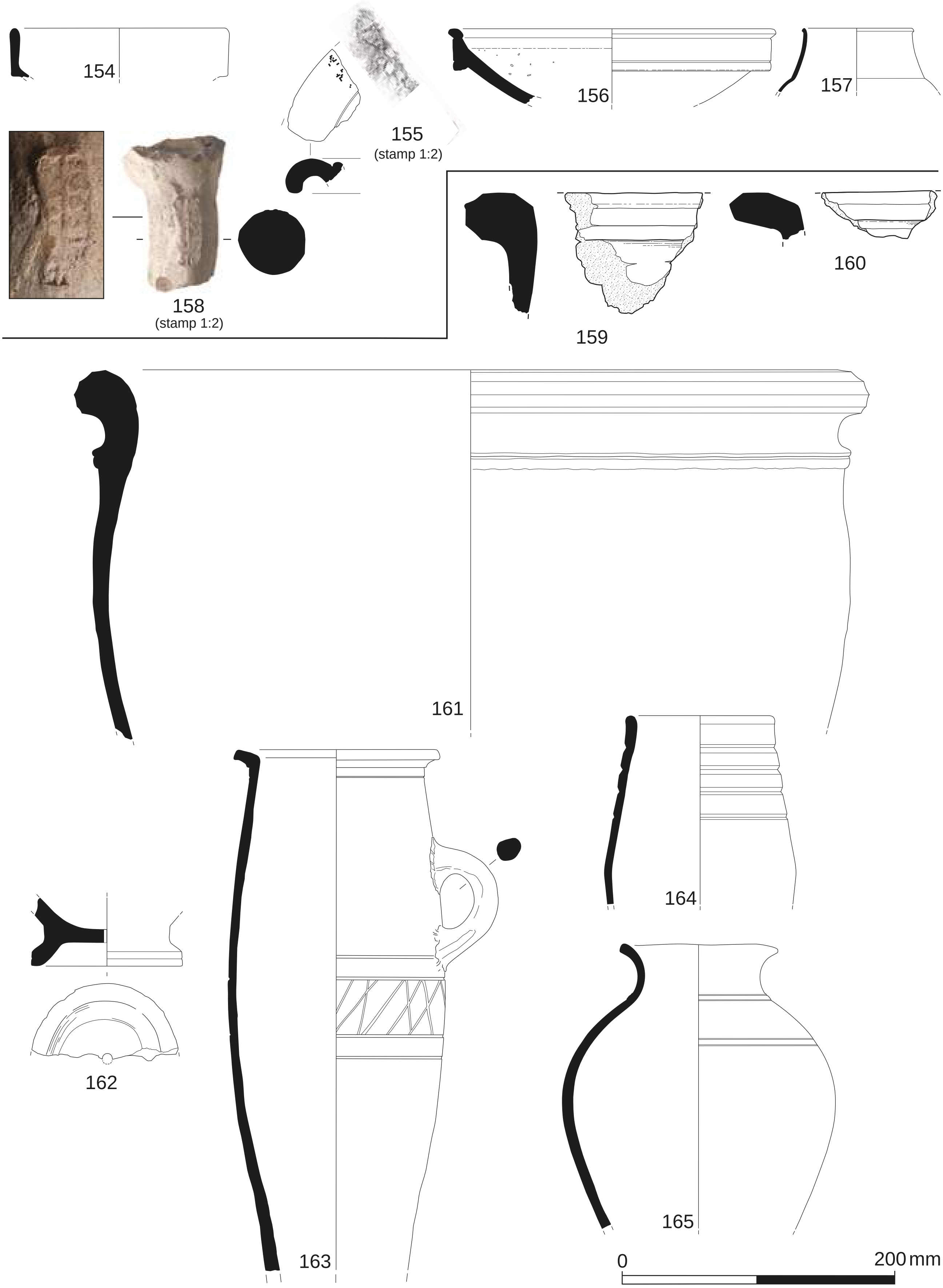


Figure 110: Pottery from the Period 6 quarry pit; Fabric 3, 154; Fabric 33.3, 155; Fabric 34.2,156; Fabric 37.3, 157; Fabric 45.4, 158; Fabric 42.1, 159–162; Pottery from other deposits; Fabric 12.23, 163; Fabric 12.34, 164; Fabric 12, 165

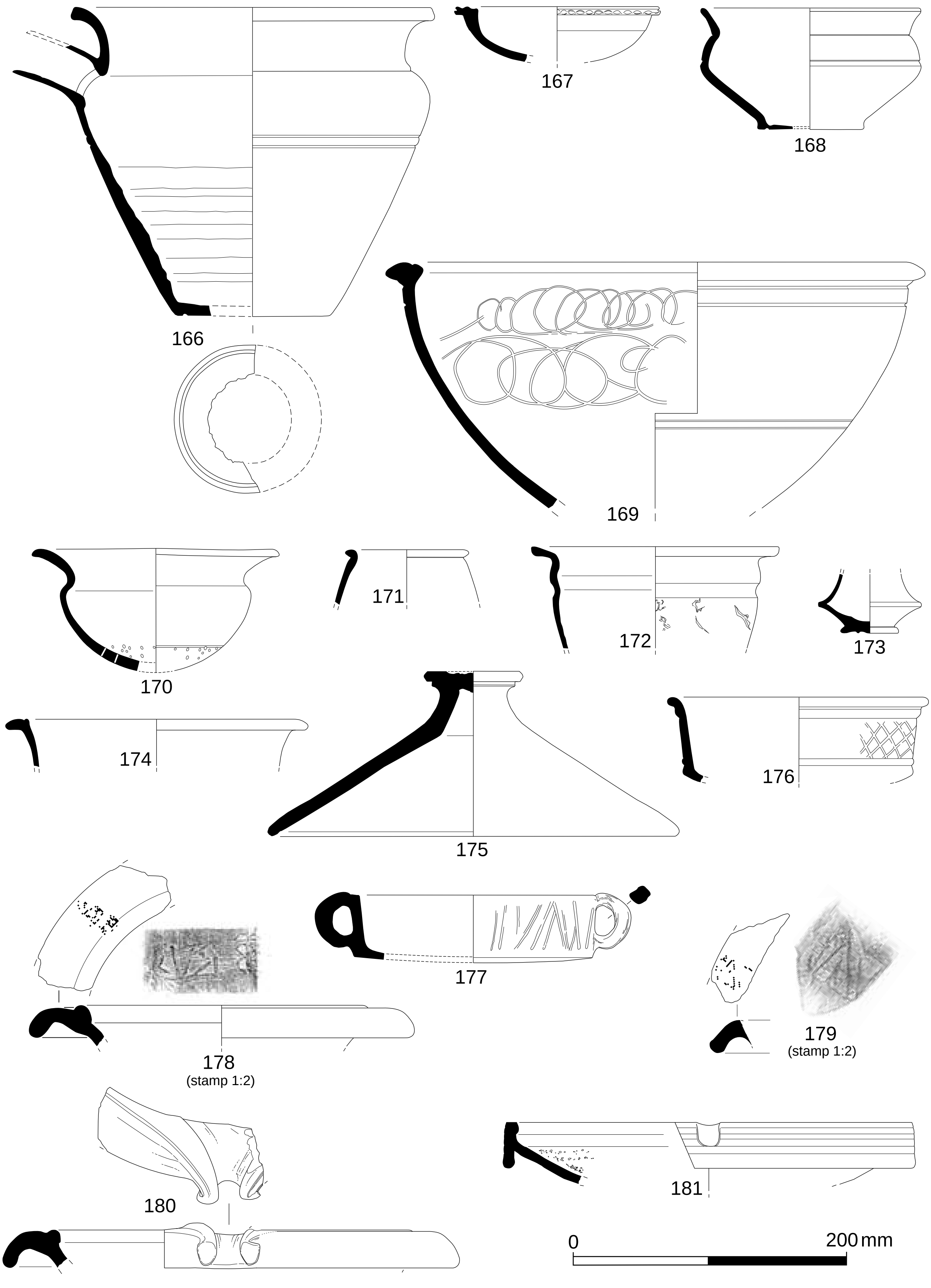


Figure 111: Pottery from other deposits; Severn Valley wares (Fabric 12 etc.), 166–170; Fabric 13, 171; Fabric 14, 172–3; Fabric 19, 174–5; Fabric 21.3, 176; Fabric 22, 177; Fabric 32, 178–181

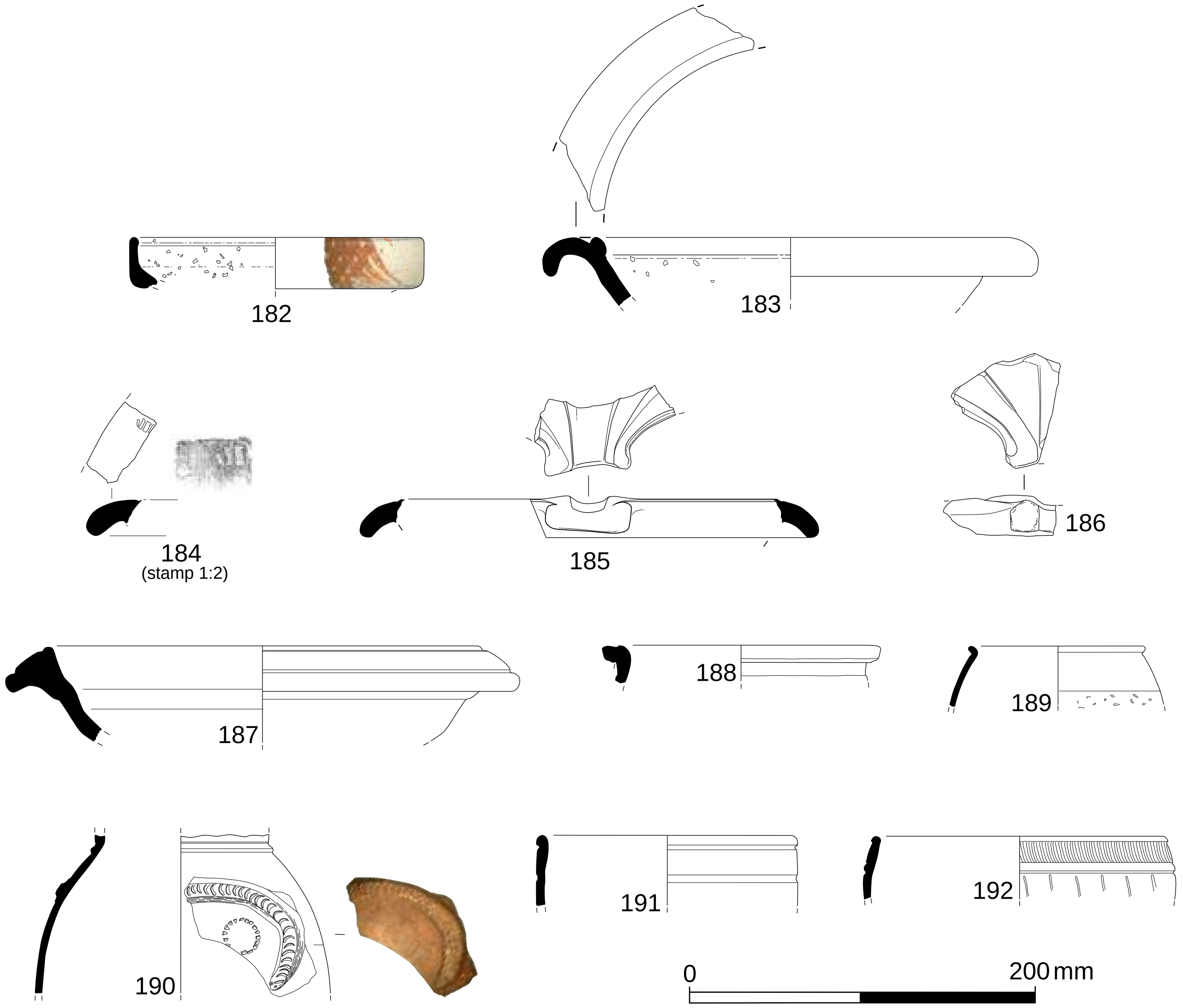


Figure 112: Pottery from other deposits; Fabric 37.5, 186; Fabric 103, 187; Fabric 29, 188; Fabric 31.1, 189; Fabric 31.2, 190; Fabric 38, 191; Fabric 98.01, 192

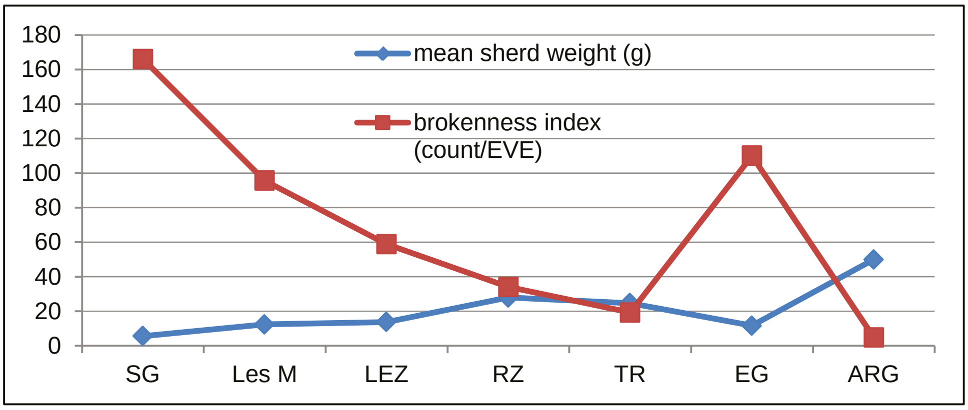


Figure 113: Samian, plot of mean sherd weight and Brokenness Index (count/rim EVE) for each fabric group (SG Southern Gaul –La Graufesenque 43.1; Les M – les Martres-de-Veyre 43.6; LEZ – Lezoux 43.2; RZ-Rheinzabern 43.3; TR – Trier 43.4; EG-unspecified East Gaulish 43.5; ARG – late Argonne ware 43.7)

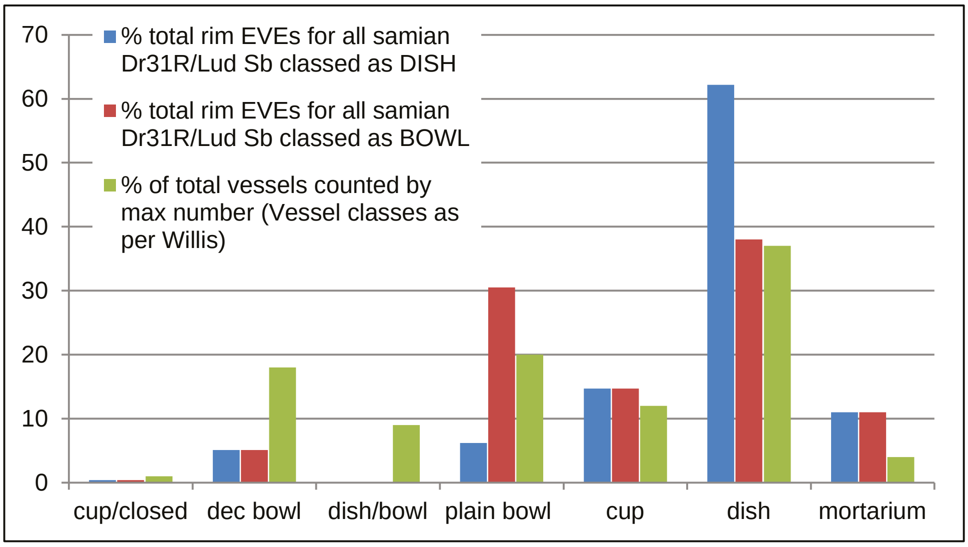


Figure 114: The samian by vessel class, comparing profiles when Dr 31R/Lud Sb is classed as a dish or as a plain bowl (% rim EVE), or as a bowl, quantified by % of the Maximum vessel number

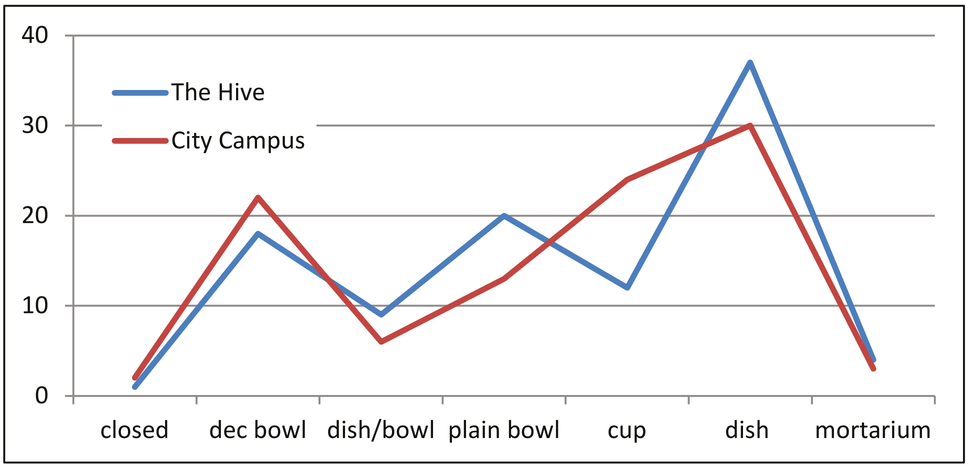


Figure 115: comparison of samian vessel classes from City Campus (Mills 2014) and The Hive (% of the total MVN for each site)

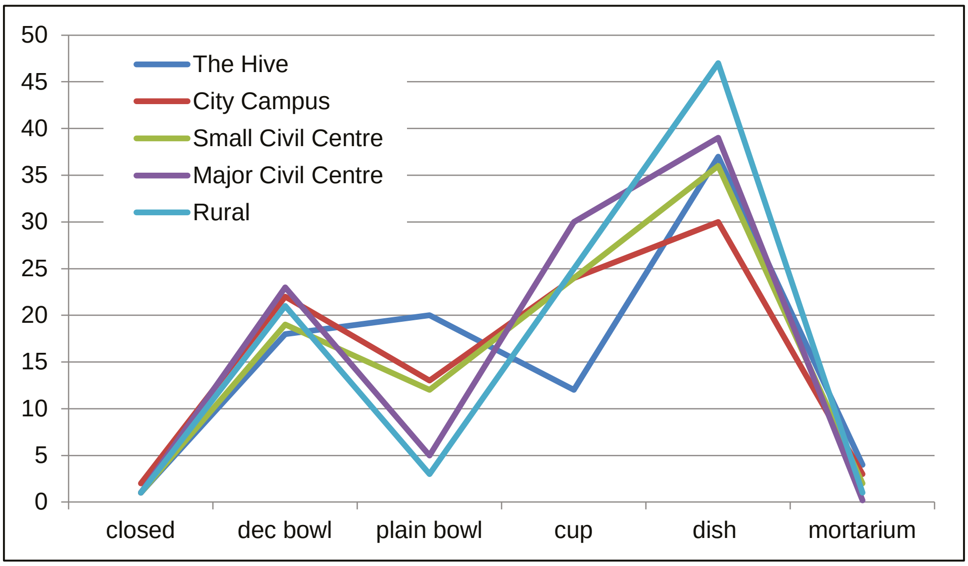


Figure 116: Comparison of samian vessel classes (% of the total MVN) from City Campus, The Hive, and three of Willis' five site-type groups (excluding military sites and extra-mural settlements outside military establishments)

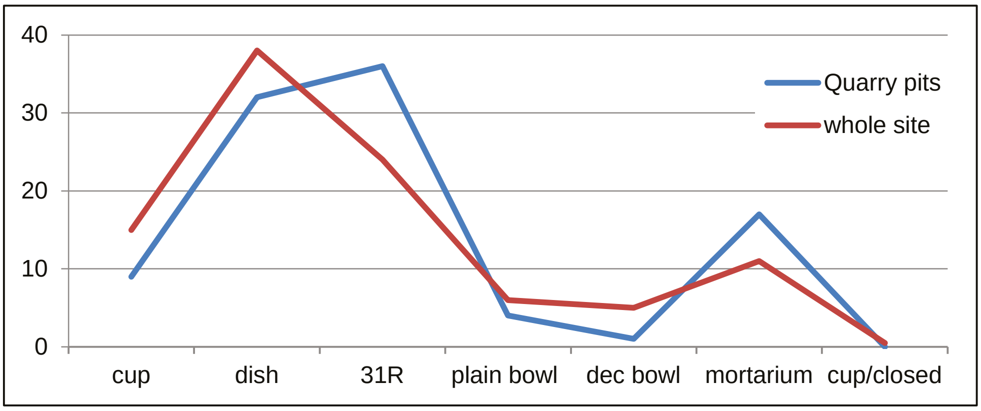


Figure 117: comparison of samian vessel classes from the Period 6 quarry pits and the assemblage as a whole (% Rim EVE)

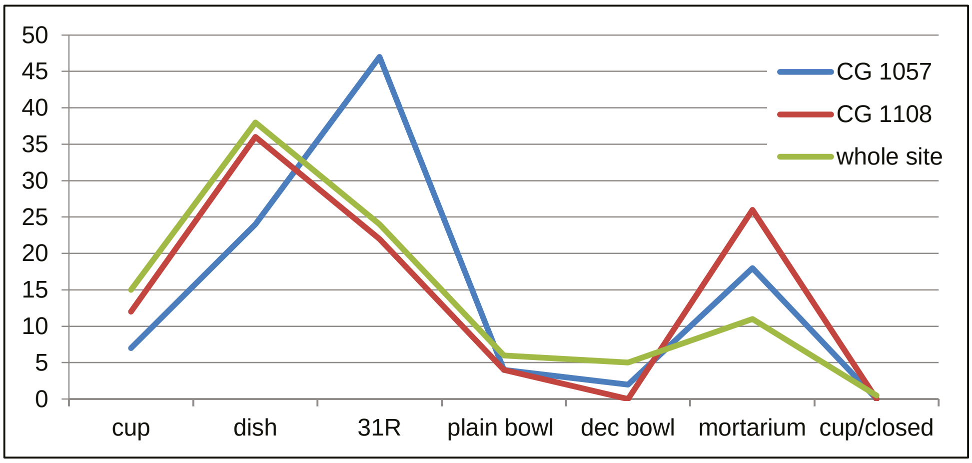


Figure 118: comparison of samian vessel classes from Period 6 quarry pit CG1057, pit CG 1108, and the assemblage as a whole (% Rim EVE)

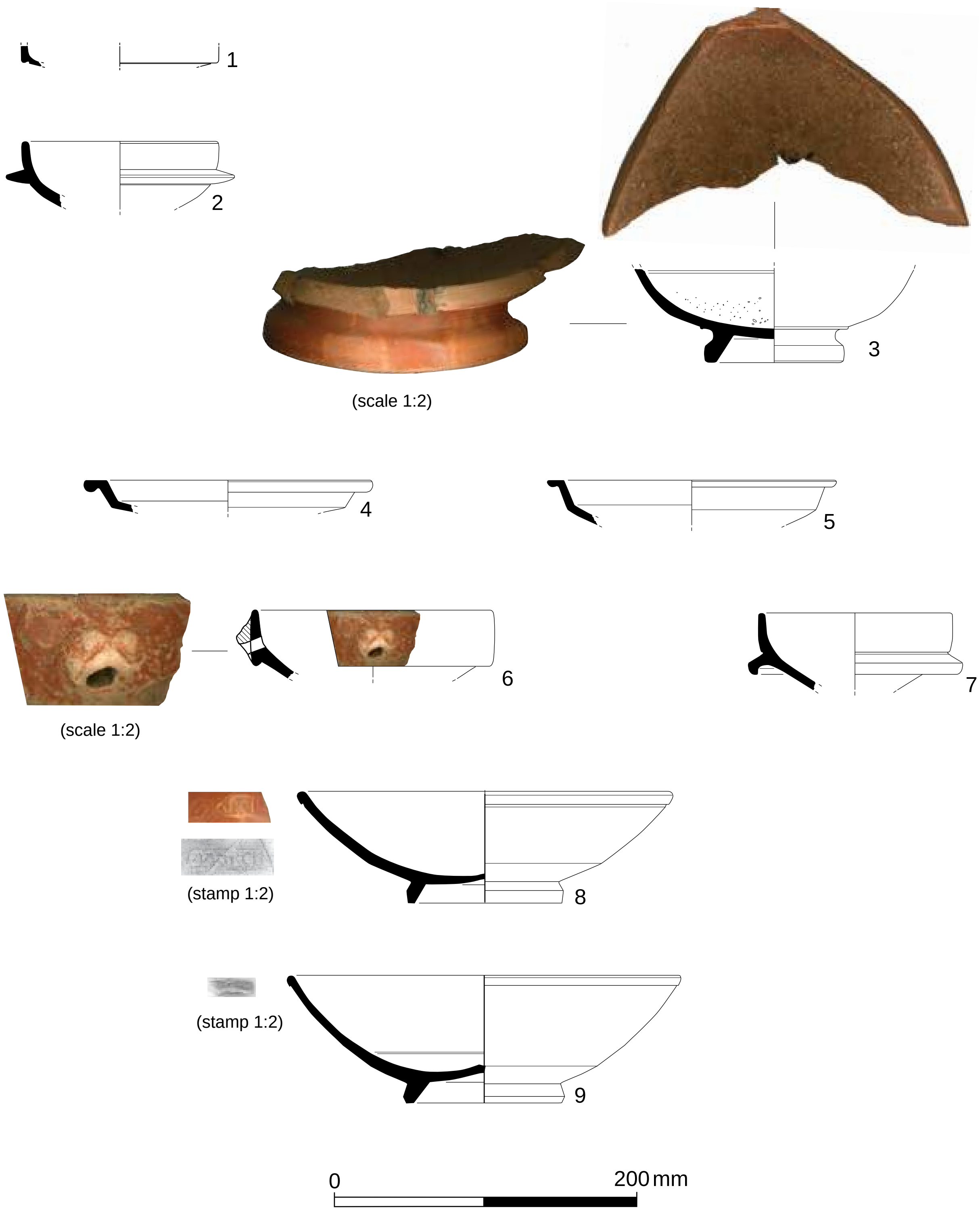


Figure 119: The illustrated samian including unusual plain forms and potters' stamps

Figure 120: the illustrated decorated samian

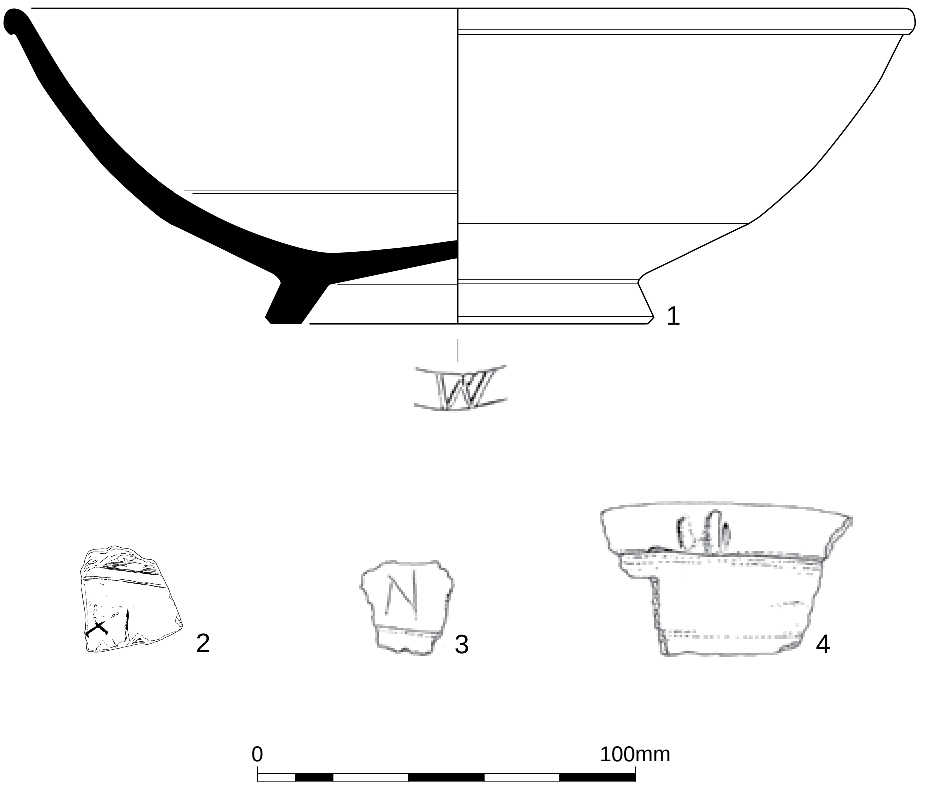


Figure 121: Graffiti

Figure 122: Re-used sherds counters and lids

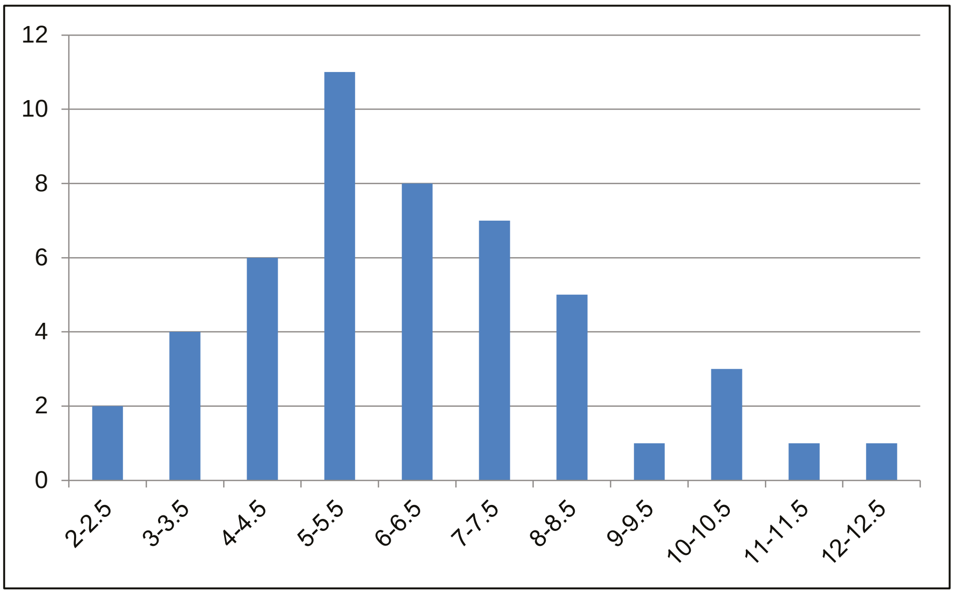


Figure 123: Diameters of Roman pottery counters by count

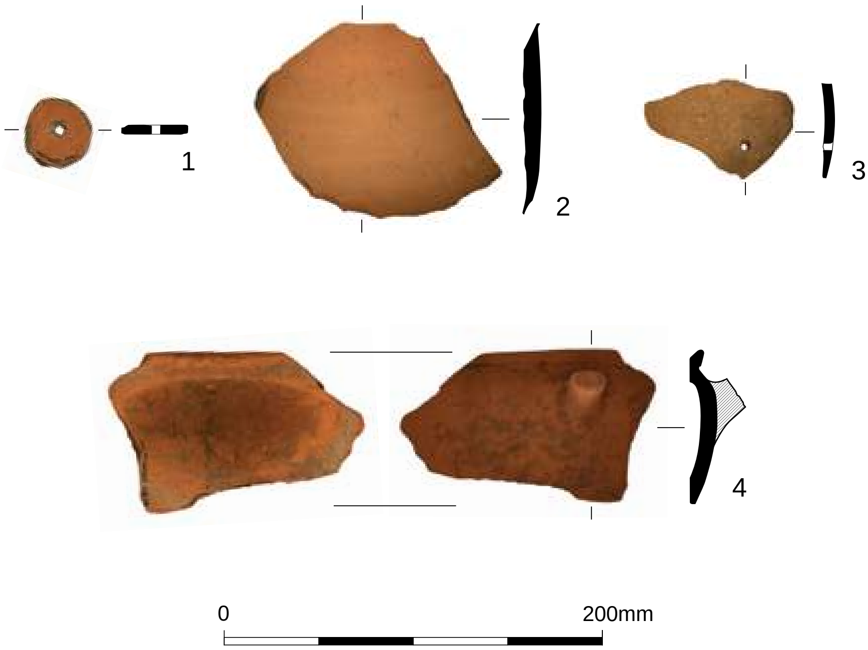


Figure 124: Re-used sherds - spindle whorl and rubbers

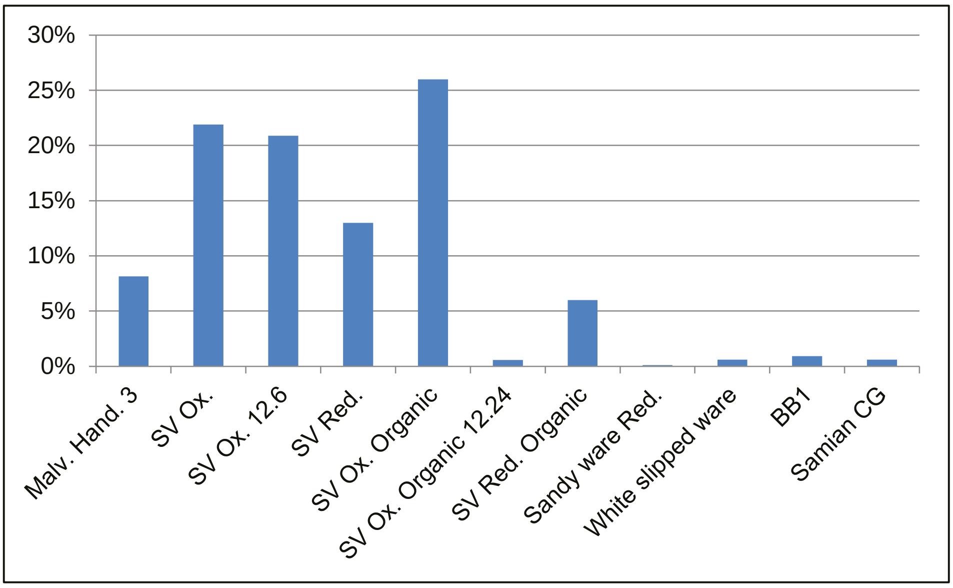


Figure 125: Period 3 pottery by main fabric groups, % weight

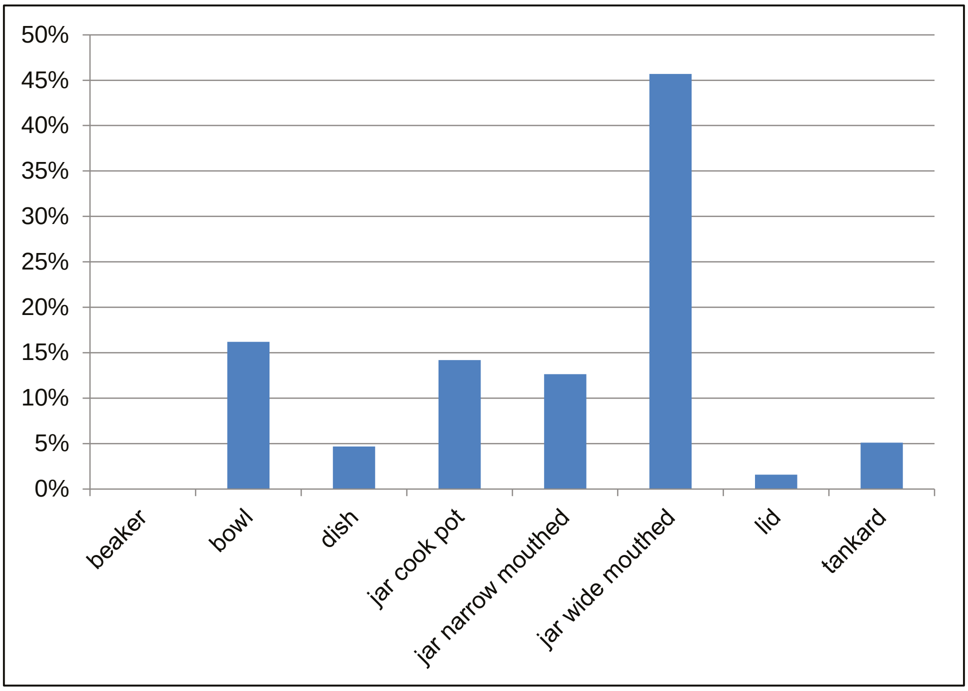


Figure 126: Period 3 pottery by vessel class

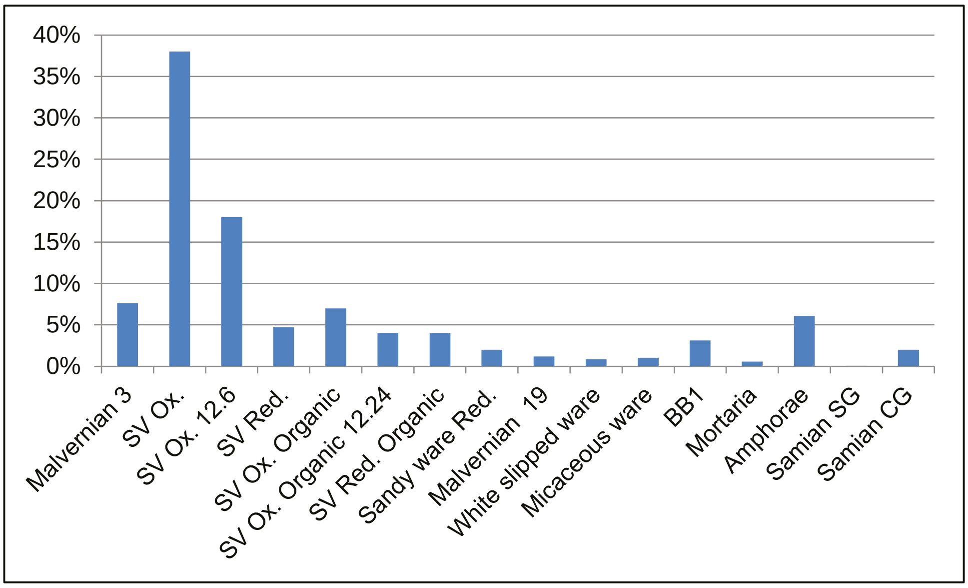


Figure 127: Period 4 pottery by main fabric groups, % weight

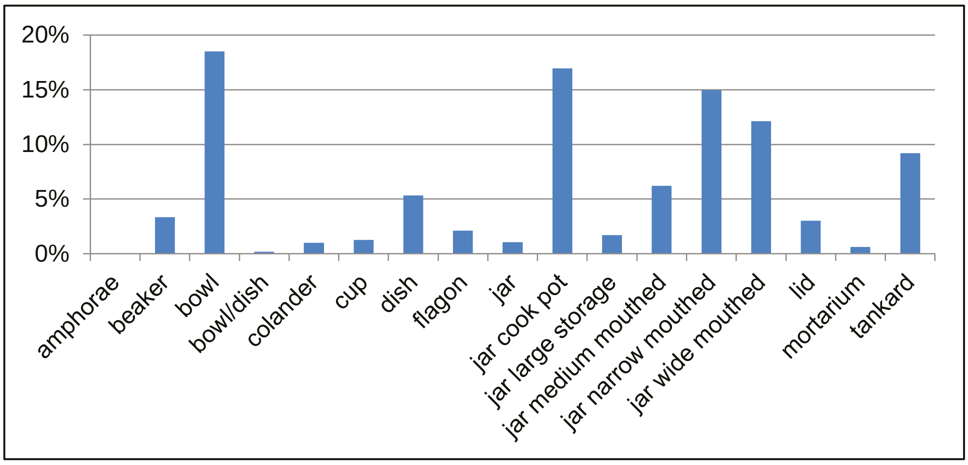


Figure 128: Period 4 pottery by vessel class (% rim EVE, total rim EVE 41.81)

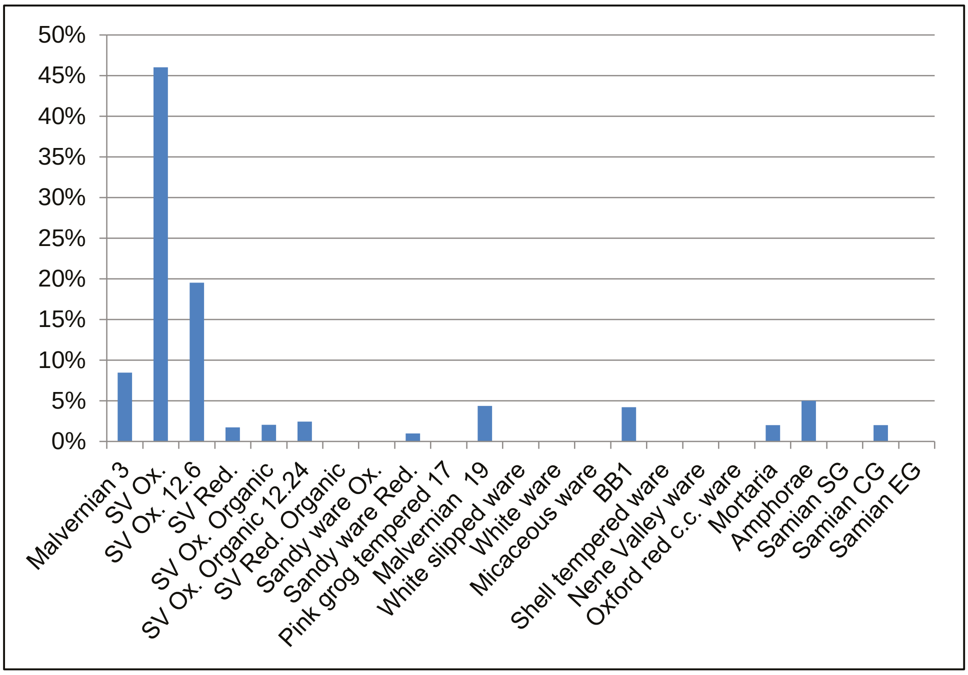


Figure 129: Period 5 pottery by main fabric groups, % weight (key to groups: Sv. Ox. Fab. 12, 12.5, 12.51, 12.7, 12.8; SV. Red. Fab. 12.1, 12.15, 12.16; SV Ox. Organic, Fabs. 12.2, 12.23, 12.25; SV. Red. Organic, Fabs 12.3, 12.34, 12.35; Sandy ware Ox. Fab. 13; Sandy ware Red., Fabs 14, 14.1, 14.24, 15, 15.1; White slipped ware, Fabs. 20.1, 20.3, 20.5, 20.6, 20.7, 20.8, 30, 151.2; Micaceous ware, Fab 21.3, 21.4; BB1 Fab. 22, 153; Mortaria, Fabs 32, 33.1, 37.5; Amphorae, Fab. 42.1, 42.3; Samian SG, Fab. 43.1; Samian CG; Fab. 43.2, 43.6), EG Fab. 43.3, 43.4, 43.7)

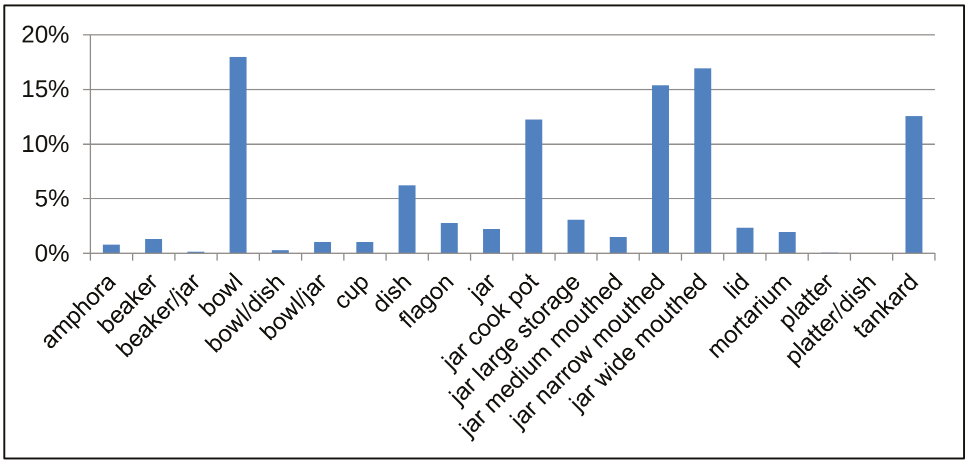


Figure 130: Period 5 pottery by vessel class

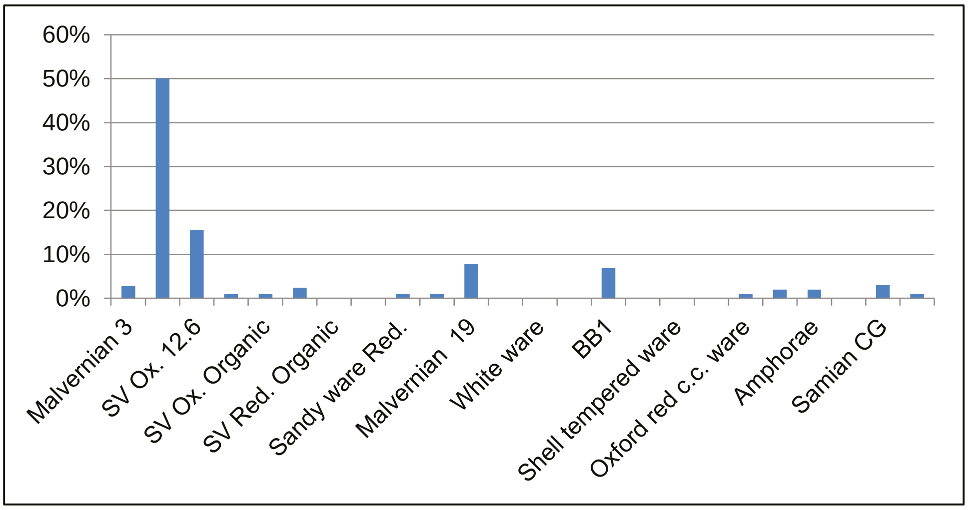


Figure 131: Period 6 pottery by main fabric groups, % weight

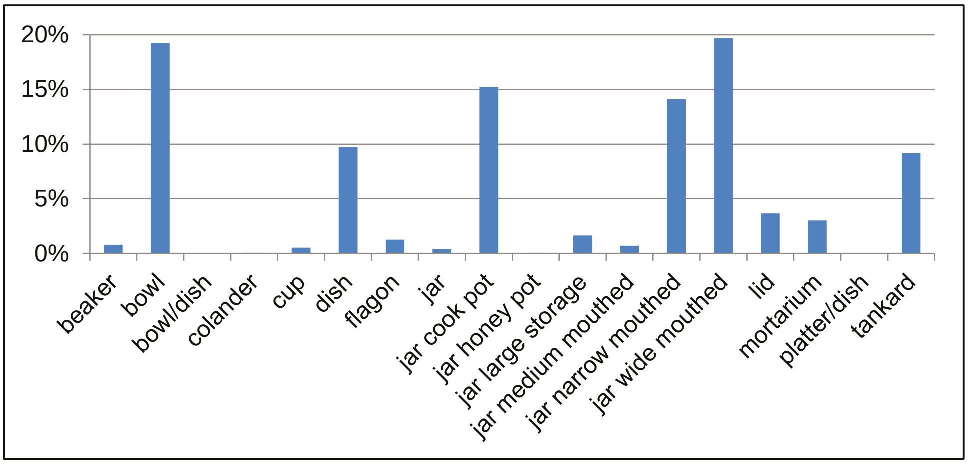


Figure 132: Period 6 pottery by vessel class

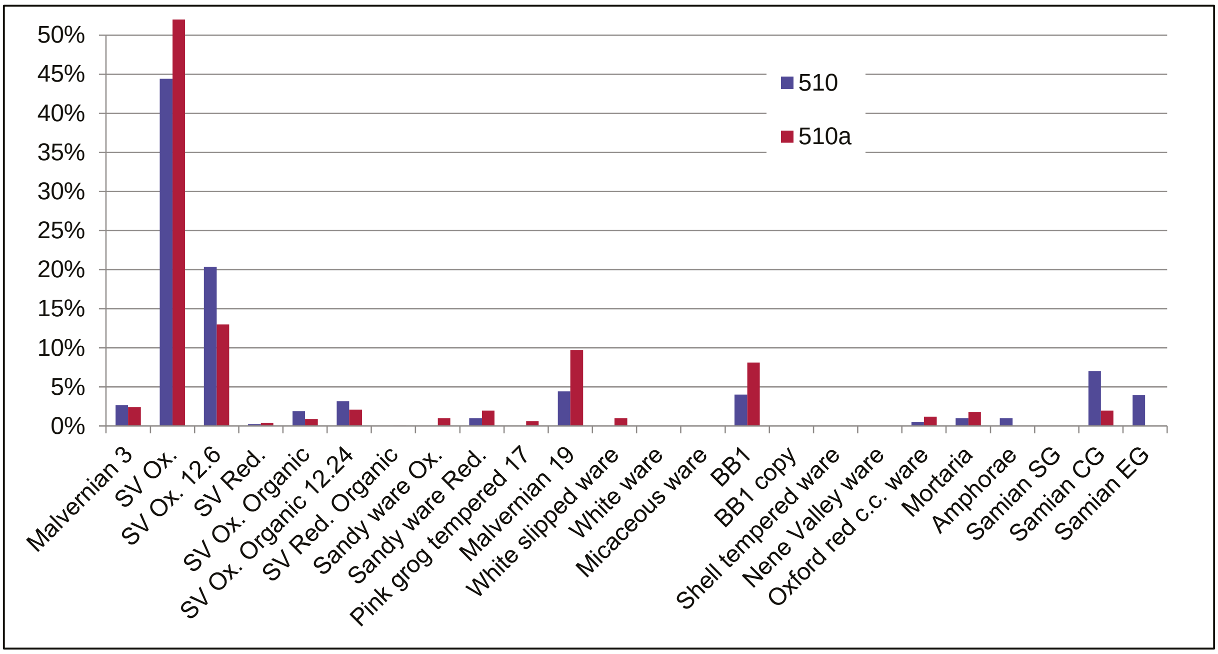


Figure 133: Period 6, quarry pit pottery by main fabric groups (% weight)

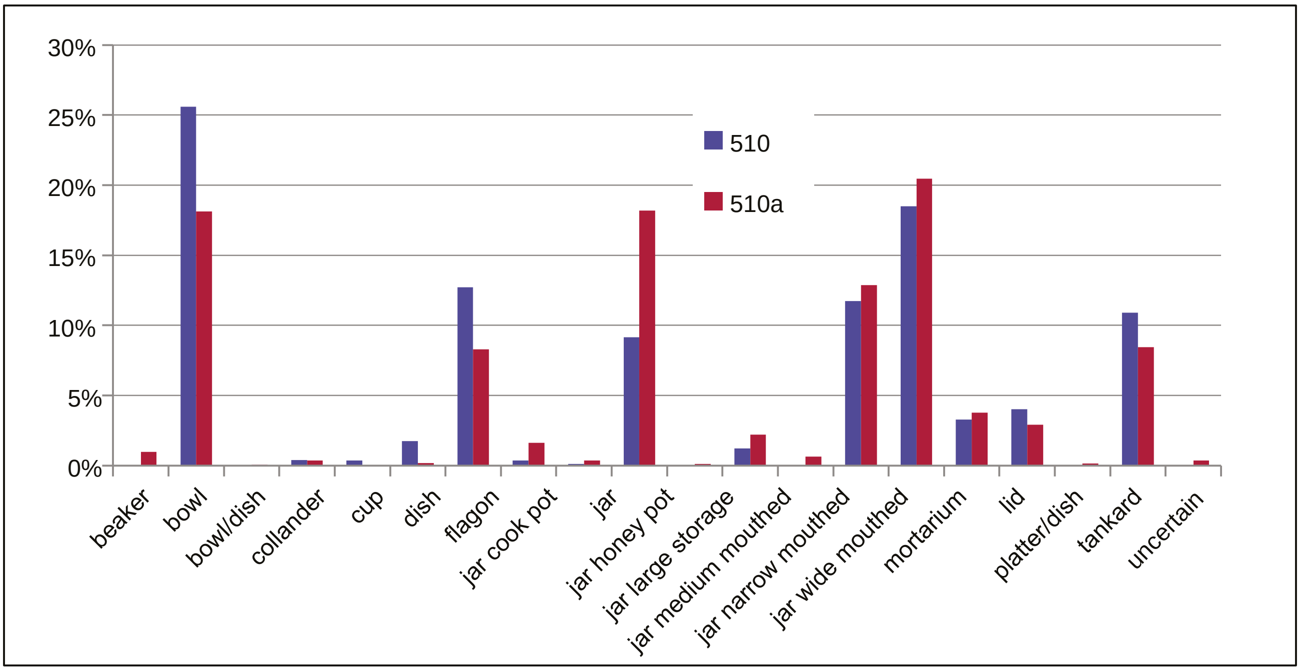


Figure 134: Period 6 quarry pit pottery by vessel class

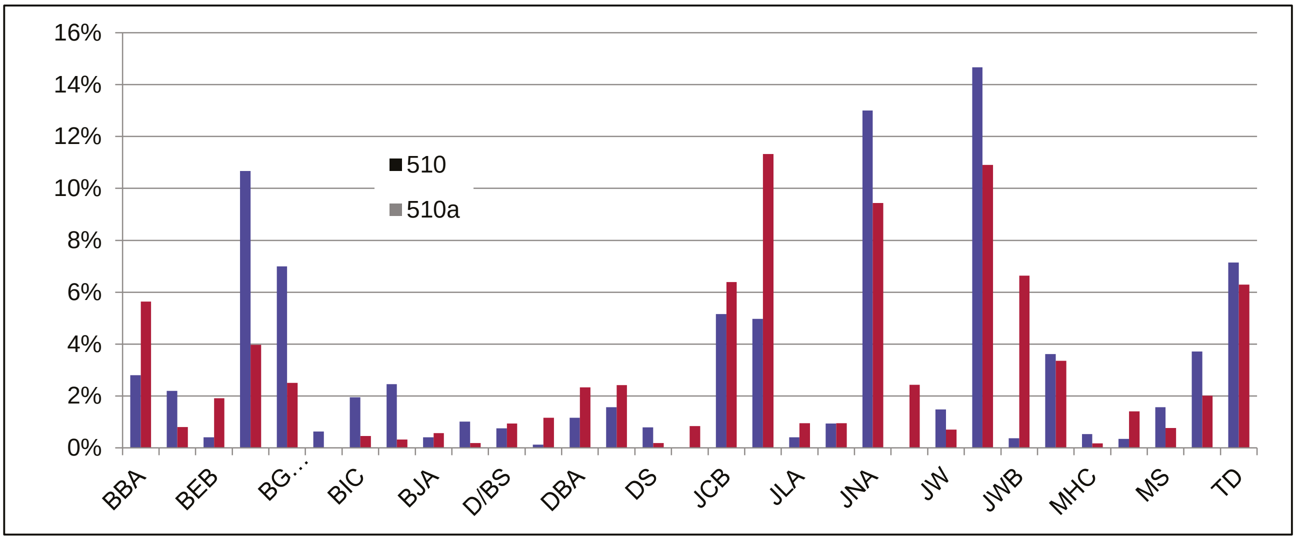


Figure 135: Period 6 quarry pit pottery, main vessel groups

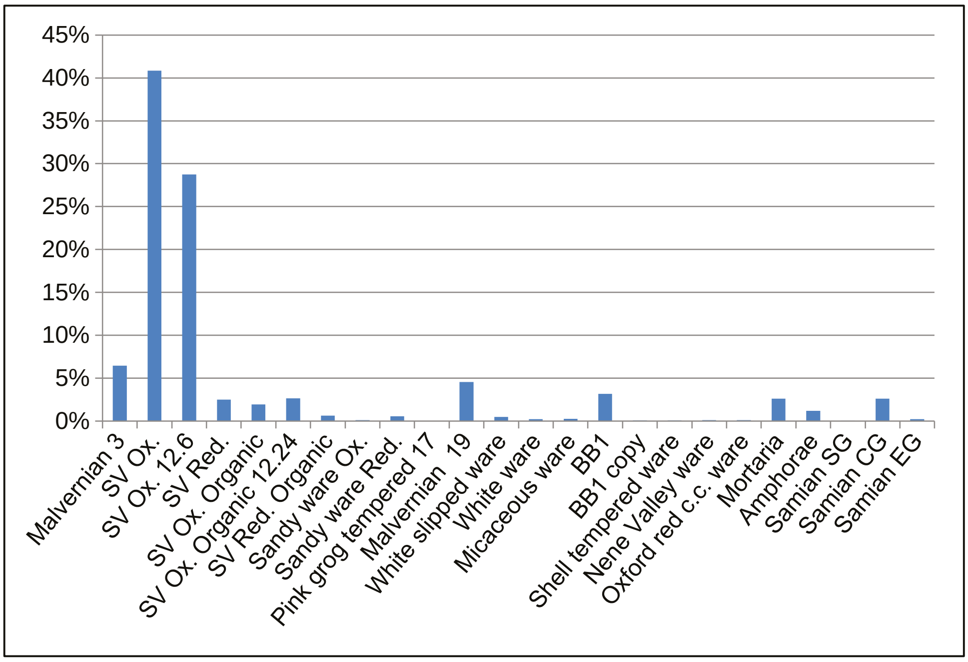


Figure 136: Period 6-7 pottery by main fabric groups, % weight

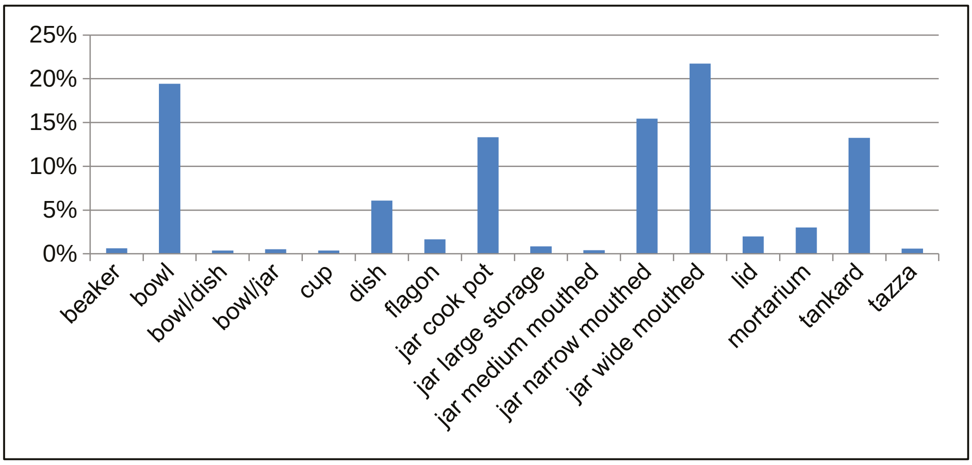


Figure 137: Period 6–7 pottery by vessel class

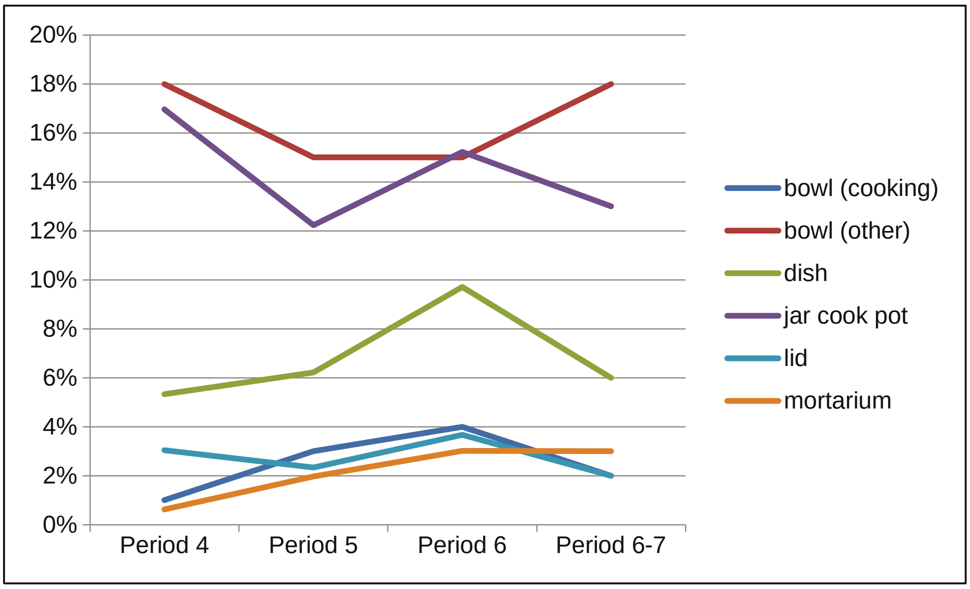


Figure 138: Pottery vessel classes by period

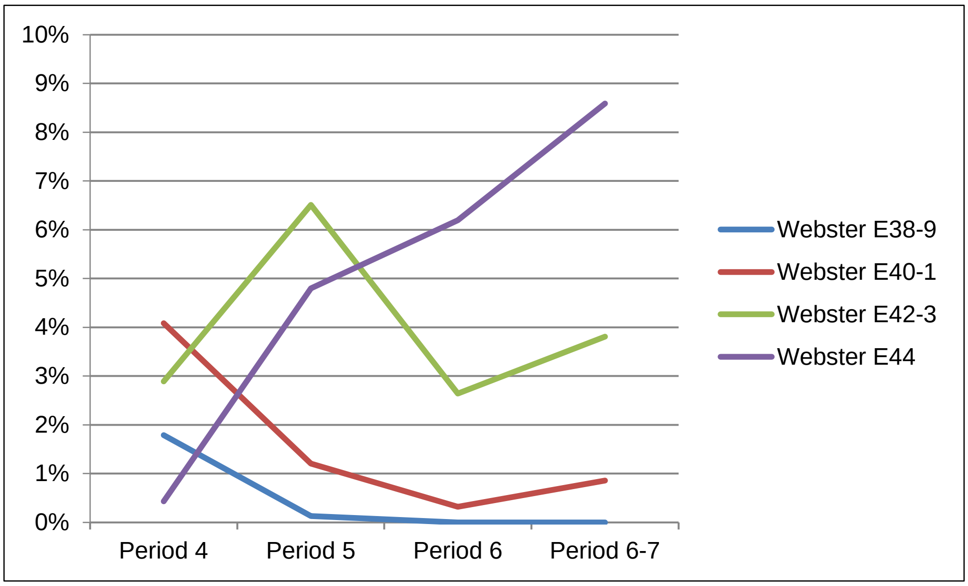


Figure 139: Severn Valley tankards, main groups by period

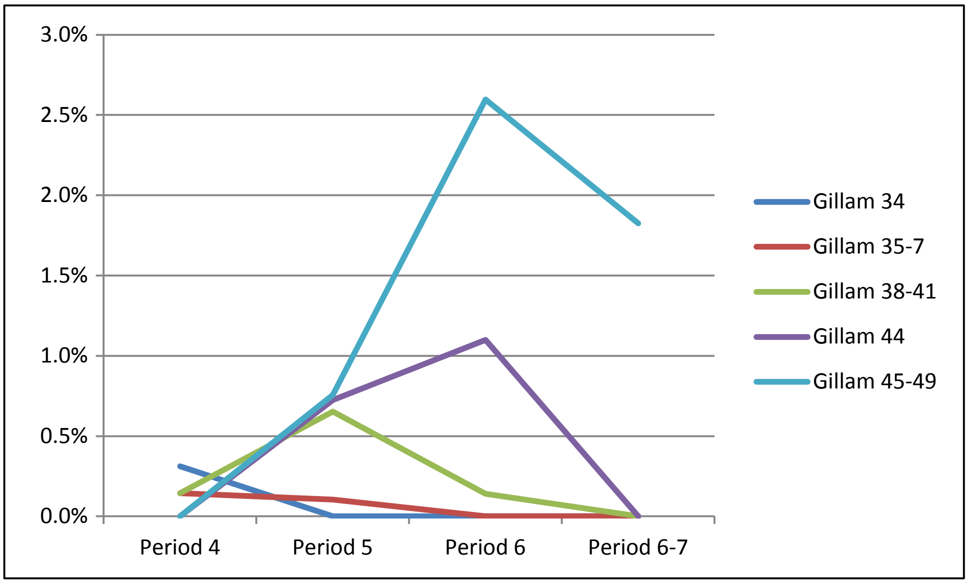


Figure 140: BB1 bowls, main groups by period

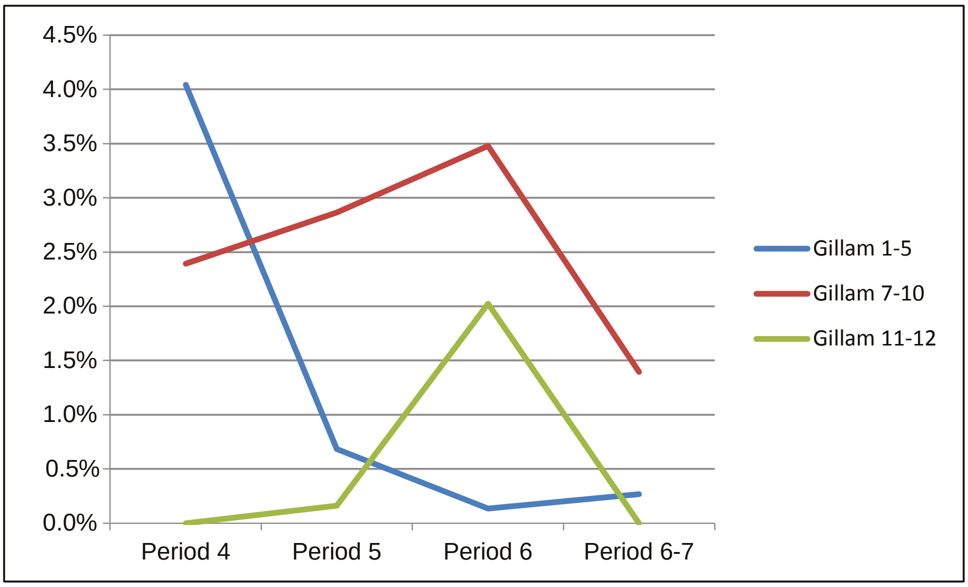


Figure 141: BB1 cooking pots, main groups by period

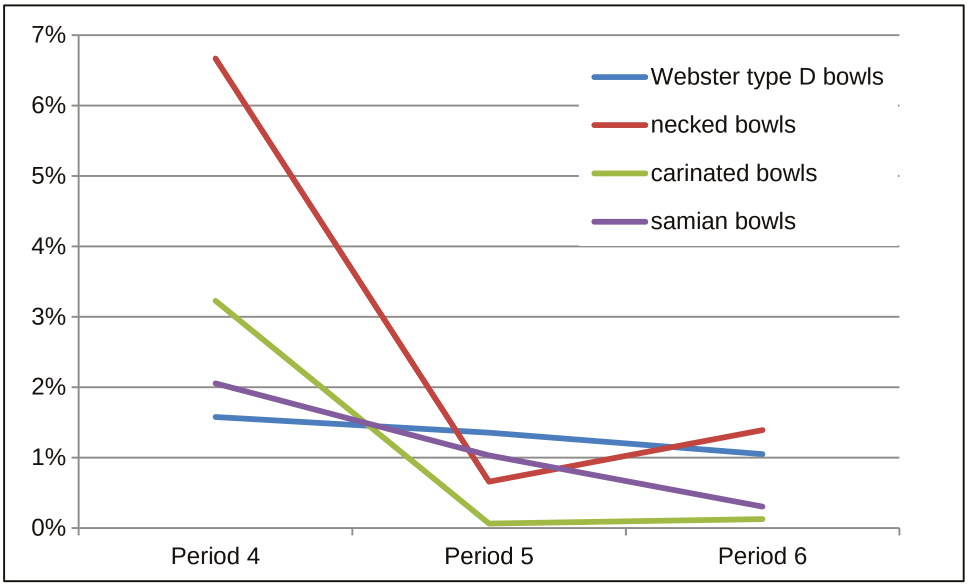


Figure 142: Bowl types in decline, main groups by period

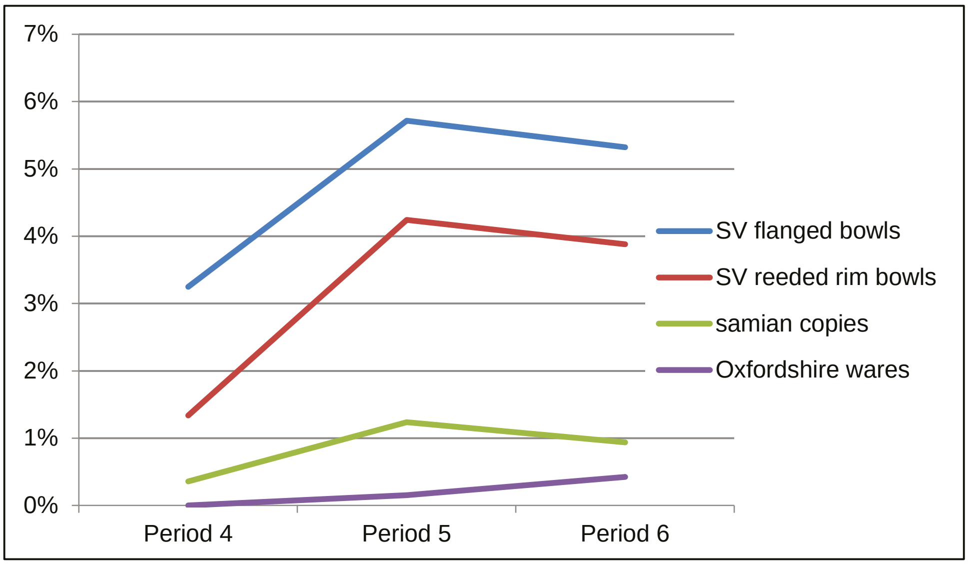


Figure 143: Bowl types increasing in frequency, main groups by period

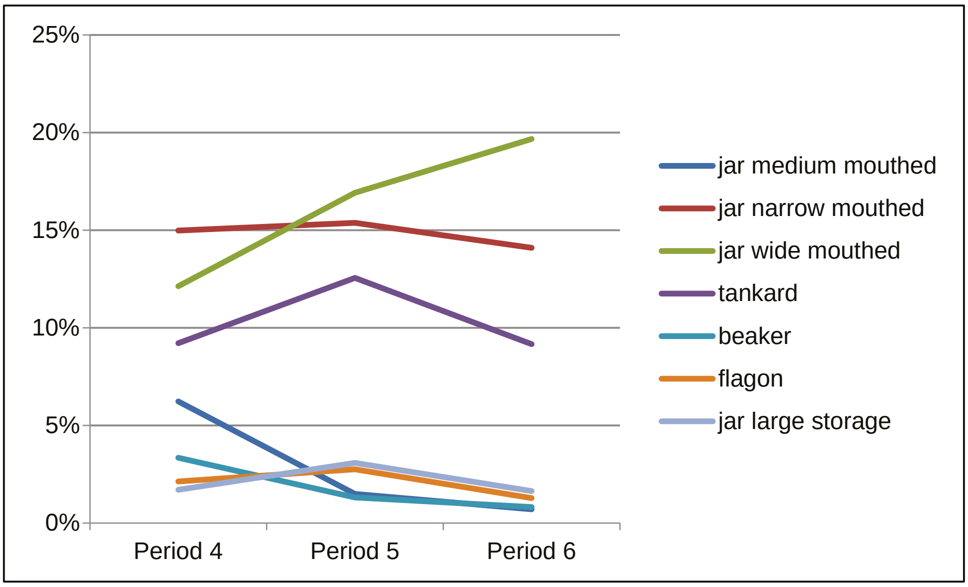


Figure 144: Jars, tankards, beakers and flagons by period

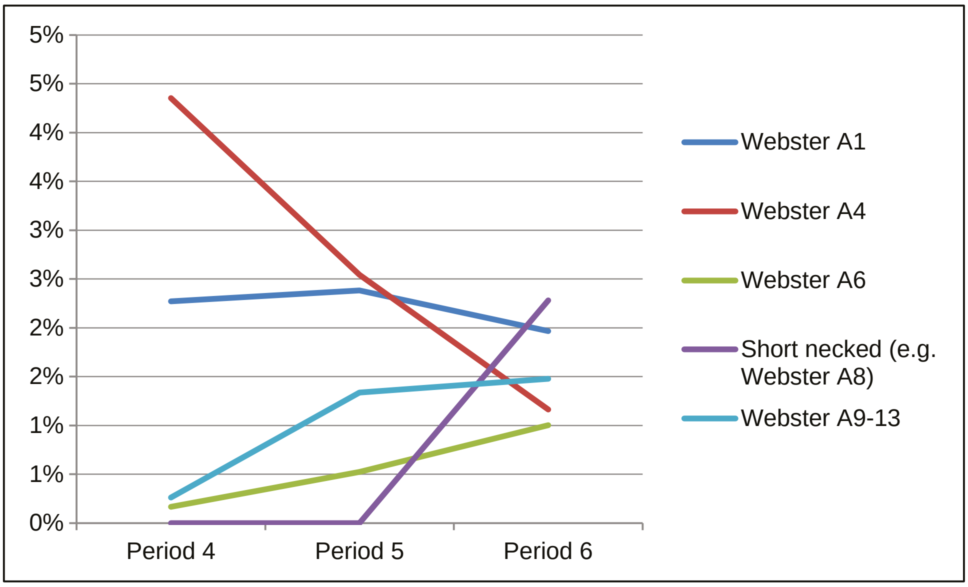


Figure 145: Severn Valley ware narrow-mouthed jars by period

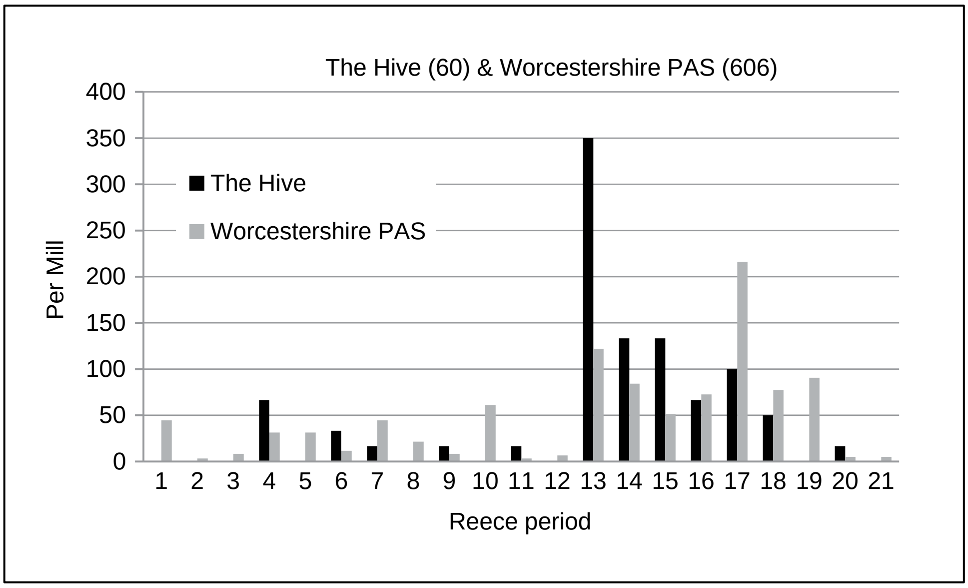


Figure 146: Roman coins from The Hive and Worcestershire PAS

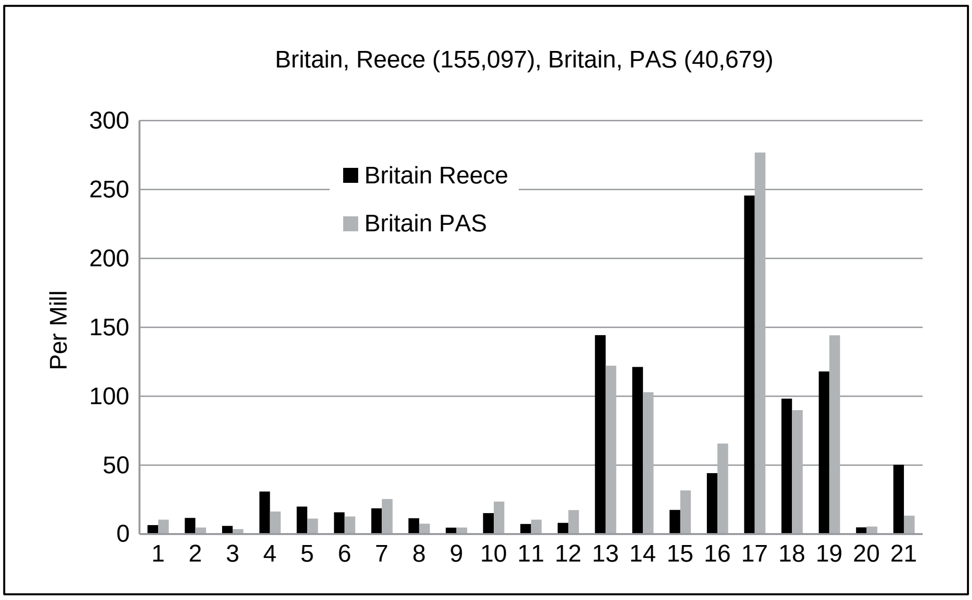


Figure 147: Coins from Britain and Britain PAS

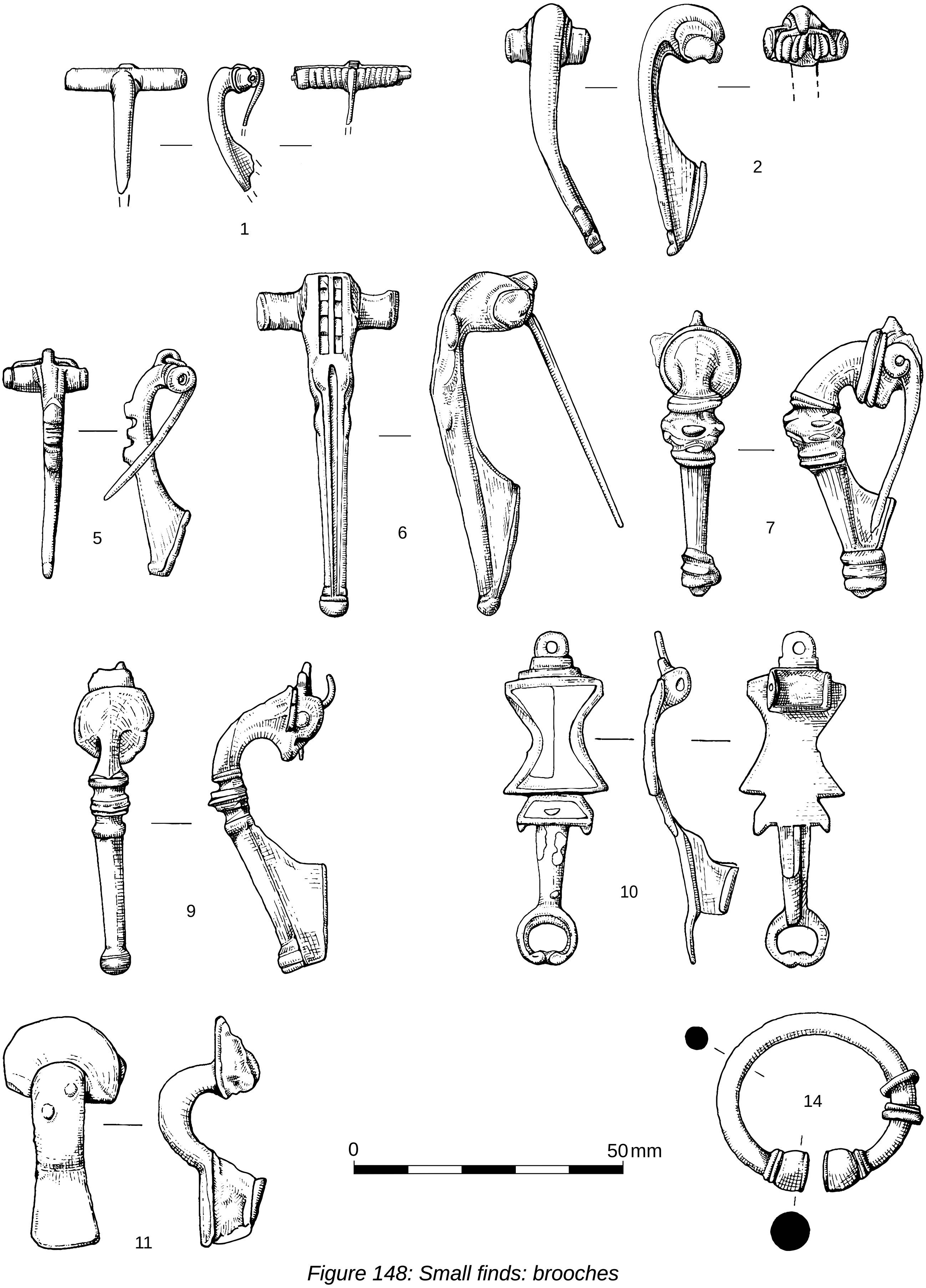


Figure 148: Small finds: brooches

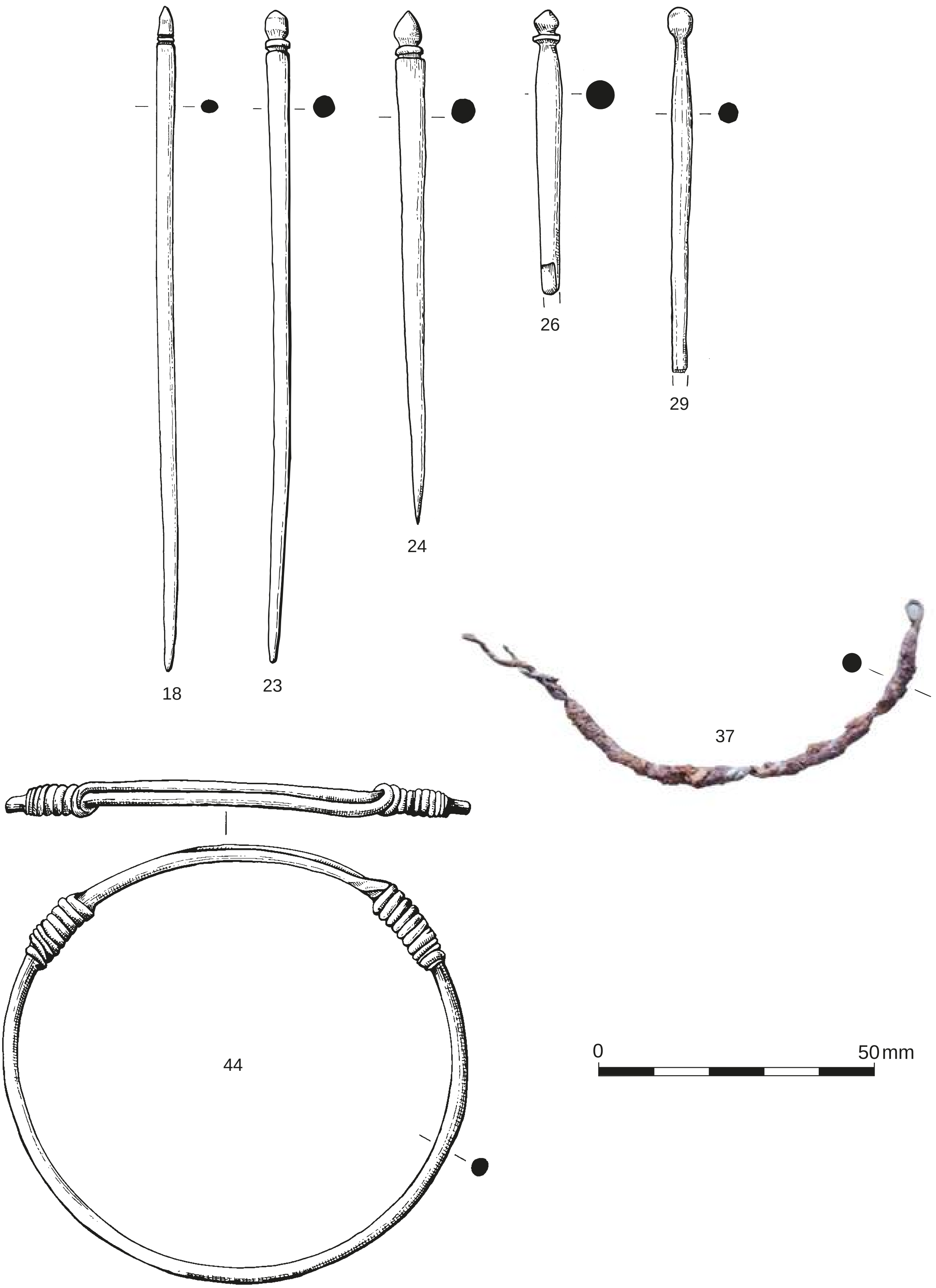


Figure 149: Small finds: hair pins and bracelets

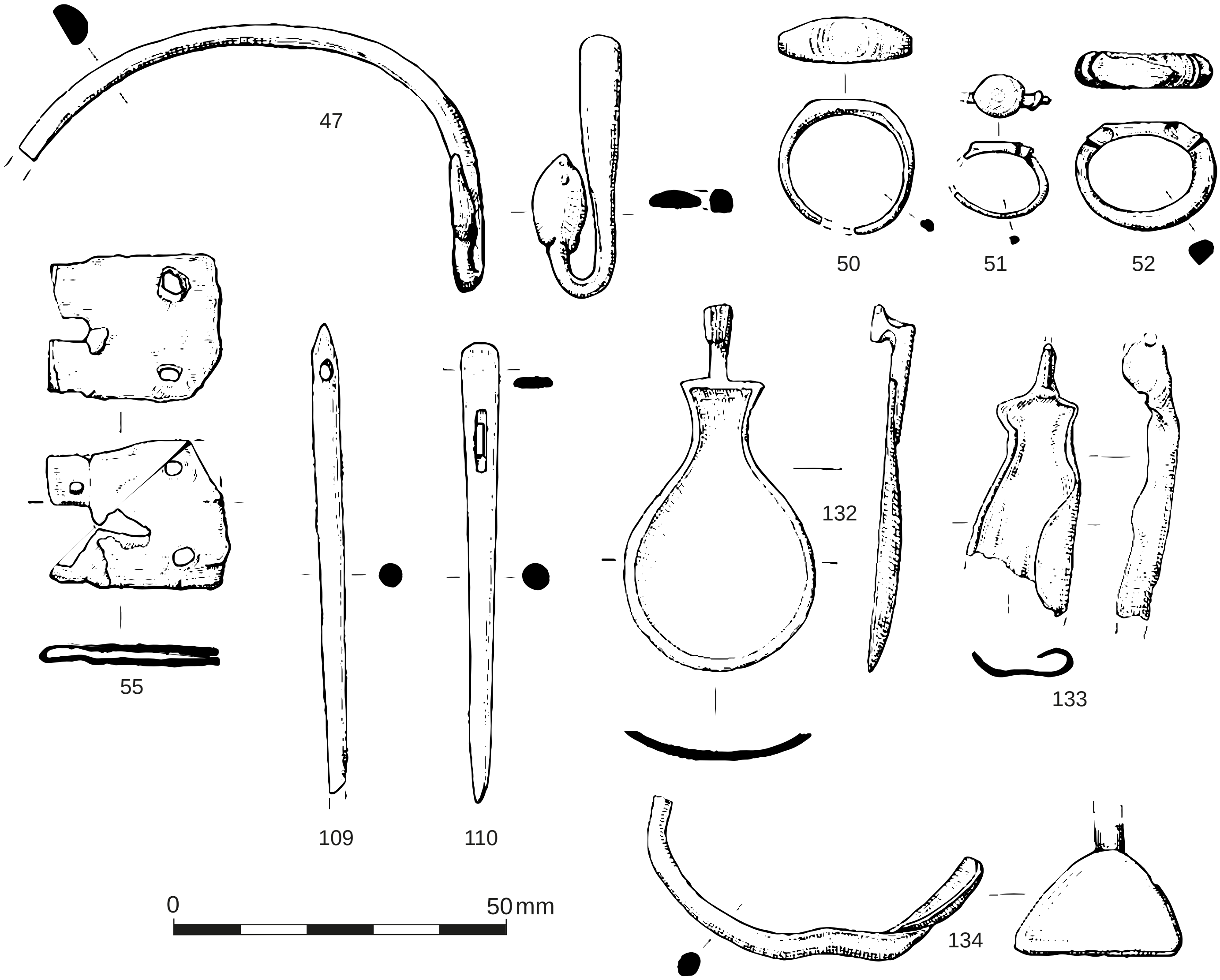


Figure 150: Small finds: snake-headed bracelet (47), finger rings (50-52), belt plate (55), needles (109-10), spoons (132-4), flesh hook (135)

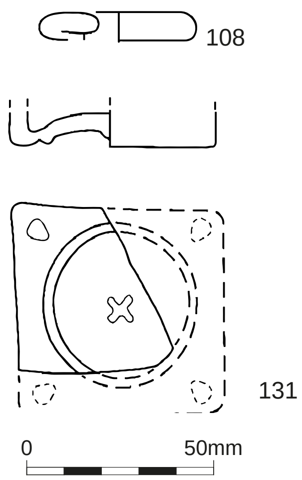


Figure 151: Small finds: Glass bath flask (108) and square bottle (131)

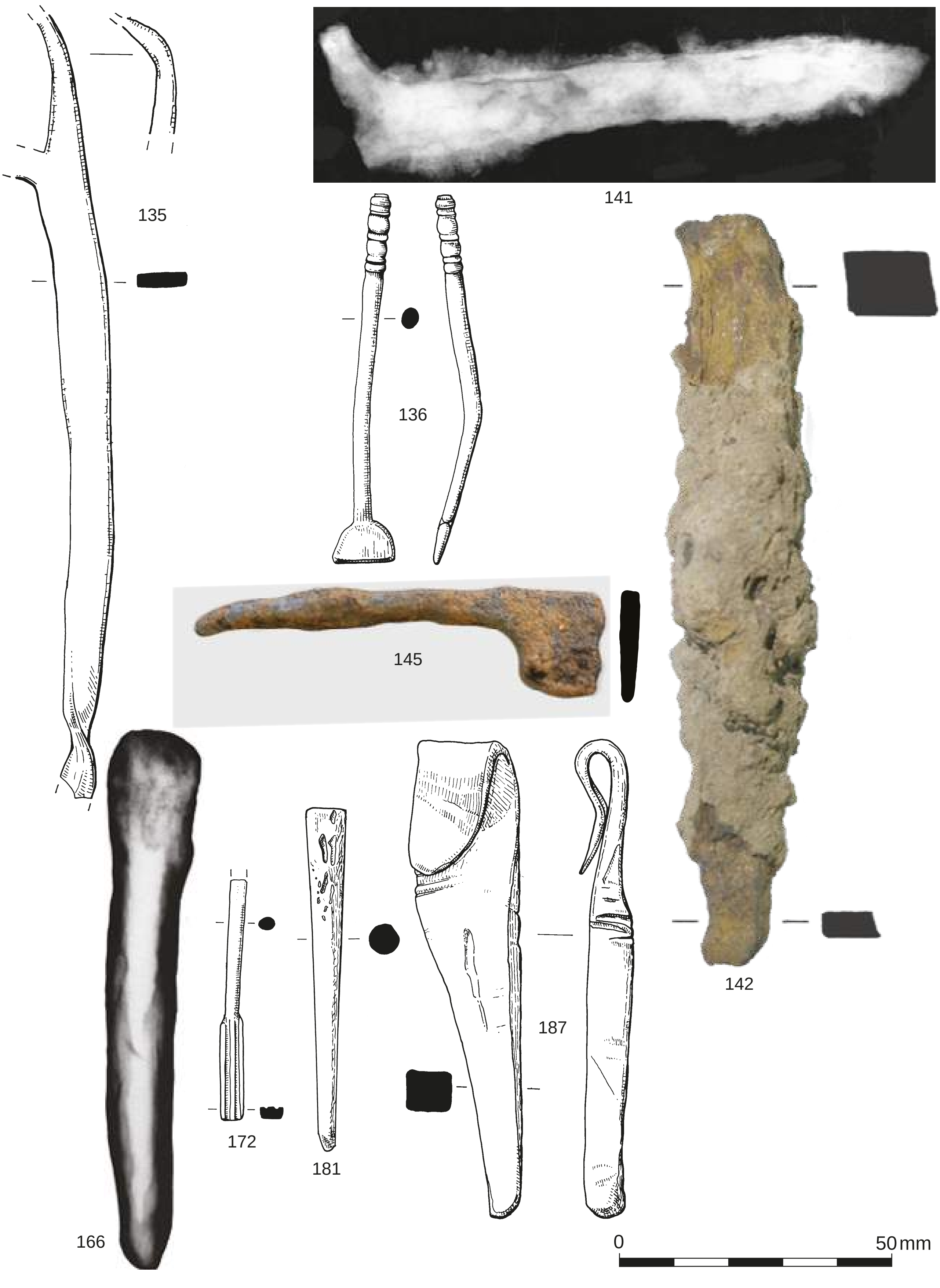


Figure 152: Small finds: stylus (136), slicker (141), gouge (142), knife (145), rake tine (166), rod (172), peg or shank (181), bar (187)

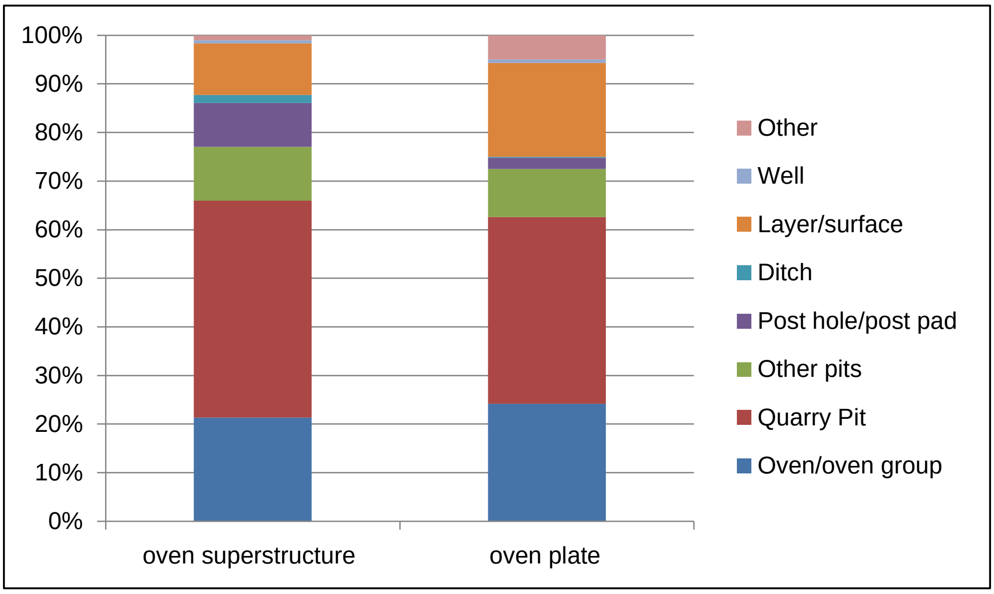


Figure 153: The oven superstructures and plates by feature type (% weight)

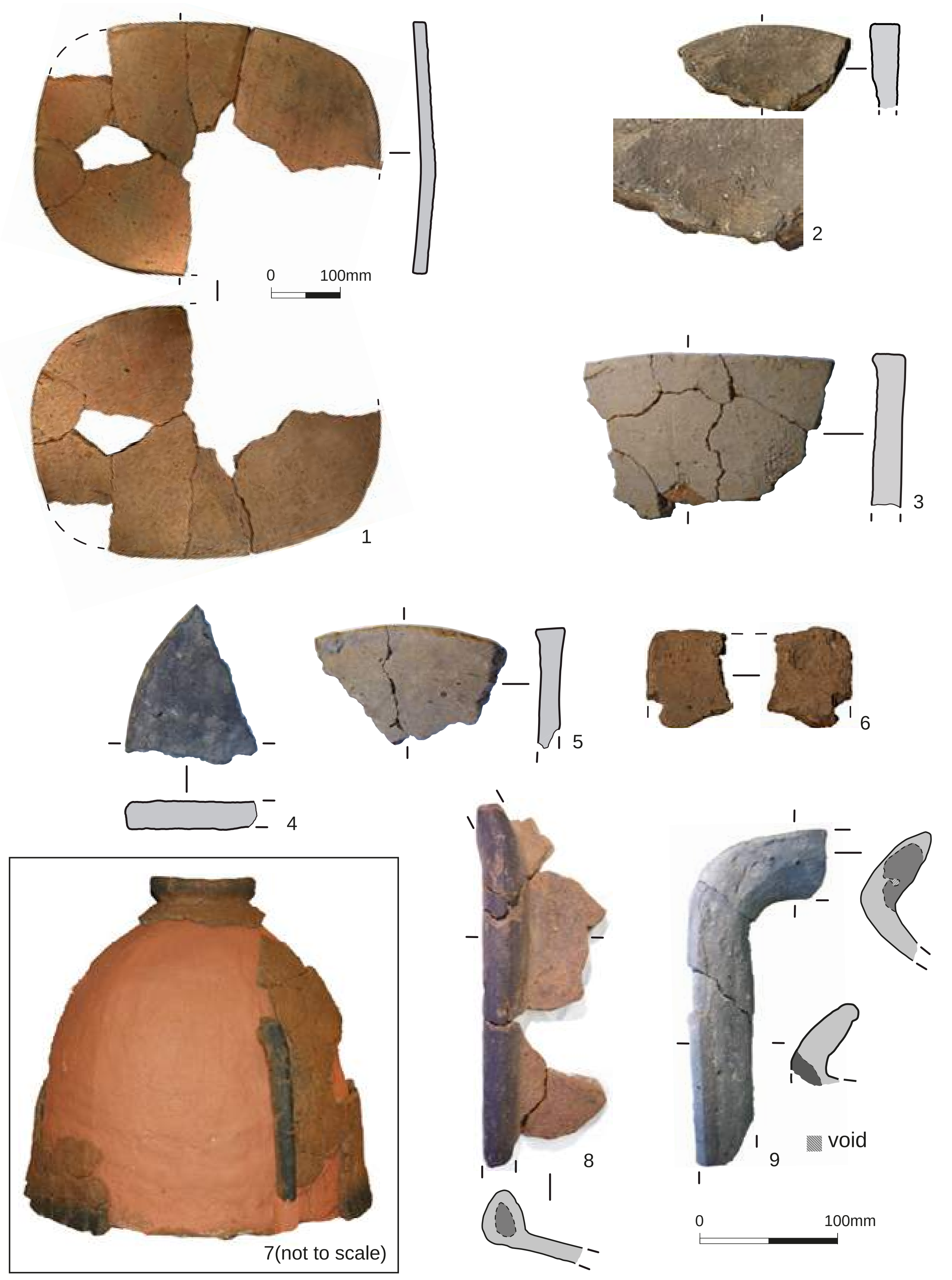


Figure 154: Roman oven material: oven plate (1-6), oven superstructure (7-9)

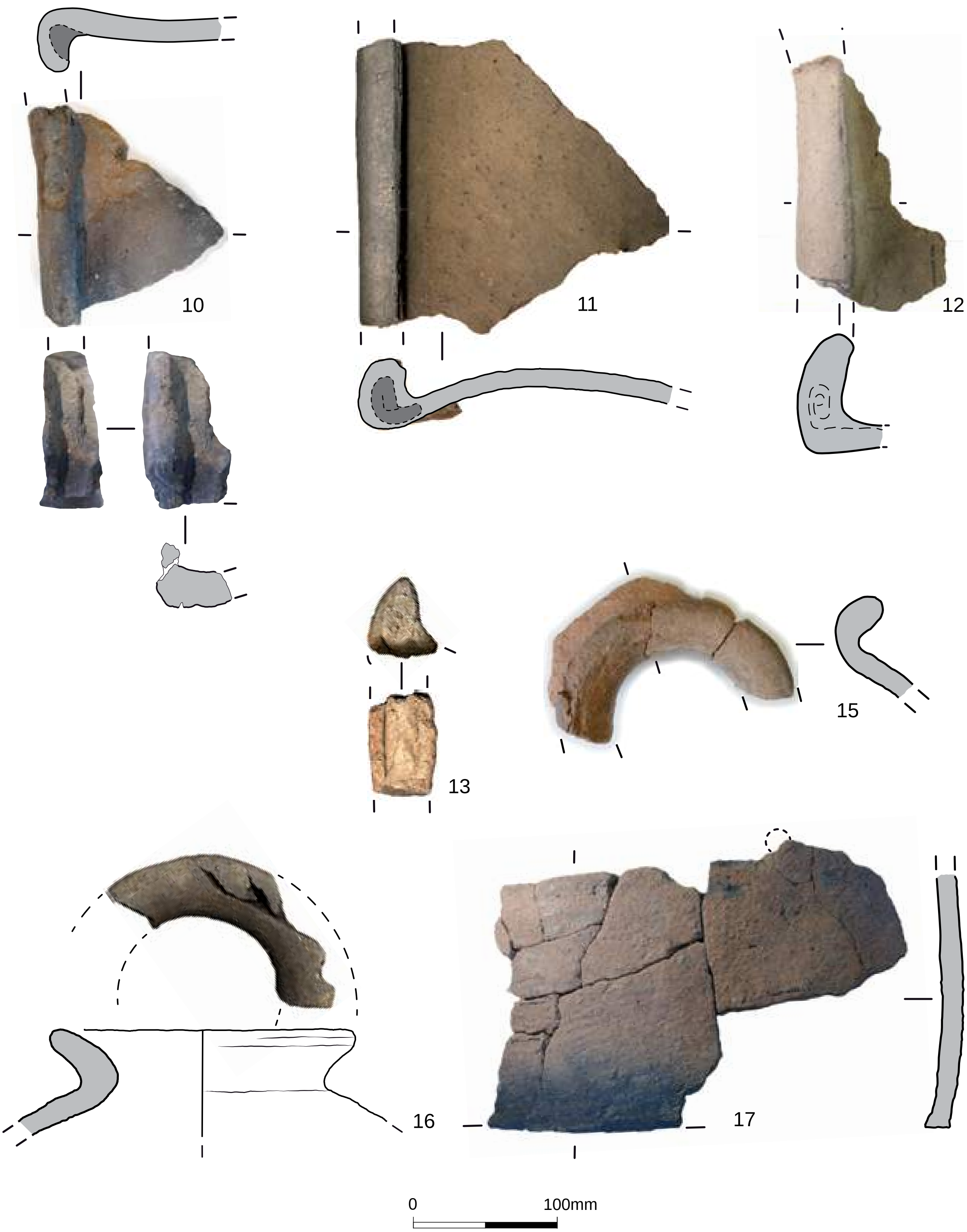


Figure 155: Roman oven material: oven superstructure (10-16)

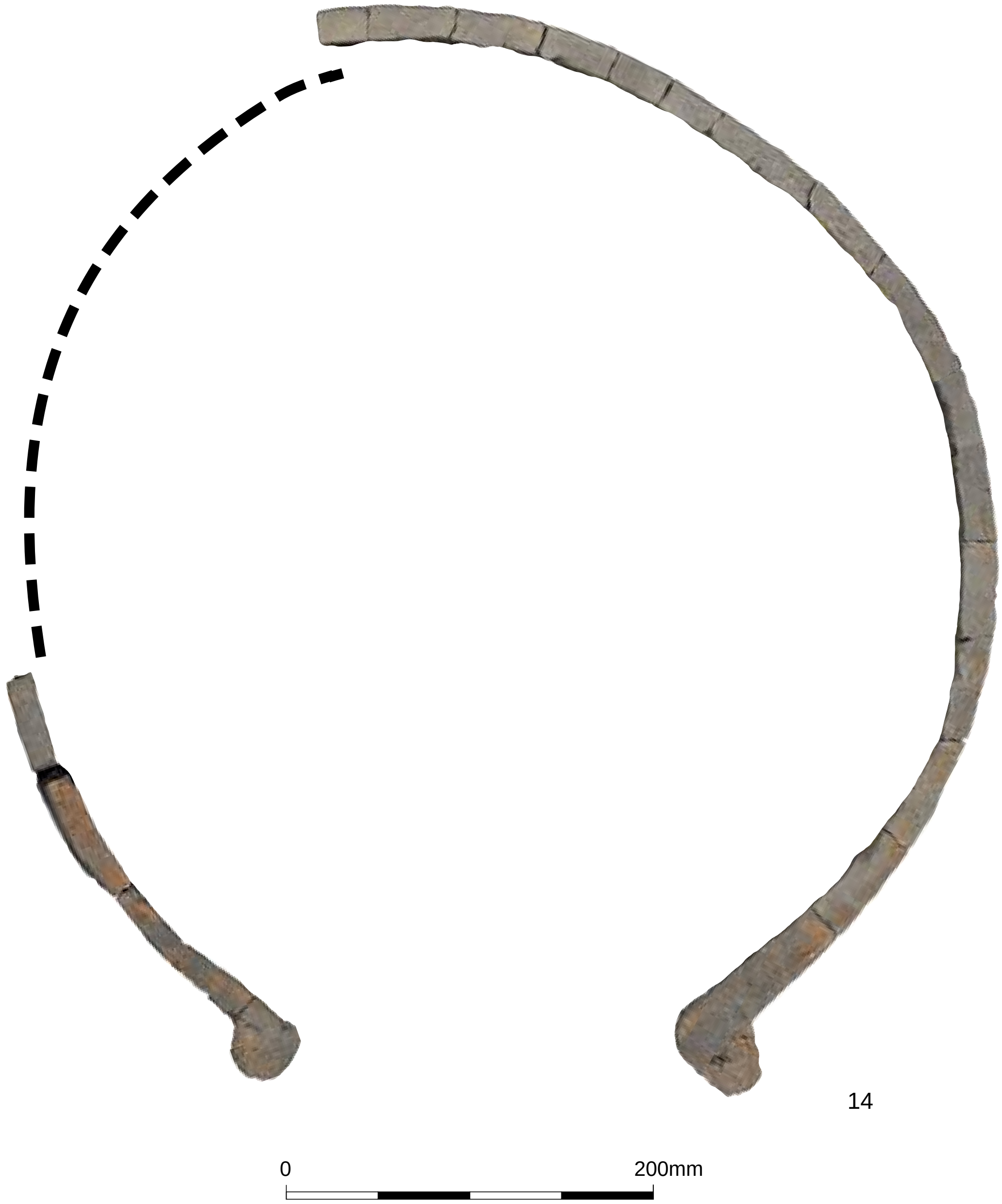


Figure 156: Roman oven material: joining fragments of base and mouth from in-situ oven (17)

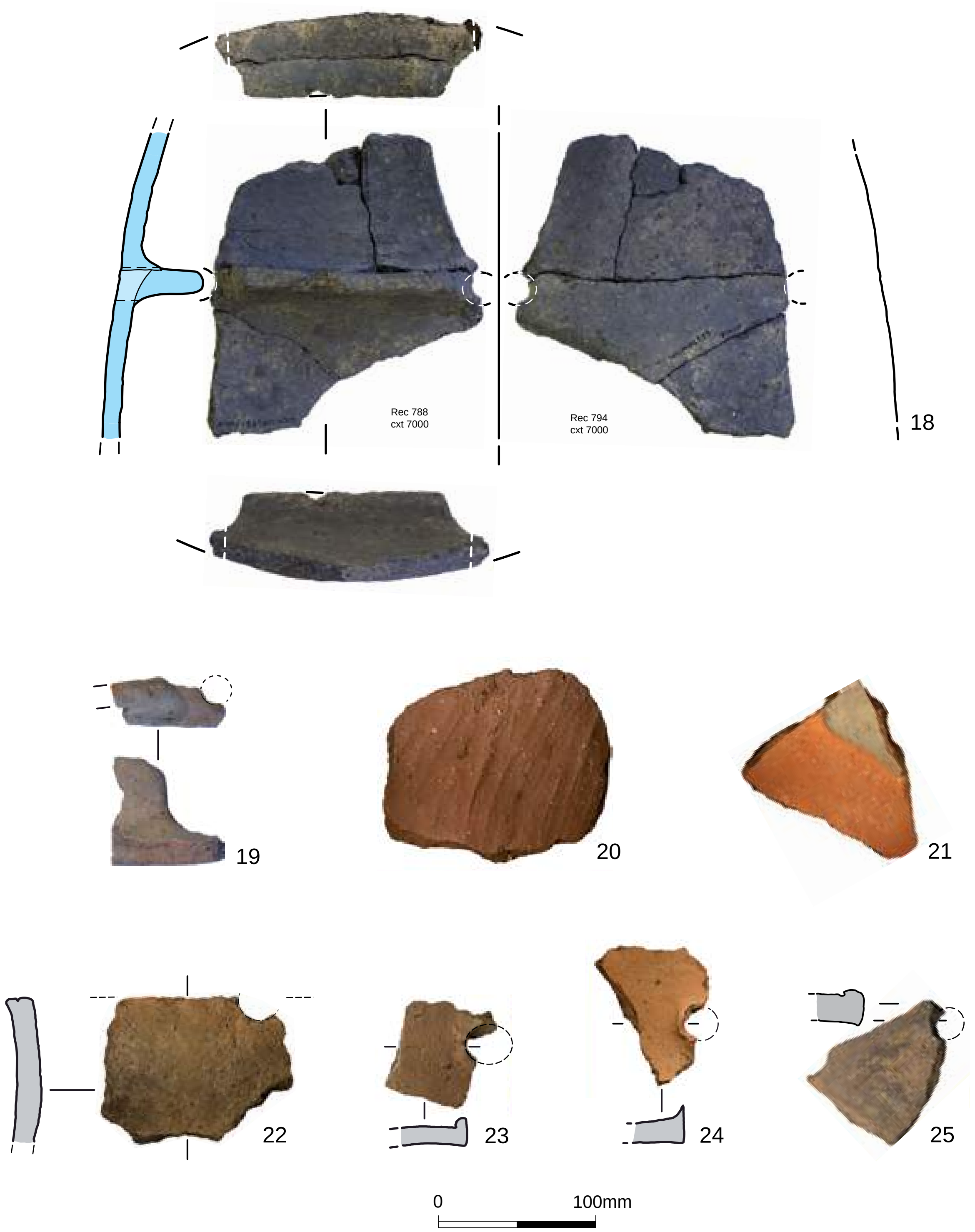


Figure 157: Roman oven material: oven walls showing internal flange, perforations and wiping (18-25)

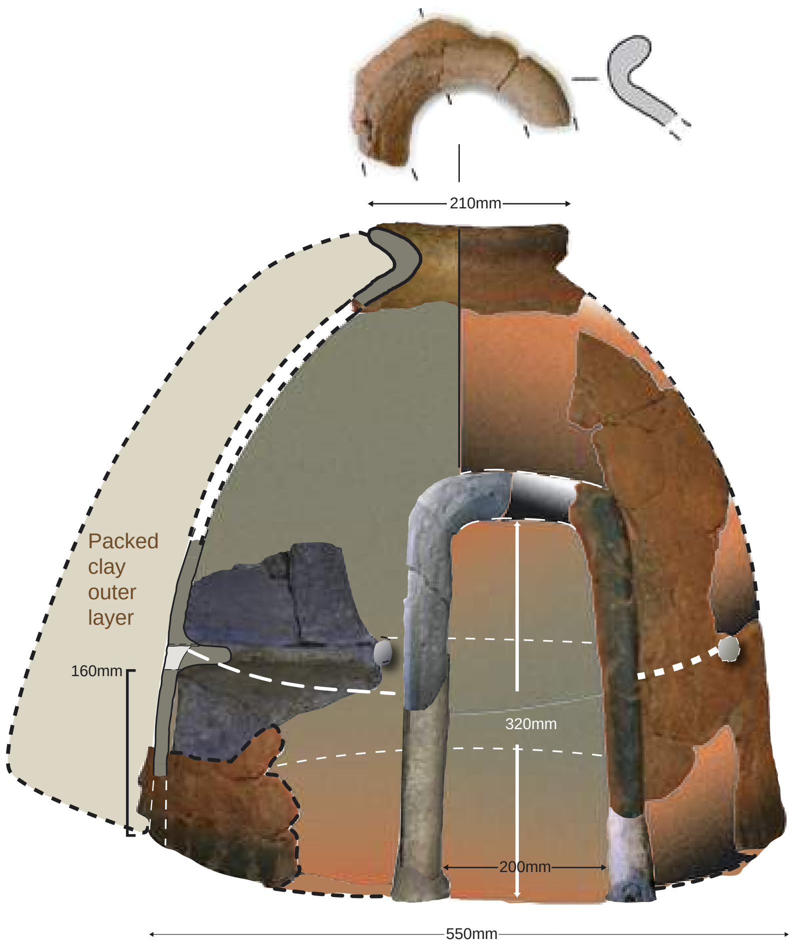


Figure 158: Roman oven material: reconstructed oven structure

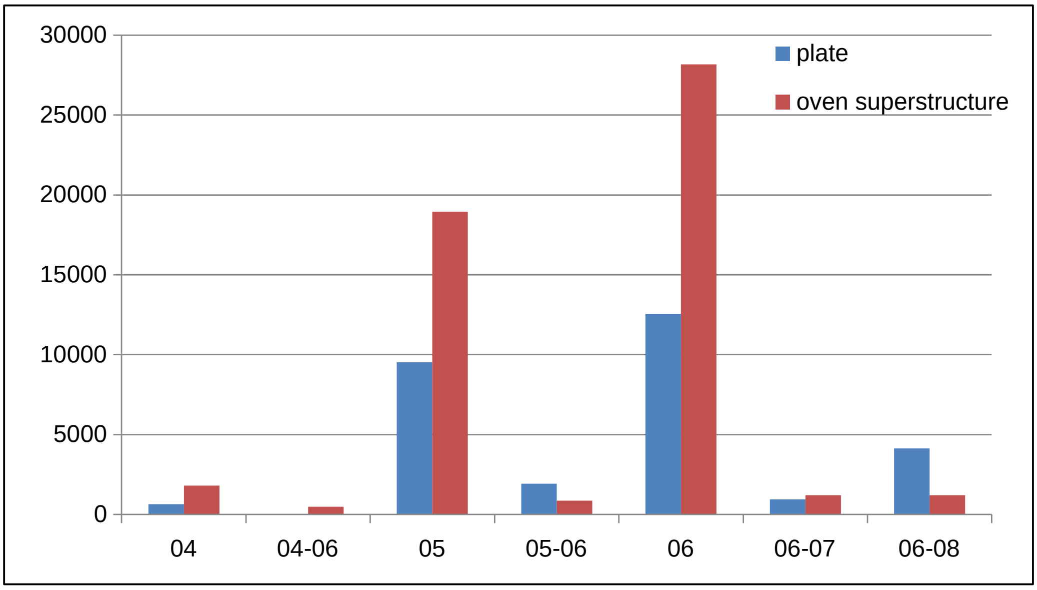


Figure 159: Oven plate and oven superstructure by Roman period (weight g)

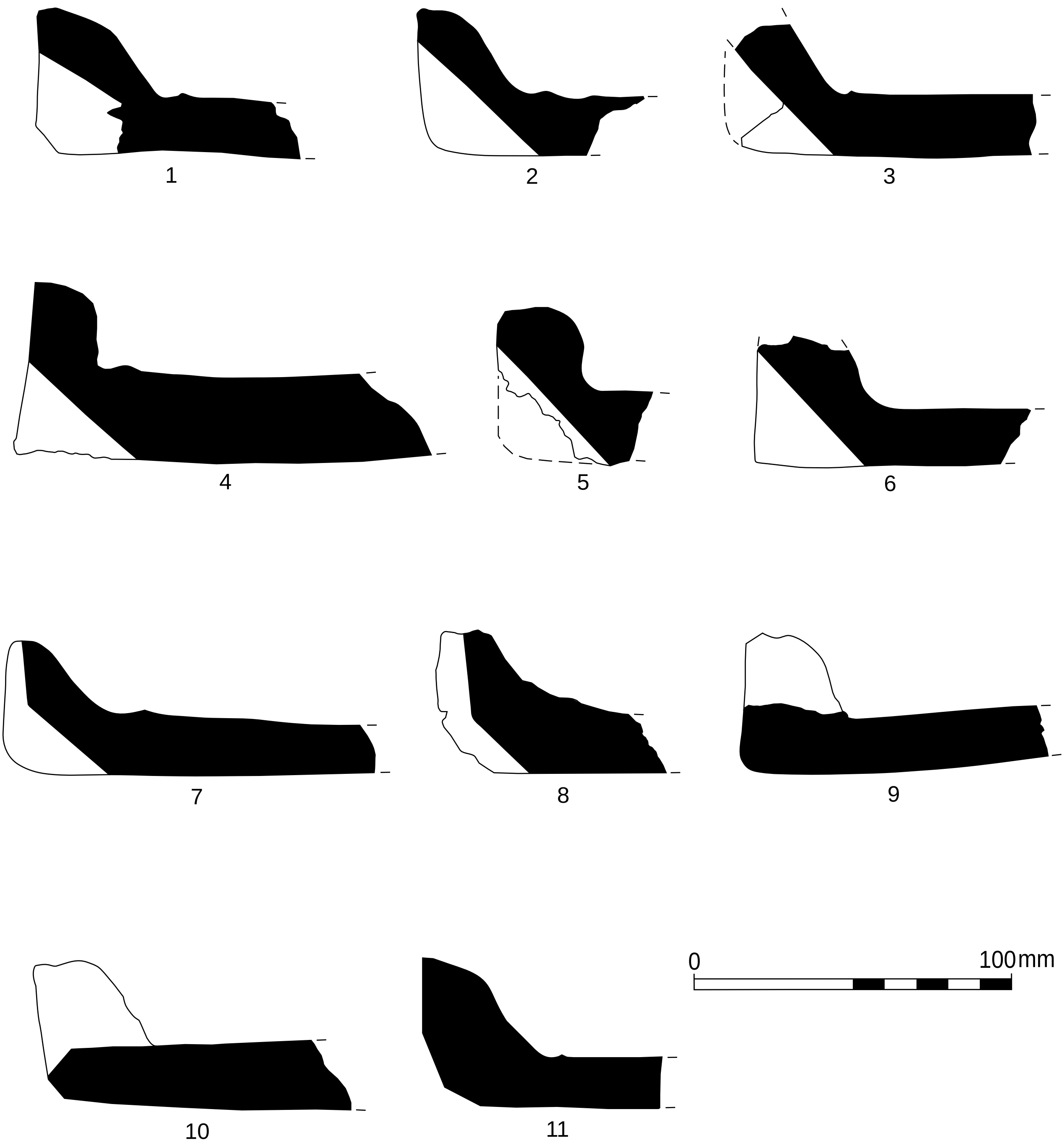


Figure 160: Roman building material: tegula sections (1-11)

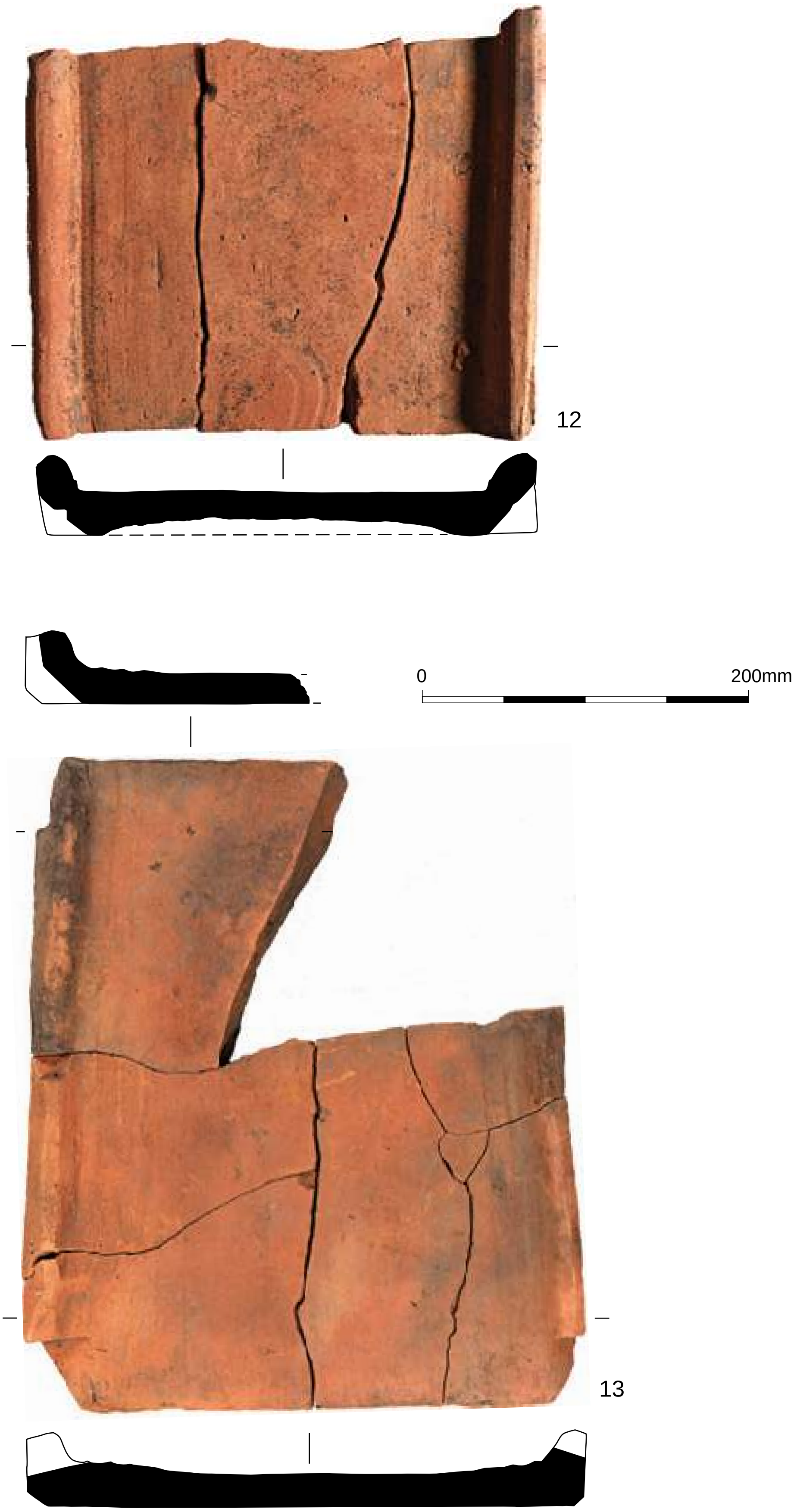


Figure 161: Roman building material: near-complete tegulae (12-13)

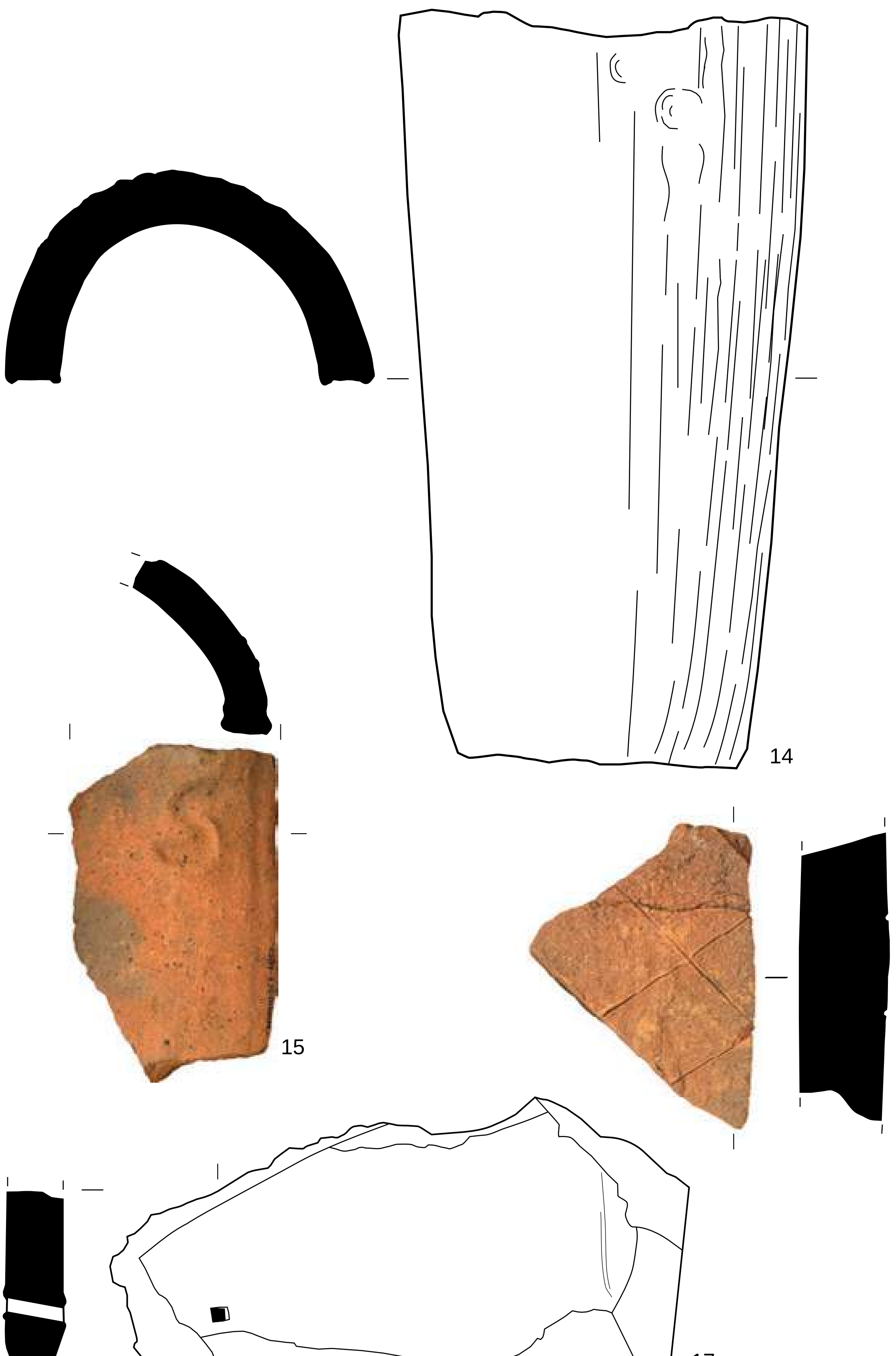


Figure 162: Roman building material: imbrex and undiagnostic tiles (14-17)

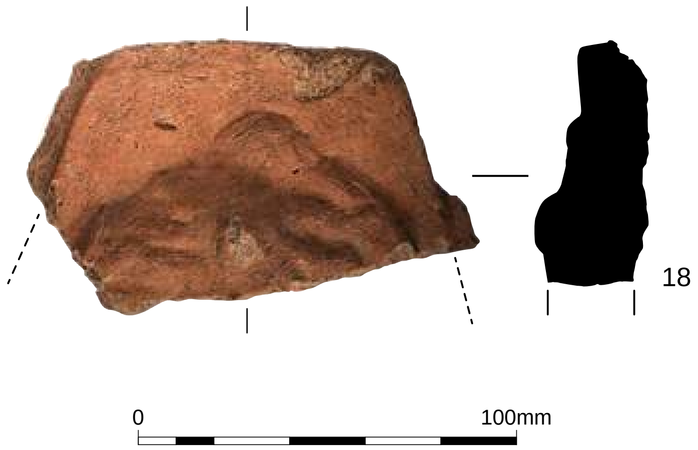


Figure 163: Roman building material: antefix (18)

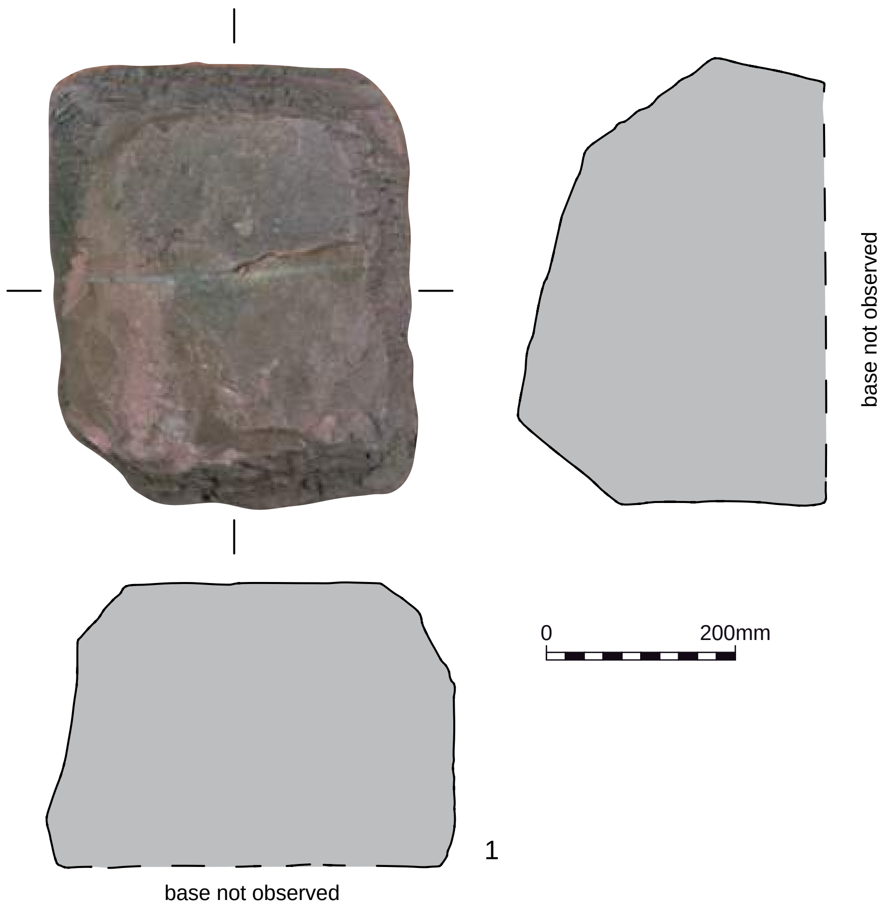
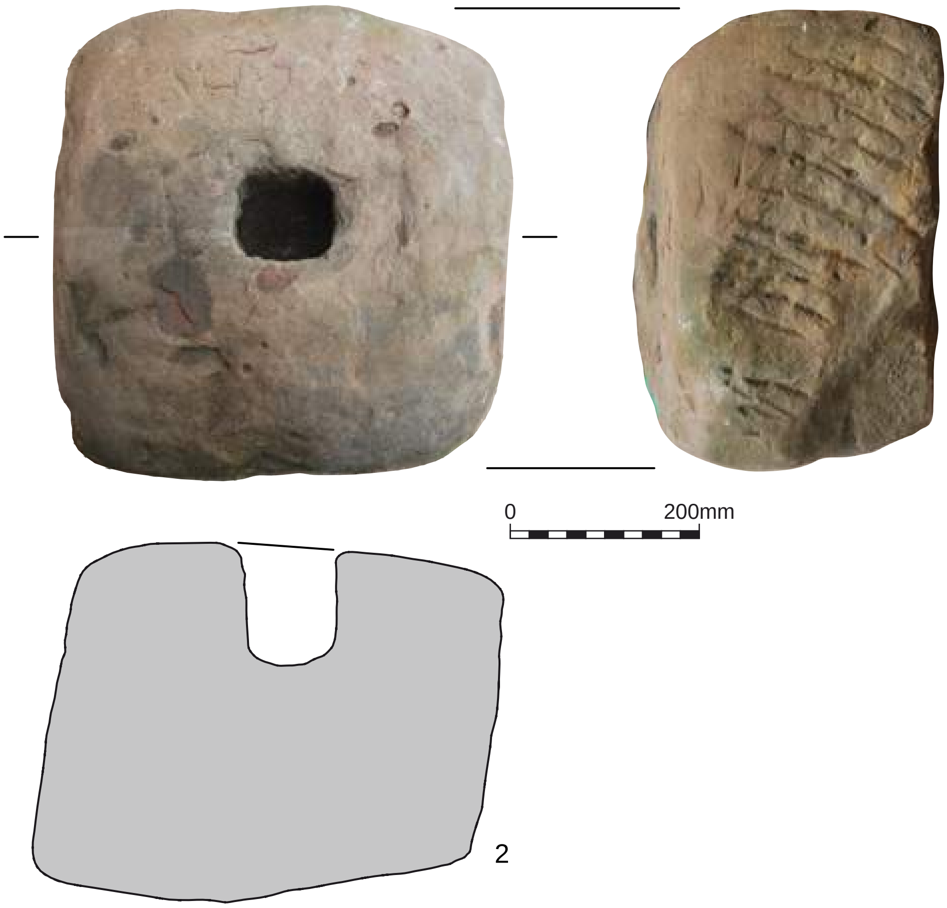
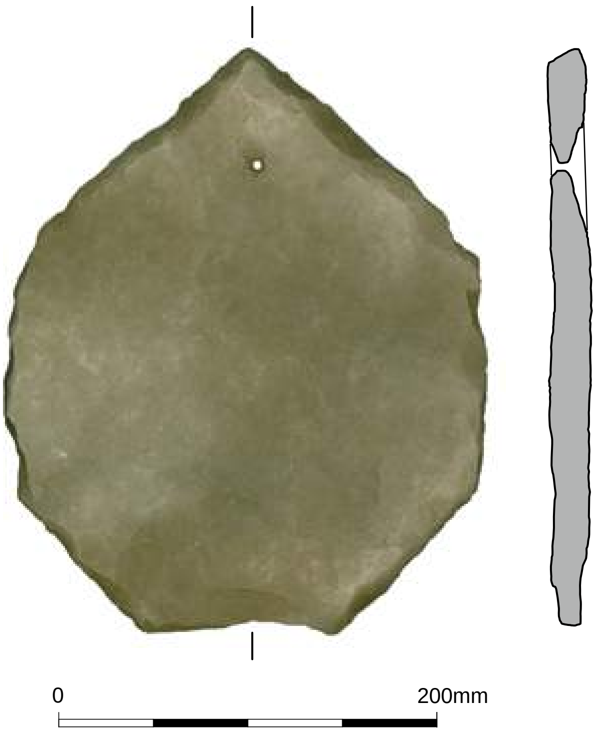


Figure 164: Stone building material - post pad



2



3

Figure 165: Stone building material: socketed block (2) and hexagonal roof tile (3)

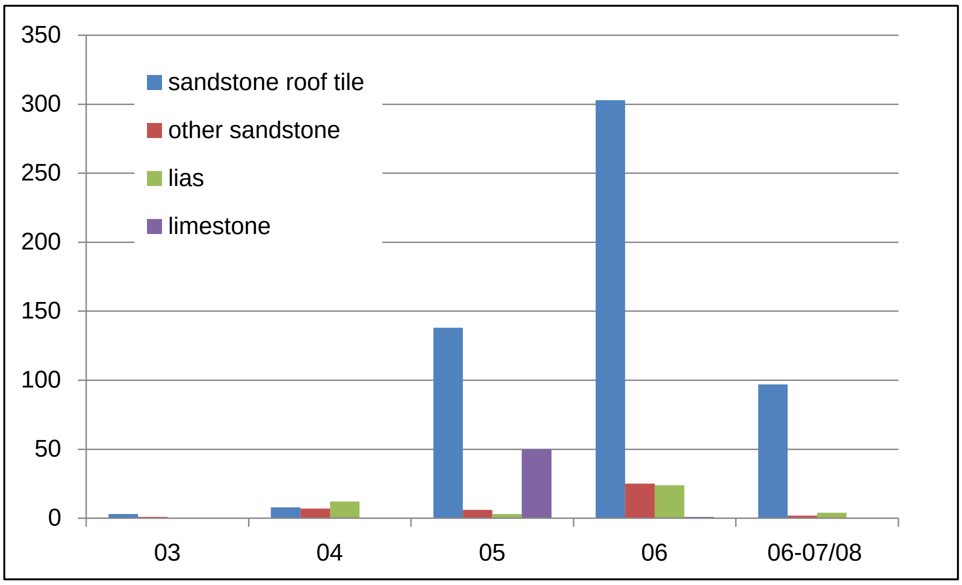


Figure 166: Stone by period, type/material (by count)

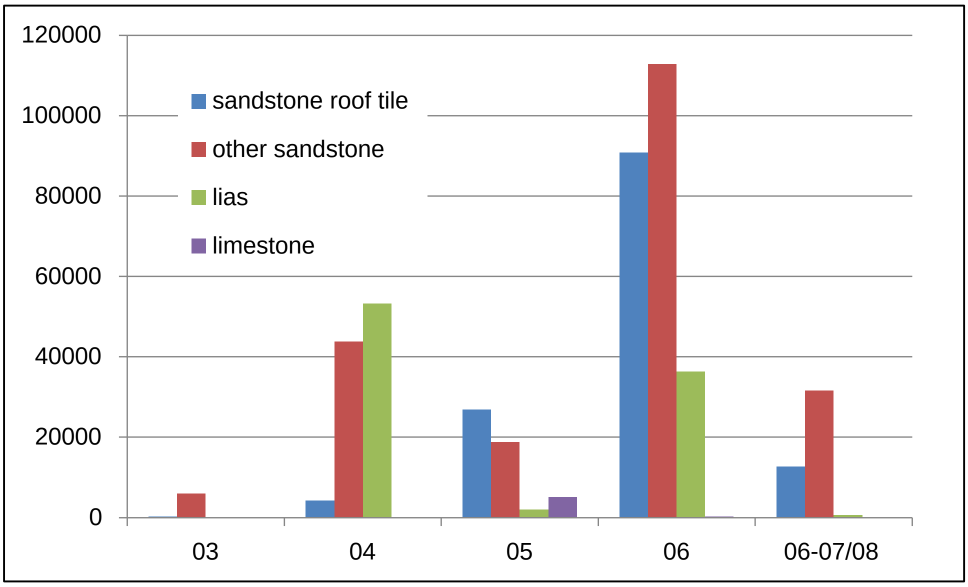


Figure 167: Stone by period, type/material (by weight g)

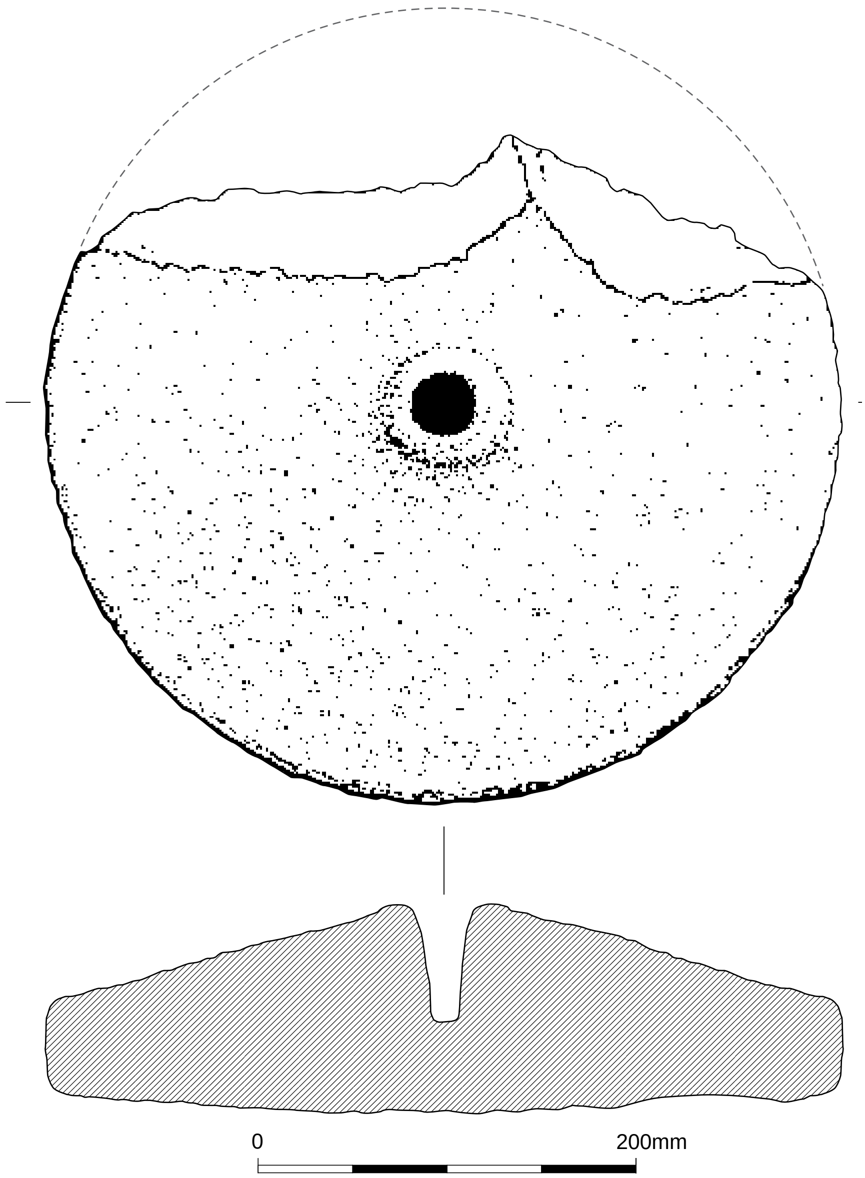


Figure 168: Stone objects: lower rotary quern

Figure 169: stone objects- hone

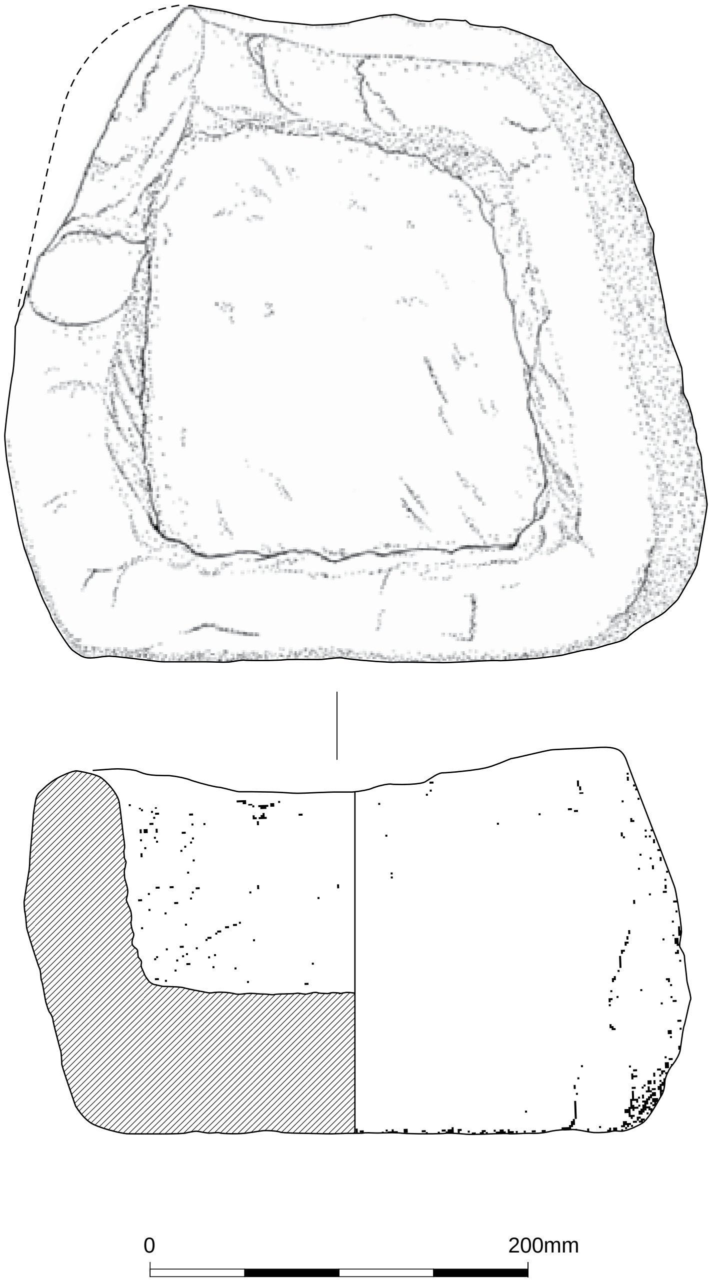


Figure 170: Stone objects - trough

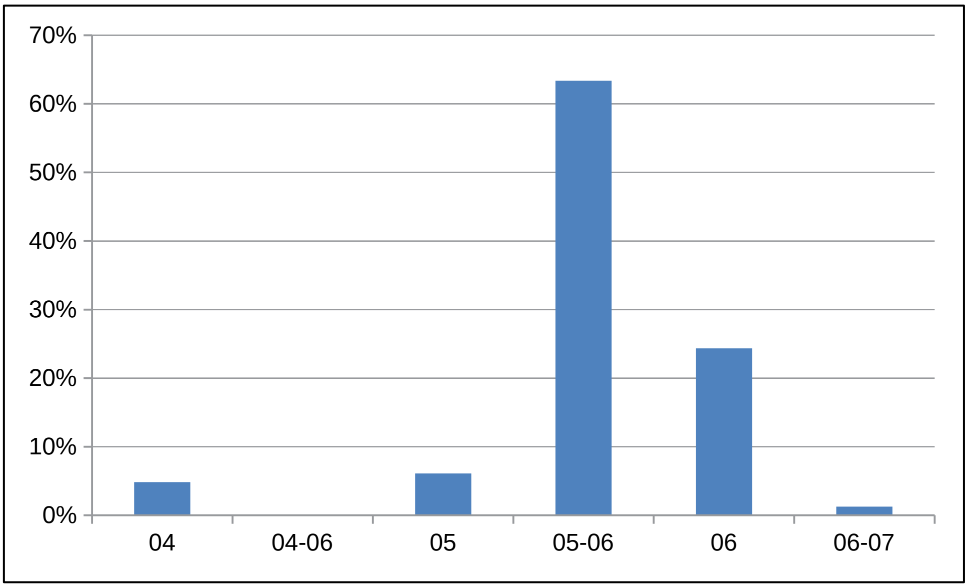


Figure 171: Mortar and plaster by period (% weight)

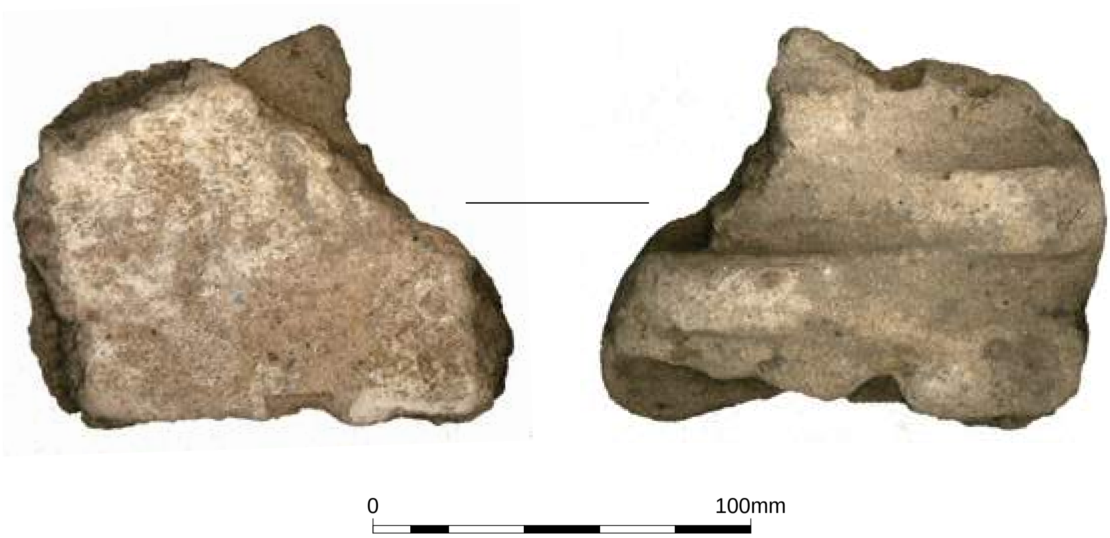


Figure 172: Mortar with lath impression

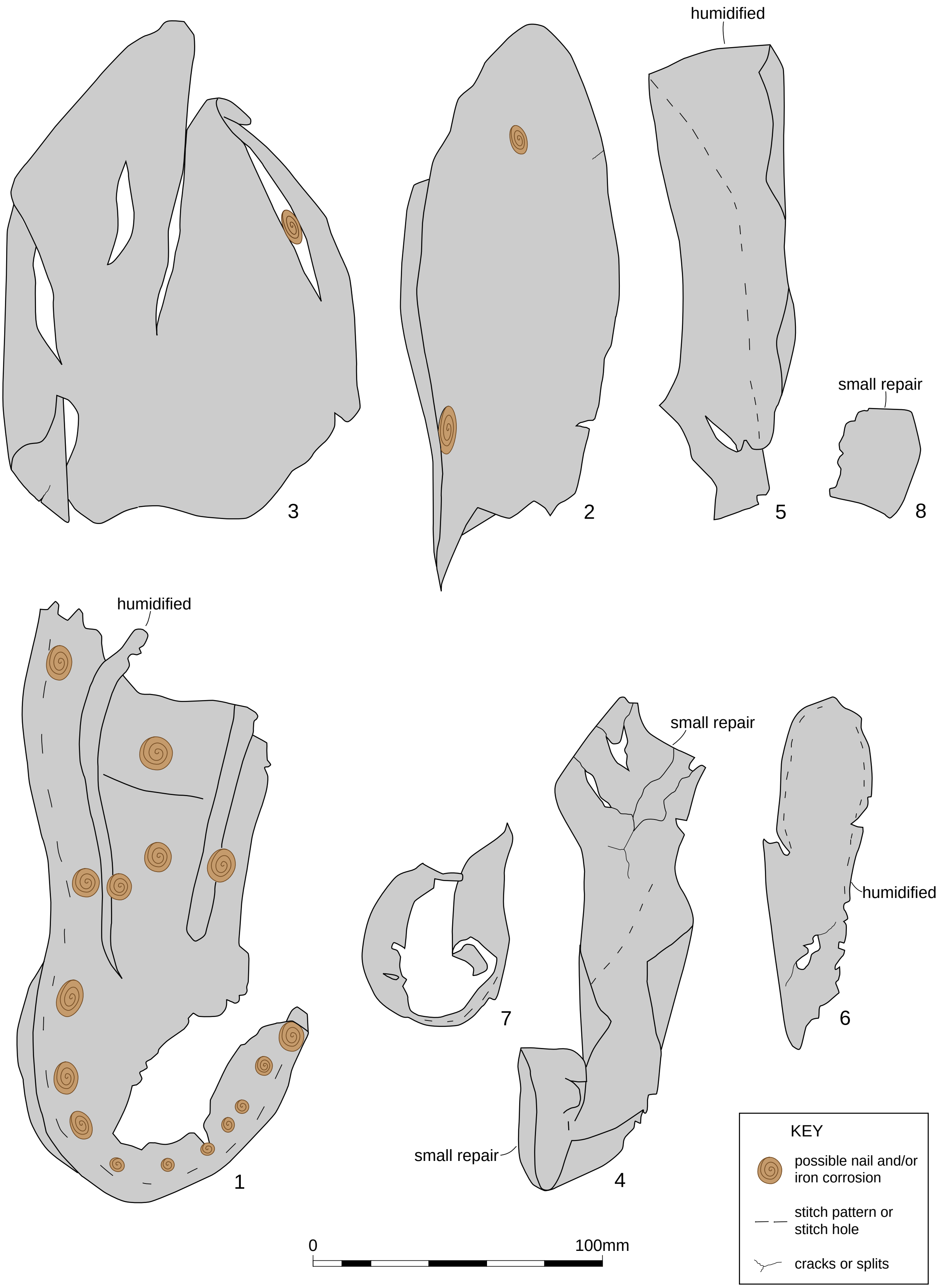


Figure 173: Post-medieval leather shoe

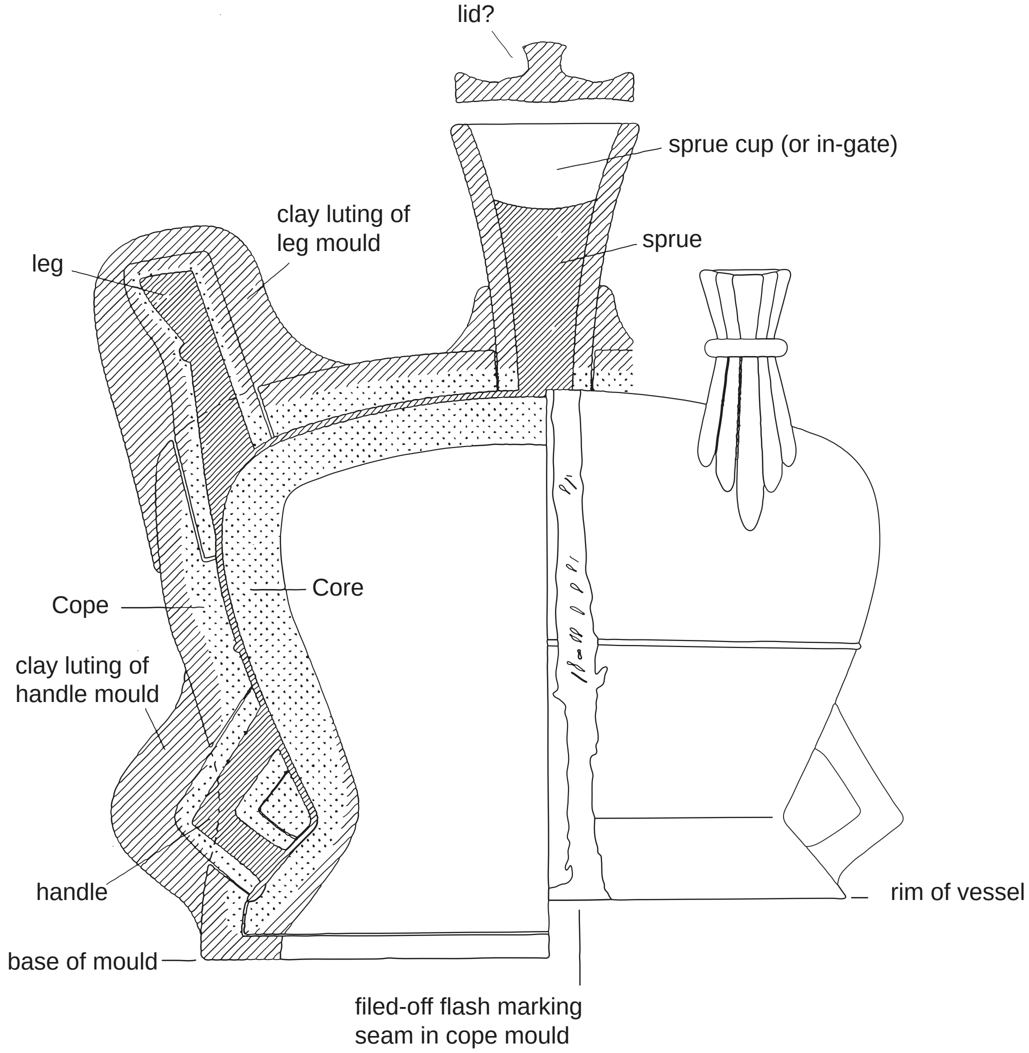


Figure 174: Conjectural reconstruction of a typical post-medieval cauldron mould in section, as positioned for casting (i.e. upside down in relation to the vessel). The mould is shown to the left, the vessel profile to the right. Based on a late 17th century cauldron in the Royal Albert Memorial Museum, Exeter and mould fragments from Cowick Street, Exeter. Not to scale, although approximately 1:4.

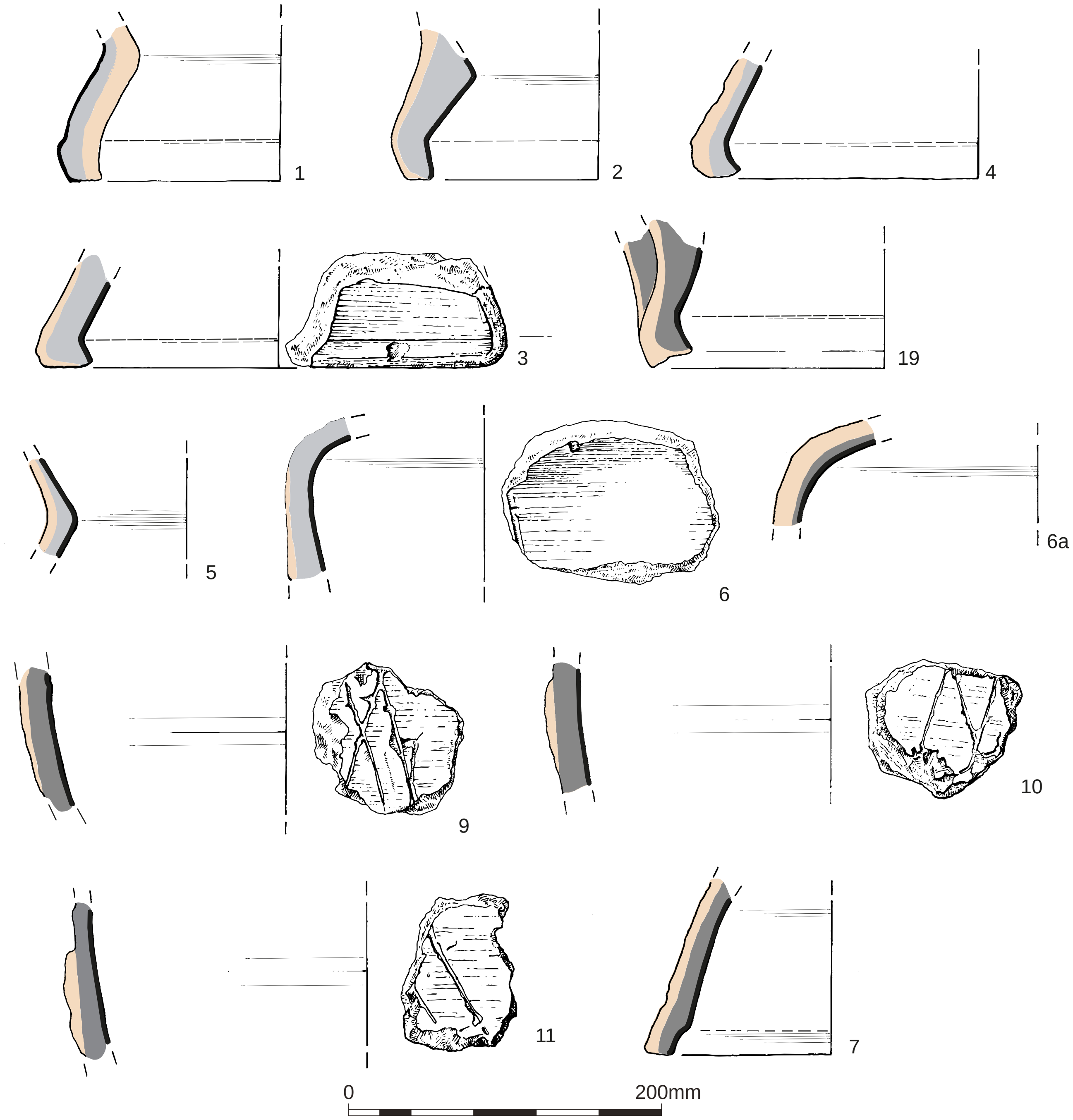


Figure 175: Line drawings of vessel-mould fragments (i): Selected fragments of core (1) and cope (2-4; 19) rims, cope body (6, 6a, 9-11, including incised 'W' mould-maker's marks, 9-11), and single fragment of skillet mould (7). Scale 1:4.

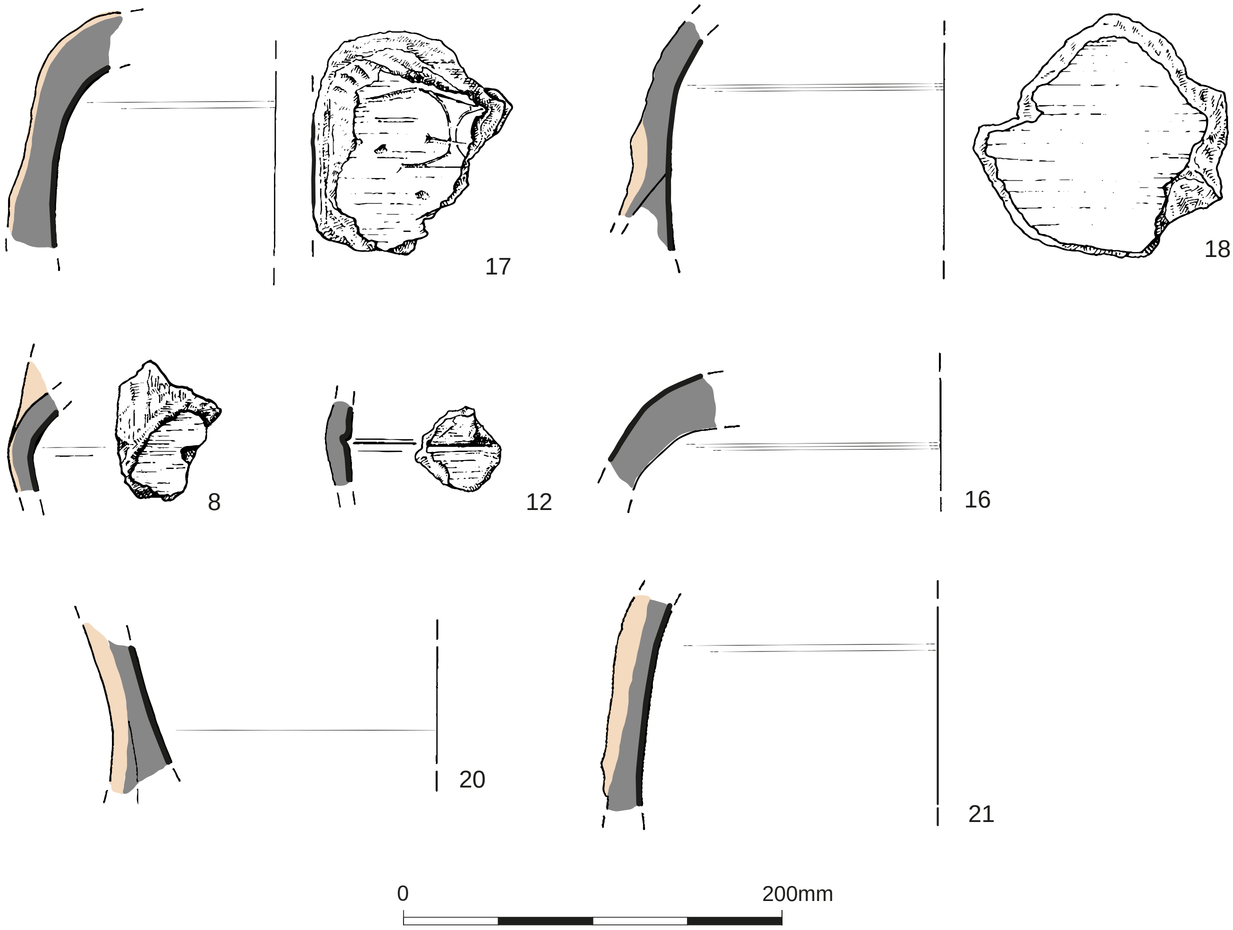


Figure 176: Line drawings of vessel-mould fragments (ii)
Selected fragments of cope body mould, including incised 'I' mould-make's mark (17).
Scale 1:4.

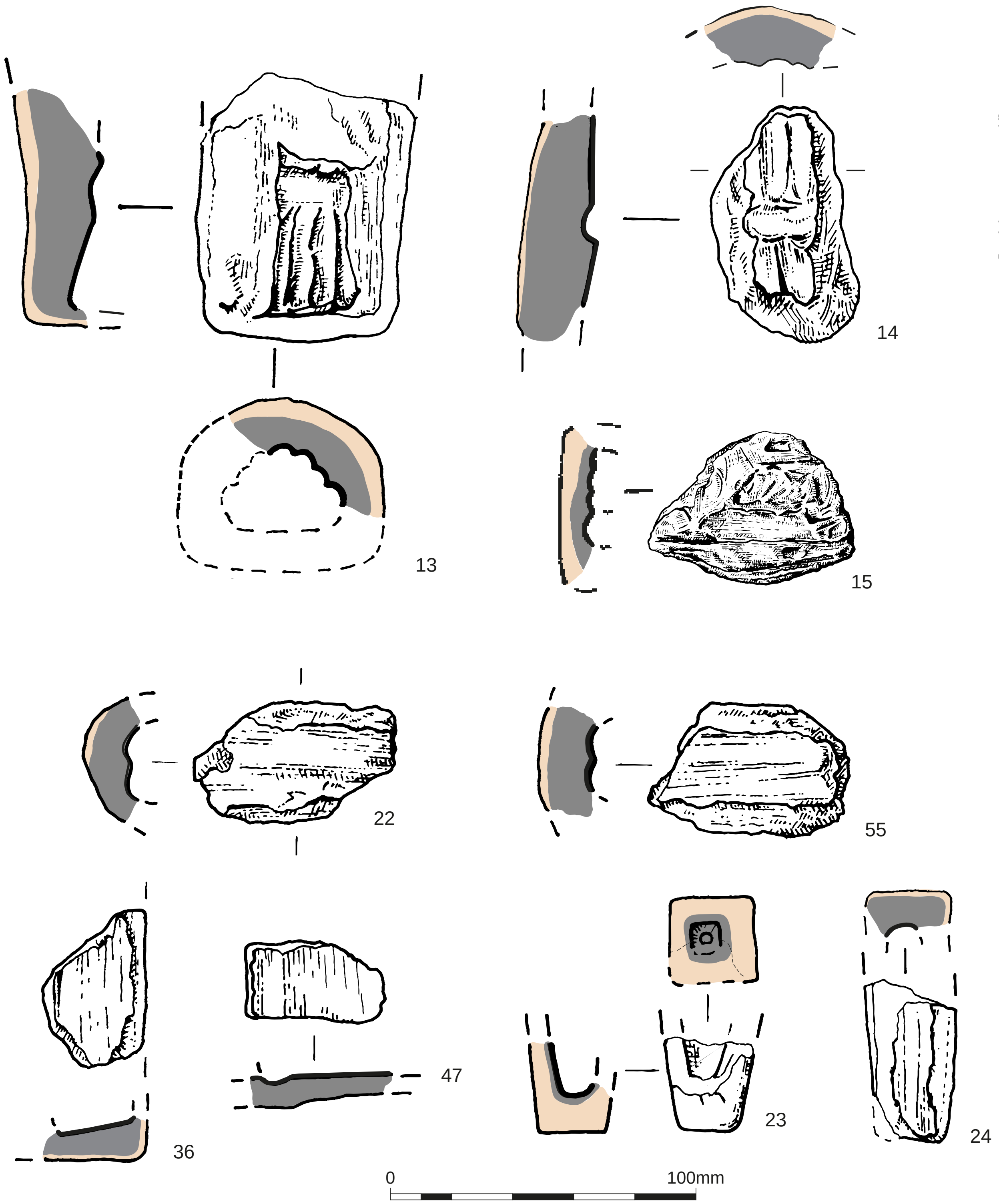


Figure 177: Line drawings of vessel-mould fragments (iii): details of leg moulds (13-15, 36, 47), possible skillet handle moulds (22, 55), and moulds of uncertain function (23, 24). Scale 1:2.

Figure 178: Catalogue no. 6:
a fragment of cauldron cope mould,
showing the typical lower profile and remains of
a diagonal rib on the left-hand side (inverted).

Figure 179: Catalogue no. 7:
a fragment of skillet cope mould,
showing the rim and body profile (inverted).

Figure 180: Catalogue no. 9: a fragment of cauldron cope mould, showing an incised 'W' mould-maker's mark and a trace of a horizontal moulding wire (top: inverted).

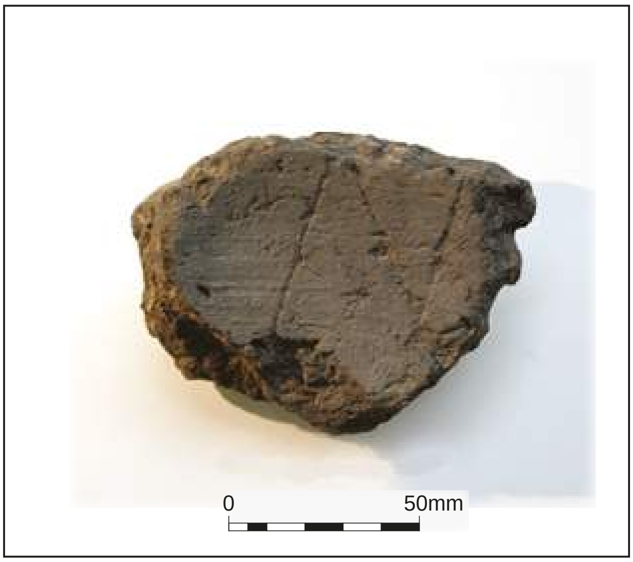


Figure 181: Catalogue no. 10: a second fragment of cauldron cope mould, with an incised 'W' mould-maker's mark (inverted).

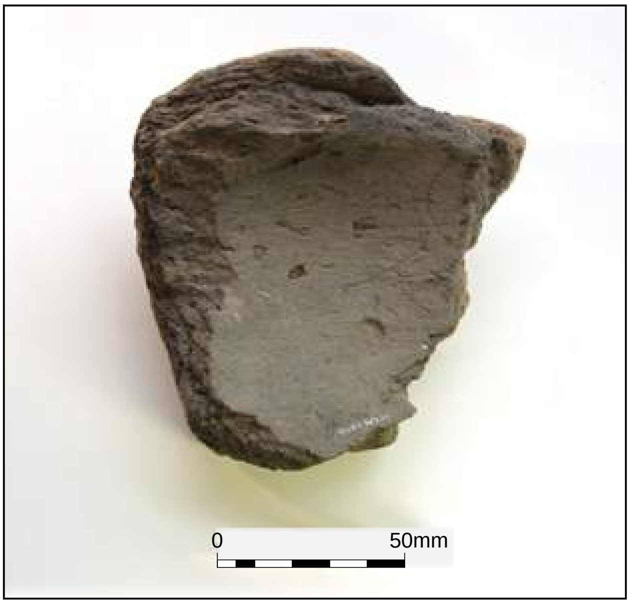


Figure 182: Catalogue no. 17: a fragment of cauldron cope mould, showing an incised 'I' mould-maker's mark positioned low-down on the body, near the turn of the base (inverted).

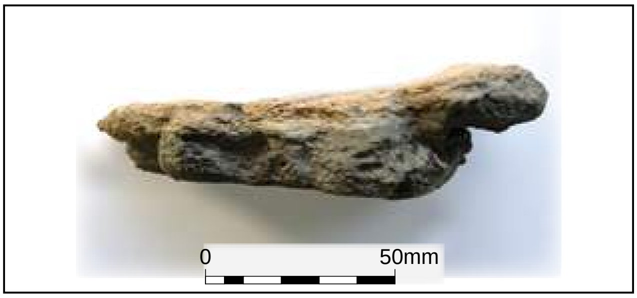


Figure 183: Catalogue no. 20: a fragment of cauldron cope mould in section, showing the laminated mould construction, oxidised exterior, reduced interior, and thickening of the mould in the area of an attached handle mould.

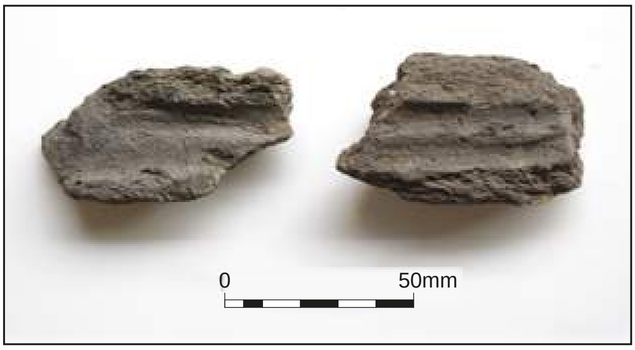


Figure 184: Catalogue nos 22 (left) and 55 (right): two possible mould fragments for ribbed skillet handles.

Figure 185: Catalogue no 13: a fragment of a leg mould showing clustered-ribbed form and closed mould construction.

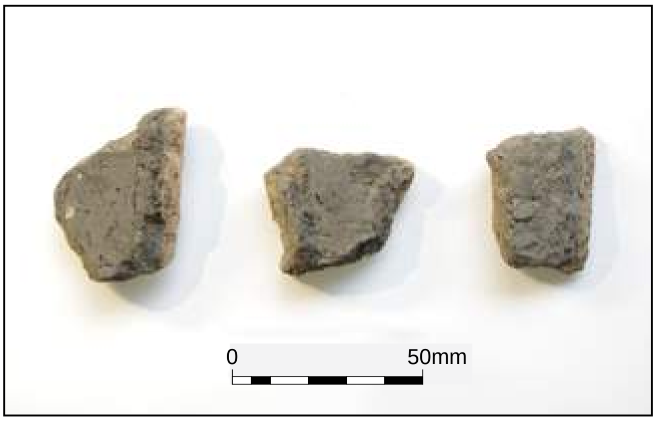


Figure 186: Catalogue nos 36 (left), 42 (centre), and 43 (right): group photograph of leg-mould fragments showing the flat rear surface of the legs.

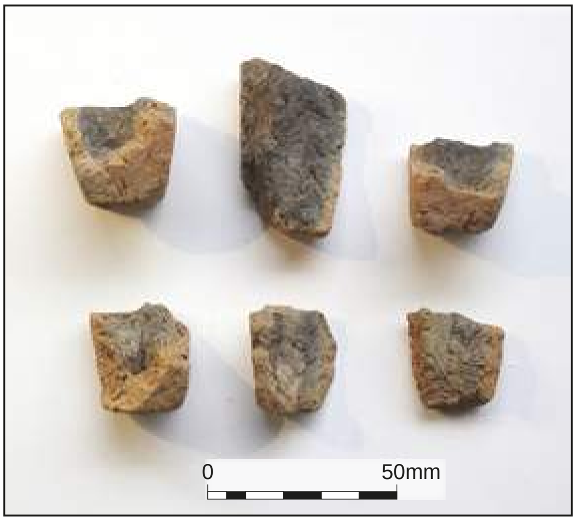


Figure 187: Catalogue nos 23, 24, 28–31: group photograph of mould fragments of truncated pyramidal form, possibly the terminals of moulds for plain tapering legs (nos 23, 24, 28: top, left to right; 29, 30, 31: bottom, left to right).

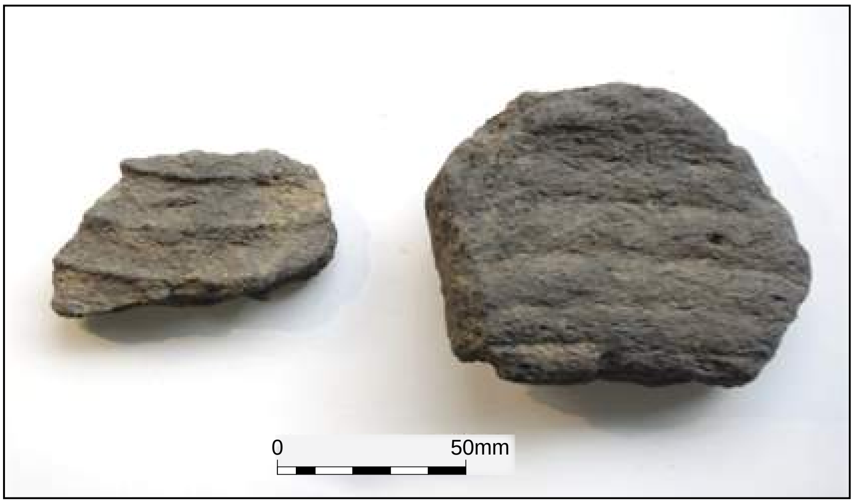


Figure 188: Catalogue nos 25–26: detail of two fragments of cope mould broken along an internal lamination, showing concentric smoothing-construction marks/finger impressions.

Figure 189: Catalogue nos 33–35: group photographs of three fragments of in-gate. Note the metal/slag encrustation on the inner surfaces of fragments 33 (left) and 35 (right).

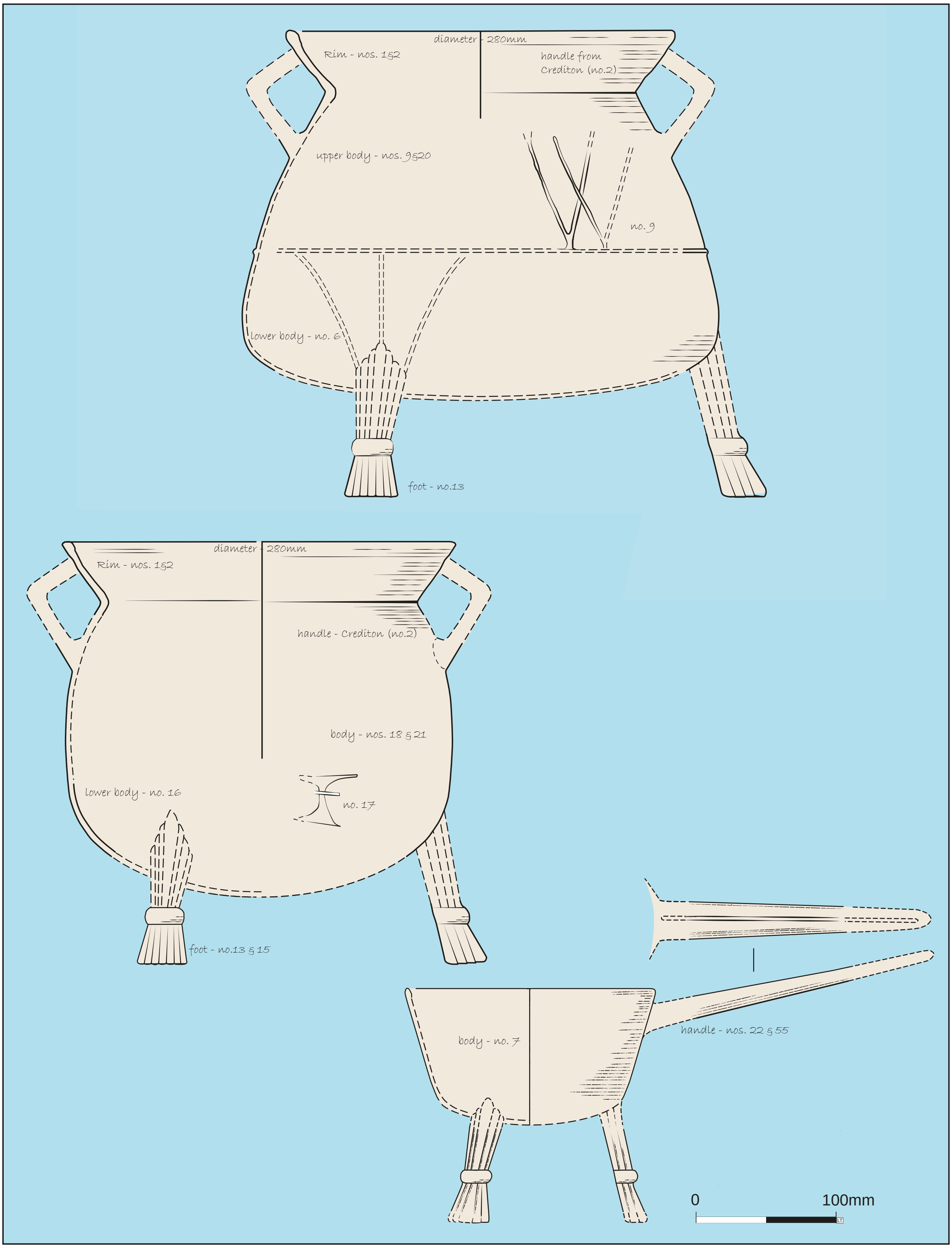


Figure 190: Conjectural reconstruction drawings of vessel profiles from The Hive based on excavated fragments (solid lines) and conjectural reconstruction (dashed lines): (i) conventional bag-shaped cauldron; (ii) cauldron of more globular form; (iii) skillet. Scale approximately 1:4

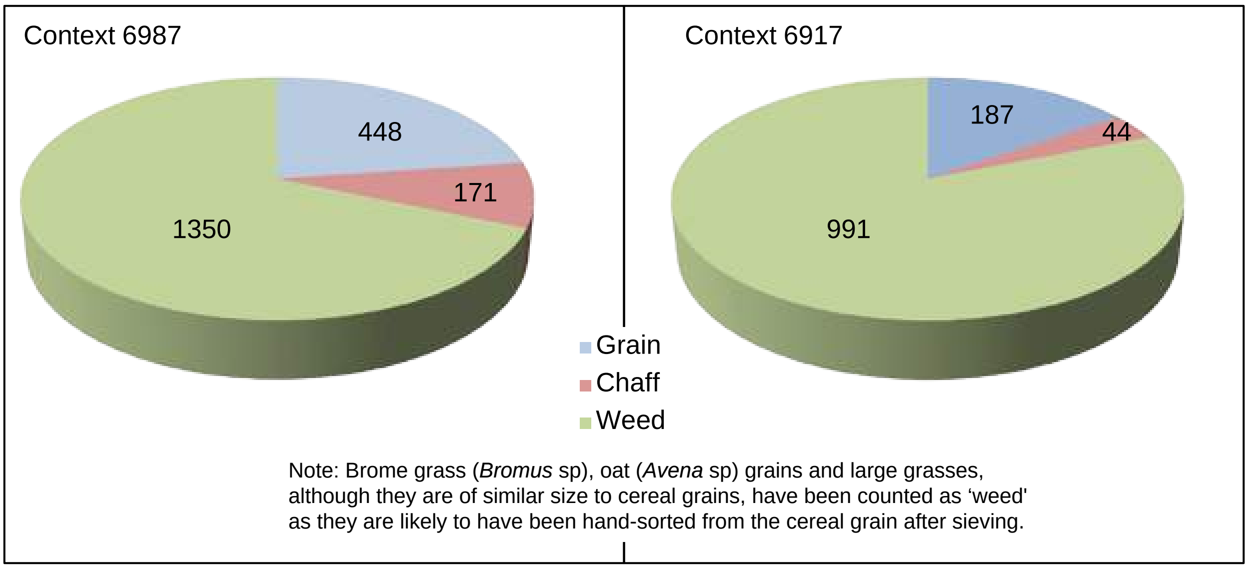
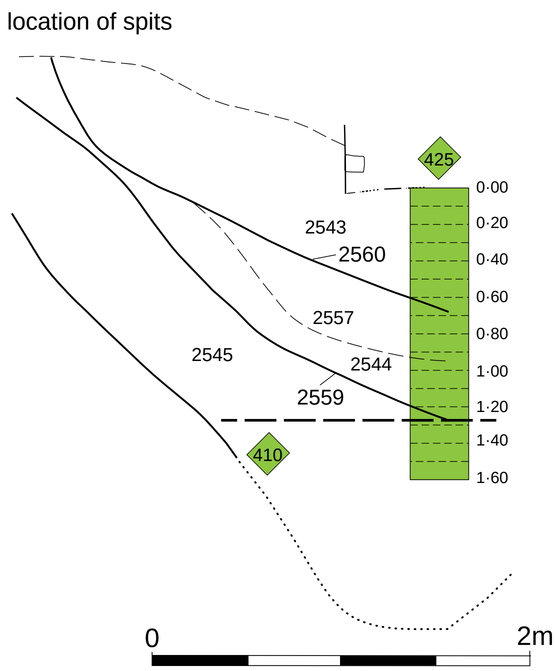


Figure 191:Charred plant remains from pit fills 6897 and 6917



	Pl	Po	In	Mo
0·00		X		
0·10–0·20	X	X		X
0·20–0·25	X			
0·25–0·30	X		X	X
0·30–0·35	X			X
0·35–0·40		X		
0·40–0·45	X		X	X
0·45–0·50	X		X	
0·50–0·55				
0·55–0·60	X		X	
0·60–0·65	X		X	X
0·65–0·70				
0·70–0·75		X		
0·75–0·80				
0·80–0·85	X			X
0·85–0·90	X		X	
0·90–0·95	X			X
1·00–1·05				
1·05–1·10	X			X
1·10–1·15				
1·15–1·20	X			X

Pl = Plant macrofossils
Po = Pollen remains
In = Insects
Mo = Molluscs

Figure 192: Location of spits

Figure 193: well preserved roundwood charcoal

Figure 194: well preserved roundwood charcoal

photographs: WAAS Digital, Worcestershire Archaeology and Archives Service, Worcestershire County Council

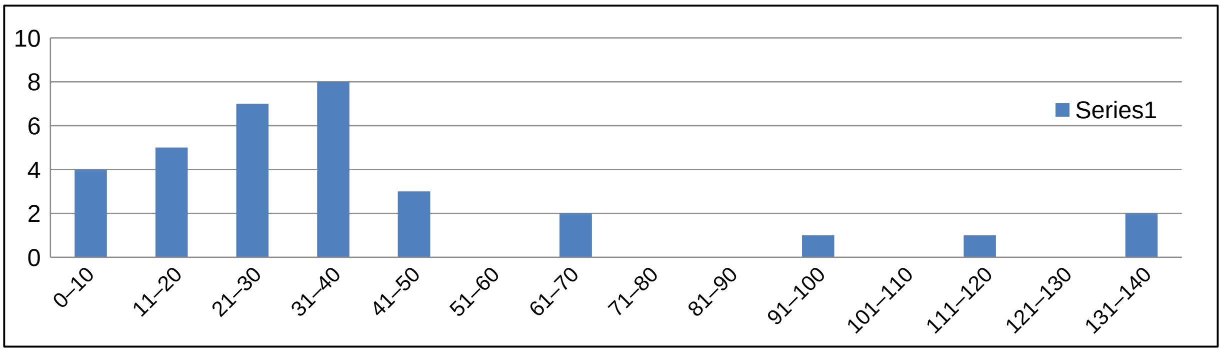


Figure 195: hand collected charcoal from context 6745 diameter (mm), oak and non-oak

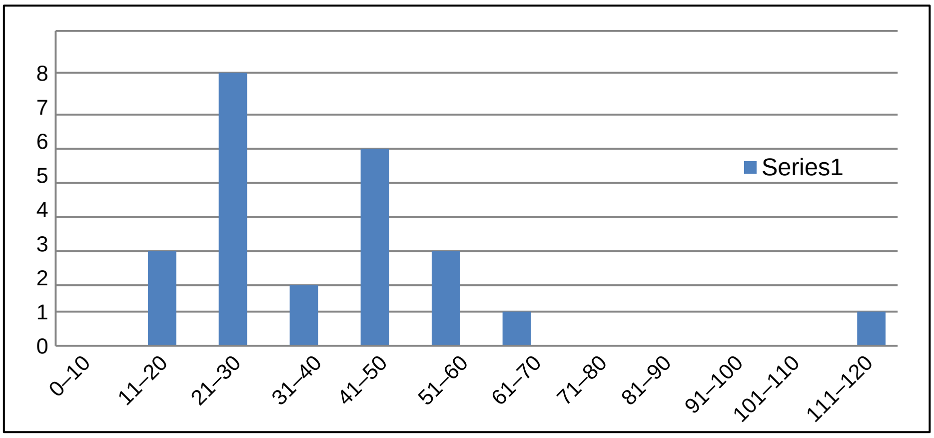


Figure 196: hand collected charcoal from context 6915 diameter (mm), oak and non-oak

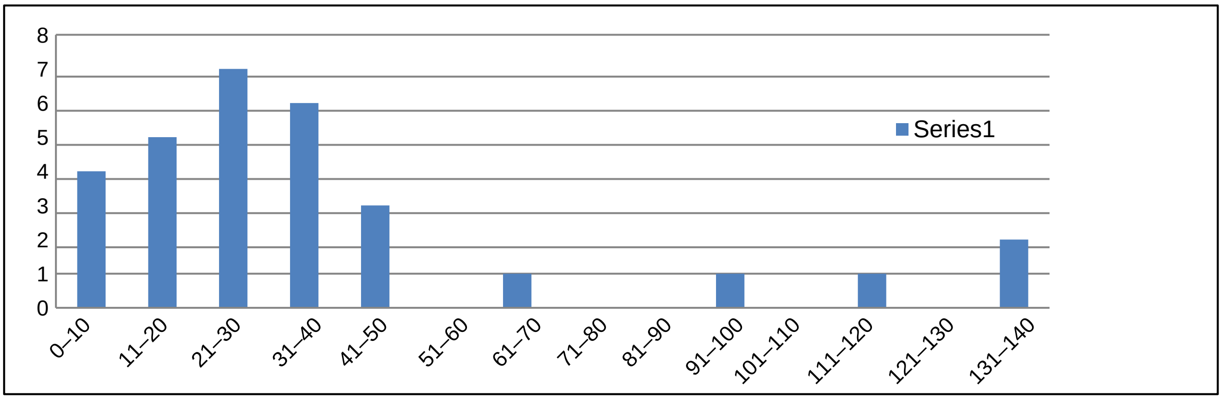


Figure 197: hand collected charcoal from 6745, diameter (mm)

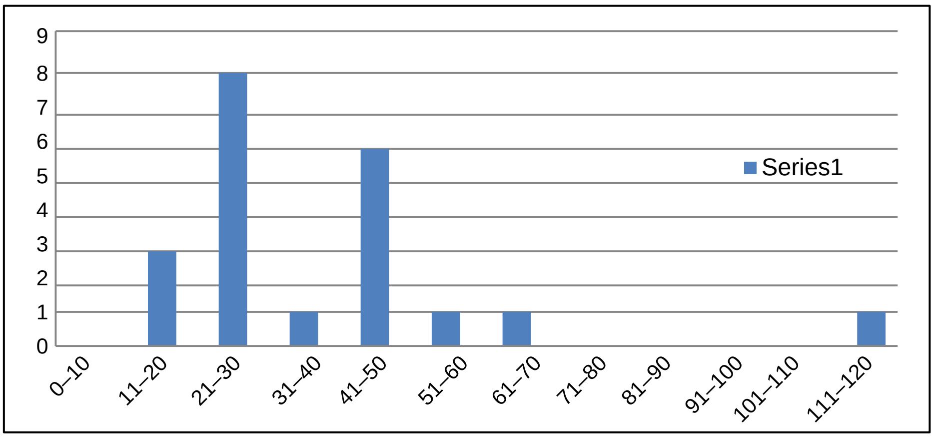


Figure 198: hand collected charcoal from 6915, diameter (mm)

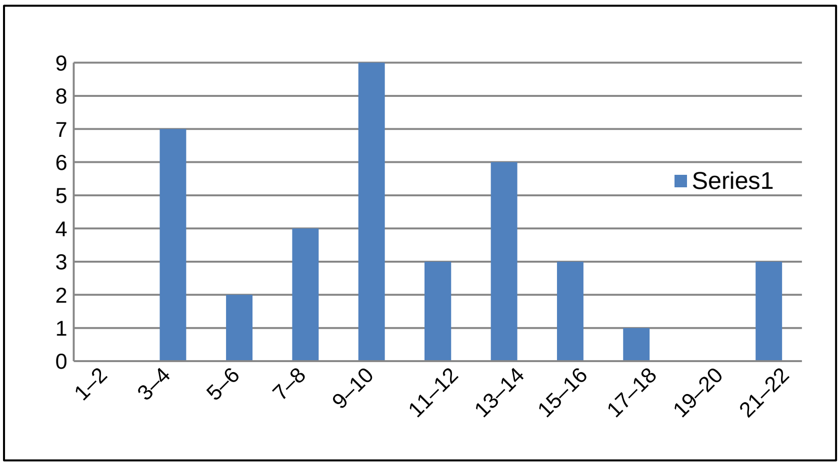


Figure 199: hand collected charcoal from 6745, no of growth rings

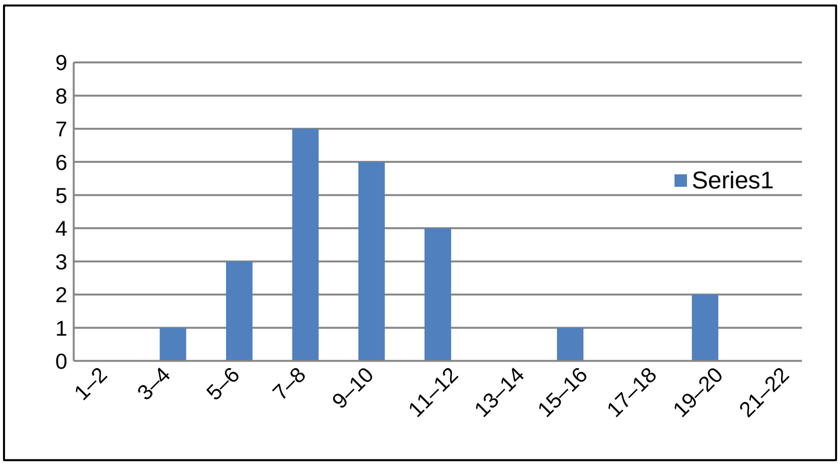


Figure 200: hand collected charcoal from 6915, no of growth rings for oak and non-oak

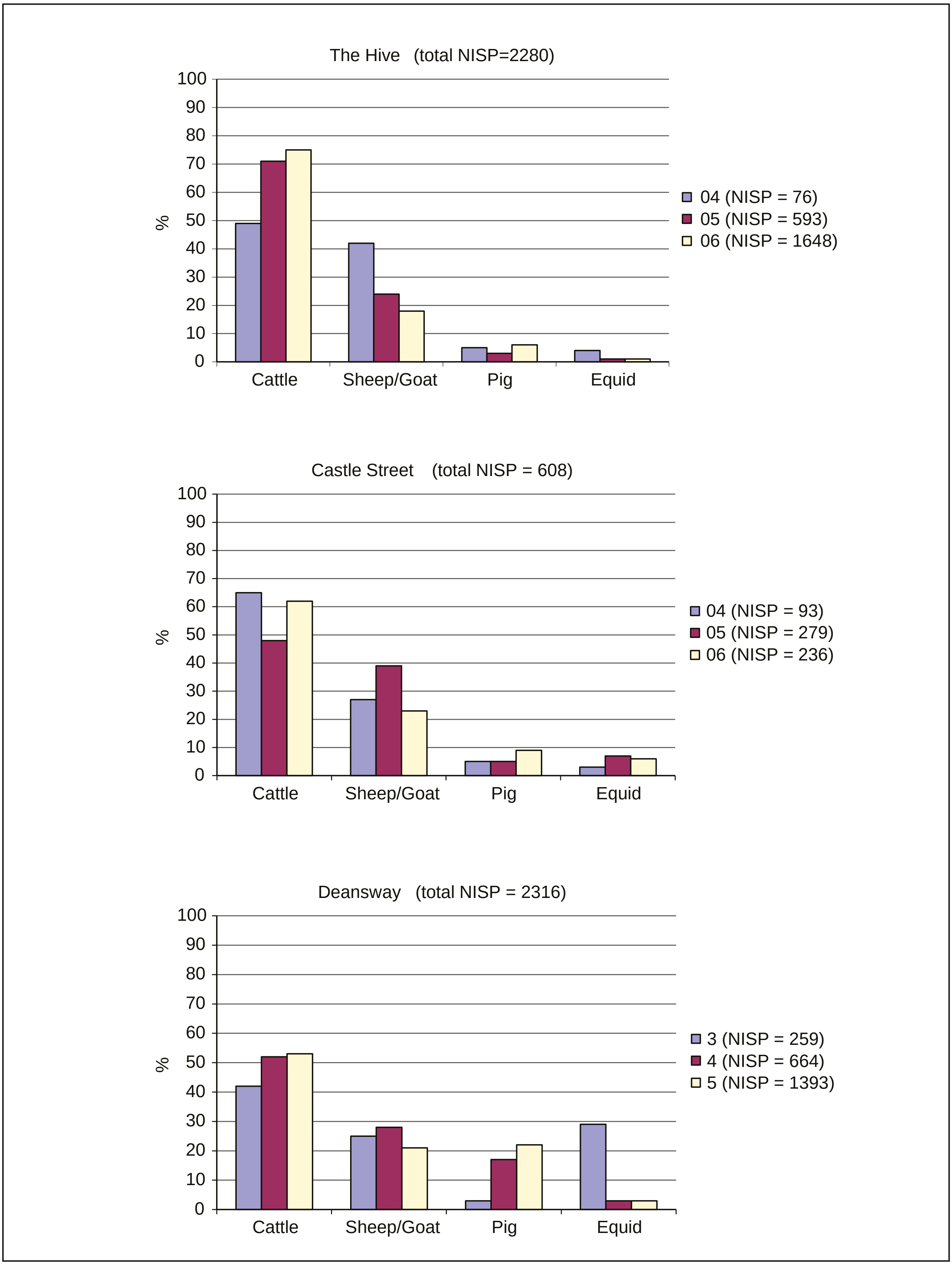


Figure 201: Frequency by NISP of the main domestic mammals by period at The Hive, Castle Street and Deansway

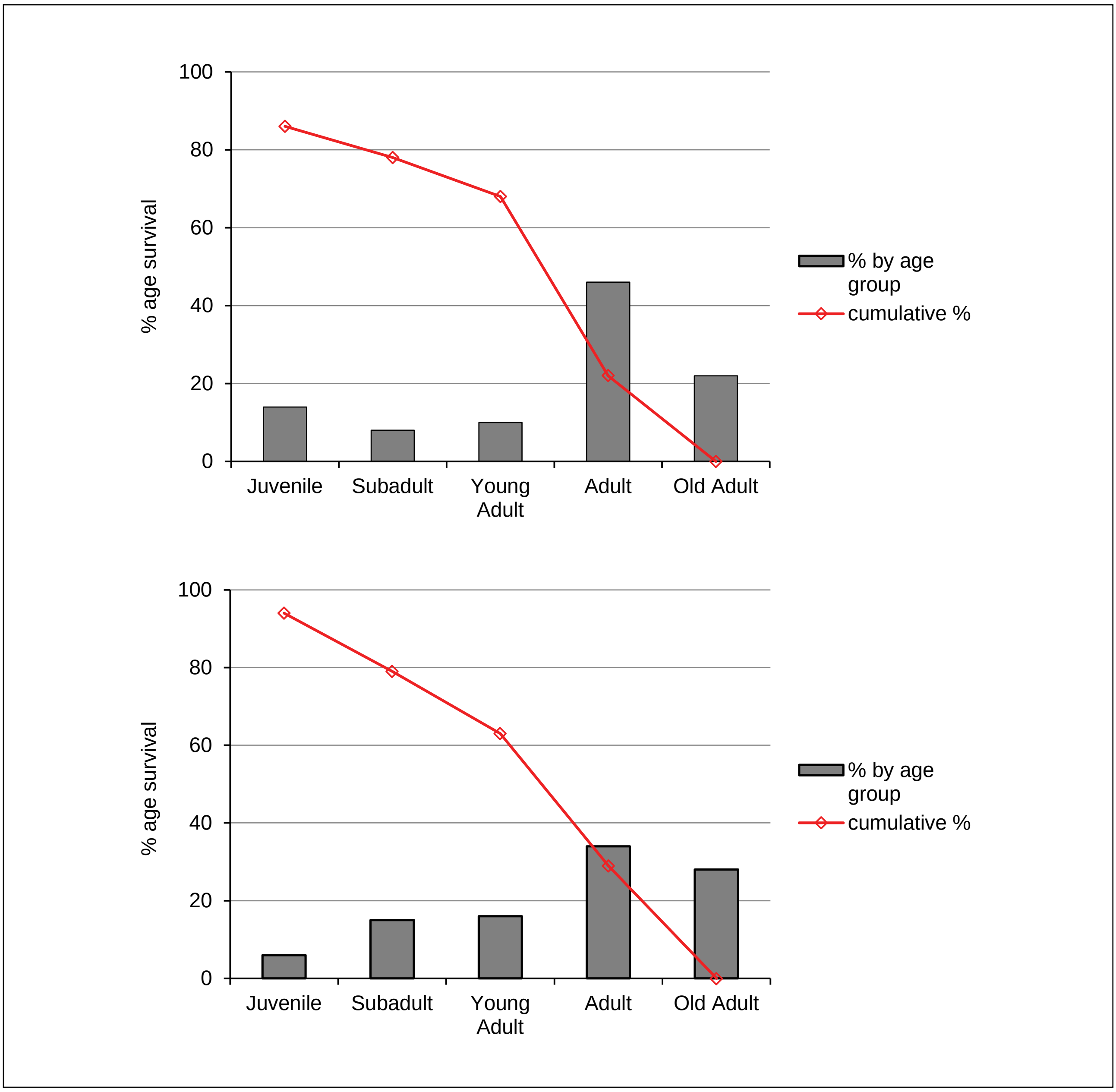


Figure 202: Distribution of cattle horncores by age stage

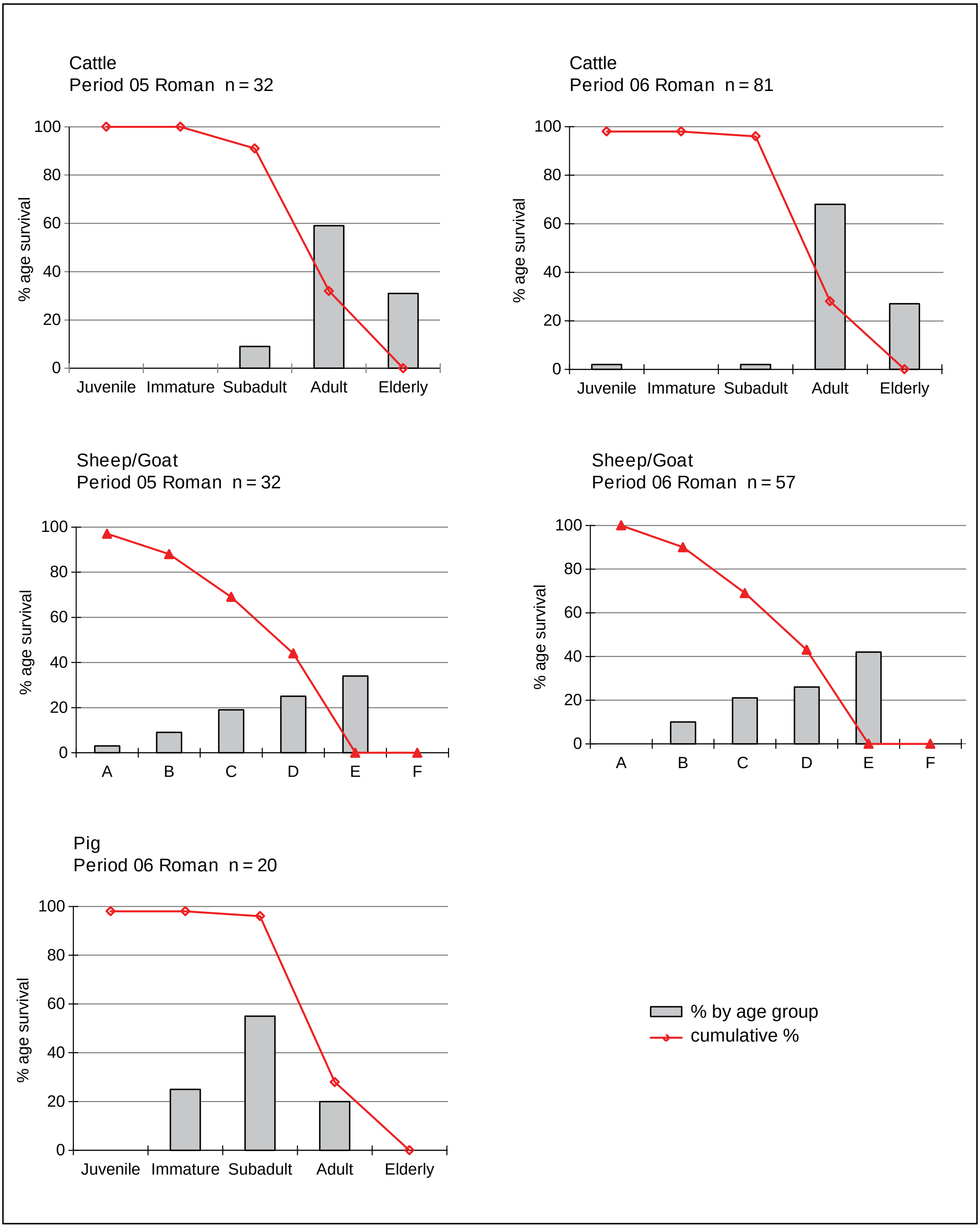
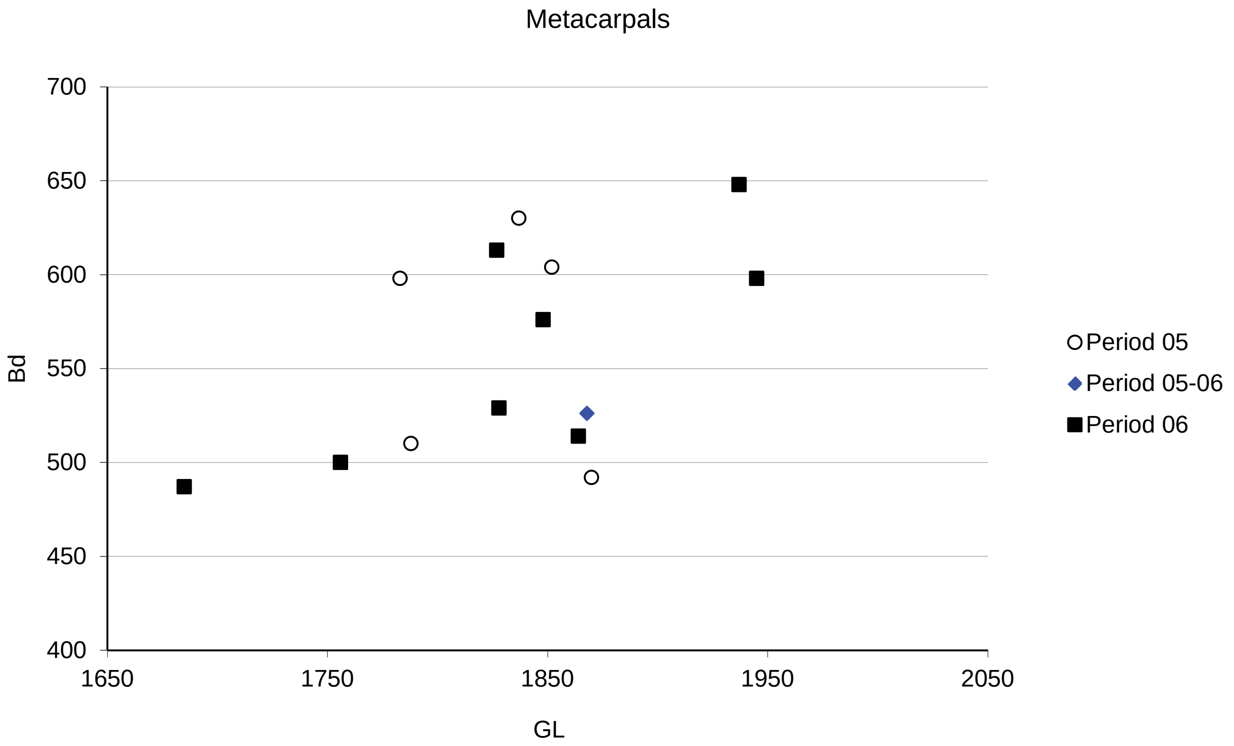


Figure 203: Distribution of cattle, sheep/goat and pig mandibles by age stage



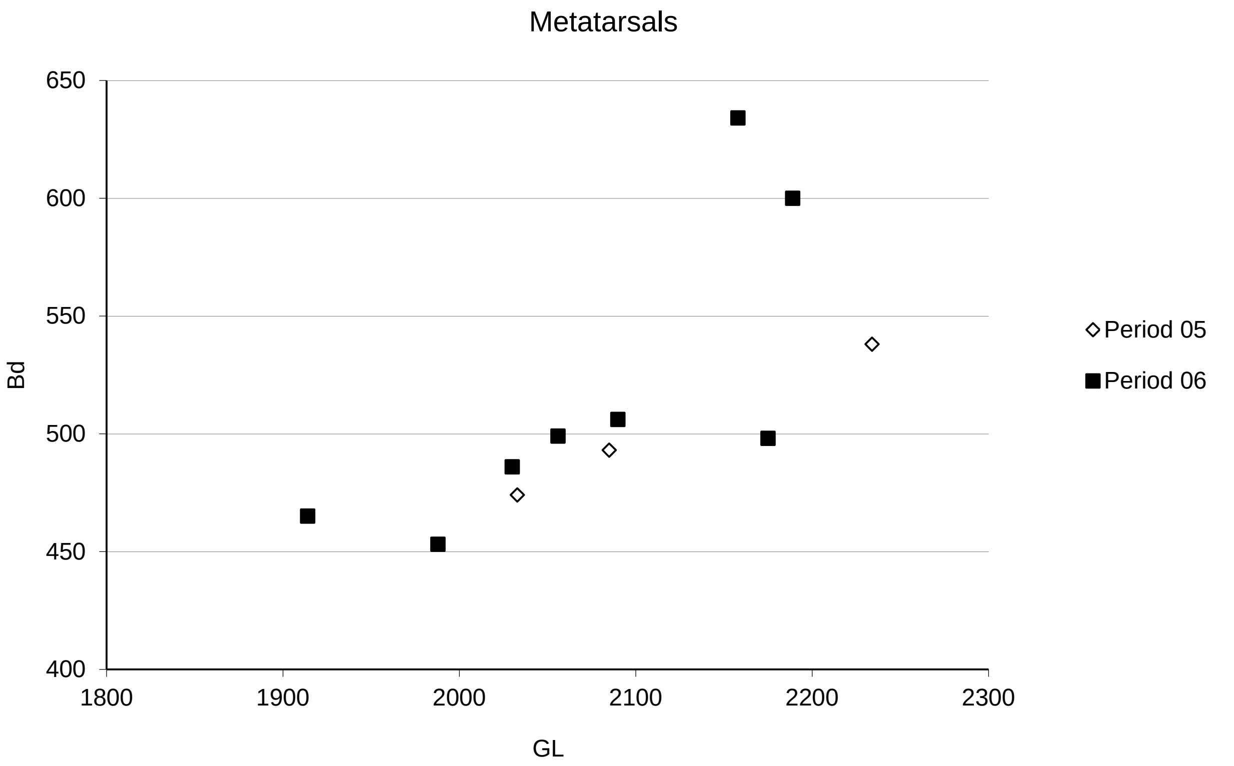


Figure 204: Periods 5 and 6. Percentage of fused epiphyses for cattle and sheep

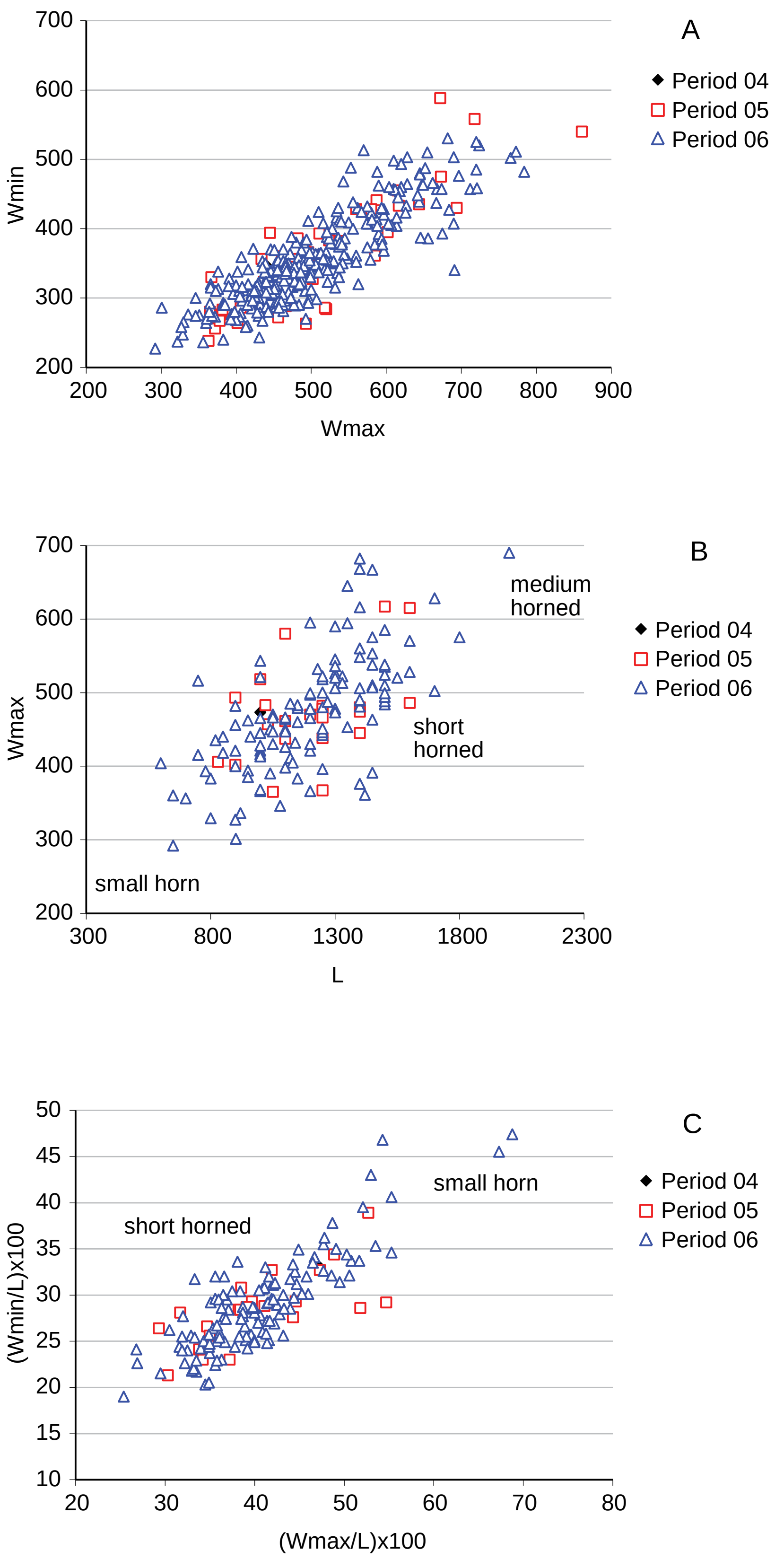


Figure 205: Size (A and B) and shape (C) of cattle horncores

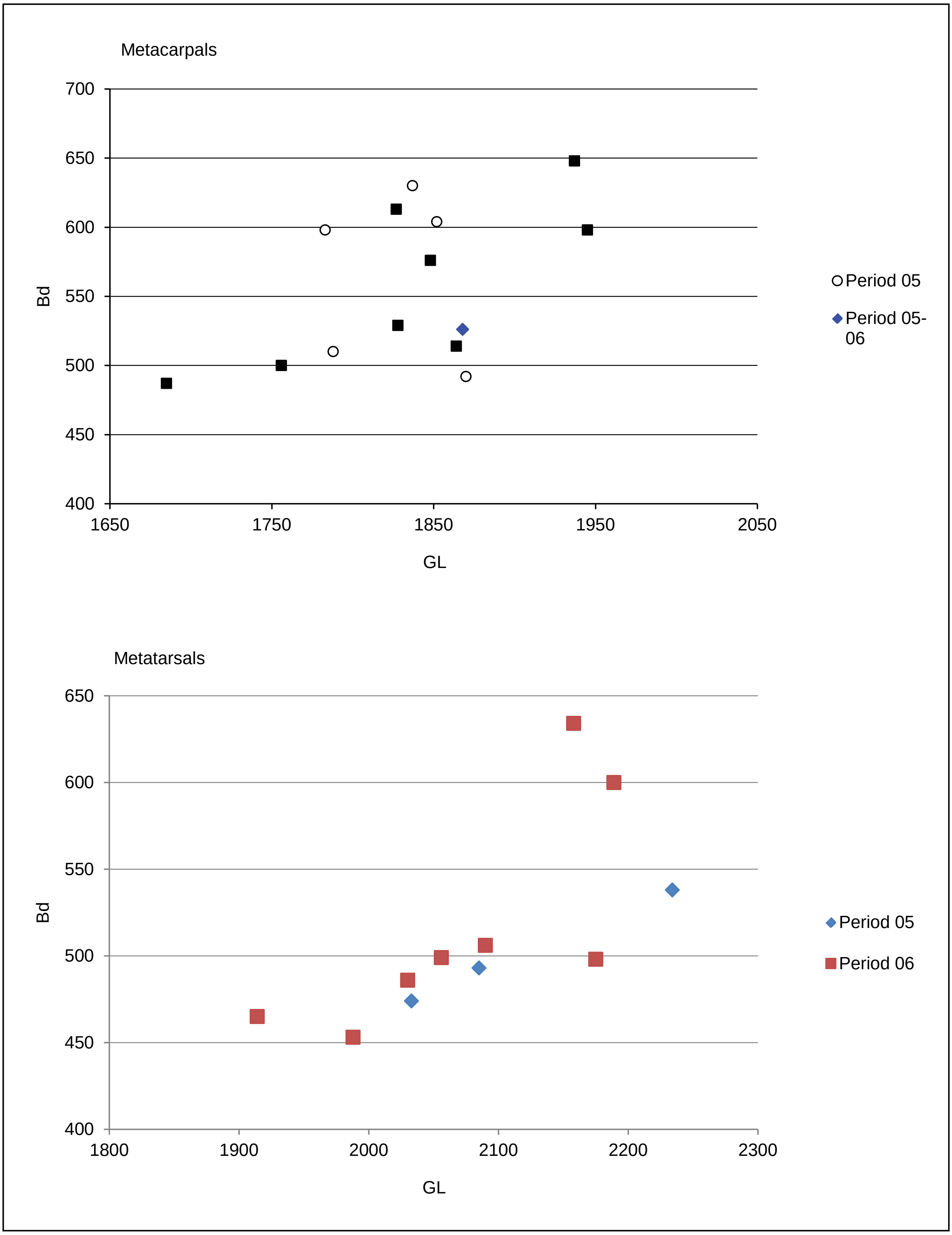


Figure 206: Size of cattle metapodials|

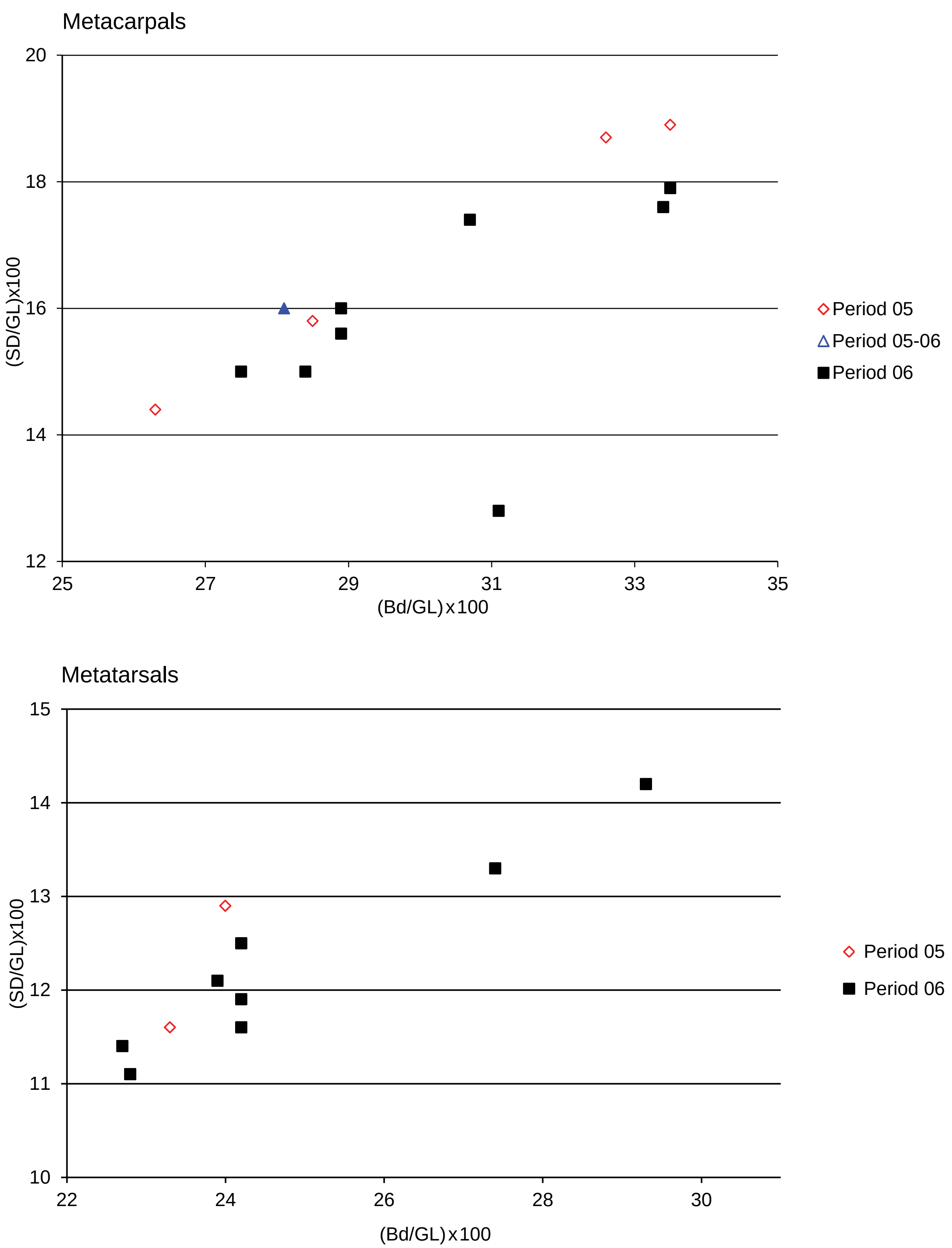


Figure 207:Shape of cattle metapodials

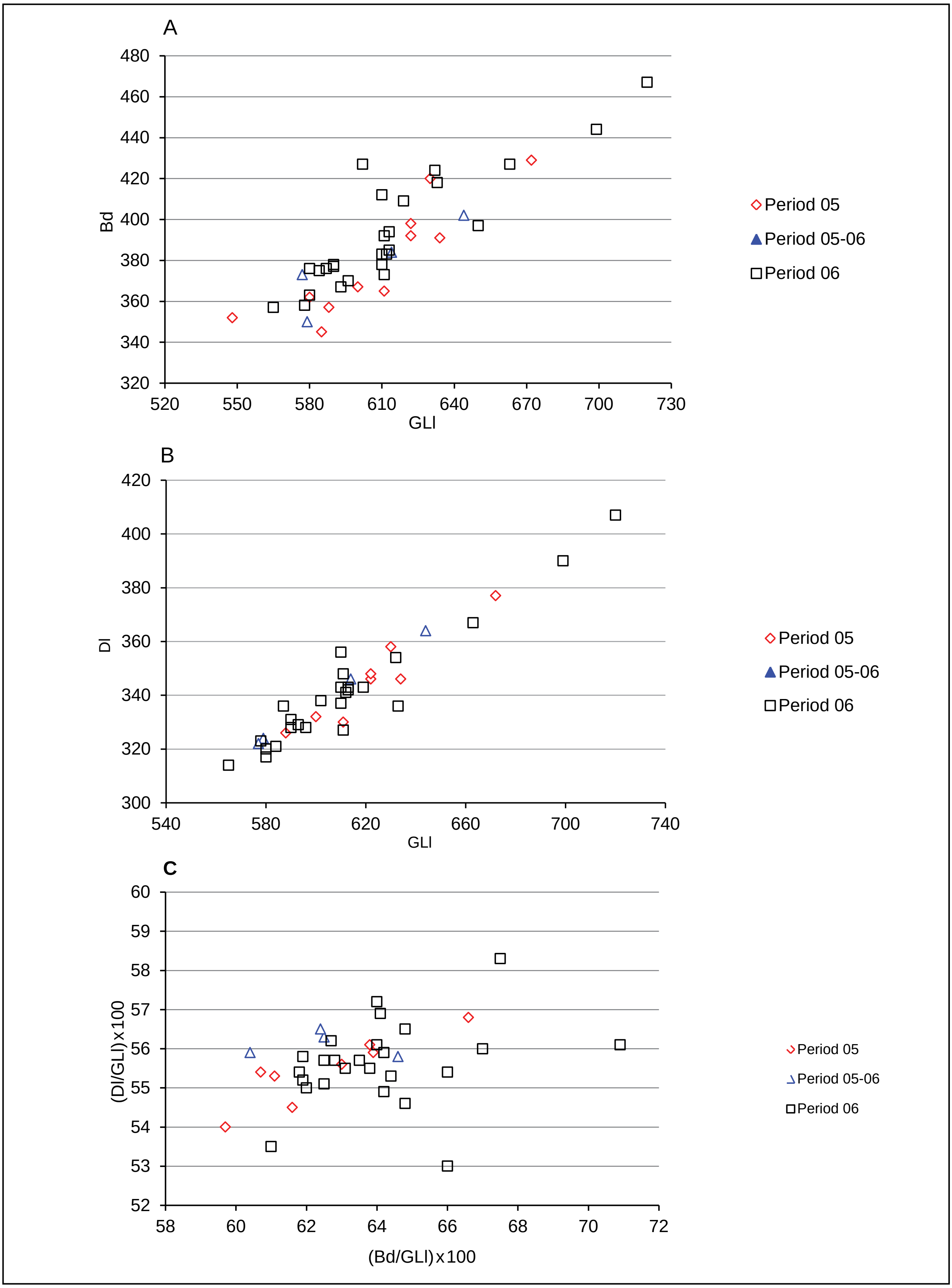


Figure 208: Size (A and B) and shape (C) of cattle astragali

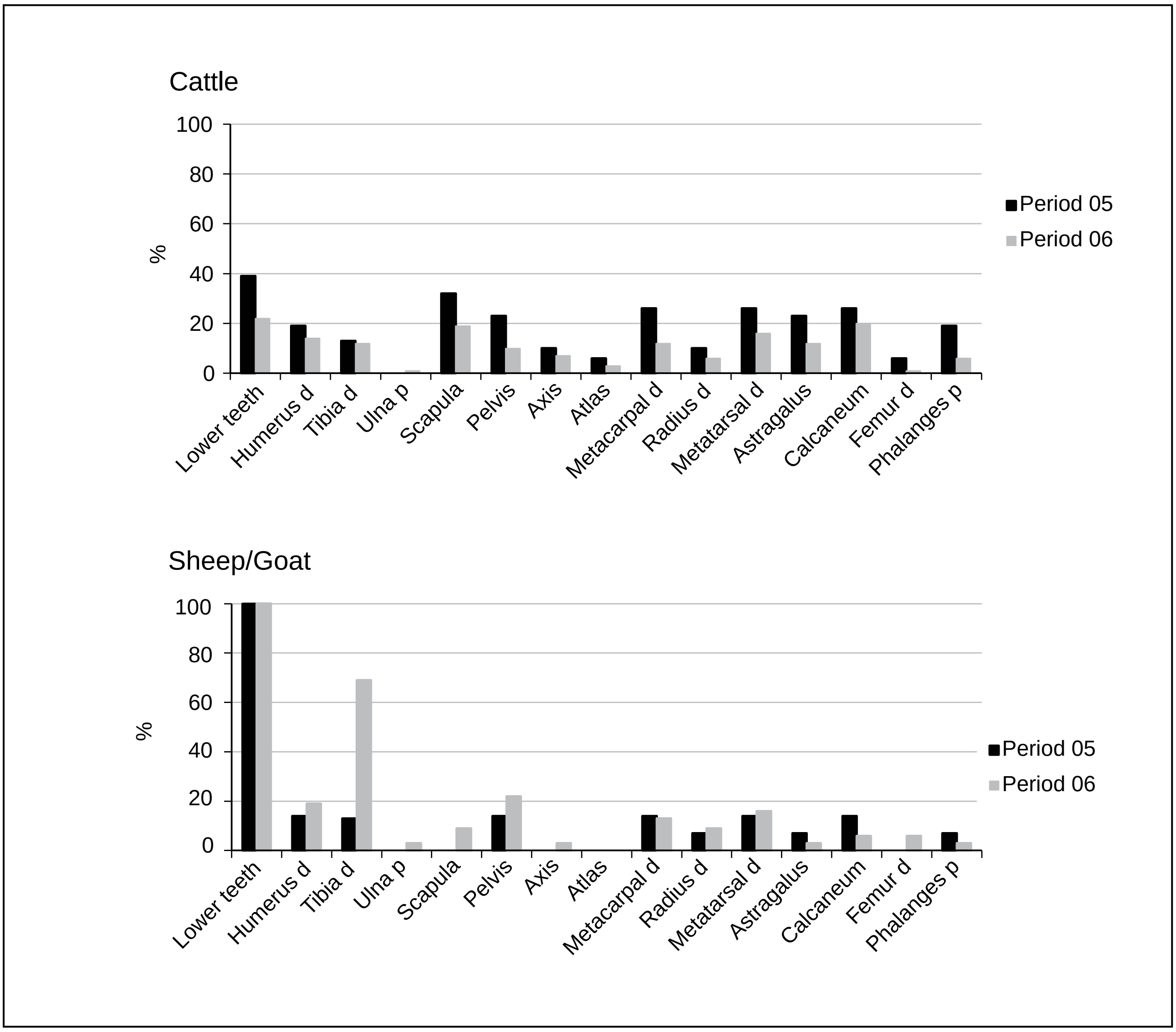


Figure 209: Percentage survival of the body parts of the main domestic mammals

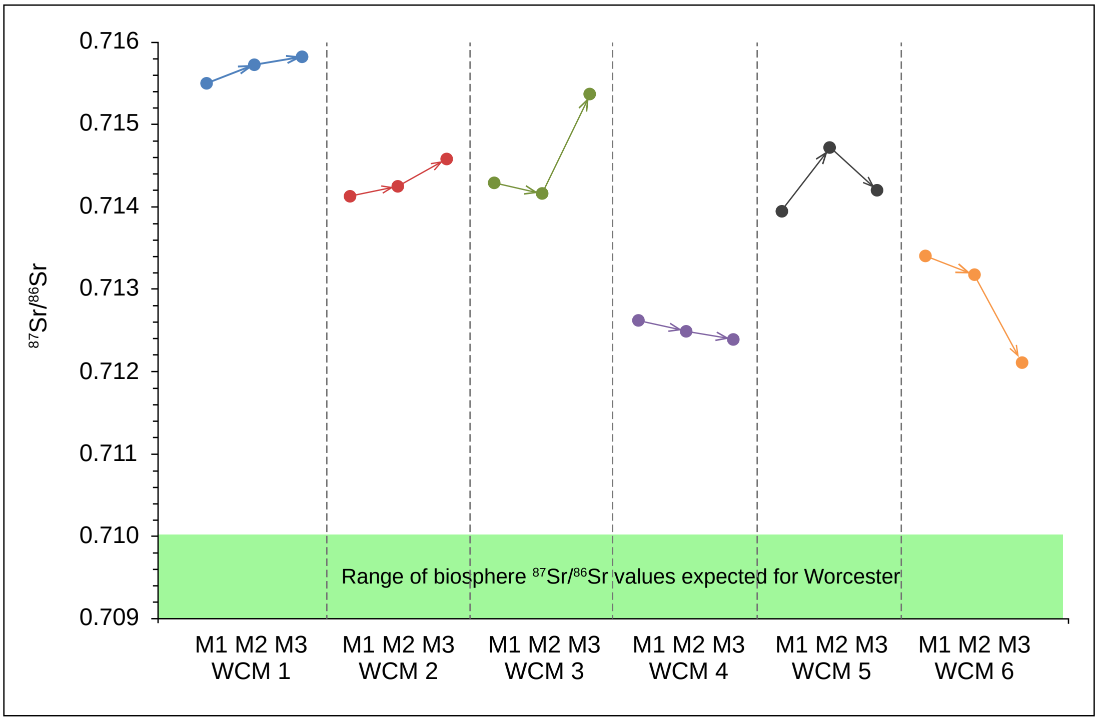


Figure 210: $^{87}Sr/^{86}Sr$ values for six Worcester cattle. The 2σ error for $^{87}Sr/^{86}Sr$ is contained within the symbols. The range of biosphere $^{87}Sr/^{86}Sr$ values expected for Worcester is that given by Evans et al. (2010). Arrows show the sequence of molar formation and hence how the $^{87}Sr/^{86}Sr$ values change with time.

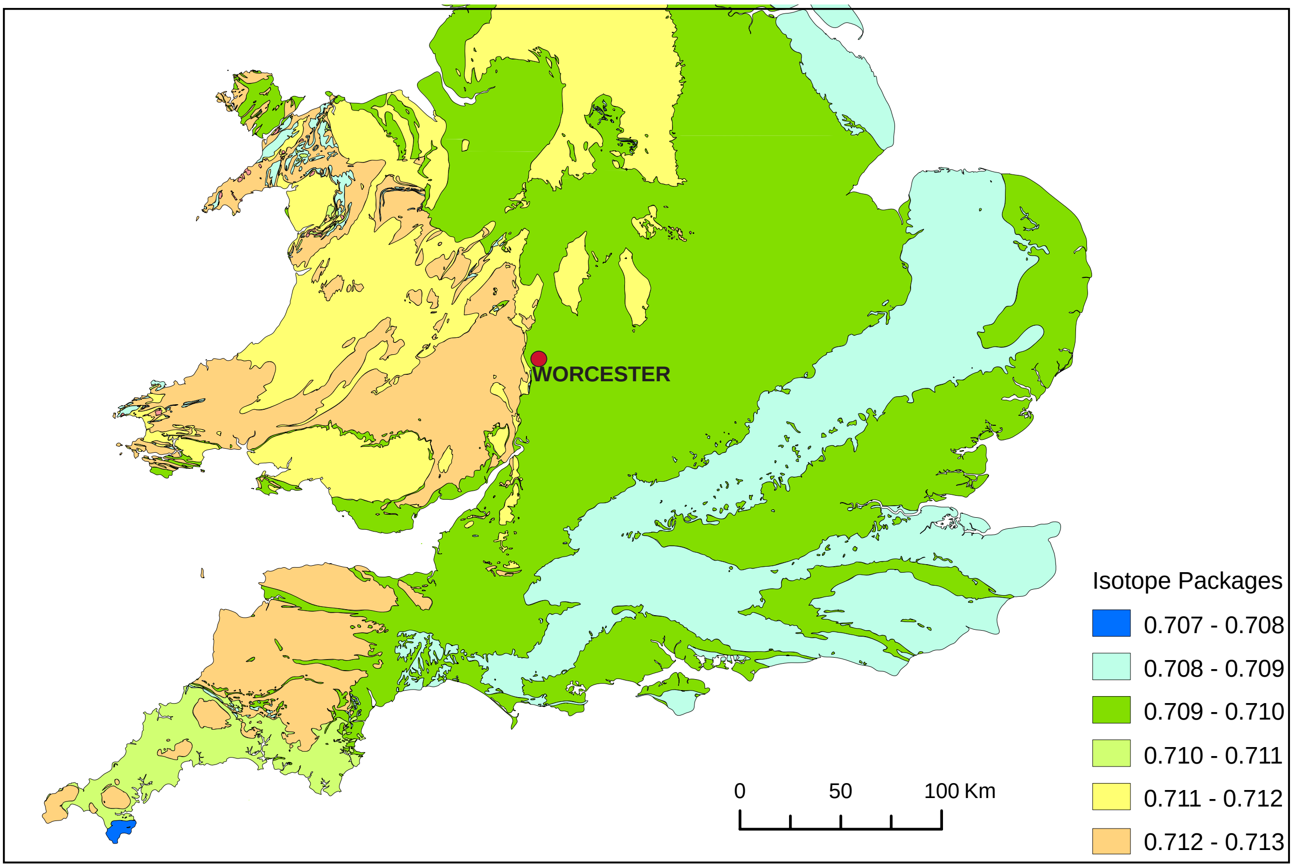


Figure 211: A map of biosphere strontium isotope ratios in England and Wales ©NERC

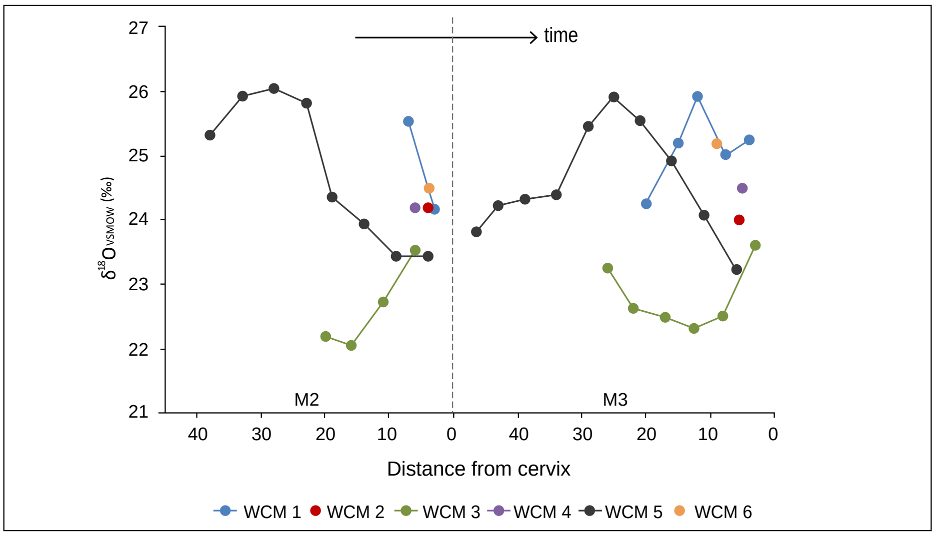


Figure 212: Intra-tooth δ18O values for six Worcester cattle

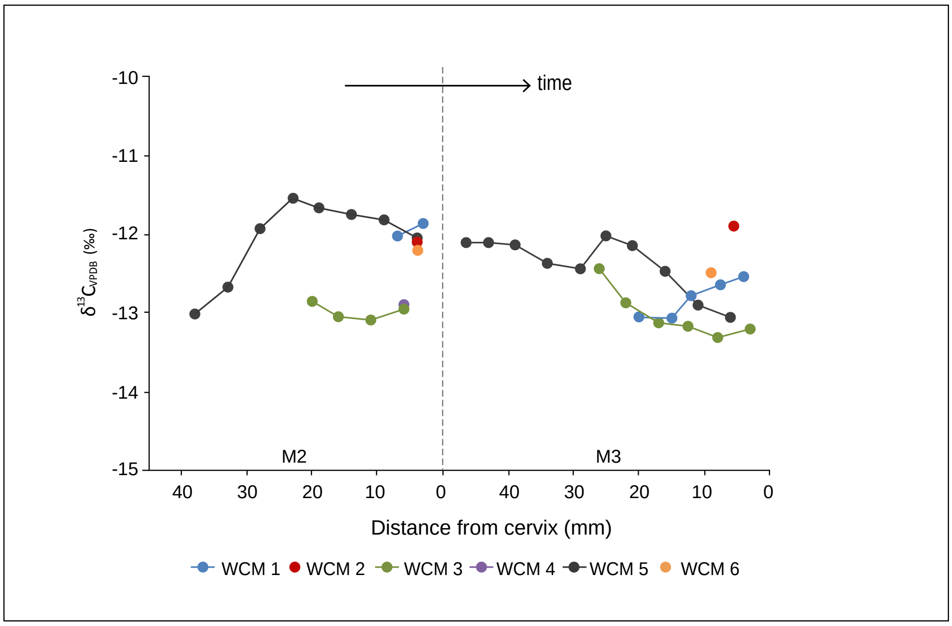


Figure 213: Intra-tooth δ13C values for six Worcester cattle.

Appendix 1: Pollen processing methodology

Appendix 1 Pollen processing methodology (Tim Mighall, Department of Geography & Environment, University of Aberdeen)

ABSOLUTE POLLEN ANALYSIS: PREPARATION SCHEDULE

PRECAUTIONARY NOTES: All procedures, up to stage 25, should take place in the fume cupboard. Read precautionary notices on fume cupboard before starting. Ascertain whereabouts of First Aid equipment NOW. Please wear laboratory coat, gloves and goggles when dealing with all chemicals. Please organize fume cupboard carefully to maximize workspace. Use the containment trays provided. Always keep the fume cupboard door down as far as practically possible. Make sure the fume cupboard is switched on and functioning correctly.

A) SOLUTION OF HUMIC COMPOUNDS

1) Switch on hotplate to heat water bath. Prepare 12 to 16 samples concurrently.

HCl. is an irritant and can cause burns. Wear gloves. Wash with water if spilt on your skin.

Using a clean spatula, place a known volume or weight of sediment (c. 2cm^3) and one spore tablet in each 50ml centrifuge tube. Add a few cm^3 of distilled water (enough to cover the pellet and tablets) and a few drops of 2M HCl. Wait until effervescence ceases, then half fill tubes with 10% KOH; place in a boiling water bath for 15 minutes. Stir to break up sediment with clean glass rod. Return HCl and KOH bottles to the chemical cabinet.

2) Centrifuge at 3,000 rpm for 5–6 minutes, ensuring first that tubes are filled to the same level. This applies throughout the schedule (Mark 7 on centrifuge).

3) Carefully decant, i.e. pour away liquid from tube, retaining residue. Do it in one smooth action.

4) Disturb pellet using vortex mixer; add distilled water, centrifuge and decant.

5) Using a little distilled water, wash residue through a fine (180 micron) sieve sitting in filter funnel over a beaker. NB Be especially careful in keeping sieves, beakers and all tubes in correct number order. Wash residue on sieve mesh into petri dish and label the lid. If beaker contains mineral material, stir contents, wait four seconds, then decant into clean beaker, leaving larger mineral particles behind. Repeat if necessary. Clean centrifuge tube and refill with contents of beaker.

6) Centrifuge the tubes and decant.

B) HYDROFLUORIC ACID DIGESTION

***(Only required** if mineral material clearly still present. Otherwise, go to stage 13)*

NB Hydrofluoric acid is extremely corrosive and toxic; it can cause serious harm on contact with eyes and skin. Rubber gloves and mask/ goggles MUST be worn up to and including stage 11. Please fill sink with H_20; have $CaCo_3$ gel tablets ready. Place pollen tube rack into tray filled with sodium bicarbonate.

7) Disturb pellet with vortex mixer. Add one cm^3 of 2M HCl.

8) With the fume cupboard sash lowered between face and sample tubes, very carefully one–third fill tubes with concentrated HF (40%). Place tubes in water bath and simmer for 20 minutes.

9) Remove tubes from water bath, centrifuge and decant down fume cupboard sink, flushing copiously with water.

10) Add $8cm^3$ 2H HCl to each tube. Place in water bath for 5 minutes. Do not boil HCl.

11) Remove tubes, centrifuge while still hot, and decant.

12) Disturb pellet, add distilled water, centrifuge and decant.

C) ACETYLATION

NB Acetic acid is highly corrosive and harmful on contact with skin. Wash with H_20 if spilt on skin.

13) Disturb pellet, add $10cm^3$ glacial acetic acid, and centrifuge. Decant into fume cupboard sink with water running during and after.

14) Acetic Anhydride is anhydrous. Avoid contact with water. The acetylation mixture can cause severe burns if spilt on skin. Wash with water.

15) Make up $60cm^3$ of acetylation mixture, just before it is required. Using a measuring cylinder; mix acetic anhydride and concentrated sulphuric acid in proportions 9:1 by volume. Measure out $54cm^3$ acetic anhydride first, then add (dropwise) $6cm^3$ concentrated H_2S0_4 carefully, stirring to prevent heat build—up. Stir again just before adding mixture to each tube.

Disturb pellet; then add $7cm^3$ of the mixture to each sample.

16) Put in boiling water bath for 1–2 minutes. (Stirring is unnecessary—never leave glass rods in tubes as steam condenses on the rods and runs down into the mixture reacting violently). One minute is usually adequate; longer acetylation makes grains opaque. Switch off hot plate.

17) Centrifuge and decant all tubes into large (1,000ml) beaker of water in fume cupboard. Decant contents of beaker down fume cupboard sink.

18) Disturb pellet, add $10cm^3$ glacial acetic acid, centrifuge and decant.

19) Disturb pellet, add distilled water and a few drops of 95% ethanol centrifuge and decant carefully.

D) DEHYDRATION, EXTRACTION AND MOUNTING IN SILICONE FLUID

20) Disturb pellet; add $10cm^3$ 95% ethanol, centrifuge and decant.

21) Disturb pellet; add $10cm^3$ ethanol (Absolute alcohol), centrifuge and decant. Repeat.

22) Toluene is an irritant. Avoid fumes.

Disturb pellet; add about $8cm^3$ toluene, centrifuge and decant carefully into 'WASTE TOLUENE' beaker in fume cupboard (leave beaker contents to evaporate overnight).

23) Disturb pellet; then using as little toluene as possible, pour into labelled specimen tube.

24) Add a few drops of silicone fluid - enough to cover sediment.

25) Leave in fume cupboard overnight, uncorked, with fan switched on. Write a note on the fume cupboard *'Leave fan on overnight - toluene evaporation',* and date it. Collect specimen tubes next morning and cork them. Turn off fan.

26) Using a cocktail stick, stir Contents and transfer one drop of material onto a clean glass slide and cover with a cover slip (22mm x 22mm). Label the slide.

27) Wash and clean everything you have used. Wipe down the fume cupboard worktop. Remove water bath from fume cupboard if not needed by the next user. Refill bottles and replace them in chemical cabinets.

Appendix 2: The Butts, Worcester: A Geoarchaeological Assessment

Appendix 2 The Butts, Worcester: A Geoarchaeological Assessment, March 2006 (Keith Wilkinson and Phil Marter, Department of Archaeology, University of Winchester)

Introduction

This document reports on the geoarchaeology of The Butts, Worcester. The Butts site was subject to an archaeological evaluation, conducted by Worcestershire County Council, Historic Environment and Archaeology Service (WCCHEA) in early February 2006. This report has been written as the result of a day long visit made to the archaeological evaluation on 6 February 2006 and from studies made of borehole cores collected by a third party geotechnical contractor.

The Butts lies on the western side of Worcester and is c 100m from the easterly bank of the River Severn. The site is currently used as a depot by Worcester City Council (northern part) and as a public car park (south) (Figure 1). The present ground surface drops from east to west by about 2m. The assessment report suggests that this fall reflects a change in sub-surface geology from the Worcester Terrace (Late Pleistocene) of the River Severn in the east to 'alluvium' (presumably floodplain and channel deposits of Holocene age) in the west (Miller, Robson-Glyde and Woodiwiss 2005, 5). However, the most recent geological map of Worcester suggests that the eastern part of the site sits on Upper Triassic sandstone and mudstones of the Eldersfield Mudstone Formation (Mercia Mudstone Group) rather than the Worcester Terrace (Figure 2) (British Geological Survey 1993).

On the basis of historic maps, the archaeological assessment suggests that with one exception, the topography has remained largely unchanged since the medieval period. Cartographic evidence suggests that a stream once ran down the southern side of the site, before cutting north-westwards along the western side of the study area (Miller *et al*. 2005, 5, figure 2). This stream was canalised to form the town wall ditch in the Middle Ages and culverted in the 17th or 18th centuries.

The aims of the geoarchaeological assessment reported here are as follows:

- To characterise Late Quaternary deposits and soils present on the site.
- To determine the archaeological and palaeoenvironmental potential of the soils and deposits on the site.
- To map the spatial extent of deposits with high archaeological and palaeoenvironmental significance.
- To make recommendations for further geoarchaeological investigation.

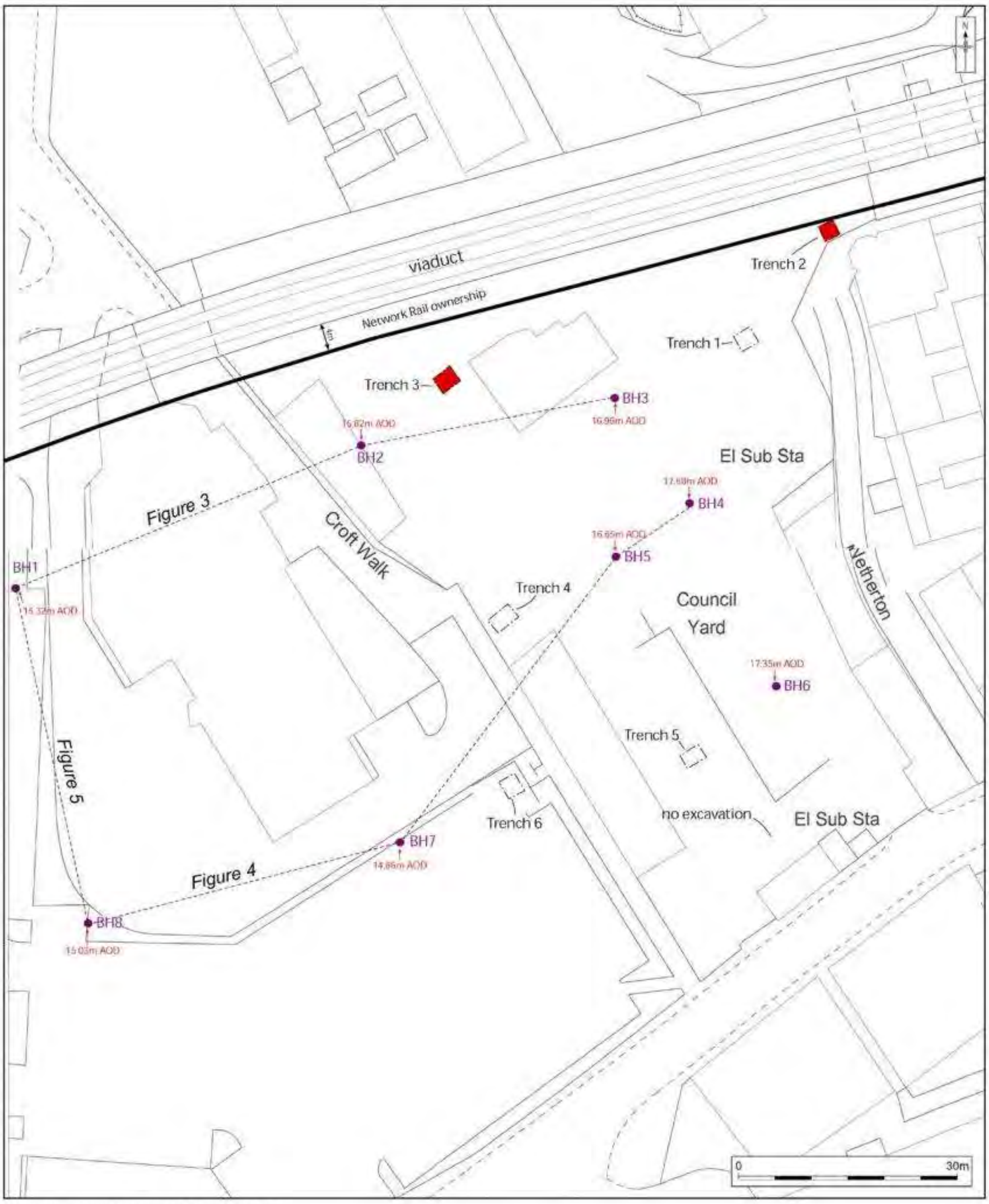


Figure 1. Location of archaeological evaluation trenches and boreholes at The Butts (figure by Worcestershire County Council, Historic Environment and Archaeology Service)

Methodology

The geoarchaeological work reported here was carried out in two stages. Firstly a visit was made to the site during the course of the archaeological evaluation in order to examine stratigraphy revealed in trenches (numbers 2 and 3) in the eastern part of the site (see red shaded locations in Figure 1). The eastern part of the site lies adjacent to 14-20 The Butts where previous archaeological fieldwork had revealed various features and deposits relating to Romano-British settlement and industrial activity (Burrows and Cutler 2004). The purpose of the visit was therefore to characterise and determine the genesis of any cultural deposits extending from 14-20 The Butts.

The second element of the geoarchaeological study was an investigation of deposits retained in cores obtained from eight boreholes (for locations see Figure 1). The boreholes were drilled by a geotechnical sub-contractor, Global Probing and Sampling (GPS) Ltd, under the supervision of Dr Katie Head (WCCHEA). WCCHEA officers labelled and sealed all the recovered cores and accurately surveyed in the location of the boreholes in relation to Ordnance Datum (OD) and Ordnance Survey National Grid Reference (NGR). GPS Ltd use a track-mounted percussion window sampling system that retrieves continuous cores to a maximum operating depth of 12m ("Competitor" Drilling System [Global Probing and Sampling Ltd. 2004]). On completion of the boreholes, all cores were removed to the WCCHEA offices for temporary storage.

The cores were subsequently transported to laboratories at the Department of Archaeology, University of Winchester for detailed study. The plastic tubes containing the cores were slit open; the sediments contained within were hand-cleaned and the freshly exposed sediments described. Sediment recovery in the cores was variable and there is an average loss of 0.2m from each 1.0m long core (see 'No Recover' in Figures 3-5). In respect of sediment 'loss' it should be noted that percussive auger systems of the type operated by GPS Ltd have a tendency to compress sediments retained in the recovered cores. Compression is a factor of sediment water content, which in turn is related to water table height, grain size and organic content. Lithological description, both of sections in the two evaluation trenches examined and of the borehole cores, was according to standard geological criteria (Tucker 1982, Jones *et al*. 1999, Munsell Color 2000).

Lithological data from the borehole cores were entered into a database within the RockWorks geological utilities software (RockWare 2005), and that software was then used to generate the composite cross sections presented in Figures 3-5. The cross sections and the lithological data form the basis of the discussion.

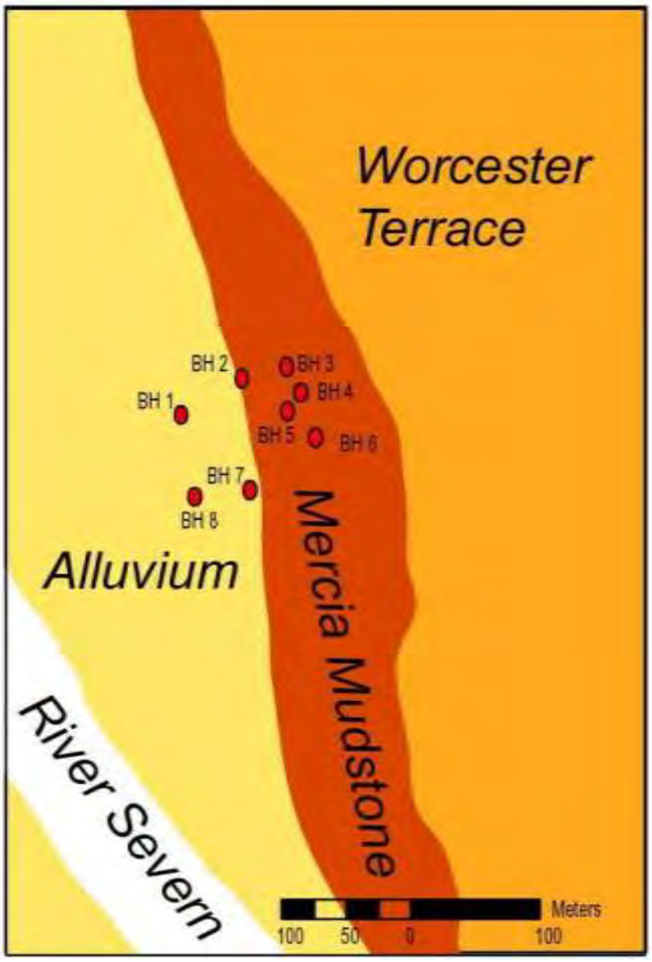


Figure 2. Location of boreholes in relation to solid and drift geology mapped by the British Geological Survey (1993)

The archive resulting from geoarchaeological study of The Butts comprises a paper and digital record. Cores from the Elmore Member in BH 1 and BH 8 have been retained, but all other cores have been discarded. The retained cores will not be suitable for further study after June 2006.

Stratigraphy

The stratigraphy of The Butts site can be conveniently divided into three for the purposes of discussion. The earliest deposits on the site are sandstones and mudstones of the Triassic period Eldersfield Mudstone Formation. These are overlain by bedded sands, silts and cultural layers of the Late Quaternary Elmore Member (Severn Formation) (Maddy 1999). The whole succession is capped by 'Made Ground' deposited during the historic period.

Eldersfield Mudstone Formation

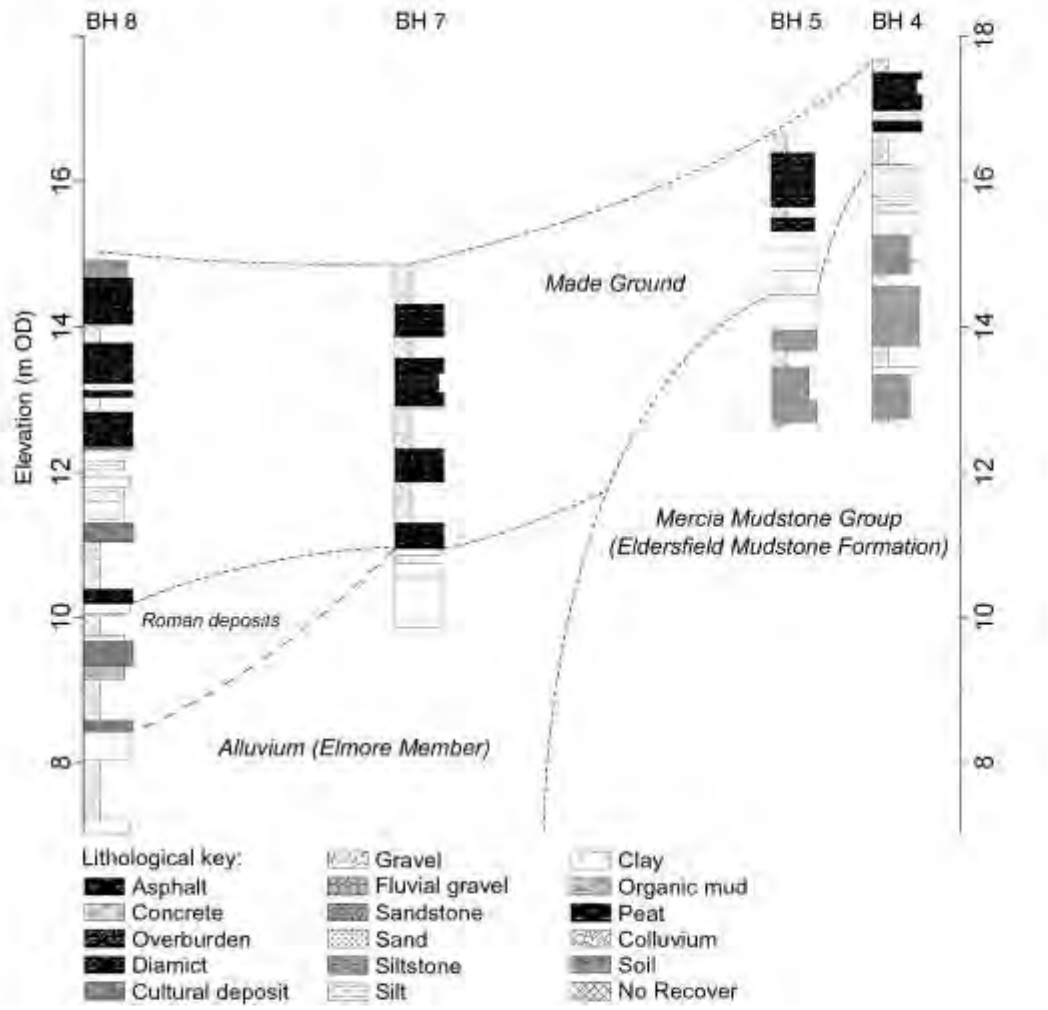


Figure 3. East-west borehole transect across the southern part of the site

The Eldersfield Mudstone Formation is part of the Mercia Mudstone Group of deposits (British Geological Survey 1993). It dates from the Carnian and Norian stage of the Upper Triassic and is therefore between 225 and 210 million years old. Deposits of the Eldersfield Mudstone Formation were separated from those of the lowest part of the Elmore Member on the basis of two characteristics:

a) Partial lithification or complete induration.
b) 5 YR or redder hue

On the basis of these criteria, four boreholes from the east of the site (BH 3-6) contain deposits of the Eldersfield Mudstone Formation (Figures 3-4).

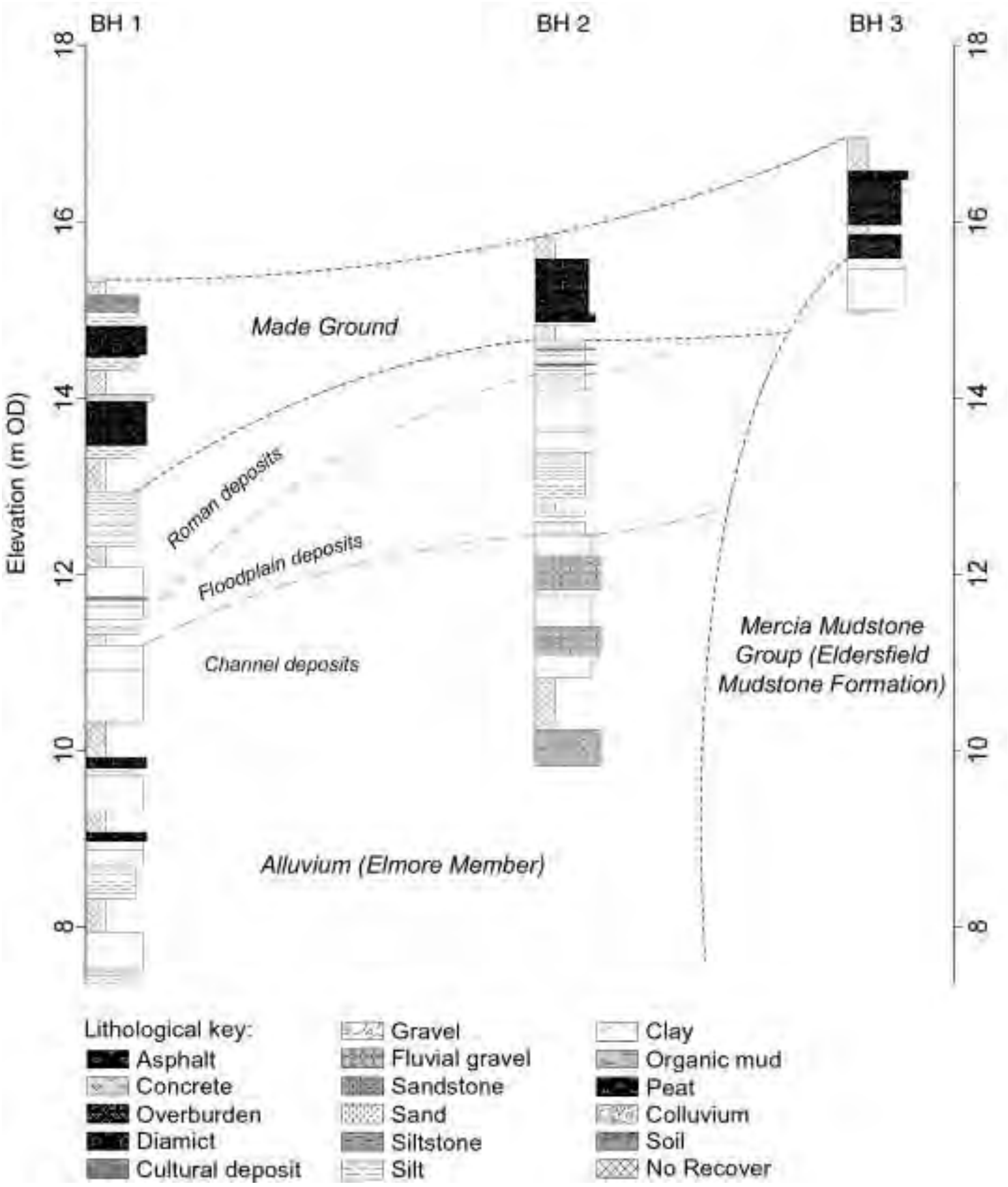


Figure 4. East-west borehole transect across the northern part of the site

Sediments of the Eldersfield Mudstone Member comprise compacted, deep red semi-lithified fine sand and silts, with occasional stringers of rounded quartzite granules and pebbles. Rare thin beds of grey semi-lithified fine sand and unlithified medium sand also occur. The uppermost deposits of the Eldersfield Mudstone Formation are heavily weathered, for example in BH 3, and are therefore largely unlithified, but they have retained their deep red colour.

The fact that deposits of the Eldersfield Mudstone Formation were not found in the southern part of the site despite drilling to a depth of 7m OD (BH 8, cf. upper contact of 15-16m OD in BH 3-6), indicates that there is a considerable drop in bedrock height from east to west across the site (see Figure 3). This has almost certainly been caused by downcutting of the River Severn during the Quaternary period, as is also evidenced by the presence of the Worcester Terrace (a former bed of the Severn), at elevations greater than 16m OD (see Figure 2).

Elmore Member

The Elmore Member comprises all alluvial deposits forming in the Severn and tributary valleys that postdate the deposition of the Power House Member (Maddy 1999). Given that the Power House Member dates to the Late Pleistocene, deposits of the Elmore Member are overwhelmingly of Holocene and, to a lesser extent, Devensian Late Glacial age (0-15 ky BP).

The Elmore Member is draped against the Eldersfield Mudstone Formation, indicating its genesis as the infill of a major channel (Figures 3 and 4). Deposits of the Elmore Member therefore thicken from east to west, reaching at least 6m in thickness in BH 1. However, as Figure 5 demonstrates, there is a drop in height of almost 3m between the upper contact of the Elmore Member in BH 1 and the same contact in BH 8, both of which are located on the western margins of the site. There could be two reasons for this difference:

a) that during deposition of the Elmore Member or subsequently, the southern and/or western part of the site was subject to channelling, thus removing much of the upper alluvial stratigraphy in BH 8. As is explained below, this must have occurred prior to the Roman period. It is possible that the stream noted in the archaeological assessment as once passing down the south and west side of The Butts could have cut such a channel (Section 1.3, Miller *et al*. 2005).
b) that the relevant cores in BH 8 have been contaminated by deposits collapsing down the hole and have therefore been wrongly ascribed as ‘made ground’. While it is true that there are many zones of non-recovery in BH 8 as a result of compression and/or sediment escape from the auger chamber, this explanation is not favoured by the authors. It is notable that the lower contact of ‘made ground’ in BH 7 is at an almost identical elevation to that in BH 8, suggesting that ‘made ground’ is infilling a former channel.

Both channel and floodplain facies are found in the Elmore Member site. There is a general tendency for channel facies to underlie those of floodplain type (see Figure 4), suggesting that former channels of the River Severn once passed over the site, but that subsequently the river has migrated westwards. The channel facies show classic fining upwards sequences, suggesting that channels formed, were active and then became infilled, and that these processes occurred on a number of occasions. The alluvial deposits are derived from two sources: the Eldersfield Mudstone Formation and the various Pleistocene terraces of the River Severn. Sands and silts forming within channels therefore tend to be of a reddish hue (7.5 YR), while the gravels are mostly of rounded quartzites. Floodplain deposits, as for example found in BH 1-2 and 8, are of a greener hue (10 YR and occasionally 2.5 Y), reflecting their higher organic content and derivation from surface soils.

The upper part of the Elmore member, corresponding to floodplain facies, contains Romano-British artefacts. These comprise ceramics, burnt animal bone and iron-working slag. The latter was found as distinctive beds in BH 1 and BH 2, and as loose particles in BH 8, and is likely to correspond to a wide spread of Romano-British slag known from western Worcester (Miller *et al*. 2005, 6). As well as providing information about the nature of Romano-British industrial activity in Worcester, the slag layer also provides an excellent temporal marker. Assuming that the slag layer can be used in this way, it would appear that at the time of its deposition the ground surface sloped from 14.5m OD (BH 2) in the centre of the site to 11.7m OD in the south (BH1) (Figure 4). At present the slope is from 16m OD to15.3m OD. Although no slag layer was found in cores from BH 8, other Romano-British artefacts (including slag) were. These outcrop at between 10m and 8.3m OD, i.e. between 1.5m and 3.2m lower than in BH 1 (Figure 5). The data suggest that the Romano-British ground surface sloped downwards from north to south across the western part of the study area, a further argument for the presence of an active channel running along the southern part of the site at this time. Yet another argument for the channel thesis is the nature of the Romano-British deposits in BH 8, which include organic-rich deposits that are characteristic of the margins of slow-flowing streams. The remaining Romano-British layers in BH 8 are suggestive of mixed alluvial and deliberate human deposition.

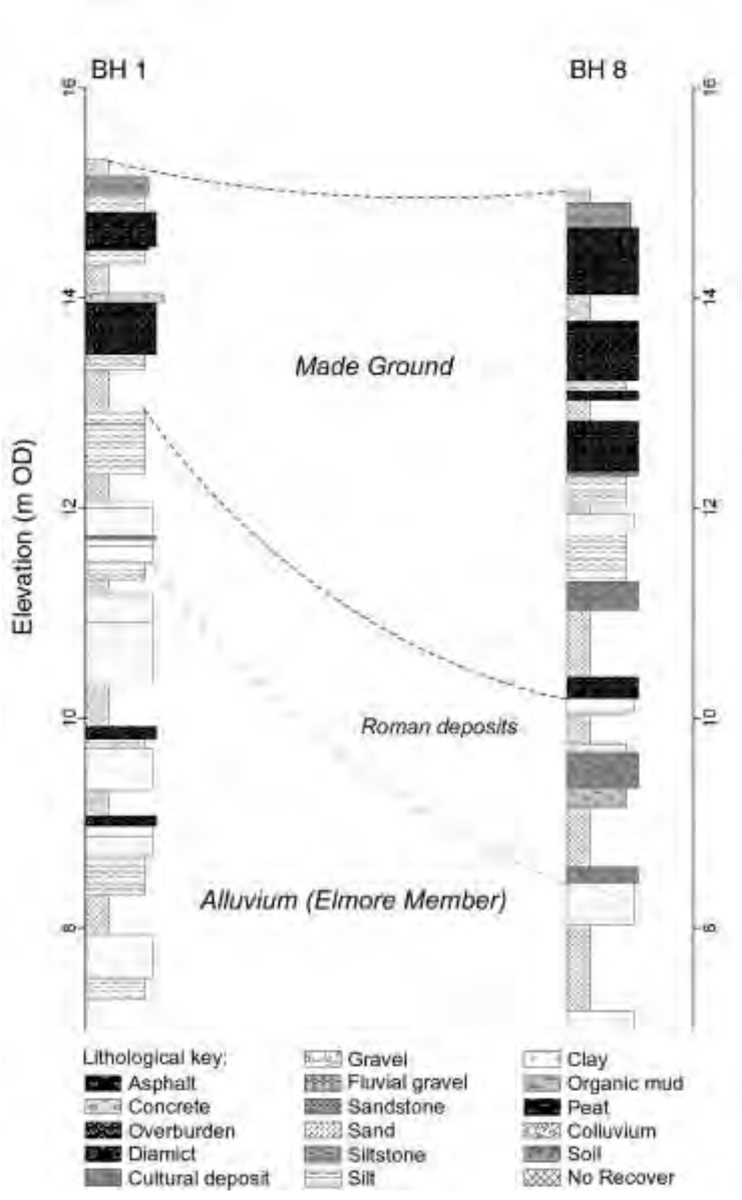


Figure 5. North-south borehole transect across the western part of the site

Despite the presence of Romano-British artefacts in the top of the Elmore Member, only an approximate chronology can be advanced for its formation. During the Romano-British period, floodplain sedimentation occurred across the southern and central parts of the site, while the southern part is likely to have included a stream channel. Deposition of metalworking debris and other cultural debris occurred on to these surfaces. However, the underlying floodplain and channel deposits could date any time from the Romano-British period to as far back as 15 ky BP.

Made Ground

'Made ground' is a term used by geologists to include all deposits formed as a product of human action. At The Butts the lowest part of the ‘made ground’ stratigraphy in the eastern part of the site includes Romano-British and ?sub-Roman layers (e.g. Trenches 2 and 3), but that to the west is predominantly comprised of 19th and 20th century material.

In general, ‘made ground’ thickens from c 1.5m in the east of the site to between 2.5m and 5m in the south. There is also a thickening of ‘made ground’ across the southern part of the site from 2.5m (BH 1) to 5m (BH 8). In other words: deposition of made ground has the effect of evening out topographic ‘lows’. This infill has been most significant in the southern part of the site where the greatest thicknesses of ‘made ground’ are found. These deposits have infilled the putative channel previously discussed, effectively obliterating this feature from the modern topography. The lowest part of the ‘made ground’ in BH 7 is late post-medieval in date (i.e. 18th century or later) on the basis of artefacts in the cores, indicating that the southern channel was infilled within the last three centuries.

Romano-British layers at the base of the ‘made ground’ in Trenches 2 and 3 are described in the archaeological evaluation report. However, it is worth commenting on their genesis here. It should be emphasised that although Romano-British layers in the evaluation trenches are not of the Elmore Member (i.e. they did not form in an alluvial environment), basal deposits in Trench 2 may be of an equivalent age to Romano-British layers in the Elmore Member. The Romano-British deposits in Trench 2 comprise poorly sorted fills - containing Mortaria and other coarse ware pottery and iron working slag - of a cut feature. The feature cuts through floodplain deposits of the Elmore Member and is buried by ‘made ground’ dating to the 19-20th century. Therefore, at this particular location, no alluvial sedimentation has occurred since the cut feature was dug.

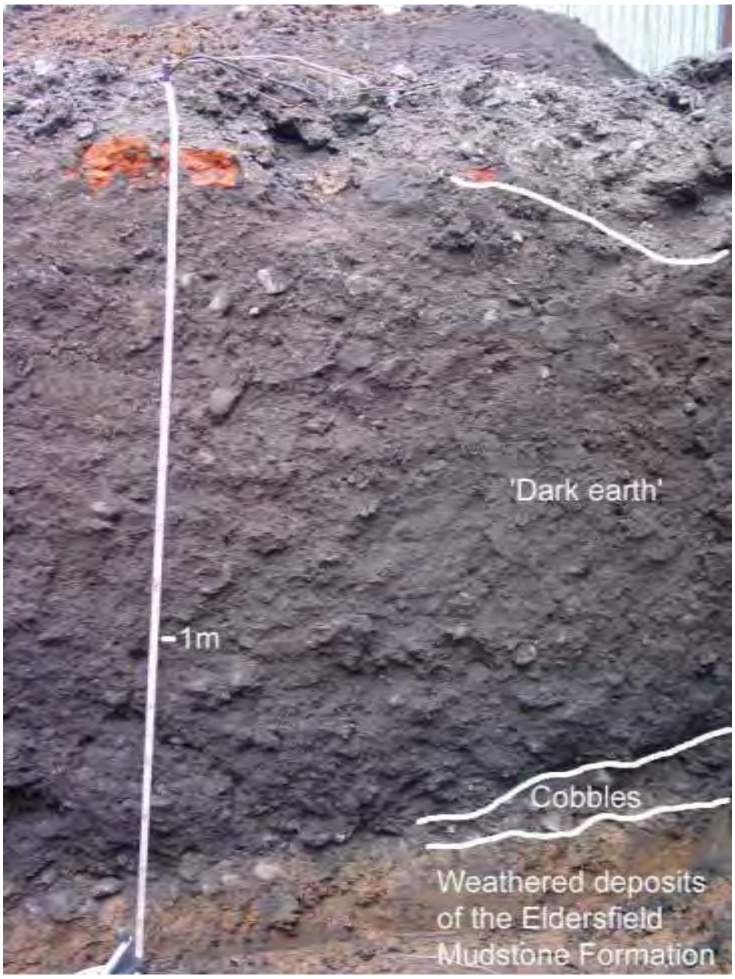


Figure 6. ‘Dark earth’ deposits in the eastern section of Trench 2

In Trench 2, ‘Dark earth’ deposits were found overlying a layer of rounded cobbles interpreted as being deliberately emplaced during the Roman period (Figure 6) (Sworn pers. comm.). ‘Dark earths’ are common Late Roman and sub-Roman deposits in urban situations in Britain and are thought to have formed when habitation and craft areas were converted to market gardens towards the end of the Roman period. The dark colour reflects the input of manure, cess and other organics to improve fertility. The ‘Dark earth’ in Trench 2 probably extends from similar deposits previously reported at 14-20 The Butts (Burrows and Cutler 2004). ‘Dark earth’ from Worcester has also been studied in detail by Dr Richard MacPhail (2004) at the Deansway site, and he suggests the deposits derive from animal manure and middens. ‘Dark earth’ in Trench 2 at The Butts is about 1.25m thick, contains frequent Romano-British ceramic fragments and charcoal pieces, but is not especially humic. It lacks any stratifications (a common property of all ‘Dark earths’), although it does lighten in colour upwards. It is interesting to note that ‘Dark earth’ was not found in any of the borehole cores, or in Trench 3, suggesting that it is restricted to the eastern margins of the site. In other words: ‘Dark earth’ does not coincide with the Elmore Member, suggesting that market gardening did not take place on the floodplain during the Late Roman/?sub-Roman period.

The non-Romano-British ‘made ground’ is comprised of diamicts of brick, concrete and asphalt in a sand matrix. The sands are of a reddish colour and are therefore likely to have been derived from the Eldersfield Mudstone Formation, while the larger clasts are reworked building materials. 'Made ground' in BH 7 and 8 contained large quantities of crushed brick, suggesting that this material was compressed during deposition – perhaps another indication that 'made ground' infills a channel at this location.

Assessment

The Eldersfield Mudstone Formation has NO archaeological or palaeoenvironmental potential. These deposits formed many millions of years before the hominid family had evolved.

The basal parts of the Elmore Member, i.e. the channel facies (BH 1 and 2, Figure 4), have a LOW archaeological and palaeoenvironmental potential. Although it is not known when these deposits accreted – except that this occurred before the Romano-British period – the high-energy environment needed to emplace such sands and gravels will have mitigated against a. human use of the area, and b. subsequent survival of archaeological material.

In contrast, the upper part of the Elmore Member, i.e. the floodplain facies, has both a HIGH archaeological and palaeoenvironmental potential. Reasonably large quantities of archaeological material were found from floodplain facies in BH 1 and BH 2, and from equivalent deposits in BH 8. These suggest activity across much of the western and northern part of the site in the Romano-British period. Indeed it is likely that this activity correlates with Romano-British deposits in evaluation Trench 3 and the 14-20 The Butts site investigated by Birmingham Archaeology. Accompanying the cultural deposits in BH 8 and to a lesser extent BH 1, are organic layers containing, in the case of BH 8, well-preserved plant macro remains. The potential therefore exists to recover well-preserved proxies from these waterlogged deposits, which would enable Romano-British economies and environments to be reconstructed.

The archaeological potential of the 'made ground' is considered in detail by the archaeological evaluation report. It is worth noting that the 'Dark earth' sequence in the eastern part of the site appears to survive in a relatively untruncated condition (at least in Trench 2), and therefore has MODERATE archaeological (but LOW palaeoenvironmental) potential. Analysis of the 'Dark earth' would enable the genesis of these deposits to be more clearly understood and suggestions made as to whether the high ground at The Butts was subject to the same land use as Deansway in the Late Roman period.

Recommendations

The geoarchaeological project reported on here has enabled the past topography of The Butts site to be reconstructed in detail. Any future archaeological/geoarchaeological work carried out in advance of construction should attempt to refine the data presented here. A number of questions suggest themselves:

a) What is the exact route of the channel passing down the southern and western sides of the site? How wide an area did the channel occupy?

b) What is the chronological, stratigraphic and functional relationship of the Late Roman/?sub-Roman 'Dark earth' in the east of the site (Trench 2), Romano-British features cut into alluvial silts of the Elmore Member in the centre of the site (Trench 3) and Romano-British cultural layers observed within the Elmore Member in BH 1, 2 and 8?
c) Is the slag noted in BH 1, 2, 8 and Trench 3 all from the same phase of activity (i.e. is there a consistent slag layer covering the site)? Can the metalworking history of this part of Worcester be reconstructed from evidence preserved at The Butts?

Archaeological/geoarchaeological techniques to address all the above questions do exist, many of them relying on trenching. However, there are considerable logistical difficulties in the use of archaeological trenches to investigate the western parts of the site, given deep burial of archaeological deposits (e.g. 2.5-4.2m in BH 1, 5.0-6.5m in BH 8). Also, these deeply stratified areas coincide with a 'terrace' in Worcestershire County Council's outline development plan (Miller *et al*. 2005, figure 4). If construction of this terrace were to remove less sediment than the depths quoted above then the development is likely to have limited impact on this buried Romano-British archaeological resource. Assuming that construction of the terrace involves ground reduction of less than 2.5m, the following strategy is suggested as part of an archaeological mitigation programme to address the questions.

- Consideration should be given to a ground-penetrating radar (GPR) survey of areas of the present public car park to be impacted by the proposed development. This survey should be able to both locate and map the extent of the buried channel passing through this part of the site. The survey could either be undertaken as a series of transects, or a total spatial survey of the whole area.
- A key constituent of the archaeological mitigation in the eastern and central part of the site is an east-west section though the Romano-British deposits, allowing their stratigraphic, chronological and functional relationship to be assessed. Consideration should be given to the use of micromorphological techniques comparable to those employed at Deansway to study the 'Dark earths' in the eastern part of the site.

Should terracing result in damage to deposits below 2.5m, or piles be driven into the deposits of the western part of the site, the following further mitigation is suggested:

- Organic deposits associated with Romano-British cultural layers in BH 8 should be assessed using plant macro-fossil and palynological techniques. This will enable both the environment in which Romano-British activity took place, and Romano-British economies to be reconstructed. Following extraction of samples for these purposes, the relevant sediments can then be disaggregated and any further artefacts extracted. It should be noted, however, that sub-sampling for these assessments would have to take place before June 2006.
- That a further borehole be drilled, using either a rotary or pneumatic drilling device, in the vicinity of BH 1. Cores would be extracted to the base of the floodplain deposits (c 4-5m) and then used for mineral magnetic and palynological studies. This would enable the metalworking

history of western Worcester to be determined (mineral magnetics) and provide sub-regional vegetation data for the Romano-British period

Acknowledgements

ARCA would like to thank Dr Katie Head, Simon Sworn and Simon Woodiwiss of Worcestershire County Council, Historic Environment and Archaeology Service for their help during the course of the project.

This text has been copy-edited by Fine Line Archaeological Language Services (http://www.finelinetext.com).

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Stratigraphic descriptions (evaluation trenches)

Trench 2

Unit	Top (m)	Base (m)	Lithology	Description
1	0.00	0.53	Diamict	10 YR 3/2 diamict of frequent slate and moderate brick sub-angular granular and fine pebble-sized clasts in a medium to coarse sand matrix. Discrete fine layers of 10 YR 3/1 silt clay ('made ground'). Sharp boundary to:
2	0.58	0.65	Overburden	Bricks (structural layer, 'made ground'). Sharp boundary to:
3	0.65	1.32	Silt	10 YR 3/2 poorly sorted silt/clay containing frequent granular-sized charcoal fragments and mortar pieces. Occasional sherds of porcelain ('made ground'). Sharp, irregular boundary to:
4	1.32	1.42	Silt	10 YR 4/4 well sorted silt/clay with frequent humus filled root traces emanating from Unit 3. Rare granular-sized charcoal pieces (reworked alluvium – 'made ground'). Diffuse boundary to:
5	1.42	1.52	Silt	10 YR 3/2 silt clay with frequent pebble and granular-sized charcoal fragments and moderate sub-rounded quartzite clasts. Moderate quantities of Romano-British pottery including Mortaria fragments (top fill of cut feature)
8	1.52	+	Sand	7.5 YR 4/4 silt-medium sand. Frequent root and worm holes visible in plan. Rare rounded granular clasts (Elmore Member). Moderately sorted.

Trench 3

Unit	Top (m)	Base (m)	Lithology	Description
1	0.00	0.18	Diamict	10 YR 3/2 diamict of slate, brick and limestone sub-angular to sub-rounded pebbles in a loose silt-medium sand matrix. Lower boundary marked by horizontally bedded, reworked bricks ('made ground'). Diffuse boundary to:
2	0.18	0.85	Diamict	7.5 YR 3/2 fine diamict of sub-rounded pebble-sized quartzite clasts and moderate sub-angular ceramic fragments. Very occasional granular sized charcoal pieces (upper 'Dark earth'). Grading into:
3	0.85	1.43	Diamict	10 YR 3/1 diamict of moderate to frequent rounded and sub-rounded quartzite pebbles in silt-fine sand humic matrix. Occasional sub-angular ceramic fragments (Romano-British) (lower 'Dark earth'). Sharp boundary to:
4	1.43	1.48	Gravel	Cobble and coarse pebble gravel of rounded and sub-rounded quartzite clasts (interpreted as deliberate cultural deposition). Sharp boundary to:
5	1.48	1.57	Silt	7.5 YR 4/6 fine sand-silt with frequent root holes filled by sediment from Unit 3 (weathered Eldersfield Mudstone Formation)

Stratigraphic descriptions (boreholes)

Borehole	Top (m)	Base (m)	Lithology	Description
Butts BH 1	0.00	0.16	No Recover	
	0.16	0.35	Soil	7.5 YR 3/2 silt clay with occasional fine sand. Rooted. Well sorted. Sharp boundary to:
	0.35	0.50	Silt	5 YR 4/4 silt clay with occasional coarse sand/granules. Moderately sorted. Sharp boundary to:
	0.50	0.83	Diamict	10 YR 4/3 diamict of cobble to pebble-sized clasts (sub-angular) in a coarse-medium sand matrix. Basal 2cm is silt-fine sand matrix. Includes brick, quartzite and concrete clasts. Sharp boundary to:
	0.83	0.86	Overburden	10 YR 2/1 granular-sized cinders. Sharp boundary to:
	0.86	1.00	Silt	5 YR 4/4 silt clay with occasional coarse sand. Moderately sorted..
	1.00	1.28	No Recover	
	1.28	1.36	Concrete	Reinforced concrete 'clast'.
	1.36	1.86	Diamict	5 YR 4/4 diamict of silt clay containing frequent sub-angular slate granular clasts and sub-rounded quartzite pebble clasts. Diffuse boundary to:
	1.86	2.00	Silt	10 YR 4/3 silt clay with occasional fine sand. Occasional granular-sized charcoal fragments.
	2.00	2.38	No Recover	
	2.38	2.51	Silt	10 YR 4/3 silt clay with occasional fine sand. Occasional granular-sized charcoal fragments. Sharp boundary to:
	2.51	2.57	Silt	2.5 Y 3/2 silt clay. Well sorted. Containing possible cess. Diffuse boundary to:
	2.57	3.00	Silt	10 YR 3/2 silt clay with moderate medium to coarse sand and granular charcoal, particularly near top. Vestiges of laminar structure. Moderately sorted.
	3.00	3.25	No Recover	
	3.25	3.32	Sand	5 YR 4/3 medium coarse sand containing moderate pebble and granular sized sub-rounded quartzite clasts. Sharp boundary to:
	3.32	3.58	Sand	10 YR 2/1 medium coarse sand with occasional sub-rounded pebble and granular quartzite clasts, increasing upwards. Moderate organics in discrete patches. Moderately sorted. Fining upwards. Sharp boundary to:
	3.58	3.62	Cultural deposit	Iron slag
	3.62	3.68	Sand	10 YR 2/1 medium coarse sand with occasional sub-rounded pebble and granular quartzite clasts, increasing upwards. Moderate organics in discrete patches. Moderately sorted. Fining upwards. Sharp boundary to:
	3.68	3.83	Sand	10 YR 4/4 fine sand, coarsening upwards. Frequent organics and roots. Well sorted. Diffuse boundary to:
	3.83	4.00	Silt	Gley 1 4/10 GY silt clay with occasional fine sand. Well sorted. Moderate roots and organic material.
	4.00	4.13	No Recover	
	4.13	4.41	Sand	10 YR 2/1 medium coarse sand with moderate granular and frequent pebble-sized sub-rounded clasts. Moderate organics present throughout. Fining upwards. Poorly sorted. Sharp boundary to:

	4.41	4.58	Silt	Gley 1 5/10 Y silt clay with occasional fine sand. Well sorted. Sharp boundary to:
	4.41	5.00	Sand	7.5 YR 3/4 medium sand with occasional bands of 10 YR 5/1 grey sand (10 YR 5/1) and occasional sub-rounded pebble-sized clasts near base. Top of bed stained grey (Gley 1 5/10 Y) from overlying bed.
	5.00	5.40	No Recover	
	5.40	5.52	Diamict	10 YR 3/2 coarse sand with occasional sub-rounded quartzite pebbles towards base. Diffuse noundary to:
	5.52	5.61	Silt	2.5 YR 4/1 silt clay with occasional fine sand. Occasional sub-rounded quartzite pebbles towards surface. Well sorted. Sharp boundary to:
	5.61	6.00	Sand	10 YR 3/6 medium sand with occasional sub-rounded quartztie pebbles below 5.80m. Fining upwards. Uppermost part of unit stained grey (10 YR 5/1) from upper unit.
	6.00	6.25	No Recover	
	6.25	6.35	Diamict	10 YR 3/1 silt clay with frequent coarse sand and moderate sub-rounded quartzite granules and pebbles. Diffuse boundary to:
	6.35	6.45	Sand	7.5 YR 3/4 coarse sand with moderate sub-rounded granular and pebble-sized clasts. Poorly sorted. Sharp boundary to:
	6.45	6.63	Sand	2.5 YR 3/3 fine sand with moderate sub-rounded granular quartzite clasts throughout, and occasional, increasing upwards to moderate, sub-rounded quartzite clasts towards top. Moderately sorted. Sharp boundary to:
	6.63	6.94	Silt	5 YR 3/4 silt clay with occasional fine sand. Well sorted. Diffuse boundary to:
	6.94	7.00	Silt	5 YR 3/3 silt clay. Well sorted.
	7.00	7.38	No Recover	
	7.38	7.80	Sand	5 YR 4/4 medium sand with occasional sub-rounded granular and pebble-sized quartzite clasts. Poorly sorted. Sharp boundary to:
	7.80	7.87	Silt	5 YR 3/4 silt clay. Well sorted. Sharp boundary to:
	7.87	8.00	Silt	Gley 1 5/10 Y silt clay with occasional fine sand. Well sorted.
Butts BH 2	0.00	0.24	No Recover	
	0.24	0.71	Overburden	10 YR 2/1 diamict of charcoal, cinders, brick, mortar and burnt slate in a coarse sand matrix. Sharp boundary to:
	0.71	0.87	Overburden	Brick and mortar - possible a floor. Sharp boundary to:
	0.87	0.96	Diamict	7.5 YR 3/2 fine to coarse sand with occasional quartzite and brick pebble clasts. Sharp boundary to:
	0.96	1.00	Silt	7.5 YR 4/3 silt clay with occasional sand and granular-sized mortar and brick clasts. Moderately sorted.
	1.00	1.17	No Recover	
	1.17	1.22	Silt	7.5 YR 4/3 silt clay with occasional sand and granular-sized mortar and brick clasts. Moderately sorted.. Sharp boundary to:
	1.22	1.26	Silt	10 YR 3/1 silt clay with occasiional fine sand and occasional granular and pebble-sized sub-rounded quartzite clasts. Moderately sorted. Sharp boundary to
	1.26	1.28	Cultural deposit	Iron slag

	1.28	1.43	Silt	10 YR 3/1 silt clay with occasiional fine sand and occasional granular and pebble-sized sub-rounded quartzite clasts. Moderately sorted. Sharp boundary to
	1.43	1.45	Cultural deposit	Iron slag
	1.45	1.51	Silt	10 YR 3/1 silt clay with occasiional fine sand and occasional granular and pebble-sized sub-rounded quartzite clasts. Moderately sorted. Sharp boundary to
	1.51	1.73	Silt	10 YR 3/3 silt with moderate fine sand. Occasional laminae of 10 YR 2/1 burnt material, one at 1.66m containing pottery. Well sorted. Sharp boundary to:
	1.73	2.20	Sand	10 YR 4/3 lightening downwards to 10 YR 4/4 fine sand. Well sorted. Diffuse boundary to:
	2.20	2.44	Sand	7.5 YR 4/6 fine to medium sand. Well sorted.Sharp boundary to:
	2.44	3.00	Silt	7.5 YR 4/6 silt clay with occasional fine sand. Occasional granular size iron stone or charcoal at 2.88m. Well sorted.
	3.00	3.11	No Recover	
	3.11	3.16	Silt	7.5 YR 4/6 silt clay with occasional fine sand. Well sorted. Sharp boundary to:
	3.23	3.39	Silt	10 YR 4/4 silt clay. Well sorted. Sharp boundary to:
	3.39	3.60	Sand	7.5 YR 3/4 coarse sand with occasional rounded granular and pebble-size quartzite clasts. Well sorted. Sharp boundary to:
	3.60	4.00	Fluvial gravel	7.5 YR 3/2 matrix supported gravel of rounded and sub-rounded granular and pebble sized quartzite clasts in coarse sand matrix.
	4.00	4.07	No Recover	
	4.07	4.42	Sand	7.5 YR 4/3 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts. Occasional coarse sand-sized shell fragments. Sharp boundary to:
	4.42	4.75	Fluvial gravel	7.5 YR 3/4 matrix supported gravel of rounded and sub-rounded granular and pebble sized quartzite clasts in coarse sand matrix.
	4.75	5.00	Sand	7.5 YR 3/4 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts. Occasional coarse sand-sized shell fragments.
	5.00	5.59	No Recover	
	5.59	6.00	Fluvial gravel	7.5 YR 3/4 matrix supported gravel of sub-rounded granular, pebble and cobble sized clasts in a coarse sand matrix. Fining upwards.
Butts BH 3	0.00	0.38	No Recover	
	0.38	0.48	Diamict	7.5 YR 2.5/1 diamict of granular and pebble-sized angular and sub-angular brick clasts. Sharp boundary to:
	0.48	1.00	Overburden	2.5 YR 4/4 crushed brick.
	1.00	1.10	No Recover	
	1.10	1.38	Overburden	2.5 YR 4/4 crushed brick with modern floor tile at very base - possibly a floor level. Sharp boundary to:
	1.38	1.50	Sand	7.5 YR 3/1 fine medium sand with occasional granular and pebble sized quartzite clasts and moderate burnt material. Poorly sorted. Sharp boundary to:

	1.50	1.90	Sand	7.5 YR 3/3 medium sand with occasional granular and pebble-size quartzite clasts. Well sorted. Sharp boundary to:
	1.90	1.97	Silt	5 YR 4/4 silt clay with occasional fine sand and occasional pebble-sized sub-rounded quartzite clasts.
	1.97	2.00	No Recover	
Butts BH 4	0.00	0.18	No Recover	
	0.18	0.28	Diamict	10 YR 4/1 diamict of angular and sub-angular granular and pebble-sized concrete/tarmac clasts in fine sand matrix. Sharp boundary to:
	0.28	0.48	Overburden	10 YR 3/3 diamict of brick, plaster, mortar and slate granular and pebble clasts in a fine medium sand matrix. Sharp boundary to:
	0.48	0.70	Diamict	7.5 YR 3/2 diamict of brick, burnt material, mortar, plaster etc in a fine sand matrix. Sharp boundary to:
	0.70	0.77	Silt	5 YR 3/4 silt clay with occasional coarse sand and granular-sized, sub-rounded quartzite clasts. Well sorted. Sharp boundary to:
	0.77	0.85	Sand	5 YR 2.5/1 fine sand with occasional sub-rounded granular quartzite clasts. Sharp boundary to:
	0.85	1.00	Diamict	5 YR 3/4 silt clay with occasional fine sand containing pebble-size brick fragments at surface
	1.00	1.44	No Recover	
	1.44	2.00	Silt	5 YR 3/4 silt clay with occasional fine sand. Well sorted
	2.00	2.10	No Recover	
	2.10	2.42	Sand	5 YR 3/3 fine sand. Well sorted. Sharp boundary to
	2.42	2.77	Siltstone	5 YR 3/4 highly compact silt clay with moderate fine sand. Well sorted. Sharp boundary to:
	2.77	2.80	Sand	10 YR 5/3 medium sand. Well sorted. Sharp boundary to:
	2.80	2.95	Siltstone	5 YR 3/4 highly compact silt clay with occasional fine sand. Well sorted.
	2.95	3.13	No Recover	
	3.13	3.94	Sandstone	5 YR 3/4 highly compact fine sand.
	3.94	4.23	No Recover	
	4.23	4.33	Sand	7.5 YR 4/4 coarse sand with occasional sub-rounded granular quartzite clasts. Well sorted. Sharp boundary to:
	4.33	4.94	Siltstone	5 YR 4/4 highly compact silt clay with occasional fine sand. Lightening in colour upwards.
	4.94	5.00	No Recover	
Butts BH 5	0.00	0.25	No Recover	
	0.25	0.45	Overburden	10 YR 2/1 diamict of angular and sub-angular tarmac and cinder clasts in medium sand matrix. Sharp boundary to:
	0.45	0.70	Overburden	10 YR 5/2 diamict of sub-angular pebble and cobble-sized brick and concrete clasts in medium sand matrix. Sharp boundary to:
	0.70	1.00	Overburden	7.5 YR 2.5/2 diamict of sub-angular brick, plaster and mortar granular and pebble clasts in fine sand matrix. Sharp boundary to:

	1.00	1.15	No Recover	
	1.15	1.34	Overburden	10 YR 3/1 diamict of sub-rounded burnt quartzite pebbles, sub-angular brick and concrete pebbles in a medium sand matrix. Diffuse boundary to:
	1.61	1.88	Sand	7.5 YR 2.5/2 fine sand with occasional sub-angular granular and pebble clasts. Occasional charcoal fragments. Sharp boundary to:
	1.88	2.00	Silt	5 YR 2.5/1 silt clay with occasional sub-rounded quartzite granules and fine pebbles. Occasional charcoal fragments. Moderately sorted.
	2.00	2.21	No Recover	
	2.21	2.51	Sand	5 YR 3/1 fine sand with occasional sub-rounded quartzite granular and pebble clasts. Occasional charcoal fragments. Sharp boundary to:
	2.51	2.69	Sand	7.5 YR 4/3 fine to medium sand with occasional sub-rounded quartzite granular and pebble clasts. Diffuse boundary to:
	2.69	2.98	Sandstone	10 YR 5/4 highly compact fine to medium sand.
	2.98	3.21	No Recover	
	3.21	3.67	Siltstone	5 YR 3/4 highly compact silt clay with occasional sub-rounded and rounded quartzite pebbles. Well sorted.
	3.67	3.97	Sandstone	7.5 YR 3/4 highly compact fine sand with occasional fine laters of Gley 1 5/10 Y fine sand towards base. Well sorted.
	3.97	4.00	No Recover	
Butts BH 6	0.00	0.13	No Recover	
	0.13	0.26	Overburden	10 YR 2/1 diamict of medium and coarse sand with frequent sub-angular and angular granular and pebble tarmac, brick and cinder clasts. Sharp boundary to:
	0.26	0.92	Sandstone	5 YR 3/4 highly compact fine sand with occasional sub-rounded granular quartzite clasts. Interbedded with thin layers of Gley 1 6/10 GY sand, particularly towards base. Sharp boundary to:
	0.92	1.21	No Recover	
	1.21	1.51	Siltstone	5 YR 3/4 highly compact silt clay with occasional fine sand. Occasional fine layers of grey fine sand (Gley 1 5/10 Y) throughout. Sharp boundary to:
	1.51	1.61	Sandstone	5 YR 4/3 highly compact medium sand. Sharp boundary to:
	1.61	1.93	Siltstone	5 YR 3/4 highly compact silt clay with occasional fine sand and sub--rounded quartzite granular clasts.
	1.93	2.55	No Recover	
	2.55	3.00	Siltstone	5 YR 3/4 highly compact silt/clay with occasional fine sand.
Butts BH 7	0.00	0.55	No Recover	
	0.55	1.00	Diamict	10 YR 4/1 diamict of angular and sub-angular granular to cobble-sized clasts in medium sand matrix.
	1.00	1.29	No Recover	
	1.29	1.50	Diamict	2.5 YR 5/2 diamict of angular pebble-sized brick fragments in a medium sand matrix. Sharp boundary to:
	1.50	1.77	Overburden	10 YR 4/6 diamcit of crushed brick. Sharp boundary to:

	1.77	1.88	Diamict	7.5 YR 2.5/1 diamict of granular-sized angular brick fragments in medium to coarse sand matrix. Sharp boundary to:
	1.88	1.96	Diamict	7.5 YR 2.5/1 diamict of pebble and cobble-sized sub-angular brick clasts in a coarse sand matrix. Sharp boundary to:
	1.96	2.00	Sand	10 YR 3/2 coarse sand with occasional sub-angular granular-sized brick clasts.
	2.00	2.54	No Recover	
	2.54	2.88	Diamict	10 YR 3/1 diamict of sub-angular granular-sized brick fragments in a medium sand- matrix. Sharp boundary to:
	2.88	3.00	Diamict	10 YR 3/1 diamict of decomposing plant material and cobble-sized sub-angular brick fragments in medium sand matrix.
	3.00	3.56	No Recover	
	3.56	3.91	Diamict	10 YR 3/1 diamict of pebble-sized sub-round quartzite clasts, pebble to cobble-sized sub-angular brick, mortar and plaster clasts, and decomposing organics in coarse sand matrix. Sharp boundary to:
	3.91	4.00	Sand	10 YR 3/6 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts.
	4.00	4.12	No Recover	
	4.12	4.32	Sand	10 YR 3/1 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts and occasional sub-angular pebble-sized brick fragments. Well sorted. Sharp boundary to:
	4.32	5.00	Sand	7.5 YR 3/3 coarse sand with occasional granular and pebble-sized sub-rounded quartzite clasts. Well sorted.
Butts BH 8	0.00	0.12	No Recover	
	0.12	0.36	Soil	7.5 YR 3/3 silt clay with occasional fine sand. Frequent roots. Increasing sub-rounded quartzite pebbles and cobbles towards base. Moderately sorted. Sharp boundary to:
	0.36	0.69	Diamict	7.5 YR 3/4 diamcit of pebble and cobble-size sub-rounded quartzite and sub-angular brick and concrete clasts in a medium and coarse sand matrix. Sharp boundary to:
	0.69	1.00	Diamict	5 YR 3/3 diamict of granular and pebble-sized sub-rounded quartzite and pebble-sized sub-angular brick granules in a silt clay matrix.
	1.00	1.25	No Recover	
	1.25	1.81	Diamict	5 YR 3/3 diamict of sub-angular pebble and cobble-sized brick clasts in silt clay matrix. Sharp boundary to:
	1.81	1.91	Silt	5 YR 3/4 silt clay with occasional medium to coarse sand. Well sorted. Sharp boundary to:
	1.91	2.00	Diamict	10 YR 2/1 diamict of pebble and granular-sized sub-angular brick, and granular charcoal in medium sand matrix.
	2.00	2.20	No Recover	
	2.20	2.68	Diamict	10 YR 2/1 diamict of granular and pebble-sized sub-rounded quartzite clasts and sub-angular brick, concrete cobbles in medium and coarse sand matrix.
	2.68	2.73	Cultural deposit	2.5 Y 2.5/1 silt clay with frequent mortar and charcoal. Sharp boundary to:
	2.73	3.00	Silt	2.5 Y 4/1 silt clay with moderate granular-sized charcoal pieces, concentrated particularly towards base of

			unit. Possible cess content.
3.00	3.09	No Recover	
3.09	3.25	Sand	10 YR 2/1 medium to coarse sand with occasional sub-angular granular sized brick clasts. Sharp boundary to:
3.25	3.73	Silt	10 YR 4/1 silt clay, darkening downwards. Well sorted. Sharp boundary to:
3.73	4.00	Cultural deposit	10 YR 2/1 silt clay with some fine sand and occasional sub-rounded quartzite granules. Frequent charcoal and occasional burnt bone and other domestic debris.
4.00	4.64	No Recover	
4.64	4.84	Diamict	10 YR 5/2 diamict of charcoal fragments, sub-angular granular and pebble-sized brick fragments and post-medieval pottery in silt clay matrix. Sharp boundary to:
4.84	4.97	Sand	10 YR 2/1 fine to coarse sand with occasional organic contect. Sharp boundary to:
4.97	5.00	Silt	Gley 1 5/10 Y silt clay. Well sorted.
5.00	5.27	No Recover	
5.27	5.36	Silt	10 YR 5/2 silt clay with occasional sand and granular-sized sub-rounded quartzite inclusions. Well sorted. Sharp boundary to:
5.36	5.70	Cultural deposit	10 YR 2/1 diamict of charcoal and waterlogged organic matter, ceramics (pottery and tile/brick) in medium to coarse sand matrix. Sharp boundary to:
5.70	5.88	Organic mud	Gley 1 4/10 GY silt clay with occasional fine sand. Frequent roots and waterlogged wood. Moderately sorted.
5.88	6.45	No Recover	
6.45	6.60	Cultural deposit	Gley 1 10 GY medium sand containing charcoal and waterlogged organic matter. Sharp boundary to:
6.60	7.00	Sand	5 YR 3/3 medium to coarse sand with occasional sub-rounded quartzite granules and pebbles.
7.00	7.82	No Recover	
7.82	8.00	Sand	5 YR 3/3 medium to coarse sand with occasional sub-rounded quartzite granules and pebbles.

Appendix 3: The Butts, Worcester:
Geoarchaeological Analysis of monolith and core samples

Appendix 3 The Butts, Worcester: Geoarchaeological Analysis of monolith and core samples, December 2013 (Nick Watson, Department of Archaeology, University of Winchester)

Introduction

This document reports on the stratigraphy of monoliths and borehole cores collected from archaeological excavations adjacent to The Butts, Worcester in 2010 (henceforth 'the site'). The excavations were on three separate sites on the north side of The Butts and carried out by Worcestershire Historic Environment and Archaeology Service (WHEAS – now Worcestershire Archaeology) in advance of the building of The Hive (Worcester Library and History Centre). Eight monolith samples were taken from selected trench sections: <41a>, <41b>, <46>, <50>, <52>, and <55> from Cattle Market Trench 15; <422> from The Butts ('Main site'); and <426> from the Transwipers site ('City ditch'). Two geoarchaeological boreholes were also drilled through the base of Trench 15 on the Cattle Market site.

The various sections of the report below outline the geology and physical geography of the site, present the field and laboratory methodologies employed, and then first describe and later interpret the stratigraphy revealed in the samples. The final section of the report evaluates the wider significance of the stratigraphic data that have been obtained.

Geology

The site covers 2.15ha and is located south of Worcester's medieval city wall and west of the River Severn. A previous geoarchaeological assessment of cores collected by a windowless sampler from the site by Wilkinson and Marter (2006) identified a north to south stratigraphic division of the site along the route of Croft Walk. To the east lie deposits of the Triassic Sidmouth Mudstone Formation [recorded by Wilkinson and Marter (2006) as the now obsolete Eldersfield Mudstone Formation] which are butted uncomfortably to the west by alluvial deposits of the Holocene Elmore Member. Further to the east still lie the north-south trending Worcester Member, a Pleistocene terrace of the River Severn (Maddy 1999).

The Sidmouth Mudstone Formation dates to the Olenekian (251-247my BP) to Carnian (235-228my BP) stages of the Mid-Late Triassic and is a component unit of the Mercia Mudstone Group. It consists of reddish brown mudstone and siltstones which are characterised by greenish grey reduction spots and a blocky weathering habit. The sediments are usually structureless but interlaminated mudstone and siltstone can occur (BGS 2013). In contrast the Worcester Member is one of six Pleistocene terrace members of the Severn Valley Formation and is composed of cross-bedded gravels and sands. Its clastic content is predominantly Triassic quartzite pebbles with occasional flint and an admixture of glacial material (BGS 2013). Finally more than 6m of sediment from the Elmore Member of the Severn Valley Formation lie unconformably on a probable shelf cut into the Sidmouth mudstones by the Severn in the Late Quaternary (Late Devensian or Holocene) (Wilkinson and Marter 2006). The deposits are channel sands and gravels fining upwards into silts and clays. In the top of this formation are Romano-British cultural layers.

Methodology

WHEAS officers selected suitable locations for sampling and then took the monolith samples reported here. Sampling was carried out by cleaning the relevant area of section, cutting a 100mm deep rectangle of 500x100mm in the sediment, placing a piece of square section plastic guttering over the block and then removing the block and guttering. Monolith samples so-taken were labelled and wrapped in plastic film on site, while the position of the monolith samples was marked on drawings that had been made of the sections. The monoliths were removed and transported to ARCA's laboratories at the University of Winchester where they were described according to standard geological criteria (Tucker 1982, Jones *et al*. 1999, Munsell Color 2000).

ARCA drilled two boreholes through the base of the Trench 15 with the objective of sampling the base of the archaeological sequence and the underlying alluvial strata. The Drilling was carried out using a 50mm diameter Eijelkamp core sampler propelled by an Atlas Cobra petrol-powered pneumatic hammer. Continuous cores were taken from the base of the trench until the sediments became impenetrable at 3m below ground surface. Gravels prevented the drilling of borehole (BH) 1 while compact medium red sands also stopped penetration of BH 2 below 3m BGL. The top metre of deposit were not collected in the case of BH2 as a piece of the sampling device broke off and became trapped in the core chamber, preventing sediment from entering.

Cores were labelled and sealed on site and transported to ARCA's Winchester laboratory for further study.

Monolith stratigraphy

P3031 Tr15 <41a> Contexts (15048) – (15051)

Monoliths <41a> and <41b> were taken through a Roman palaeochannel [15237] at the western end of Trench 15. The section drawing describes a single monolith <41> which appears to be equivalent to <41a> here. Monolith <41b> is not recorded but appears to sample the stratigraphy (context 15051) below <41a>; the two monoliths do not overlap. The sampled stratigraphy was as follows:

0-0.23m	Unit 1	7.5 YR 4/1 Dark grey silt/clay with occasional fine to medium sand-sized mineral grains, compact and structureless. Frequent sand to granular-sized iron oxide 'spots' evenly distributed. Rare coarse pebble-sized tap slag and rare coarse sand-sized charcoal and red ceramic building material (CBM). Cultural deposit) Sharp boundary to:
0.23-0.46m	Unit 2	7.5 YR 2.5/1 Black silt/clay with occasional to frequent medium sand-sized mineral grains. Frequent granular-sized charcoal fragments and light brown clay inclusions. Rare red granules of CBM, and slag. (Cultural Deposit). Sharp boundary to:
0.46-0.55m	Unit 3	10 YR 3/3 Dark brown silt/clay with rare fine sand-sized mineral grains. Occasional granular-sized rock fragments and rare pebble-sized tap slag and bloom. (Cultural Deposit).

P3031 Tr15 <41b> Contexts (15048) – (15051)

0-0.25m	Unit 1	Void
0.25-0.27m	Unit 2	10 YR 4/2 Dark greyish brown silt/clay with frequent fine to medium sand-sized mineral grains and occasional granular to pebble-sized charcoal fragments. Rare red pebble-sized friable mudstone clasts. Diffuse boundary to:
0.27-0.57m	Unit 3	2.5 Y 5/2 Greyish brown medium sandy clay with frequent iron oxide 'spots', rare granules of charcoal and pebble-sized red mudstone clasts. Rare large well rounded pebble of quartzite.(Roman palaeochannel)

Monolith <41a> and <41b> sampled the deposits at the western end of Trench 15. The archaeological interpretation of the stratigraphy visible on site is that the sampled deposits are the fills (15051)of a possible palaeochannel of Roman date (in Monolith <41b>) ,a slag layer (15050), which sealed the channel fill, an alluvial clay (15049) and a 'tillage soil' (15048) (in Monolith <41a>).

In Monolith <41b> Units 2 and 3 (contexts 15051) are relatively coarse-grained deposits that are likely to have been laid down in a relatively high energy environment and are probably channel fills. The coarse-grained nature of the fill suggests that the running water was well oxygenated which would hinder the preservation of any organic material that might have been present. The channel was draining the east bank of the Severn before significant human occupation of the immediate environs.

In Monolith <41a> Unit 3 (context 15050) is an anthropogenically deposited sediment comprising Roman iron working detritus and includes fragments of tap slag and bloom set in a silt/clay matrix. It is overlain by a humic cultural deposit Unit 2 (Context 15049) which is predominantly composed of alluvial silt/clays laid down with organic material in a reducing environment. The silt/clay is coloured black from microbial degradation of plant material producing humic acids. A sharp boundary separates this unit from Unit 1 (Context 15048), the latter being a plough soil. Unit 1 is lighter and redder in colour than Unit 2 as a result of the oxidation of the iron minerals contained in the silt/clays, a property that is consistent with aeration by tillage. Furthermore, the unit contains cultural artefacts from the medieval period and it is laterally extensive, both of which support the interpretation that it is, in fact, a tillage soil.

P3031 Tr15 <46> Contexts (15032), (15171), (15197), (15163)

Monolith <46> samples a Late Roman ditch [15034] and later recut [15169]. The sampled stratigraphy contained within the monolith sample was as follows:

0-0.07m	Unit 1	10 YR 3/2 Very dark greyish brown silt/clay with rare medium sand-sized mineral grains. Occasional granular-sized plant fibres and a large pebble-sized angular fragment of bloom. (Cultural deposit) Sharp boundary to:
0.07-0.15m	Unit 2	10 YR 4/4 Dark yellowish brown silt/clay with 50% evenly distributed, granular-sized 10 YR 2/1 Black organic matter. (Cultural deposit). Diffuse boundary to:
0.15-0.36m	Unit 3	10 YR 4/4 Dark yellowish brown homogenous and compact silt/clay. Rare granular-sized organic inclusions at boundaries. Sharp boundary to:
0.36-0.39m	Unit 4	10 YR 2/1 Black medium sand to granular-sized charcoal fragments. (Cultural deposit) Sharp boundary to:
0.39-0.47m	Unit 5	10 YR 4/4 Dark yellowish brown compact silt/clay with occasional sand to granular-sized inclusions of charcoal. Sharp boundary to:
0.47-0.50m	Unit 6	2.5 Y 5/3 Light olive brown with 7.5 YR 4/3 Brown mottles compact silt/clay with rare large rounded pebble of siliceous rock. (Reworked? Sidmouth Mudstone Formation)

Monolith <46> sampled the fills of a Roman ditch [15169], filled by first Context (15197), then (15171) and lastly (15032). Unit 6 appears to be an alluvial deposit of reworked silt/clays derived from the underlying/adjacent Sidmouth Mudstone Formation. Overlying it and presumably the first fill of the ditch is an alluvial silt/clay, Unit 5 (Context 15197), in which charcoal granules have been incorporated, most probably from the unit above, while the silt/clays were exposed to the air and unconsolidated. The unit of charcoal (Unit 4) is an anthropogenically deposited sediment and shows no signs of being fluvially laid: there is no long axis orientation, interlaminations of clay nor any sorting of the particles. Sealing Unit 4 are homogenous and structureless alluvial silt/clays. This may be a deposit which has been deliberately laid down by human action or, alternatively it might be fluvial in origin, however, the lack of any fine structure (e.g. laminations), as would be expected within a low energy alluvial fill settling from suspension in a small basin, augers against this latter mode of formation. On the other hand, bioturbation and deformation processes (the compact nature of the Unit is an indication of this) will remove fine structure: the balance of the evidence weighs towards a fluvial origin. The archaeological recording of the stratigraphy suggests that the ditch is recut and that Unit 2 represents the first fill. This fill is a mixed stratum of granular-sized organic remains and yellowish brown silt/clay inclusions. There is no evidence of any gradational structure based on particle size which could relate to fluvial processes, and as a consequence, it is suggested that Unit 2 is deliberately deposited. It is overlain by Unit 1 which is a further deliberately deposited sediment of similar material to Unit 2 and includes iron working refuse.

P3031 Tr15 <50>

Monolith <50> sampled a possible palaeochannel of Roman age. The section drawing distinguishes a layer between 0.13-0.24m containing furnace bloom and ceramic sherds. The sampled stratigraphy was as follows:

0-0.24m	Unit 1	7.5 YR 4/2 Brown silt/clay with compact prismatic structure and rare fine sand-sized mineral grains. Occasional sub-angular to rounded granular to pebble-sized rock fragments (green grey fine grained sandstone) and cultural material (including a decorated sherd of possible Oxford Colour Coated Ware of 3-4th century date, and pebble-sized furnace bloom). Occasional roots and iron oxide staining along root holes. Rare granules of charcoal. (Cultural deposit). Sharp boundary to:
0.24-0.41m	Unit 2	7.5 YR 4/1 Dark grey silt/clay with compact prismatic structure and rare fine sand-sized mineral grains. Occasional sub-angular to rounded granular to pebble-sized rock fragments. (Weathered bedrock?). Sharp boundary to:
0.41-0.45m	Unit 3	5 Y 6/4 Pale olive silt/clay (Sidmouth Mudstone Formation)

The section drawing records both monoliths <50> and <52> (see below) as coming from the same position, however, labelling supplied with the samples describes <50> as from the ‘Lower Roman palaeochannel’ and <52> as from the ‘Upper Roman palaeochannel’.

Unit 3 in monolith <50> is an indurated silt/clay with green grey reduction ‘spots’ suggesting an origin in the Sidmouth Mudstone Formation. Unit 3 is overlain by a darker silt/clay (Unit 2) with a blocky/prismatic habit which is possibly the *in situ* weathered Sidmouth Mudstone Formation bedrock and through which the palaeochannel has cut. On the other hand, Unit 2 may be a reworked lower fill of the channel, the distinction is unclear within the 100mm sample window of the monolith. A cultural deposit containing pottery and furnace bloom (Unit 1) completes the stratigraphic sequence. Unit 1 is a bioturbated silt/clay with a poorly developed ped structure and possibly represents a soil developed within Unit 2 below be that weathered bedrock or ditch fill.

P3031 Tr15 <52>

As noted above monolith <52> sampled the upper part of a possible Roman palaeochannel. The sampled stratigraphy was as follows:

0-0.66m	Unit 1	10 YR 3/2 Very dark greyish brown silt/clay with occasional medium sand-sized mineral grains. Granular crumb structure, occasional bioturbation (fine roots). Occasional granular-sized charcoal and red CBM. Rare pebble-sized well rounded quartz and quartzite clasts, occasional granular to pebble-sized angular furnace bloom, rare pebble-sized twig (waterlogged) and one rib fragment (sheep size). Frequent dendritic iron oxide staining and light yellow dendritic powdery coating to crumbs (limonite?). (Cultural deposit).

A single sedimentary Unit (1) is recorded in monolith <52>. It is a deposit that is likely to have been deliberately laid down by a human agency, and is a diamict composed of clastic cultural refuse, in particular iron working debris, and rock fragments set in a silt/clay matrix with a granular crumb structure. It is bioturbated by plant roots with frequent diagenetic secondary iron oxides around root holes and crumb surfaces. The concentration of iron oxide deposition increases towards the base and may be evidence of rainwater leaching or a former water table. Well-rounded quartzites have an origin in the gravels of the Worcester Member and /or the Elmore Member - though the latter is less probable - both of which were undoubtedly quarried in the past.

P3031 Tr15 <55> Contexts (15027) and (15199)

Monolith <55> sampled the fills of a ditch thought to date to the English Civil War of the mid-17th century. The sampled stratigraphy was as follows:

0-0.16m	Unit 1	Void
0.16-0.40	Unit 2	10 YR 2/1 Black silt/clay/organic mud with rare fine sand-sized mineral grains, rock fragment granules and clay inclusions. Rare large pebble-sized angular sherd of red tile. Sharp boundary to:
0.40-0.43m	Unit 3	5 Y 5/1 Grey silt/clay with 7.5 YR 5/3 Brown mottles. Rare rounded red sandstone pebbles.

Unit 3 is a grey and red mottled silt/clay and represents the geological stratum through which the ditch is cut. It appears to be either the weathered top of the Sidmouth Mudstone Formation or redeposited material originating from that unit. The overlying stratum (Unit 2, Context 15199) is the basal fill of the ditch and is an organic mud mixed with the plastic silt/clays derived from the sides and base. The succeeding layer (Unit 1, Context 15027) is a dense black organic mud that is likely to have resulted from the decomposition of organic waste under anaerobic conditions. The component particles were most likely deposited into the ditch by rainwater runoff and/or deliberate disposal. There is no evidence (e.g. in terms of sediment structure, grain size or sorting properties) for the ditch containing running water, rather, Units 1 and 2 are indicative of stagnation.

P3031 <422> Contexts (8882) – (8883)

0-0.44m	Unit 1	10 YR 2/1 Black sandy silt/clay with frequent medium to coarse sand-sized mineral grains and occasional granular-sized clasts of sub-angular flint, rounded quartz and quartzite. Friable granular crumbs and unstructured, no bioturbation. Rare pebble-sized red ceramic sherd, rounded quartzite and an unidentified igneous rock (Cultural deposit). Gradual boundary to:
0.44-0.85m	Unit 2	10 YR 3/2 Very dark greyish brown, lightening towards base, sandy silt/clay with frequent medium to coarse sand-sized mineral grains and occasional granular-sized sub-angular flint, rounded quartz and quartzite. The sand-sized fraction increases towards base. Friable and unstructured, no bioturbation. Occasional pebble-sized rounded quartzite clasts, frequent at base.

Monolith <422> sampled strata interpreted as Dark Earth and a ditch fill in Area 6 which was part of Area 1 the main excavation site located in the former Worcester City Council depot, between The Butts to the south and the railway viaduct to the north. There is no section drawing available that show the stratigraphic context of this monolith. The sampled stratigraphy is shown above.

Unit 2 comprises redeposited sandy silt/clays derived from the Sidmouth Mudstone Formation with gravel clasts probably derived from the Worcester Member to the east (gravels from the Elmore Member are only to be found as a subcrop to the west). The unit appears to be normally bedded and lighten upwards (i.e. increasing in Munsell value and decreasing in sand content) and grades into Unit 1, a massive, black, cultural diamict with ceramic sherds and quartzite clasts set in a silt/clay matrix. The latter clasts are conglomerated as a friable granular crumb structure. There is no evidence of waterlain deposits in the monolith and rather the unit appears to have been deliberately deposited. The archaeological interpretation is that the deposit is a Dark Earth forming in the Late/Sub-Roman period. It has been suggested by MacPhail (2004, cited in Wilkinson and Marter 2006) that Dark Earth deposits derive from animal manure and middens. If the deposit were laid down incrementally under a regime of tillage, then an unstructured mass as recorded in the monolith would result.

P3031 <426> Contexts (2541) – (2557) – (2556)

Monolith <426> sampled fills of medieval and Civil War city ditch on the Transwipers site. The sampled stratigraphy was as follows:

0-0.04m	Unit 1	2.5 Y 3/3 Dark olive brown medium sand. Sharp horizontal boundary to:
0.04-0.18m	Unit 2	2.5 Y 2.5/1 Black homogenous and compact organic mud. Pebble-sized Roman? rim sherd at top. Sharp boundary to:
0.18-0.21m	Unit 3	2.5 Y 3/3 Dark olive brown medium sand. Sharp dipping boundary to:
0.21-0.46m	Unit 4	2.5 Y 2.5/1 Black organic mud with rare fine sand-sized mineral grains. Rare well rounded, small quartz and quartzite pebbles and sub-angular mortar fragments. Rare land molluscs and waterlogged twigs. Rare granular-sized red friable and irregular elongated lenses of mudstone towards top. Medium sand lamina marks the lower boundary. Sharp dipping boundary to:
0.46-0.62m	Unit5	2.5 Y 2.5/1 Black organic mud with rare medium sand-sized mineral grains increasing towards base. Rare well rounded, fine quartz and quartzite pebbles and sub angular mortar fragment. Rare land molluscs, waterlogged twigs and charcoal (Fluvial deposit) Gradual dipping boundary to:
0.62-0.90m	Unit 6	5 YR 4/2 Dark reddish grey medium sandy clay, matrix supported, with occasional granular to cobble-sized, rounded quartzite and limestone clasts. Rare granular-sized plant fragments.(Fluvially reworked deposit)

Unit 6 is fluvially reworked sandy silt/clay of the Sidmouth Mudstone Formation through which the ditch has been cut while the gravel clasts probably derived from the Worcester Member. The overlying Units 4 and 5 are humic cultural deposits deliberately deposited into the ditch with no evidence for fluvial reworking, although waterlogging has preserved macroscopic plant remains (twigs) (it is notable in this respect that the deposits were level with the water table at the time of excavation). A lamina of medium sand (recorded as the base of Unit 4) separates the two units and was possibly deposited by storm runoff down the north bank into the course of the ditch. Rare, irregular, granular-sized, red sandy silt/clay lenses which dip gently at c.8º south characterize the top of Unit 4 and are the result of human recutting of the ditch sides. The succeeding Unit 3 is a thin and approximately horizontal sand which may also have been deposited as a result of storm water flow. At this point the ditch was shallow with a wide base and the penultimate deposit (Unit 2) is 0.14m of homogenous, black organic mud indicative of a tranquil, low energy environment in which fine-grained minerogenic sediment formed in slack water and under anoxic conditions. The humic content is likely to be the result of microbial degradation of aquatic plants growing in the ditch. The final Unit 1 a third bed of medium sand 0.04m thick. The section drawing indicates that the top of the monolith is level with brick footings (no context number is visible on the section drawing) which appear to cut Context 2519 and it is possible that Unit 1 is associated with the construction of the footings).

Borehole stratigraphy

As outlined above, two boreholes were drilled through the base of Trench 15 on the Cattle Market site to sample alluvial strata attributable to the Elmore Member.

BH1

0.00-0.08m	Unit 1	10 YR 3/2 Very dark greyish brown silt/clay with rare granular plant fibres and oxide stains. Sharp boundary to:
0.08-0.65m	Unit 2	5 Y 5/1 Grey silt/clay. Sharp boundary to:
0.65-0.69m	Unit 3	5 YR 4/3 Reddish brown diamict of sub-rounded granular-sized quartzite clasts in a fine to medium sand matrix. Sharp boundary to:
0.69-0.86	Unit 4	5 Y 5/1 Grey silt/clay with occasional beds of diamict and fine, straight, parallel fine sand laminae
0.86-1.0m	Unit 5	Void.
1.0-1.12m	Unit 6	7.5 YR 4/4 Brown diamict of sub-rounded to well-rounded pebble-sized quartzite clasts in a medium sand matrix. Sharp boundary to:
1.12-1.4m	Unit 7	7.5 YR 5/4 Brown medium sand. Well sorted. Sharp boundary to :
1.40-1.63m	Unit 8	7.5 YR 4/4 Brown diamict of sub rounded to well rounded granular to pebble-sized quartzite clasts in a medium sand matrix. Sharp boundary to:
1.63-1.84m	Unit 9	7.5 YR 5/4 Brown fine to coarse sand. Poorly sorted. Sharp boundary to :
1.84-2.51m	Unit 10	Void
2.51-2.93	Unit 11	7.5 YR 4/4 Brown diamict of sub-rounded to well-rounded granular to pebble-sized quartzite clasts in a medium sand matrix. (Elmore member)
2.93-3.0m	Unit 12	2.5 YR 4/3 Reddish brown mudstone with green reduction spots. (Sidmouth Mudstone Formation)

BH2

1-2m 2-3m

1.0-1.40m	Unit 1	10 YR 4/2 Dark greyish brown silt clay with occasional medium sand. (Alluvial silt/clay). Diffuse boundary to:
1.40-2.0m	Unit 2	5 YR 4/2 Dark reddish grey medium sand with rare silt clay. Well sorted. (Alluvial sand reworked from the Sidmouth Mudstone Formation).
2.0-3.0m	Unit 3	5 YR 3/4 Dark reddish brown, indurated, medium sand with rare silt clay. Well sorted. (Reworked Sidmouth Mudstone Formation).

In BH1 the Sidmouth Mudstone Formation (Unit 12) is recorded at 2.93m below the base of Trench 15. It is unconformably overlain by interbedded coarse sands and diamicts Units 6 to 11) which represent a high energy channel facies of the Elmore Member and therefore indicate that the River Severn migrated across the site during its deposition. The gravel-sized clastic content comprises well-rounded quartzites derived from conglomeratic facies of the Sidmouth Mudstone Formation. Lenses of ‘diamict’ perversely contain both clay grade and pebble grade particles indicative of high and low energy fluvial regimes. Their formation might be explained by accreting alluvium deposited during slack water trapped within the interstices of clasts on coarse channel bars, followed by rapid burial by a high energy bed load. The succeeding strata (Units 4 to 2) represent the low energy floodplain deposits of the Elmore Member. Unit 4 is interlaminated silt/clays and fine sand that was probably deposited on a levee as the channel migrated across its floodplain. Unit 3, a diamict, is perhaps a crevasse splay formed when the channel stream breaks its levee and deposits coarse grained sediment on the floodplain. The penultimate Unit 2 is c.0.6m of grey silt/clay characteristic of deposits that accumulate on floodplains as fine particles settle out of suspension when flood water recedes. Unit 1 is a dark coloured oxidised deposit containing fine plant fibres which appears to truncate the underlying alluvium and is possibly an archaeological deposit at the base of Trench 15.
A comparable succession has been described in BH2 The Butts by Wilkinson and Marter (2006).

In BH2 a dark red indurated medium sand (Unit 3) is recorded at 2m below the base of Trench 15 This represents a channel fill deposit derived from the Sidmouth Mudstone Formation. Unit1 is conformably overlain by further medium sands tending to a reddish grey colour that is indicative of a gradually increasing silt/clay content. The Unit is the fill of a silting up channel that is eventually buried by grey silt/clay alluvium of Unit 1. The sampled strata are alluvial facies of the Elmore Member.

Conclusion

The study area sampled the Late Quaternary Elmore Member of the Severn Formation which comprises a fining upward sequence of channel gravels and sands to silt and clay floodplain deposits. These alluvial facies were recorded from boreholes drilled though the base of Trench 15. The palaeochannels and floodplain strata underly archaeological deposits of Roman date and indicate that the River Severn had migrated westwards to its present position and which therefore permitted occupation of the floodplain to the east.

Three monoliths (<52>,<50>,and <41a>) sampled fills of what are believed to be Roman palaeochannels which drained the floodplain eastwards. The later fills all contained cultural material, particularly metal working detritus which may have been deposited to fill the channels and level the floodplain surface in the Roman period. A fourth monolith (<41b>) sampled only the basal fill of a palaeochannel and did not contain any cultural material which suggests these palaeochannels were active before recognisable human occupation on the floodplain. A Roman ditch was sampled by monolith <46> and it too shows the same pattern as the palaeochannels: an early alluvial fill followed by a later anthropogenic deposit of metal working waste, in this case deposited into the recut ditch. The presence of an alluvial fill in the base of the ditch implies that it served as a drainage ditch and was perhaps dug for this very purpose improving upon or, at least, augmenting the network of palaeochannels on the floodplain.

Monolith <426> sampled fills of the medieval and Civil War city ditch which had been cut through the Sidmouth Mudstone Formation. The early fills are fluvially reworked sandy silt/clay derived from the bedrock and are indicative of running water. With the passage of time though the ditch silted up as can be seen from the presence of black organic mud comprising the later fills. Through put of water was intermittent and the ditch would probably have contained isolated ponds of stagnant water for much of the year.

Finally, the sampled stratum from monolith <422> is interpreted as a Late/Sub Roman Dark Earth because of its characteristic black colour, its lack of internal structure, and its clastic content that included local rock fragments and ceramic sherds.

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Appendix 4: Notes on Site visit to The Butts excavation (post-Roman dark earth)

Appendix 4 Notes on Site visit to The Butts excavation, Worcester, 24/09/08 (Dr Steve Lancaster, Headland Archaeology)

Introduction
These notes relate to a site undertaken to the two areas being excavated as part of the excavation at The Butts. The visit was undertaken specifically with a view to advising on the value of undertaking thin section analysis on possible post-Roman dark earth deposits encountered on both parts of the site. This follows the discovery a variety of different dark earth deposits in excavations in other nearby parts of the city, which have been subject to thin section analysis, producing an interpretation that suggests different and changing conditions of formation, pointing to different and changing land use around the outskirts of the town.

Cattle Market
The sequence of deposits in the trench examined was as follows:

- 1) A layer of grey moderately to well sorted fine sand, indicating alluvial deposition and probably a channel fill;
- 2) A thin, uneven layer composed principally of fragments of slag;
- 3) A layer of material composed of chaotically arranged, poorly mixed dark brown silt, including abundant small stones (1-4mm) and charcoal fragments;
- 4) A layer of well sorted grey brown silt, with rare orange flecks, possibly fragments of tile or marl. Weakly developed blocky structure at base of deposit, grading to a well developed crumb structure at the top of the deposit. Colour also grades to a dark grey brown toward the top of the deposit, and the texture becomes more humic.

The deposit initially identified as a dark earth is number 4 in the sequence. This deposit appears to be a an alluvial deposit, probably of the kind associated with overbank flooding, that has subsequently developed into a soil, leading to the formation of the darker, crumb structured upper part of the deposit, which constitutes the ‘A’ horizon of the soil. There is unlikely to be much additional information to be gained through thin section analysis of samples from this layer.

The third deposit of the sequence is potentially a more interesting deposit. The distribution of components reflects the deposition process, which would have been rapid and chaotic. Possible processes involve deliberate dumping of material, perhaps as part of an attempt to manage the floodplain area, or a relatively high energy flood event. Thin section analysis of samples from this deposit should provide evidence concerning the process of deposition and the composition of the deposit, that would aid in identifying the source of the deposit. Three Kubiena tin samples were taken from this deposit, covering the boundary with the overlying alluvium deposit.

The Butts
A sequence was recorded from the trench section, through the deposits below a modern layer of hardcore. Depths in the description are from the interface between the hardcore and dark earth deposit.

0-15 cm Dark grey brown sandy silt loam, with flecks of red clay, mortar and charcoal, 2-4 mm. Occasional to frequent pebbles (2-6 cm). This layer produced a fragment of

porcelain, indicating intrusion of modern material, possibly as a result of gardening during the nineteenth century.
15-31 cm Dark grey brown sandy silt loam, with frequent flecks of red clay and charcoal, 2-4 mm and rare fragments of mortar and slag (1-2 cm). Occasional to frequent pebbles (2-6 cm).
31-59 cm Dark grey brown sandy silt loam, with frequent irregularly shaped fragments of red clay (up to 9 cm) and charcoal (up to 1 cm), and common to occasional fragments of coal (5-6mm). Occasional to frequent pebbles (2-6 cm). Upper boundary grades in over 3-5 cm.
59-71 cm Dark brown humic silt loam, with frequent pebbles (0.5-6 cm), increasing to dominant pebbles with loam as infill.
71+ cm Cobbled layer.

The base of the sequence (59-71 cm) appears to be a buried soil. It is highly stony and seems to have developed around and above the cobble layer, suggesting a layer forming after abandonment.

The chaotic distribution of components throughout the rest of the deposit suggests the rapid deposition of the rest of the sequence. The reduction in size of the clay and charcoal component that occurs upwards through the profile suggests the impact of later soil forming processes, particularly the effects of reworking by root and earthworm activity. The origin of the dark earth material is difficult to be certain of: possibilities include the deposition of animal dung and the collapse of buildings partially constructed with earth or turf. Thin section micromorphology should be able to distinguish these processes, and therefore there will be some value in examining thin sections from the profile: five samples have been taken. The disturbed nature of at least the top part of the profile must be noted: simple control methods through sampling should allow the depth of disturbance to be identified.

Recommendations

- The three Kubiena samples from the Cattle Market should be analysed
- A series of bulk samples should be spit sampled form the profile from which the Kubiena tins on the main Butts excavation were taken. The spits should be taken at 10 cm intervals.
- The bulk samples should be processed for small finds in order to establish the likely depth of later disturbance of the dark earth deposit.
- Using the findings from the bulk samples, Kubiena tin samples from undisturbed sections of the profile should be subject to thin section analysis.

Appendix 5: Dark Earth, The Butts, Worcester: Soil Micromorphology, Chemistry and Magnetic Susceptibility

Appendix 5 Dark Earth, The Butts, Worcester: Soil Micromorphology, Chemistry and Magnetic Susceptibility

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Introduction

Seven Kubiena monolith box samples of a ~0.5 m thick dark earth soil, associated with a late Roman stone building (possibly a drying oven), at The Butts, Worcester, was received from Nick Daffern (Worcestershire Archaeology, Worcestershire Archive and Archaeology Service). The dark earth was investigated employing soil micromorphology (UCL), chemistry and magnetic susceptibility (UWLAS), as previously utilised at previous dark earth sites at Worcester and across Europe (Goldberg and Macphail, 2006; Macphail, 2004; Macphail *et al*., 2007).

Methods

The seven Kubiena box samples were assessed, and six were selected for study employing soil micromorphology (see Tables 2-3). Before resin impregnation of the Kubiena samples, four bulk samples were extracted from these monoliths at the following depths: 0-80mm, 60-140 mm, 180-260 mm and 360-440 mm.

Chemistry and magnetic susceptibility

Analysis was undertaken on the fine earth fraction (i.e. < 2 mm) of the samples. Phosphate-P_i (inorganic phosphate) and phosphate-P_o (organic phosphate) were determined using a two-stage adaptation of the procedure developed by Dick and Tabatabai (1977) in which the phosphate concentration of a sample is measured first without oxidation of organic matter (P_i), using 1N HCl as the extractant; and then on the residue following alkaline oxidation with sodium hypobromite (P_o), using 1N H_2SO_4 as the extractant. Phosphate-P (total phosphate) has been derived as the sum of phosphate-P_i and phosphate-P_o, and the percentages of inorganic and organic phosphate calculated (i.e. phosphate-P_i:P and phosphate-P_o:P, respectively). LOI (loss-on-ignition) was determined by ignition at 375oC for 16 hours (Ball, 1964).

In addition to χ (low frequency mass-specific magnetic susceptibility), determinations were made of χ_{max} (maximum potential magnetic susceptibility) by subjecting a sample to optimum conditions for susceptibility enhancement in the laboratory. χ_{conv} (fractional conversion), which is expressed as a percentage, is a measure of the extent to which the potential susceptibility has been achieved in the original sample, viz: (χ/χ_{max}) x 100.0 (Tite, 1972; Scollar *et al.*, 1990). In many respects this is a better indicator of magnetic susceptibility enhancement than raw χ data*,* particularly in cases where soils have widely differing χ_{max} values (Crowther and Barker, 1995; Crowther, 2003). χ_{conv} values of ≥ 5.00% are often taken as being indicative of some degree of susceptibility enhancement. A Bartington MS2 meter was used for magnetic susceptibility measurements. χmax was achieved by heating samples at 650°C in reducing, followed by oxidising conditions. The method used broadly follows that of Tite and Mullins (1971), except that household flour was mixed with the soils and lids placed on the crucibles to create the reducing environment (after Graham and Scollar, 1976; Crowther and Barker, 1995).

Soil micromorphology

Kubiena monolith samples (Tables 2-3) were impregnated with a clear polyester resin-acetone mixture; samples were then topped up with resin, ahead of curing and slabbing for 75x50 mm-size thin section manufacture by Spectrum Petrographics, Vancouver, Washington, USA (Goldberg and Macphail, 2006; Murphy, 1986)(Figs 1 and 19). Thin sections were further polished with 1,000 grit papers and analysed using a petrological microscope under plane polarised light (PPL), crossed polarised light (XPL), oblique incident light (OIL) and using fluorescent microscopy (blue light – BL), at magnifications ranging from x1 to x200/400. SEM/EDS (Energy Dispersive X-ray Spectrometry; (Weiner, 2010)) was carried out on M5325A (Table 3, Figs). Thin sections were described, ascribed soil microfabric types (MFTs) and microfacies types (MFTs)(see Tables 2 and 3), and counted according to established methods (Bullock et al., 1985; Courty, 2001; Courty *et al*., 1989; Macphail and Cruise, 2001; Stoops, 2003; Stoops *et al*., 2010).

Results

Chemistry and magnetic susceptibility

The analytical results, with the key anthropogenic features of individual contexts highlighted, are presented in Table 1. Here, a broad overview of the individual soil properties is presented.

Loss-on-ignition

None of the samples analysed is particularly organic rich, though, as would be anticipated, there is a progressive reduction in LOI (from 2.90–1.50%) down through the profile. It should be noted that the soil will undoubtedly have been subject to some degree of post-burial organic decomposition, and that these values may therefore significantly underestimate the original organic matter concentrations present.

Phosphate (phosphate-P_i, P_o, P, P_i:P and P_o:P)

The four samples show quite marked variability in phosphate-P, with concentrations ranging from 1.10 mg g^{-1} in the basal sample to 2.03 mg g^{-1} at 6–14 cm. In view of the small number of samples and absence of 'control' samples, it is difficult to assess the extent to which the soil has been enriched. However, none of the values are particularly high, and only the sample at 6–14 cm shows likely signs of phosphate enrichment, as might be associated with the incorporation of midden material, etc. As is generally the case with palaeosols, particularly where some degree of post-burial organic decomposition is likely to have taken place, the majority of the phosphate is in inorganic forms, with the phosphate-P_i:P ratio ranging from 88.3–90.6%. The fact that the sample with the highest phosphate-P concentration does not have a notably higher proportion of inorganic phosphate suggests that bone-derived phosphate is not a major factor in the likely enrichment observed.

Magnetic susceptibility (χ, χ_{max} and χ_{conv})

All four samples have a quite a high χ (range, 120–194 x 10^{-8} m^3 kg^{-1}) and relatively low χ_{max} (range, 905–1200 x 10^{-8} m^3 kg^{-1}). The resulting χ_{conv} values range from 13.3–16.2%, and well exceed the 5.00% threshold which is often taken as being indicative of enhancement through burning under UK conditions. Here, all four samples have been categorised as ‘strongly enhanced’ (10.0–29.9%). Enhancement of this magnitude seems likely to be the result of the inclusion of material affected heating/burning (e.g. hearth residues) and/or the effects of *in situ* heating/burning.

Overall, the analytical results provide likely evidence of phosphate enrichment at 6–14 cm and strong evidence of either the inclusion of material affected heating/burning (e.g. hearth residues) or the effects of *in situ* heating/burning throughout the dark earth profile investigated (see soil micromorphology, below).

Soil micromorphology
Results are presented in Tables 2-3, illustrated in Figs 1-27, and supported by material on the accompanying CD-Rom. 17 characteristics were identified and counted from 7 sub-units found in the 7 thin sections analysed. These findings are presented from the base upwards.

Lowermost Context 8882; 300-380 mm (M421F): This is composed of weakly prismatic, poorly humic and very poorly sorted gravely sands (common gravel – max 18mm)(Fig 1). The fine fabric includes rather more very fine amorphous and charred organic matter up-profile, albeit still in small amounts. The soil contains examples of coprolitic bone (max 1.5mm), occasional fine wood charcoal (max ~1.7mm), rare burned sand and trace amounts of burned clay/brick, rare rounded clay daub (max 3mm) and brickearth/brick like material, and trace amounts of micaceous silty clay (daub?; 4mm max)(Figs 2-5). An enigmatic rubefied, possible ‘industrial’ waste? (>2mm) fragment, is also present. This lowermost context is characterised by very abundant broad burrows, with occasional thin burrows, and abundant broad and occasional thin organo-mineral excrements. Bulk analyses identified a strongly enhanced magnetic susceptibility – 13.3% χ_{conv}.
The base of the sampled dark earth sequence, is made up of weakly humic, subsoil sands and gravels, with general biomixing and partial homogenisation of the weakly humic soil and, upwards, soil containing higher amounts of charred organic matter, and finely fragmented background anthropogenic materials, of settlement waste origin including charcoal, coprolitic bone, clay daub and micaceous clay (of alluvial origin?). This appears to be a possible truncated natural subsoil which was affected by dilute spreads of occupation debris; as reflected in the strongly enhanced magnetic susceptibility.

Context 8882; 240-320 mm (M421D): This is a massive weakly humic loamy sand, with frequent gravel (max 12mm), becoming a more humic sandy loam upwards. Anthropogenic inclusions are: examples of coprolitic bone (max 2.5mm), occasional fine wood charcoal (max 2mm), occasional burned sand and trace amounts of burned clay/brick, rare traces of clay/daub and brickearth like material, and occasional micaceous silty clay (daub?; 2.5mm max) – with one moderately strongly burned example (Figs 6-7). Two examples of yellow, isotropic Fe-P/Fe-Ca-P faecal nodules (~400 µm), were recorded (Figs 8-9). Very abundant thin and broad burrows, and many thin and broad organo-mineral excrements, occur.

This is a mainly homogenised, increasingly very fine charcoal-rich sandy loam containing faecal waste and burned settlement debris. Microprobe studies of phosphate nodules have commonly found a Fe-Ca-P (iron-calcium-phosphate) chemistry; and such inclusions may hint at manuring or simply middening; here, at this level, these phosphate inputs are not intensive, but higher than below (cf. 1.80 mg g^{-1} with 1.10 mg g^{-1})(Galinié *et al*., 2007; Henning and Macphail, 2004; Karkanas and Goldberg, 2010).

Upper Context 8882; 180-260 mm (M421C):This is a prismatic structured moderately humic sandy loam with few gravel (max 6mm), containing increased amounts of hearth and industrial debris upwards, albeit in very small amounts (namely: occasional iron slag with neoformed Al-silicates? 'fayalite'; max 2mm (Figs 10-11) and a patchy rare fine charcoal-rich matrix soil with reddish clay coatings in uppermost few cms). Also present are trace amounts of very fine coprolitic bone (<1mm), many fine wood charcoal (max 2.5mm), occasional burned sand and a trace of burned clay/brick and Fe-P-Ca nodules (cess?). Amounts of burrows and excrements are the same as in M421D, with a partial excremental fabric formed; some unworked reddish clay zones are still present (Figs 12-13).

The uppermost part of Context 8882 is an almost totally homogenised dark earth soil formed from general settlement middening waste, with input of industrial iron-processing debris soils (?). The presence of iron slag in the dark earth at Worcester is not unusual, and was ubiquitous as coarse inclusions at the Deansway site, some hundreds of metres away (N. Daffern, pers. comm.)(Dalwood and Edwards, 2004). At The Butts site, however, the slag, formed of probable fayalite and dendritic iron oxide (wustite)(Macphail, 2003a)cf (Kresten and Hjärthner-Holdar, 2001), is always only sand size, indicating this site is removed from the centre of iron-working debris at Worcester; it may be in a secondary/tertiary location. It is also likely that this is a partially earthworm-worked, stone-free soil, marking a period of stasis – perhaps before the area was re-occupied in relationship to the construction of a late Roman drying oven, and the formation of overlying Context 8856 above (N. Daffern, pers. comm.)(see below). Soil with reddish clay textural pedofeatures is discussed in more detail below, for Context 8856.

8856; 120-200 mm (M421E): The lower part of this context is a poorly prismatic structured sandy loam with frequent gravel (max 11mm). It also shows very abundant broad burrowing from above, bringing in rubefied/charred humic fine soil, which includes phytoliths and is often characterised by occasional soil with relict reddish very finely dusty clay void coatings and infills (see Figs 12-13); trace amounts of possible fine calcitic ash are also possibly present. Many burned (rubefied) sands and gravel, occasional fine fragments of iron slag and charcoal (2mm max), occasional burned clay/brick (max 6mm) and trace amounts of very fine coprolitic bone, phosphate nodules (e.g. with vivianite), also occur (Figs 14-16). The layer is characterised by a strongly enhanced magnetic susceptibility - 15.1% χ_{conv}.

Waste disposal recommences and includes much burned material, including fine fragments of iron slag and burned sand and gravel – tertiary residues from industrial processes(?). Charred humic matter and trace amounts of phosphate indicate small amounts of mineralised faecal inputs. The presence of rubefied fine soil which contains phytoliths, and the presence of reddish clay void coatings, may be significant. Reddish clay textural pedofeatures in charcoal-rich microfabrics have been found elsewhere, in a corn dryer deposit at the Roman farmstead of Heathersett, Norfolk, where monocotyledonous charcoal, burned clay and an enhanced magnetic susceptibility were all recorded (Macphail and Crowther, 2005). It can be noted that weathered ash releases K (potassium) mobilising very fine burned soil (cf. (Courty and Fedoroff, 1982; Slager and Van der Wetering, 1977).

8856; 60-140 mm (M421B): This is a burrow fragmented, prismatic sandy loam with few gravel (ferruginous fine sandstone - max13mm). Mixed fine fabrics containing much very fine charred organic matter, with very few burrow fills of generally rubefied burned micaceous fine fabric, rich in charcoal and containing phytoliths (Fig 17). Rare rubefied micaceous clay inclusions embed examples of pollen/spores (Fig 18). Also present are occasional charcoal (max 5mm), burned sand with strongly rubefied aggregates(?), rare fine iron slag and trace amounts of coprolitic bone. (For bulk chemistry, see M421A, below)

Burned anthropogenic waste is dominant, and likely reflects the disposal of small size debris. This includes unknown use of micaceous clay (of original wetland origin?) which became mixed with organic matter (including phytoliths), and which became burned. This may suggest the deposition of small size debris around the Late Roman drying oven, possibly through human and animal traffic, where it became biologically mixed into the dark earth soil.

8856, 0-80 mm (M421A): This slide is divided into two sub-units, a bioworked 'buried soil' and an upper spread of coarse constructional material (Fig 19).
35-80 mm: Here Context 8856 is a homogeneous (total excremental fabric) humic sandy loam with very few small gravel (max 4mm), and includes amorphous organic matter fragments within fine fabric (Figs 20-22). The layer also contains occasional fine iron slag including, a 4mm-size example of rusty vesicular iron slag, an example of pot (11mm), rare burned mineral materials and charcoal (max <1mm), and an example of fine burned bone. Rare coprolitic bone and Fe-P nodules are also present. Bulk analysis recorded a relatively high LOI (2.60%), phosphate-enrichment (2.03 mg g^{-1}) and strongly enhanced magnetic susceptibility (15.4%χ_{conv})(Table 1).

This is an earthworm-worked and biologically homogenised, almost stone-free soil, which contains relict small size waste ground residues, alongside high levels of amorphous organic matter – some possibly of dung/charred dung origin (phytoliths also present). Phosphate fractionation also shows that this layer, which has the highest phosphate content, has not got the highest proportion of inorganic P, indicating that phosphate from sources other than bone is enriching the soil (see Table 1, and Chemistry above). This phosphate input may therefore be from dung, implying a stock husbandry land use. The biologically homogenised nature of this layer indicates a period of stasis prior to uppermost 8856 deposition of coarse material.

0-35 mm: The topmost layer in this dark earth sequence is a massive, very poorly sorted sandy loam containing gravels and dominant amounts of coarse anthropogenic inclusions, such as very abundant mortar/plaster (max 11 mm) and burned clayey material (>21mm, reddish micaceous fine fabric – also present as burrows in lower part of 8856)(Figs 19, 25-27; see also Figs 17-18). Additionally present are abundant charcoal (max 2.5mm), rare trace of iron slag, coprolitic bone and probable faecal phosphate nodules. The strongly heterogeneous burned clayey fine soil is mixed with humic soil from below, local calcitic fine fabric (from lime plaster) and much very fine and coarse charcoal (Figs 26-27). This layer is characterised by very abundant thin and occasional broad burrows, and very abundant thin and occasional broad organo-mineral excrements. Bulk analyses recorded a relatively high LOI (2.90%), and strongly enhanced magnetic susceptibility (16.2% χ_{conv}).

This appears to be a surface spread of demolition debris or coarse rake out from the drying oven which includes large fragments of burned clay, as well as lime plaster/mortar, and much charcoal. There has been minor weathering and biological working of this layer, with some burrows mixing small amounts burned clay down profile. Field photos suggest that this layer may have a series of origins, possibly simply as relict debris from coarse rake out, or possibly associated with construction – ground-raising or development of hard standing; there is no evidence, however, that this ‘surface’ was influenced by stock pounding for example, but was essentially beginning to weather *in situ*.

Discussion

The dark earth seems to have first developed as a bioworked soil formed in truncated alluvial sands and gravels subsoil, becoming moderately enriched with small amounts of settlement waste. This included much burned material, such as burned clay and iron slag, presumably mainly of Roman age and typical of Roman dark earth at Worcester (cf. Deansway; (Dalwood and Edwards, 2004). In contrast, anthropogenic inclusions are sand-size compared to coarse material found at Deansway (Macphail, 2004). This suggests that it may be tertiary waste disposal. Also small amounts of coprolitic and phosphate nodules of likely faecal origin, *sensu lato*, also occur, probably raising phosphate levels, although not significantly (see Chemistry, Table 1). There is no obvious evidence that these are cultivated plaggen-like anthrosols as recorded for some urban Roman, early medieval and mediaeval sites (Devos *et al*., 2009; Galinié *et al*., 2007; Macphail, 1994), however, and upwards Context 8882 becomes increasing stone-free and biologically homogenised. This more probably indicates natural dark earth soil formation – here as a totally decalcified brown earth, because there is a lack of lime-based building material and/or ashes, compared to some London sites, for example (Macphail, 2003b; Macphail and Linderholm, 2004).

This period of stasis and soil weathering between the putative 1st-2nd century and Late Roman activity, is not unusual, and recorded elsewhere, such as at Winchester and Whitefriars, Canterbury (Ford and Teague, 2011; Macphail, 2010; Macphail and Crowther, 2007; Macphail *et al*., 2005). Renewed middening of tertiary waste forming Context 8856 includes more burned material, such as ubiquitous small size iron slag, coprolitic bone and phosphate nodules, which sometimes enclose phytoliths. These nodules are known to have a Fe-Ca-P chemistry, and can also embed crystalline iron-phosphate (vivianite)(Karkanas and Goldberg, 2010); these may be of a latrine ‘nightsoil’ origin although an experiment showed that they could also result from keeping pigs; secondary phosphate can also form from a multitude of reasons of course (Goldberg and Macphail, 2006; Macphail and Crowther, 2011; Thirly *et al*., 2006). These inputs help explain the strongly enhanced magnetic susceptibility and overall peak in phosphate enrichment (Table 1). Again, as in Context 8882, the dark earth becomes more humic and biologically homogenised upwards, and phosphate fractionation suggests that phosphate additions are not solely from an inorganic ‘bone’ origin (see Chemistry). The presence of preserved amorphous organic matter traces of possible dung in the soil, may thus indicate that domestic animals were managed on grazed waste land at The Butts site. Late Roman/early medieval grazing was identified as a land use at Deansway, as well as at Whitefriars, Canterbury, for example (Greig, 2004; Macphail, 2004; Macphail and Crowther, 2007).

This area of Worcester may therefore have been something of a Late Roman greenfield site when a stone building/drying oven were constructed. It is not completely clear from this one sequence, what exactly was happening on site during the use of the drying oven, but some hearth residues did become incorporated into the dark earth. This includes soil material with anomalous reddish clay textural pedofeatures, which elsewhere has been associated with weathering of fire debris; a Roman corn dryer at Heathersett, Norfolk is one example (Macphail and Crowther, 2005). The dark earth itself was then ‘sealed’ by a spread of constructional waste or demolition material composed of lime mortar/plaster, burned constructional clay and charcoal. This forms the uppermost part of Context 8856.

Conclusions

Six thin sections and four sub-sampled bulk samples were analysed employing soil micromorphology, chemistry and magnetic susceptibility. Dark earth accumulated over probably truncated subsoil formed in alluvial sands and gravel, through disposal of small size (tertiary) settlement middening waste. Burned mineral material, such as small size burned clay constructional material (some of likely wetland origin) and iron slag, produced a strongly enhanced magnetic susceptibility. Small amounts of probable faecal waste (coprolitic bone and phosphate nodules) were also deposited. A stone-free, biologically worked and weathered Roman decalcified brown soil (dark earth) formed in waste ground (Context 8882). Renewed (late Roman?) middening, again of mainly small size burned mineral material and faecal waste, then occurred contemporary with a second phase of humic topsoil/dark earth development (8856). Phosphate enrichment, with fractionation data indicating that more than 'bone-derived' P is present, and alongside traces of possible dung in the microfabric, imply pasture soil development associated with domestic animal husbandry. Renewed middening and animal husbandry in the late Roman Period has been found elsewhere in Roman towns. Fire debris became incorporated into this upper dark earth and is possibly associated with the nearby late Roman drying oven. The dark earth soil is 'sealed' by a spread of little-weathered coarse constructional debris and charcoal, possibly as demolition material from this structure or more conjecturally to produce hard-standing or ground raising ahead of further but unrecorded construction.

Acknowledgements

Nick Daffern (Worcestershire Archaeology, Worcestershire Archive and Archaeology Service) is thanked for supplying samples and background information.

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Table 1: The Butts, Worcester; bulk sample analytical data

Sample depth (cm)	LOI[a] (%)	Phosphate-P_i (mg g^{-1})	Phosphate-P_o (mg g^{-1})	Phosphate-P (mg g^{-1})	Phosphate-P_i:P (%)	Phosphate-P_o:P (%)	χ (10^{-8} m^3 kg^{-1})	χ_{max} (10^{-8} m^3 kg^{-1})	χ_{conv}[c] (%)
0–8	**2.90***	1.41	0.187	1.60	88.3	11.7	194	1200	**16.2****
6–14	**2.60***	1.83	0.198	**2.03***	90.2	9.8	179	1160	**15.4****
18–26	2.25	1.63	0.169	1.80	90.6	9.4	142	941	**15.1****
36–44	1.50	0.979	0.118	1.10	89.2	10.8	120	905	**13.3****

[a] **LOI:** values highlighted indicate notably higher LOI (≥ 2.50%) than the remaining samples

[b] **Phosphate-P:** value highlighted indicates likely phosphate-P enrichment: * = 'enriched' (2.00–3.99 mg g^{-1})

[c] χ_{conv}**:** values highlighted indicate likely magnetic susceptibility enhancement: ** = 'strongly enhanced' (10.0–29.9%)

Table 2: The Butts, Worcester; soil micromorphology samples and counts

Thin section	Depth	Context	MFT	SMT	Voids	'Stones'	Charcoal	Burned min.	Burned clay/brick	Burned Ind. Waste?	Clay daub	Micaceus clay daub
M421A	0-35 mm	8856	D1	4a,2d,3a	40%	fffff	aaaa	a	aaaaa	a*		(aa)
M421A	35-80 mm	8856	C3	2d	35%	*	a	a	(pot)	a		
M421B	60-140 mm	8856	C2	2c(3a)	55%	f	aa	aa		aa?		a
M421E	120-200 mm	8856	C1/B2	2c,2b/2b	35%	ff	aa	aaa	aa	aaaa?		
M421C	180-260 mm	8882	B2	2b,2a	35%	f	aaa	aa	a	aa?		
M421D	240-320 mm	8882	B1/A2	2b/2a(1a)	40%	ff	aa	aa	a	a*	a	aa
M421F	300-380 mm	8882	A1	1a,2a	50%	fff	aa	a	a*	a-1	a	a*

Table 2, cont.

Thin section	Cop bone	Mineral cess FeP	Plaster/ mortar	Iron slag	Reddish clay coat.	Thin burrows	Broad burrows	Thin O-M excr.	Broad O-M Excr.
M421A	a*	a*	aaaaa	a*		aaaaa	aa	aaaaa	aa
M421A	a	a		aa		aaaaa	aaaaa	aa	aa(total)
M421B	a*			a		aaaaa	aaaaa	aaa	aaaaa(part total)
M421E	a*	a*		aa	aaa	aaaaa	aaaaa	aaaa	aa
M421C	a	a*		aa	a	aaaaa	aaaaa	aaa	aaa(part total)
M421D	a*	a*				aaaaa	aaaaa	aaa	aa(part total)
M421F	a*		a*			aa	aaaaa	aa	aaaa

* - very few 0-5%, f - few 5-15%, ff - frequent 15-30%, fff - common 30-50%, ffff - dominant 50-70%, fffff - very dominant >70%
a - rare <2% (a*1%; a-1, single occurrence), aa - occasional 2-5%, aaa - many 5-10%, aaaa - abundant 10-20%, aaaaa - very abundant >20%

Table 3: The Butts, Worcester; Soil Micromorphology (Descriptions and preliminary interpretations)

Microfacies type (MFT)/Soil microfabric type (SMT)	Sample No.	Depth (relative depth) Soil Micromorphology (SM)	Preliminary Interpretation and Comments
MFT D1/SMT 4a,2d,3a MFT C3/SMT 2d	M421A	0-80 mm SM: Broadly layered MFT D1 (0-35mm) and MFT C3 (35-80mm); 0-35 mm: SM: general calcitic SMT 4a, with few SMT 2d and very few SMT 3a fragmented from 'brick'; *Microstructure*: massive, 40% voids, with fissure junction to layer below, with open vughs, channels and simple packing voids; *Coarse Mineral*: C:F, 70:30, very poorly sorted with gravel and common anthropogenic inclusions (>20mm); *Coarse Organic and Anthropogenic*: very abundant mortar (max 11 mm) and 'brick' (with SMT 3a fine fabric; 21 mm), abundant charcoal (max2.5mm), rare trace of iron slag, coprolitic bone and nightsoil phosphate nodules; *Fine Fabric*: SMT 4a: pale to dark speckled and dotted brown (PPL), patchy high interference colours (close porphyric, crystallitic b-fabric, XPL), brown to grey (OIL), very abundant very fine to fine charcoal; *Pedofeatures*: *Fabric*: very abundant thin and occasional broad burrows; *Excrements*: very abundant thin and occasional broad organo-mineral excrements. 35-80 mm: SM: essentially homogeneous SMT 2d; *Microstructure*: massive with compact subangular blocky, essentially 35% voids, open vughs, channels and chambers; *Coarse Mineral*: C:F, 60:40, poorly sorted coarse silt, fine to very coarse sand, with very few gravel (max 4mm); *Coarse Organic and Anthropogenic*: occasional fine iron slag with 4mm-size example of rusty vesicular iron slag, eg of pot (11mm), rare burned mineral materials and charcoal (max <1mm), eg of fine burned bone, rare coprolitic bone and Fe-P nightsoil nodules;	8856 0-35 mm: massive, very poorly sorted sandy loam containing gravels and dominant amounts of coarse anthropogenic inclusions, such as very abundant mortar (max 11 mm) and 'brick' (21mm, reddish micaceous fine fabric – present as burrows in lower part of 8856). Also present are abundant charcoal (max2.5mm), rare trace of iron slag, coprolitic bone and nightsoil phosphate nodules. Strongly heterogeneous fine soil with mixed humic soil from below and local calcitic fine fabric and much very fine charcoal. Layer characterised by very abundant thin and occasional broad burrows and very abundant thin and occasional broad organo-mineral excrements. (Relatively high LOI (2.90%), and strongly enhanced magnetic susceptibility (16.2% %χ_{conv})). *Surface spread of demolition (constructional) debris, including much charcoal and with minor biological working. Ground-raising and/or demolition of drying oven and stone building, for unknown construction/activity on waste ground site.* 35-80 mm: Homogeneous (total excremental fabric) humic sandy loam with very few small gravel (max 4mm), with amorphous organic matter fragments within fine fabric. Layer contains occasional fine iron slag with 4mm-size example of rusty vesicular iron slag, an example of pot (11mm), rare burned mineral materials and charcoal (max <1mm), and

		Fine Fabric: SMT 2d: speckled and dotted very dark brown/blackish (PPL), very low interference colours/isotropic (close porphyric, stipple speckled/undifferentiated –fabric, XPL), very dark brown (OIL), many very fine charcoal and amorphous OM staining and fragments; *Pedofeatures*: *Fabric*: very abundant thin and broad burrows; *Excrements*: occasional thin and broad O-Min excrements, but essentially total excremental fabric.	example of fine burned bone, rare coprolitic bone and Fe-P nightsoil nodules. (Relatively high LOI (2.60%), phosphate-enriched (2.03 mg g-1) and strongly enhanced magnetic susceptibility (15.4% $\%\chi_{conv}$)). *Earthworm-worked and homogenised, almost stone-free soil, containing relict small size waste ground residues, with high levels of amorphous organic matter – some possibly of dung/charred dung origin (phytoliths). Period of stasis recorded prior to uppermost 8856 deposition.*
MFT C2/SMT 2c (3a)	M421B	60-140 mm SM: heterogeneous with mixed SMT 2a and 2c and homogenised 2a-2c – as 2d, with very few areas – burrows – of SMT 3a; *Microstructure*: fragmented prismatic with fine subangular blocky and crumb, 55% voids, poorly accommodated planar voids, chambers, complex packing voids; *Coarse Mineral*: C:F, as below, with few gravel (ferruginous fine sandstone - max13mm); *Coarse Organic and Anthropogenic*: occasional charcoal (max 5mm), burned sand with strongly rubefied aggregates?, rare fine iron slag and trace amounts of coprolitic bone; rare micaceous clay (associated with SMT 3a); *Fine Fabric*: SMT 3a: dusty and dotted reddish brown (PPL), moderate interference colours (close porphyric, stipple speckled b-fabric, XPL), reddish (OIL), abundant very fine and fine charred OM, phytoliths present, sometimes micaceous with spores and pollen(?); SMT 2d: see M421A. *Pedofeatures*: *Textural*: trace of textural intercalations within SMT 3a, *Fabric*: very abundant thin and broad burrows; *Excrements*: many thin and very abundant broad organo-mineral excrements, with bio-fragmented total excremental fabric.	8856 Burrow fragmented, prismatic sandy loam with few gravel (ferruginous fine sandstone - max13mm). Mixed fine fabrics containing much very fine charred organic matter, with very few burrow fills of generally rubefied burned micaceous fine fabric, rich in charcoal and containing phytoliths. Rare rubefied micaceous clay inclusions embed examples of pollen/spores. Also present are occasional charcoal (max 5mm), burned sand with strongly rubefied aggregates?, rare fine iron slag and trace amounts of coprolitic bone. (for bulk chemistry see M421A, above) *Waste disposal of burned anthropogenic waste is dominant, and likely reflects the use of small size debris. This includes unknown use of micaceous clay (of original wetland origin?) which became mixed with organic matter (including phytoliths), and which became burned.*
MFTC1/SMT 2c,2b over SMT B2/SMT 2b	M421E	120-200 mm SM: heterogeneous with dominant SMT 2b and common 2c (very broad burrow mixing – with calcitic ash traces); *Microstructure*: poor prismatic with welded	8856 Poorly prismatic structured sandy loam with frequent gravel (max 11mm), showing very abundant broad burrowing from above of

		subangular blocky and crumb, 35% voids, open fissures, vughs, channels and chambers; *Coarse Mineral*: C:F, 55:45 for SMT 2c; as below, frequent small stones (max 11mm), including metamorphic quartzites, siltstone, chert; *Coarse Organic and Anthropogenic*: many burned (rubefied) sands and gravel, occasional fine fragments of iron slag and charcoal (2mm max), with trace amounts of very fine coprolitic bone, phosphate nodules ('nightsoil'? – eg with vivianite; trace of possible calcitic ash in SMT 2c, which also shows reddish clay void coatings – sometimes very finely dusty; occasional burned clay/brick (max 6mm); *Fine Fabric*: SMT 2c: dusty, speckled and dotted dark reddish brown (PPL), isotropic with low interference colours produced by mica and trace of possible calcite ash (close porphyric, undifferentiated with stipple speckled and trace of crystallitic b-fabric, XPL), reddish brown to reddish (OIL), humic with very abundant amorphous OM charred amorphous OM – phytoliths present; possible trace of calcitic ash in places; *Pedofeatures*: *Textural*: occasional reddish very finely dusty clay void coatings and infills; *Crystalline*: trace of vivianite within Fe-P-Ca nodules; *Amorphous*: trace of Fe-P-Ca nodules; *Fabric*: very abundant thin and broad burrows with a series of broad burrows mixing-in SMT 2c; *Excrements*: abundant thin and occasional broad O-Min excrements.	rubefied/charred humic fine soil, which includes phytoliths and is often characterised by occasional relict reddish very finely dusty clay void coatings and infills; trace amounts of possible fine calcitic ash is present. Many burned (rubefied) sands and gravel, occasional fine fragments of iron slag and charcoal (2mm max), occasional burned clay/brick (max 6mm) and trace amounts of very fine coprolitic bone, phosphate nodules ('nightsoil'? – eg with vivianite), also occur. (Strongly enhanced magnetic susceptibility - 15.1% $\%\chi_{conv}$) *Waste disposal recommences and includes much burned material, including fine fragments of iron slag and burned sand and gravel – residues from industrial processes. Charred humic matter and trace amounts of phosphate indicate small amounts of nightsoil inputs.*
MFT B2/SMT 2a and 2b	M421C	180-260 mm SM: heterogeneous with mixed SMT 2a and 2b;*Microstructure*: massive, prismatic?, 35% voids, fissures, complex packing voids, chambers, channels and open vughs; *Coarse Mineral*: C:F, as below, few gravel (max 6mm); *Coarse Organic and Anthropogenic*: occasional iron slag with neoformed Al-silicates?'olivines' (max 2mm) in uppermost cms; trace of very fine coprolitic bone (<1mm), many fine wood charcoal (max 2.5mm), occasional burned sand and trace burned clay/brick, rare trace clay/ daub and brickearth like material; trace of Fe-P-Ca – cess?; patchy rare fine charcoal matrix soil with reddish clay coatings;	8882 Prismatic moderately humic sandy loam with few gravel (max 6mm), containing increased amounts of hearth and industrial debris upwards, albeit in very small amounts (namely: occasional iron slag with neoformed Al-silicates? 'fayalite' (max 2mm) and patchy rare fine charcoal matrix soil with reddish clay coatings in uppermost cms). Also present are trace amounts of very fine coprolitic bone (<1mm), many fine wood charcoal (max 2.5mm), occasional burned sand and trace burned clay/brick, and a trace of Fe-P-Ca –

		Fine Fabric: *Pedofeatures*: *Textural*: rare reddish clay void coatings and infills; *Fabric*: very abundant thin and broad burrows; *Excrements*: many thin and broad organo-mineral excrements – as below – almost total excremental fabric.	cess(?). Amounts of burrows and excrements are the same as in M421D, with partial excremental fabric formed; some reddish clay zones still present. *Almost totally homogenised dark earth soil formed from general settlement middening waste, with input of industrial iron-processing debris soils (?)*
MFT B1/SMT 2b(2a) Over MFT A2/SMT 2a, 2b (1a)	M421D	240-320 mm SM: heterogeneous with mixed very few SMT 1a, common SMT 2a and common SMT 2b, becoming dominant upwards; *Microstructure*: massive, with subangular blocky and crumb, 40% voids, open vughs, channels and chambers – some simple packing voids; *Coarse Mineral*: C:F, 70:30, very poorly sorted as M421F, with frequent gravel (max 12mm); *Coarse Organic and Anthropogenic*: examples of coprolitic bone (max 2.5mm), occasional fine wood charcoal (max 2mm), occasional burned sand and trace burned clay/brick, rare trace clay/ daub and brickearth like material; occasional amount of micaceous silty clay (daub?; 2.5mm max) – eg moderately strongly burned; 2 examples of yellow, isotropic Fe-P/Fe-Ca-P cess nodules (~400 µm); *Fine Fabric*: SMT 2b: speckled and dotted dark blackish brown dark reddish brown (PPL), XPL – as SMT 2a, brown, reddish brown (OIL), humic/rubefied humic, with abundant very fine amorphous and charred OM; *Pedofeatures*: *Textural*: trace of limpid clay void infills – only in micaceous daub; *Fabric*: very abundant thin and broad burrows; *Excrements*: many thin and occasional broad organo-mineral excrements, partial total excremental fabric.	8882 Massive weakly humic loamy sand, with frequent gravel (max 12mm), becoming a more humic sandy loam upwards. Anthropogenic inclusions are: examples of coprolitic bone (max 2.5mm), occasional fine wood charcoal (max 2mm), occasional burned sand and trace amounts of burned clay/brick, rare trace clay/daub and brickearth like material, and occasional micaceous silty clay (daub?; 2.5mm max) – with a moderately strongly burned example. Two examples of yellow, isotropic Fe-P/Fe-Ca-P cess nodules (~400 µm), were recorded. Very abundant thin and broad burrows, and many thin and broad organo-mineral excrements, occur. *Mainly homogenised, increasingly very fine charcoal-rich sandy loam containing latrine waste and burned settlement debris.*
MFT A1/SMT 1a and 2a	M421F	300-380 mm SM: heterogeneous with mixed SMT 1a and 2a – the latter becoming more dominant upwards; *Microstructure*: poor prismatic with embedded subangular blocky and crumb, 50% voids, simple to complex packing voids, open vughs and channels, chambers; *Coarse Mineral*: C:F (Coarse:Fine limit at 10µm), 80:20, very poorly	8882 Weakly prismatic, poorly humic and very poorly sorted gravely sands (common gravel – max 18mm). Fine fabric includes more very fine amorphous and charred organic matter up-profile. Soil contains examples of coprolitic bone (max 1.5mm), occasional fine wood

		sorted coarse silt, fine, medium and coarse sand, with common rounded small stones/gravel (max 18mm); quartz, quartzite, feldspar, flint, chert, fine sandstone, ironstone, examples of magnetite-rich igneous rock; *Coarse Organic and Anthropogenic*: examples of coprolitic bone (max 1.5mm), occasional fine wood charcoal (max ~1.7mm), rare burned sand and trace burned clay/brick, rare rounded clay daub (max 3mm) and brickearth like material; trace amount of micaceous silty clay (daub?; 4mm max), enigmatic rubefied 'industrial' waste? (>2mm); possible weathered mortar traces; *Fine Fabric*: SMT 1a: blackish (PPL), isotropic (loose porphyric and coated grain, undifferentiated b-fabric, XPL), orange brown (OIL); patchy humic staining, occasional to many very fine amorphous and charred OM; SMT 2a: very dusty reddish brown (PPL), very low interference colours (close porphyric, speckled b-fabric (mica), XPL), pale yellow brown (OIL), relict humic, many very fine amorphous and charred OM; *Pedofeatures*: *Fabric*: very abundant broad burrows, with occasional thin burrows; *Excrements*: abundant broad and occasional thin organo-mineral excrements.	charcoal (max ~1.7mm), rare burned sand and trace amounts of burned clay/brick, rare rounded clay daub (max 3mm) and brickearth/brick like material, and trace amount of micaceous silty clay (daub?; 4mm max). An enigmatic rubefied, possible 'industrial' waste? (>2mm) fragment, is present. Soil is characterised by very abundant broad burrows, with occasional thin burrows, and abundant broad and occasional thin organo-mineral excrements. (strongly enhanced magnetic susceptibility – 13.3% $\%\chi_{conv}$) *Weakly humic, subsoil sands and gravels, with general biomixing and partial homogenisation of weakly humic soil and soil containing higher amounts of charred occupation organic matter, and finely fragmented background anthropogenic materials, of settlement waste origin including charcoal, coprolitic bone, clay daub and micaceous clay (of alluvial origin?).*

Figs

Fig. 1: Scan of M421F (Context 8882); gravelly sands of mixed alluvial subsoil mixed with middening waste. Frame width is ~50mm.

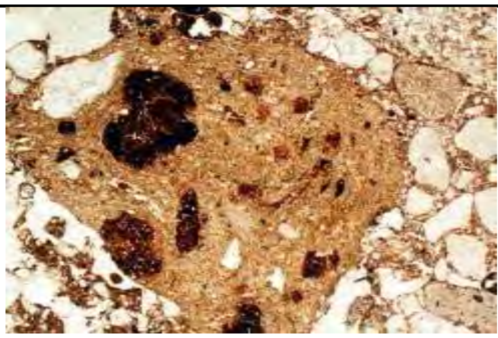


Fig. 2: Photomicrograph of M421F (Context 8882); a burned, generally iron-depleted micaceous clay, with iron mottling, of probable wetland origin. Plane polarised light (PPL), frame width is ~4.62mm.

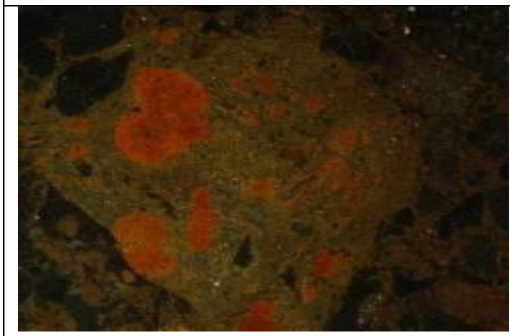


Fig. 3: As above, under oblique incident light (OIL), showing rubefied iron mottles (contributing to enhanced magnetic susceptibility).

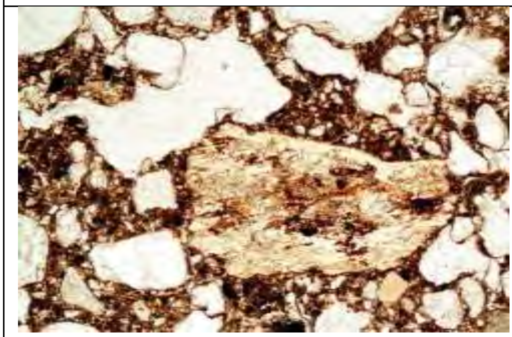


Fig. 4: Photomicrograph of M421F (Context 8882); detail of dark earth showing weakly iron-manganese stained coprolitic bone fragment, relict of middening and contributing to 1.10 mg g-1 P in this layer. PPL, frame width is ~2.38mm.

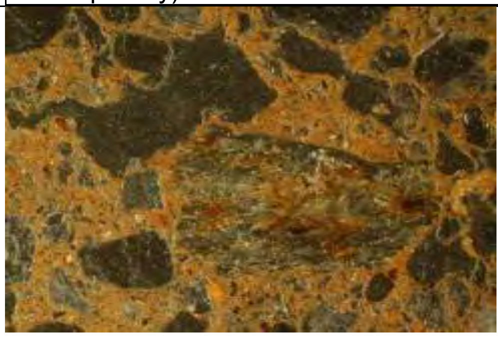


Fig. 5: As Fig 4, under OIL; note staining of bone.

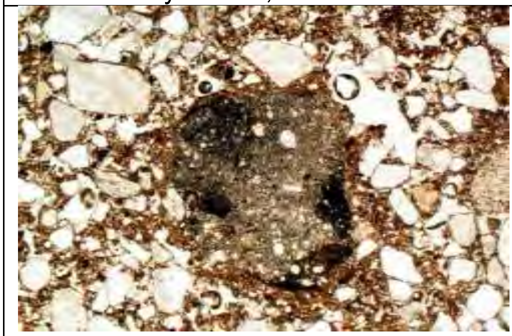


Fig. 6: Photomicrograph of M421D (Context 8882); strongly burned micaceous silty clay within poorly humic bioworked fine soil. PPL, frame width is ~2.38mm.

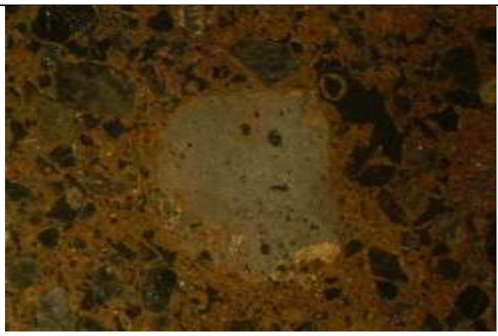


Fig. 7: As Fig 5, under OIL, showing moderately strongly burned, iron-depleted silty clay fragment.

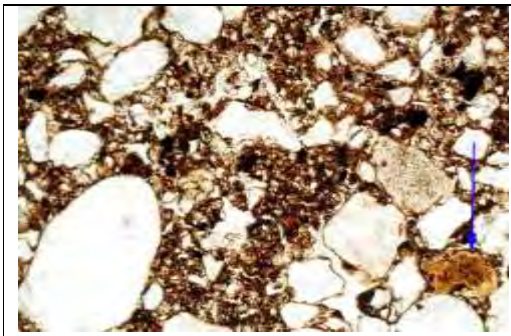


Fig. 8: Photomicrograph of M421D (Context 8882); detail of fine weakly humic dark earth soil; note probable Fe-P-Ca nodule (arrow) of probable latrine waste/'nightsoil' origin. PPL, frame width is ~2.38mm.

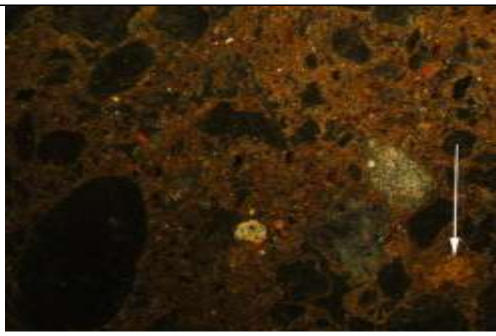


Fig. 9: As Fig 7, under OIL, showing inclusion of very fine charcoal and calcined and rubefied fine burned mineral material.

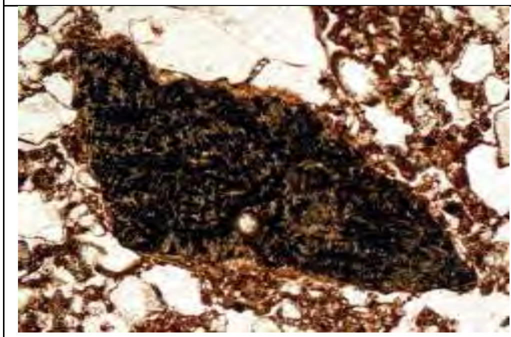


Fig. 10: Photomicrograph of M421C (Uppermost Context 8882); example of iron slag, with crystals of neo-formed, probable fayalite, and dendritic crystals of probable iron oxide (possible wustite). PPL, Frame width is ~4.62mm.

Fig. 11: As Fig 9, under crossed polarised light (XPL); iron oxide is isotropic, whereas the 'fayalite' has an orthorhombic crystal structure, high relief and interference colours.

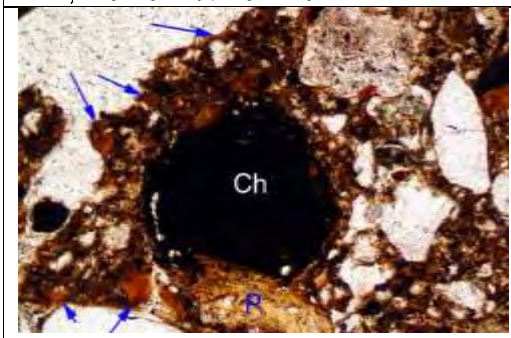


Fig. 12: Photomicrograph of M421C (Uppermost Context 8882); burrow mixed reddish soil (from 8856 above) containing phosphate (P) embedded charcoal and showing anomalous reddish finely dusty clay void coatings. PPL, frame width is ~2.38mm.

Fig. 13: As Fig 12, under XPL, illustrating low interference colours of reddish clay coatings.

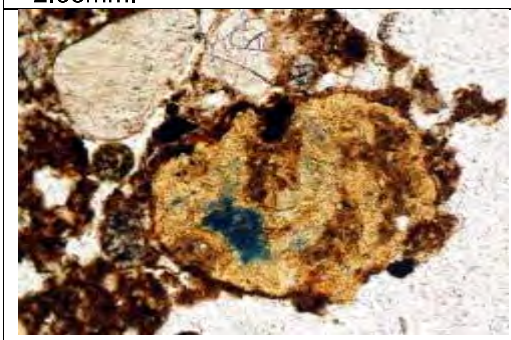


Fig. 14: Photomicrograph of M421E (Junction of Uppermost Context 8882 and 8856); amorphous phosphate nodule embedding crystalline 'blue' vivianite (e.g., $Fe_3(PO_4)_2$ $8H_2O$). PPL, frame width

Fig. 15: As Fig 12, under XPL; note birefringent, crystalline vivianite, within amorphous, isotropic phosphate (probable Fe-Ca-P).

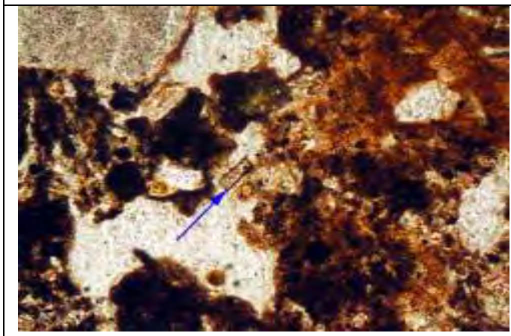
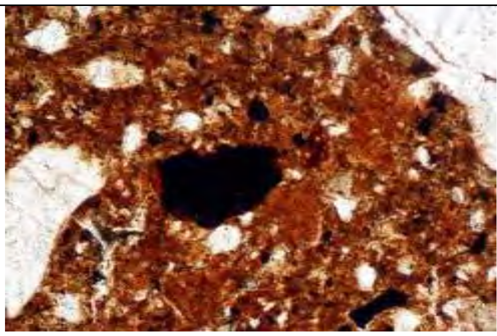
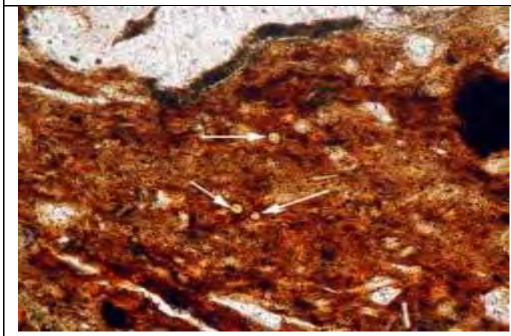
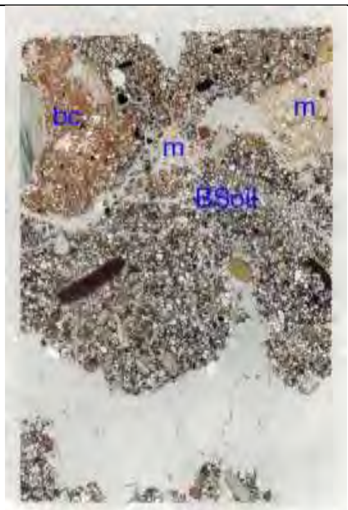
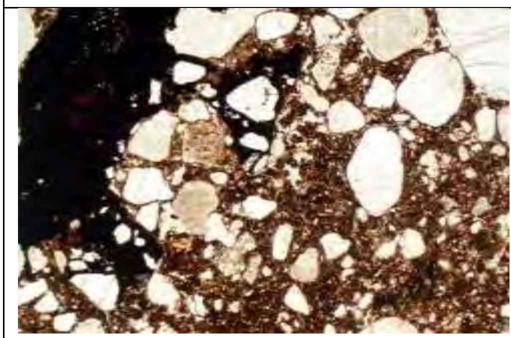
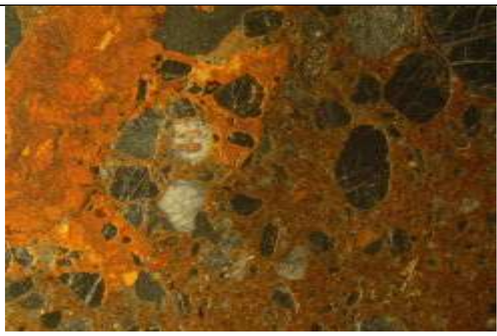
<table>
<tr><td>is ~2.38mm.</td><td></td></tr>
<tr><td>
Fig. 16: Photomicrograph of M421E (Junction of Uppermost Context 8882 and 8856); detail of phosphate-stained humic fine fabric which includes phytoliths (arrow). PPL, frame width is ~0.47mm.</td><td>
Fig. 17: Photomicrograph of M421B (Lower part of Context 8856); rubefied micaceous silty clay rich in fine charcoal and containing phytoliths; this material could be debris from the late Roman corn dryer debris (see M421A), which became burrowed into the dark earth. PPL, frame width is ~0.90mm.</td></tr>
<tr><td>
Fig. 18: Photomicrograph of M421B (Lower part of Context 8856); detail of rubefied micaceous clay, containing pollen/spores (arrows); this constructional clay may have been originally collected from wetland. PPL, frame width is ~0.47mm.</td><td>

Fig. 19: Scan of M421A (Uppermost Context 8856; buried bioworked soil (Bsoil), below demolition debris including coarse fragments of plaster/mortar (m) and burned clay (bc) of possible corn dryer origin. Frame width is ~50mm.</td></tr>
<tr><td>
Fig. 20: Photomicrograph of M421A (Upper Context 8856); rusty iron slag within biologically homogenised dark earth ‘topsoil’. PPL, frame width is ~4.62mm.</td><td>
Fig. 21: As Fig 20, under OIL; note brown ‘humic’ topsoil.</td></tr>
</table>

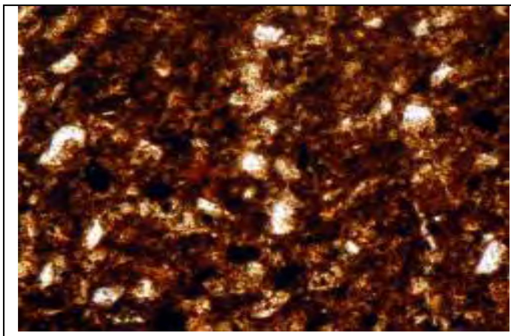


Fig. 22: As Fig 20; detail of fine fabric containing relict humus, fine charcoal and reddish brown amorphous organic matter – dung residues(?). PPL, frame width is ~0.47mm.

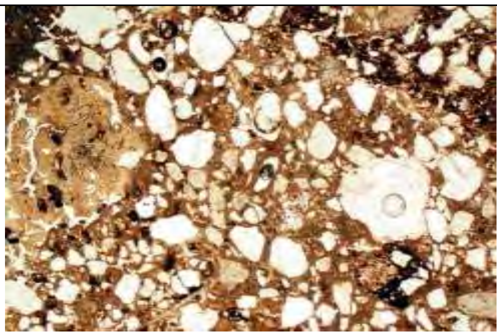


Fig. 23: Photomicrograph of M421A (Uppermost Context 8856); large fragment of weathered possibly 'river sand'-tempered lime mortar/plaster; note voids formed by weathering.

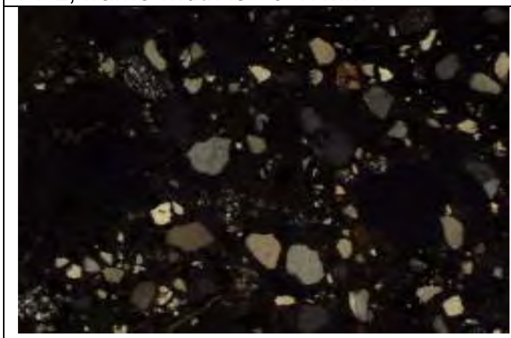


Fig. 24: As Fig 23, under XPL, showing poorly preserved calcitic fine cement.

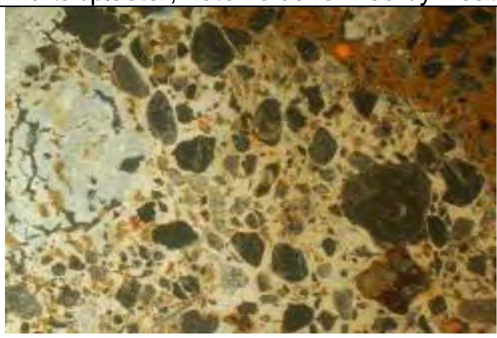


Fig. 25: As Figs 23-24, under OIL.

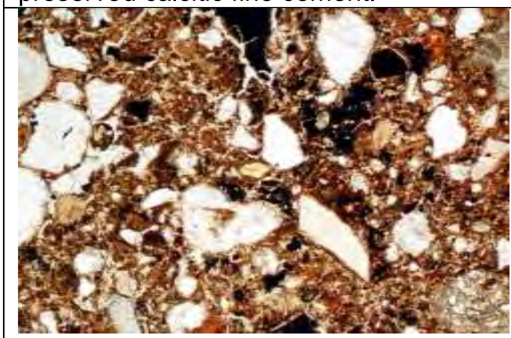


Fig. 26: Photomicrograph of M421A (Uppermost Context 8856); mixed and burrowed soil formed from humic topsoil, calcitic weathered plaster and burned clay and charcoal – possibly of demolished corn dryer origin (or rake –out). PPL, frame width is ~2.38mm.

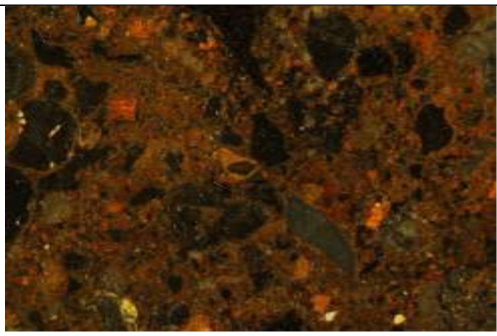


Fig. 27: As Fig 26, under OIL; note red burned clay and black charcoal inclusions.

Appendix 6: Worcester Library and Heritage Centre, The Butts: requirements for deposit monitoring?

Appendix 6 Worcester Library and Heritage Centre, The Butts: requirements for deposit monitoring?

Ian Panter
York Archaeological Trust
March 2009
Revised June 2009

This report addresses whether deposit monitoring should be a requirement following construction of the new centre in Worcester, where substantial waterlogged deposits were revealed in Trench 15 at The Butts. The following conclusions are based on a site visit on 26th August 2008 and the results from the assessment of the palaeoenvironmental remains by Elizabeth Pearson.

The trench lies within the floodplain of the River Severn with alluvial deposits and bedrock geology of Mercia Mudstone underlain by Sherwood Sandstone (British Geological Survey sheet 199), and trenches were positioned with the aim to assess the nature and the significance of deposits, and assess the degree of preservation of any organic remains.

Waterlogged deposits dating from late prehistoric/Roman to last post-medieval/modern were sampled and contents assessed using standard methods. Features sampled included a late prehistoric/Roman palaeochannel, a medieval bell casting pit and primary fills of a 17th Century Civil War period ditch. The nature of the remains comprise insects, waterlogged macrofossils, plant remains as well as leather fragments and a well preserved 18th Century wooden water pipe still in situ.

The assessment identified well preserved organic deposits as well as deposits having less well preserved material, and the overall conclusions of the palaeoenvironmental assessment were:

- Best preservation was observed at depths below 12.42m OD
- Waterlogging has become more consistent following the Roman period
- No evidence for more recent or active decay
- The survival of the wooden water pipe suggests that there has been no decay since the 18th Century at a depth of 12.25m OD.
- Absence of organic remains doesn't necessarily imply decay – deposits may never have had an organic content in the first instance

The inference from these conclusions is that the deposits within the floodplain are still in hydraulic connection with the River Severn. Whilst no testing has been undertaken on the physical characteristics of the anthropogenic sediments from Trench 15, it is likely that the alluvial deposits possess a low hydraulic conductivity and do not drain rapidly, therefore staying saturated and anaerobic during episodes of low river levels.

The key to continued preservation will be the ability to maintain this connection between the river and the floodplain, and groundworks and other activities associated with the construction of the new library complex should accommodate this requirement. If the hydraulic connection can be maintained then there should be no need to instigate a programme of monitoring of either water levels or water quality.

Construction activities that might impact upon effective recharge include construction of cofferdams using augered secant or driven sheet piles, which might create a barrier to recharge, particularly if such a barrier is long-term (English Heritage, p 18). Short-term, temporary use may not impact too greatly due to the low hydraulic conductivity of the sediments at The Butts.

Pile type is another important factor, and whilst the requirements from a civil engineering perspective must always take precedence, some issues need to be considered during design and construction of the complex. Again, the arrangement of the piles should be such that the deposits aren't isolated from river recharge. Site investigations in the floodplain have identified no perched water tables so there won't be problems with puncturing and draining deposits through pile insertion. Elsewhere along The Butts though, two quarry pits and a well with waterlogged deposits were uncovered further up the river terrace, and off the floodplain. As these deposits are likely to be recharged through precipitation and surface water flow only (and not river recharge) and hence vulnerable to piling and subsequent drainage and desiccation, the preferred archaeological mitigation strategy has been for total excavation rather than in situ preservation (Simon Woodiwiss, pers comm.). This is the preferred approach when dealing with perched water table deposits.

The use of certain types of piles may create pathways for ingress of oxygen into the anaerobic deposits and hence should be avoided. For example, the English Heritage guidelines recommend avoidance of H-section displacement piles because of the potential for "possible migration and oxygen ingress" (ibid, Table 3, page 18).

Use of replacement (bored) piles, including continuous flight augered (CFA) piles, where liquid concrete/grout is poured into pre-augered holes has been recommended for foundation construction in urban developments where waterlogged organic remains are known to exist (Over Arup, 1991, p. 49). If pile groupings are such that no barrier is created that would prevent groundwater flow between the river and the archaeological deposits then there should be no problem with such systems being used at the Butts, Worcester.

However, one potential impact from replacement piles relates to the possible impact on the groundwater geochemistry through the migration of the grout into the surrounding deposits. Two field tests suggested that impact is negligible at distances beyond 0.5m from the pile (ibid, page 17), and that the hydraulic conductivity of the surrounding deposits could be important in determining how far contaminants arising from the curing of the concrete migrate through the deposits. The EH guidance document cites the example of coarse sediments such as gravel having a high hydraulic conductivity and fairly rapid groundwater flow giving rise to contaminant migration some distance away from the pile. However, as stated above, the available evidence suggests that the sediments at the site are likely to be ones that drain slowly and therefore contaminant migration could be minimal during curing. Installation of permanent casings should also eliminate contaminant migration and might be considered here too.

RECOMMENDATION:

If all of the above factors are taken into consideration and the hydraulic connection between the River Severn and the archaeological/palaeoenvironmental deposits at The Butts remains effective both during- and post-construction work then there is no requirement to implement a programme of deposit monitoring.

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Pearson, E. Preliminary assessment of the environmental remains from an evaluation at The Butts, Worcester (Trench 15). Unpublished specialist report

English Heritage, 2007. Piling and Archaeology An English Heritage Guidance Note. English Heritage Publishing.

Ove Arup & Partners, 1991. York Development & Archaeology Study. English Heritage and York City Council.

Appendix 7: Archaeomagnetic dating of two fired features from the excavations at The Butts, Worcester

Appendix 7 Archaeomagnetic dating of two fired features from the excavations at The Butts, Worcester, February 2009 (David Greenwood and Cathy Batt, Archaeological Sciences, University of Bradford)

Introduction
Two sets of oriented archaeomagnetic samples were taken from two well preserved fired features during excavations at The Butts, Worcester. The objectives were:

- to determine whether the material from both features had been heated *in situ* to a high enough temperature to record the geomagnetic field.

- to provide a date of last use of the features.

David Greenwood carried out the sampling and measurement programme as consultancy for Worcestershire County Council. Appendix 1 provides an introduction to the archaeomagnetic method. The results of all the laboratory work are presented in Appendices 2 and 3.

Archaeological Context
The site for the new Worcester Library and History Centre, at The Butts, Worcester (SO 846 550) was excavated in 2008 in advance of development. The excavation revealed three fired structures initially interpreted as bread ovens dating to the Romano-British period on the basis of other archaeological evidence found on the site.

Sampling
Two of the three fired features were sampled (contexts 6364 and 6365); the third feature was not sampled as it appeared to have been truncated and disturbed, making it unsuitable for archaeomagnetic studies. A total of 45 *in situ* samples were taken from cleaned horizontal surfaces from within the features using the tube method (see Appendix 1), as follows:

- Context 6364 (Fig. 2): 25 samples (6364-01 to 6364-25) from a freshly exposed basal section of firm, but moist, heat affected clay with no evidence of bioturbation or disturbance.

- Context 6365 (Fig. 3): 20 samples (6365-01 to 6365-20) from a freshly exposed basal section of firm, but moist, heat affected clay with no evidence of bioturbation or disturbance.

All of the samples were north-oriented using a magnetic compass, and there appeared to be no local disturbances to the geomagnetic field caused by the feature itself or other factors.


Figure 2 – Context 6364: cleaned horizontal base with sampling tubes in position. (Source: David Greenwood)


Figure 3 – Context 6365: cleaned horizontal base with sampling tubes in position. (Source: David Greenwood)

Measurement
The direction of natural remanent magnetisation (NRM) of all samples was measured using a Molspin fluxgate spinner magnetometer at the University of Bradford. The results are presented in Figure 4 and further details of the methodology can be found in Appendix 1. The stability of the magnetisation was investigated by the stepwise demagnetisation of five pilot samples from context 6364 and four pilot samples from context 6365 (representing 20% of the samples from each sample set). Fields of 2.5, 5, 7.5, 10, 12.5, 15, 20, 30, 40, 50, 60, 80 and 100mT (peak applied field) were used, with the magnetisation being measured after each step. These pilot samples were chosen for three reasons:

- their declination and inclination values represented a spread of magnetic directions exhibited by all the samples in that particular set.

- their initial magnetic strengths were sufficiently high enough to obtain meaningful results.

- the pilot samples were spread physically over each of the areas under investigation.

Results
The results of the analyses of these two sample sets are detailed in Appendix 2 (context 6364) and Appendix 3 (context 6365).

Context	**Number of samples**	**Mean Declination**	**Mean Inclination**	α_{95}	**Mean Intensity**	
		degrees	**degrees**		**x10^{-6} Am^{2}kg^{-1}**	
6364						
NRM	25	-0.2	68.5	7.0	21.6	
ChRM	20	14.6	61.7	3.7	15.7	
6365						
NRM	20	15.9	65.2	3.1	51.2	
ChRM	19	3.2	62.9	3.0	26.0	

Figure 4: Table summarising the results from the direction of remanent magnetisation (NRM) and the characteristic remanent magnetisation (ChRM) after removal of the less stable components, these values have been corrected to Meriden.

Context 6364

25 samples were analysed from this feature. The intensity of NRM varied between 3 and 42 x10^{-6} Am^{2}kg^{-1}, with one outlier at 216 x10^{-6} Am^{2}kg^{-1}. These values are sufficiently strong to be measurable. For fired clay from domestic hearths values typically range between 10 and 200 x10^{-6} Am^{2}kg^{-1} so the strength of the magnetisation is consistent with this surface being exposed to heat in the past. There were no systematic differences observed between the intensities of the materials within the feature.
The initial directions of magnetisation were fairly scattered providing an alpha-95 of 7.0°, which is outside the limit of 5° defined by Clark *et al.* as being appropriate for dating (1988: 606). Five representative samples were selected for pilot stepwise demagnetisation, as detailed above. The behaviour of the samples fell into two distinct groups; one group had a very low median destructive field of 5-10mT and a single magnetic component, the other group had a higher median destructive field of 15-20mT and two magnetic components. These results suggest a variety of magnetic minerals, predominantly magnetite for the first group and

magnetite with haematite contribution for the second. Based on the demagnetisation behaviour an alternating field of 7.5mT was chosen to provide the optimum removal of the less stable magnetic components from the remaining samples (Tarling & Symons 1967), thus leaving the magnetisation of archaeological interest. After partial demagnetisation in this field the sample remanences were remeasured. Once this magnetic cleaning has been performed the characteristic remanence (ChRM) had an improved alpha-95 of 5.1°. The samples were then assessed to determine if they were all recording the same heating event (see Appendix 1).

Five samples were identified as deviating significantly from the rest of the samples using the statistical procedures recommended by McFadden and McElhinny (2000: 92). An alpha-95 of 3.7° was obtained from the remaining group, within the limit for dating.

<u>Context 6365</u>

20 samples were analysed from this feature. The intensity of NRM varied between 16 and 163 $x10^{-6}$ Am^2kg^{-1}. These values are sufficiently strong to be measurable and were higher than for Context 6364 suggesting higher temperatures or a change in mineralogy. For fired clay from domestic hearths values typically range between 10 and 200 $x10^{-6}$ Am^2kg^{-1} so the strength of the magnetisation is consistent with this surface being exposed to heat in the past. There were no systematic differences observed between the intensities of the materials within the feature.

The initial directions of magnetisation were very well grouped providing an alpha-95 of 3.1°, which is inside the limit of 5° defined by Clark *et al.* as being appropriate for dating (1988: 606). Four representative samples were selected for pilot stepwise demagnetisation, as detailed above. The behaviour of the samples fell into two distinct groups as before; 3 samples one group had a very low median destructive field of 5-10mT, one sample had a higher median destructive field of 15-20mT. Both groups showed a viscous remanence reflecting the present field. These results suggest a variety of magnetic minerals, predominantly magnetite for the first group and magnetite with haematite contribution for the second. Based on the demagnetisation behaviour an alternating field of 7.5mT was chosen to provide the optimum removal of the less stable magnetic components from the remaining samples (Tarling & Symons 1967), thus leaving the magnetisation of archaeological interest. After partial demagnetisation in this field the sample remanences were remeasured. Once this magnetic cleaning has been performed the characteristic remanence (ChRM) had a slightly larger alpha-95 of 3.6°. The samples were then assessed to determine if they were all recording the same heating event (see Appendix 1).

Although the general grouping was good, it was clear that one sample had undergone a significant direction change following demagnetisation. This sample was deleted as an outlier giving an alpha-95 of 3.0° from the remaining group, within the limit for dating.

Dating Of Magnetic Direction

The mean declination and inclination of both sample sets after demagnetisation, and the removal of outliers, were corrected to Meriden; the reference locality for the British calibration curve using the standard method (Noel & Batt 1990). The corrected mean direction was then dated using the RenDate calibration programme. The RenDate software is an improvement on the previous British calibration curve (Clark et al. 1988; Zananiri *et al.* 2007) because it takes into account the errors associated both with the magnetic direction of the samples being calibrated and the magnetic directions that make up the reference data, whereas the Clark curve only considered the errors associated with the samples being dated and required a visual interpretation of the direction against the calibration curve. Therefore, calibration using the RenDate software provides a larger but more realistic date range (Appendix 1).

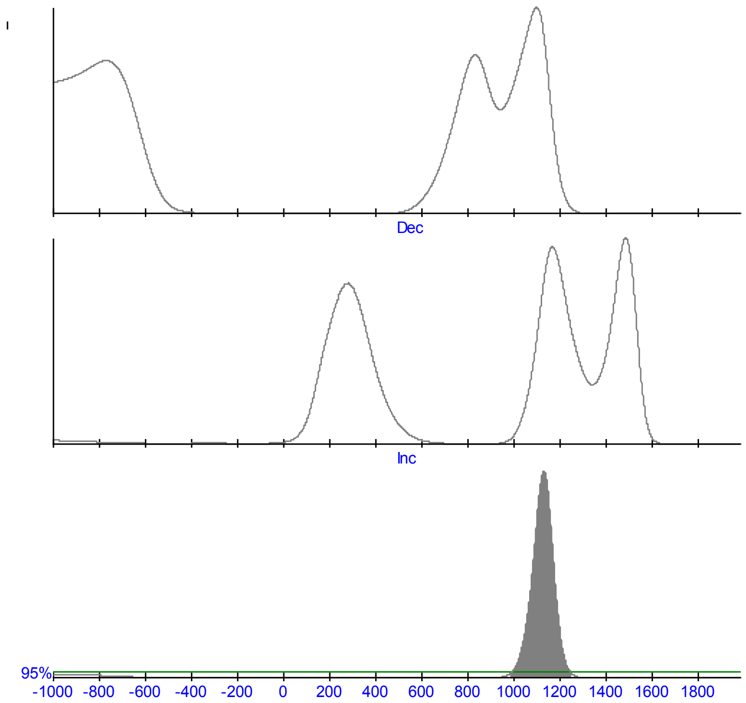

Figure 4 – Archaeomagnetic date ranges for context 6364 produced using RenDate software at 95% confidence level

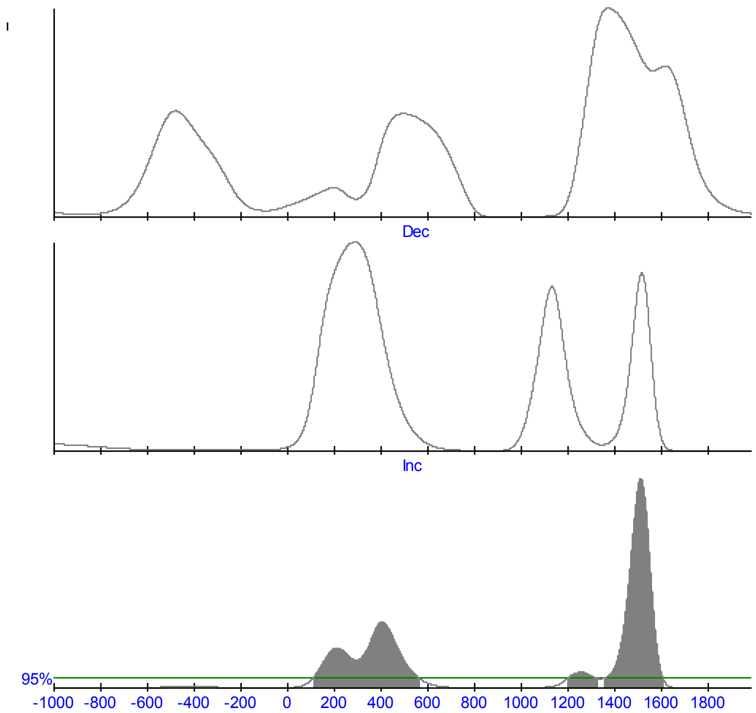

Figure 5 – Archaeomagnetic date ranges for context 6365 produced using RenDate software at 95% confidence level

The date ranges obtained are:

- Context 6364: AD 990 - AD 1250 (Fig. 4).

- Context 6365: AD 110 - AD 560 or AD 1200 - AD 1324 or AD 1360 – AD 1608 (Fig. 5).

In archaeomagnetic dating it is sometimes necessary to give multiple date ranges as the earth's magnetic field has had the same direction at different times in the past. However, the available archaeological evidence is usually sufficient to select the most probable range.

If both features were last in use at the same time and the magnetic directions are reliable, they can be combined to give a single date of use (Figure 6).

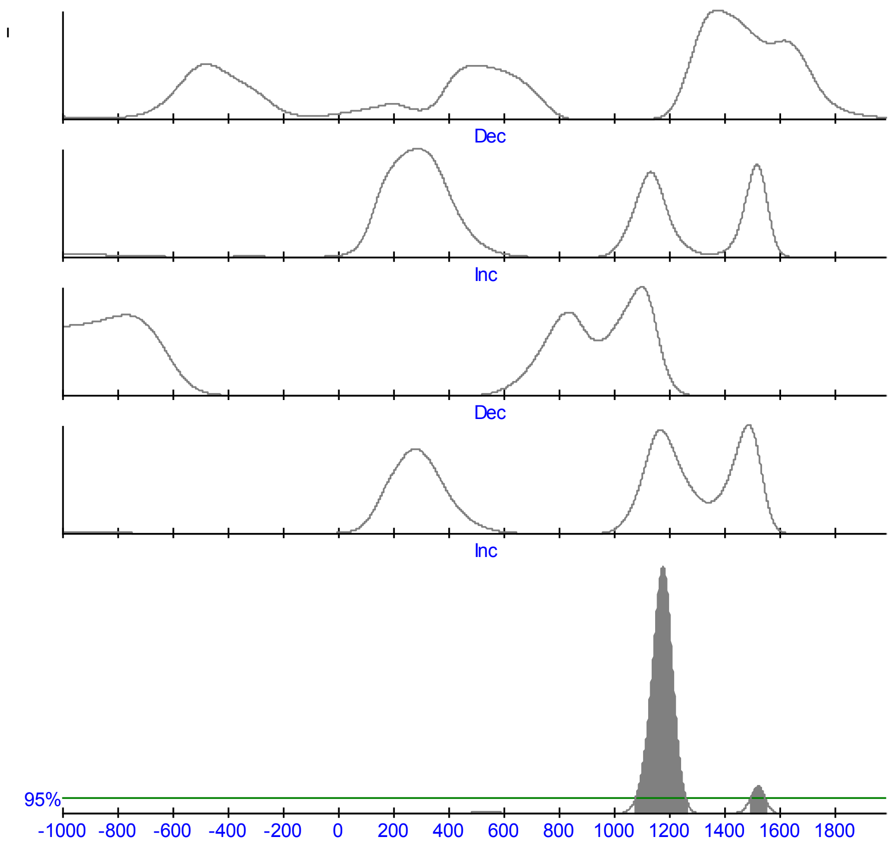

Figure 6 – Archaeomagnetic date ranges for contexts 6364 and 6365 combined.

Given those assumptions, the combined date is AD 1080 – AD 1260 or AD 1500 – AD 1550

There is a significant discrepancy between some of the dates obtained and the expected Romano-British date indicated by the archaeological evidence. The date produced for Context 6364 indicates last heating in 11th to mid-13th century. Context 6365 could have been last used in 2nd to mid-6th century but a date of 13th century or later is also possible. If both features were both last used at the same time and the magnetic directions are reliable, the date of last use is most likely to be11th to mid 13th century.

Summary And Conclusions

Oriented archaeomagnetic samples were recovered from two fired features at The Butts, Worcester. Both sample sets were shown to be magnetically stable and suitable for archaeomagnetic dating. It is possible that Context 6365 is Romano-British in date, but Context 6364 appears to be significantly later. At this stage of the investigation there are two main possibilities; that both features record the magnetic direction accurately and the features are significantly later that the date indicated by the archaeological context or that Context 6365 is Romano-British and Context 6364 has undergone significant post-firing disturbance which has rendered its magnetic direction inaccurate. Further examination of the archaeological context is required to choose between these possibilities.

Archaeomagnetic ID:	TB6364
Feature:	Bread oven: Context No. 6364
Location – latitude:	52.19°
Location – longitude;	-2.23
Magnetic deviation:	-2.8
Number of samples (taken/used in mean):	25/20
AF demagnetisation applied:	Yes
Distortion correction applied:	No
Declination (at Meriden):	14.6
Inclination (at Meriden):	61.7
Alpha-95:	3.7
Date range (95% confidence):	AD 990 - AD 1250
Archaeological date range:	Romano-British?

Archaeomagnetic ID:	TB6365
Feature:	Bread oven: Context No. 6365
Location – latitude:	52.19°
Location – longitude;	-2.23
Magnetic deviation:	-2.8
Number of samples (taken/used in mean):	20/19
AF demagnetisation applied:	Yes
Distortion correction applied:	No
Declination (at Meriden):	3.2
Inclination (at Meriden):	62.9
Alpha-95:	3.0
Date range (95% confidence):	AD 110 -AD 560 or AD 1200 - AD 1324 or AD 1360 – AD 1608
Archaeological date range:	Romano-British?

Appendix 1: An Introduction to Archaeomagnetic Dating Principles

Archaeomagnetic dating is based on a comparison of the ancient geomagnetic field, as recorded by archaeological materials, with a dated record of changes in the Earth's field over time in a particular geographical area. The geomagnetic field changes both in direction (declination and inclination) and in strength (intensity) and archaeomagnetic dating can be based on either changes in direction or intensity or a combination of the two. Dating by direction requires the exact position of the archaeological material in relation to the present geomagnetic field to be recorded, and so the material must be undisturbed and sampled *in situ*. Dating by intensity does not require *in situ* samples but is less precise and experimentally more difficult. The laboratory at Bradford uses archaeomagnetic dating by direction.

Suitable Materials For Dating

For an archaeological material to be suitable for dating using magnetic direction it must contain sufficient magnetised particles and an event must have caused these particles to record the Earth's magnetic field. Many geologically derived materials, e.g. soils, sediments, clays, contain sufficient magnetic minerals. There are primarily two types of archaeological events that may result in the Earth's magnetic field at a particular moment being recorded by archaeological materials: heating and deposition in air or water.

If materials have been heated to a sufficiently high temperature (>600°C) they may retain a thermo-remanent magnetisation (TRM), which reflects the Earth's magnetic field at the time of last cooling. Suitable archaeological features would include hearths, kilns and other fired structures.

Sediments may acquire a datable detrital remanent magnetisation (DRM) from the alignment of their magnetic grains by the ambient field during deposition. Such an effect allows deposits in wells, ditches and streams to be dated. However, this aspect of archaeomagnetic dating is still under development, as factors such as bioturbation and diagenesis, can cause post-depositional disturbance of the magnetisation.

Archaeomagnetic dating can be applied to features expected to date from 1000BC to the present day, as this is the period covered by the calibration curve. However, as discussed below the precision of the date obtained will vary according to the period being dated.

Sampling

Samples of robust fired materials are taken by attaching a 25mm flanged plastic reference button to a cleaned stable area of the feature using a fast setting epoxy resin (Clark *et al.* 1988). The button is levelled, using a spirit level, and held in place with a small bead of plastecine whilst the resin sets. The direction of north is then marked on using a magnetic compass, sun compass or gyrotheodolite, and the button removed with a small part of the feature attached to it. Samples are trimmed and consolidated in the laboratory with a solution of 10% polyvinylacetate in acetone. Sediments and friable fired materials are sampled by insertion of a 2.5cm diameter plastic cylinder, onto which the direction of north is marked. Magnetometers used are sufficiently sensitive for only small samples (*c.* 1cm^3) to be required; approximately 15 samples are needed from each feature and it may be possible to select sampling locations to minimise the visual impact if the feature is to be preserved.

Laboratory Measurements

In the laboratory a large-sample spinner magnetometer is used to measure the remanent magnetisation of each sample (Molyneux 1971). The measurement indicates the relative strength and direction of the magnetic field of the sample. The stability of this magnetisation is then examined by placing the sample in alternating magnetic fields of increasing strength and removing the magnetisation step-by-step. The demagnetisation measurements allow removal of any less stable magnetisation acquired after the firing or depositional event, leaving the magnetisation of archaeological interest. It can also be used to indicate the magnetic mineralogy of the samples using information relating to the field required to reduce the intensity to half its original value, known as the median destructive field (MDF); higher values are indicative of harder magnetic minerals such as haematite (Sternberg *et al.* 1999:422). The results of measurements of the direction of magnetisation of a group of samples are represented on a stereographic plot, which shows declination as an angle measured clockwise from north, and inclination as a distance from the perimeter.

Statistical Analysis

The magnetic directions from a number of samples expected to have the same date are combined to find a mean direction, the precision of which is defined using Fisherian statistics (Fisher 1953). The alpha-95 (α_{95}) represents a 95% probability that the true direction lies within a cone of confidence around the observed mean direction, and would be expected to be less than 5° for dating purposes. A value larger than this indicates that the magnetic directions of the samples are scattered and therefore do not all record the same magnetic field.

Samples thought to be very different from the mean directional value are assessed using statistical tests defined by Beck (1983) and McElhinny and McFadden (2000:92). The Beck '2-delta' test defines the samples that are located 2 angular standard deviations from the mean value. These samples are then tested using McElhinny and McFadden's equation of $\cos\theta_{95}$, if the values fail this test they can statistically be classified as lying significantly from the mean and therefore be removed from the analysis.

The stability of magnetisation of an individual sample after demagnetisation is quantified using the Stability Index (Tarling & Symons 1967). For a stable magnetisation this value would be expected to be greater than 2.5, a value less than this would indicate that the recorded magnetisation was not reliable for dating purposes.

Calibration Of Dates

Once a stable, mean magnetic direction has been obtained this is dated by comparing it with a calibration curve showing changes in the Earth's field over time. The calibration curve is compiled from direct measurements of the field, which extend back to AD1576 in Britain, and from archaeomagnetic measurements from features dated by other methods. As the geomagnetic field changes spatially, data for the calibration curve can only be drawn from within an area approximately 1000km across and all magnetic directions must be corrected mathematically to a central location (Noel & Batt 1990). There is a single calibration curve for England, Scotland and Wales and directions are corrected to Meriden (52.43°N, 1.62°W). Conventionally British archaeomagnetic dates are calibrated by visual comparison to the calibration curve produced by Clark *et al.* (1988). However, this method takes no account of the errors in the calibration curve itself and an alternative method is also used (Zananiri *et al.* 2007). This latter method gives a larger error margin on the dates but is a better reflection of the actual error.

Precision Of Dates

There are a number of factors that will influence the error margins of the dates obtained:

- Differential recording of the field by different parts of the feature.
- Disturbance of the material after firing/deposition.

- Uncertainties in sampling and laboratory measurements.
- Error margins in the calibration curve itself.
- Uncertainties in the comparison of the magnetic direction with the calibration curve.
- Spatial variation of the geomagnetic field.

The precision of the calibration curve varies according to the archaeological period and so the precision of the date obtained will depend on the archaeological dates. As the geomagnetic field has occasionally had the same direction at two different times, it is also possible to have two or more alternative dates for a single feature. In most cases the archaeological evidence can be used to select the most likely of these.

Given the number of different factors it is not possible to give a general figure for the precision of archaeomagnetic dates but there will be an error margin of at least ± 25 years in the UK. It is important to note that since the method relies on the reliability of previous dated sites the calibration curve can be improved as more measurements become available. Features that cannot be dated or given broad age ranges now, may be datable in the future.

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Appendix 2: Detailed Measurements And Statistical Analyses Of The Samples From Context 6364

Incorporating:

- Site information
- Magnetic measurements of NRM & partial demagnetisation
- Scatter plot of NRM and partial demagnetisation directions
- Statistics for NRM & partial demagnetisation measurements
- Pilot demagnetisation measurements, intensity spectra and Zijderveld plots
- Outlier test results
- Scatter plot of NRM & partial demagnetisation directions showing outliers removed
- Final statistics

Site Information:

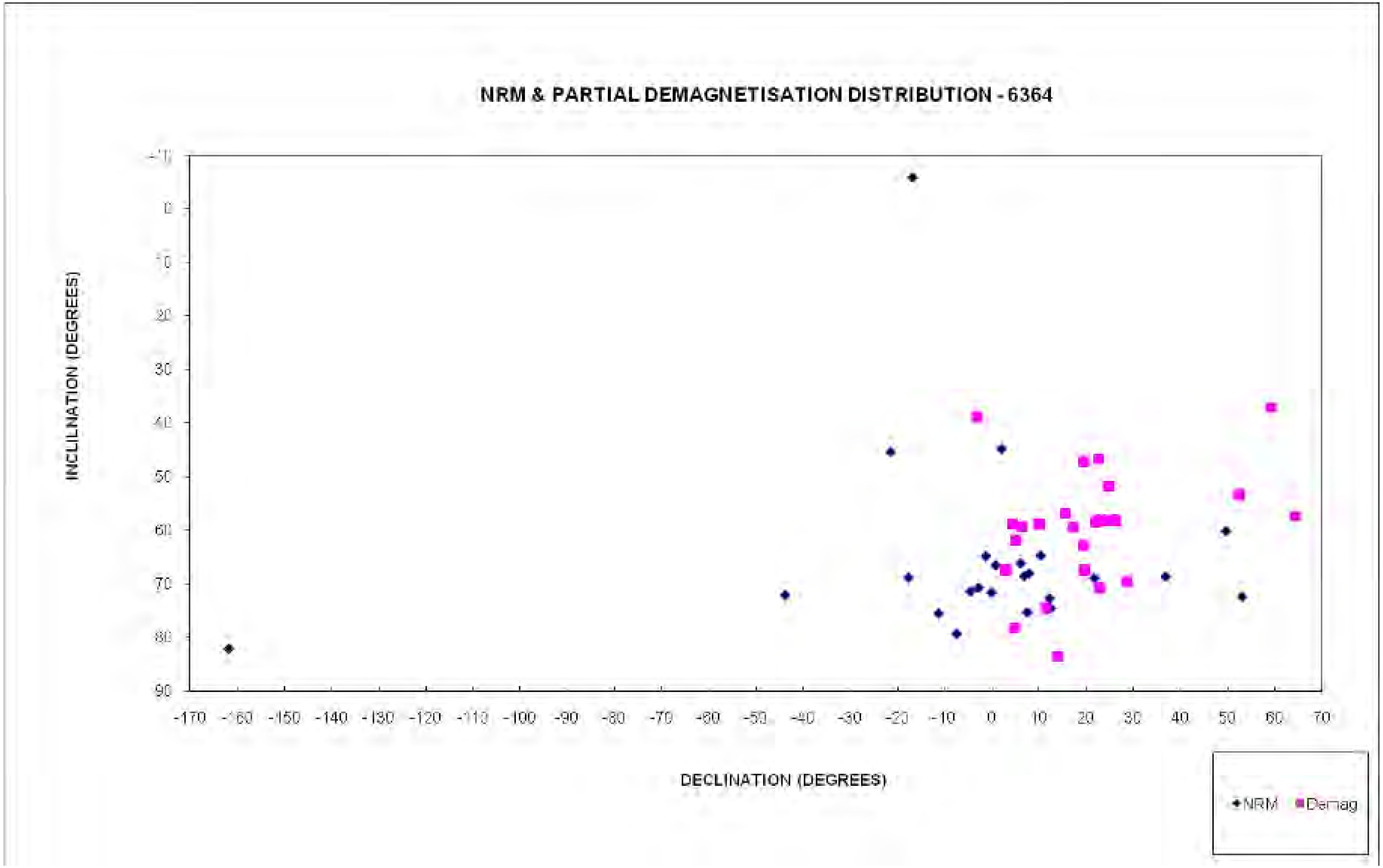
Site name: Worcester Library and History Centre, The Butts
Site code: WCM101653
Feature: Possible Romano-British bread oven
Context number: 6364
Description: Freshly exposed heat affected basal layer
Latitude (+ve N): 52.19°
Longitude (+ve E): -2.23°
Date Sampled: 2 Oct 2008
Magnetic Variation on date sampled (+ve E): -2.8°

Magnetic Measurements

Sample no.	NRM			Field	After partial demag			Pilot?
	D	I	Int		D	I	Int	
	degs.	*degs.*	*arb*	*mT*	*degs.*	*degs.*	*arb*	*Y/N*
6364-01	359.9	71.6	215.9888	7.5	6.3	59.3	176.5281	
6364-02	352.5	79.3	42.5781	7.5	11.5	74.5	36.9156	
6364-03	343.2	-6.0	7.9089	7.5	356.8	38.8	4.5887	
6364-04	316.2	72.1	8.9660	7.5	4.8	78.3	3.8146	
6364-05	0.8	66.5	12.0861	7.5	15.6	56.8	8.6991	
6364-06	358.7	64.8	15.4017	7.5	5.0	61.9	11.9417	
6364-07	11.5	74.8	27.5931	7.5	22.8	70.8	18.8335	Y
6364-08	2.0	44.7	12.7791	7.5	19.4	47.2	10.5442	
6364-09	338.6	45.3	4.9574	7.5	4.3	58.7	5.1647	Y
6364-10	6.1	66.1	15.2667	7.5	21.9	58.5	10.4312	
6364-11	6.9	68.5	25.0351	7.5	17.2	59.5	14.3648	
6364-12	12.2	72.7	15.1885	7.5	26.2	58.1	12.0406	
6364-13	12.5	74.6	12.9844	7.5	19.6	67.4	11.3663	
6364-14	10.3	64.7	5.2031	7.5	28.6	69.7	4.5774	Y
6364-15	7.9	68.0	7.7682	7.5	24.8	58.2	5.6162	
6364-16	53.0	72.4	5.6442	7.5	64.3	57.3	3.3209	
6364-17	49.6	60.1	6.4550	7.5	59.2	37.1	4.8713	
6364-18	36.8	68.6	19.4095	7.5	52.6	53.3	14.1640	
6364-19	357.2	70.7	16.9514	7.5	23.1	58.1	11.4339	
6364-20	7.5	75.3	11.4101	7.5	19.4	62.9	5.2412	Y
6364-21	342.3	68.8	3.4526	7.5	22.6	46.6	1.6566	
6364-22	348.7	75.5	4.4193	7.5	2.8	67.4	1.8652	
6364-23	198.3	82.1	28.4708	7.5	14.0	83.6	6.5021	Y
6364-24	355.5	71.4	6.7187	7.5	10.0	58.8	4.0754	
6364-25	21.7	68.9	8.3874	7.5	24.7	51.8	5.1670	

NRM DISTRIBUTION **PARTIAL DEMAG DISTRIBUTION**

Sample no.	NRM				Demag			
	D	I	D	I	D	I	D	I
	degs.	*degs.*	*degs*	*degs.*	*degs.*	*degs.*	*degs*	*degs.*
6364-01	359.9	71.6	-0.1	71.6	6.3	59.3	6.3	59.3
6364-02	352.5	79.3	-7.5	79.3	11.5	74.5	11.5	74.5
6364-03	343.2	-6.0	-16.8	-6.0	356.8	38.8	-3.2	38.8
6364-04	316.2	72.1	-43.8	72.1	4.8	78.3	4.8	78.3
6364-05	0.8	66.5	0.8	66.5	15.6	56.8	15.6	56.8
6364-06	358.7	64.8	-1.3	64.8	5.0	61.9	5.0	61.9
6364-07	11.5	74.8	11.5	74.8	22.8	70.8	22.8	70.8
6364-08	2.0	44.7	2.0	44.7	19.4	47.2	19.4	47.2
6364-09	338.6	45.3	-21.4	45.3	4.3	58.7	4.3	58.7
6364-10	6.1	66.1	6.1	66.1	21.9	58.5	21.9	58.5
6364-11	6.9	68.5	6.9	68.5	17.2	59.5	17.2	59.5
6364-12	12.2	72.7	12.2	72.7	26.2	58.1	26.2	58.1
6364-13	12.5	74.6	12.5	74.6	19.6	67.4	19.6	67.4
6364-14	10.3	64.7	10.3	64.7	28.6	69.7	28.6	69.7
6364-15	7.9	68.0	7.9	68.0	24.8	58.2	24.8	58.2
6364-16	53.0	72.4	53.0	72.4	64.3	57.3	64.3	57.3
6364-17	49.6	60.1	49.6	60.1	59.2	37.1	59.2	37.1
6364-18	36.8	68.6	36.8	68.6	52.6	53.3	52.6	53.3
6364-19	357.2	70.7	-2.8	70.7	23.1	58.1	23.1	58.1
6364-20	7.5	75.3	7.5	75.3	19.4	62.9	19.4	62.9
6364-21	342.3	68.8	-17.7	68.8	22.6	46.6	22.6	46.6
6364-22	348.7	75.5	-11.3	75.5	2.8	67.4	2.8	67.4
6364-23	198.3	82.1	-161.7	82.1	14.0	83.6	14.0	83.6
6364-24	355.5	71.4	-4.5	71.4	10.0	58.8	10.0	58.8
6364-25	21.7	68.9	21.7	68.9	24.7	51.8	24.7	51.8


NRM & PARTIAL DEMAGNETISATION DISTRIBUTION - 6364
INCLILNATION (DEGREES)
DECLINATION (DEGREES)
NRM
Demag

STATISTICS FOR NRM DATA

Sample no.	Dec	Inc	x	y	z
6364-01	359.9	71.6	0.3156486	-0.000551	0.948876
6364-02	352.5	79.3	0.1840782	-0.024234	0.982613
6364-03	343.2	-6.0	0.9520752	-0.287448	-0.104528
6364-04	316.2	72.1	0.2218378	-0.212735	0.951594
6364-05	0.8	66.5	0.3987102	0.005567	0.91706
6364-06	358.7	64.8	0.4256697	-0.00966	0.904827
6364-07	11.5	74.8	0.2569257	0.052272	0.965016
6364-08	2.0	44.7	0.7103665	0.024807	0.703395
6364-09	338.6	45.3	0.6548997	-0.256652	0.710799
6364-10	6.1	66.1	0.4028477	0.043052	0.914254
6364-11	6.9	68.5	0.3638468	0.04403	0.930418
6364-12	12.2	72.7	0.2906589	0.062843	0.954761
6364-13	12.5	74.6	0.2592614	0.057477	0.964095
6364-14	10.3	64.7	0.420471	0.076413	0.904083
6364-15	7.9	68.0	0.3710514	0.051488	0.927184
6364-16	53.0	72.4	0.1819707	0.241483	0.953191
6364-17	49.6	60.1	0.3230798	0.379618	0.866897
6364-18	36.8	68.6	0.2921683	0.21857	0.931056
6364-19	357.2	70.7	0.3301198	-0.016146	0.943801
6364-20	7.5	75.3	0.251587	0.033122	0.967268
6364-21	342.3	68.8	0.3445058	-0.109946	0.932324
6364-22	348.7	75.5	0.2455263	-0.049061	0.968148
6364-23	198.3	82.1	-0.1304934	-0.043157	0.990509
6364-24	355.5	71.4	0.3179761	-0.025025	0.947768
6364-25	21.7	68.9	0.3344848	0.133108	0.932954

STATISTICS FOR DEMAG DATA

Sample no.	Dec	Inc	x	y	z
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-03	356.8	38.8	0.778123	-0.0435	0.626604
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-16	64.3	57.3	0.23428	0.486798	0.841511
6364-17	59.2	37.1	0.408397	0.685093	0.603208
6364-18	52.6	53.3	0.362983	0.474762	0.801776
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-23	14.0	83.6	0.108158	0.026967	0.993768
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

STATISTICS FOR NRM DATA

Number = 25.0
Sum x = 8.7
Sum y = 0.4
Sum z = 22.0
R = 23.7
x bar = 0.4
y bar = 0.0
z bar = 0.9

Mean Dec = 2.6
Mean Inc = 68.4
Alpha95 = 7.0

CORRECTIONS

Mean Dec = 2.6
Mean Inc = 68.4

Correction for magnetic variation

Mean Dec = -0.24
Mean Inc = 68.37

Correction to Meriden (CVP)

Uncorrected Dec = -0.24
Uncorrected Inc = 68.37
Latitude = 52.19
Longitude = -2.23

Kai = 38.42
Latitude of pole= 89.37
Beta1 = -13.90
Longitude of pole = 191.68
Geomag colat = 38.18
Corrected Inc= 68.53
Beta 2 = -13.30
Corrected Dec= -0.23

FINAL RESULT

Corrected Dec= -0.2
Corrected Inc = 68.5
Alpha95 = 7.0

STATISTICS FOR DEMAG DATA

Number = 25.0
Sum x = 10.9
Sum y = 4.4
Sum z = 21.2
R = 24.3
x bar = 0.4
y bar = 0.2
z bar = 0.9

Mean Dec = 22.0
Mean Inc = 61.0
Alpha95 = 5.1

CORRECTIONS

Mean Dec = 22.0
Mean Inc = 61.0

Mean Dec = 19.25
Mean Inc = 60.97

Correction to Meriden (CVP)

Uncorrected Dec = 19.25
Uncorrected Inc = 60.97
Latitude = 52.19
Longitude = -2.23

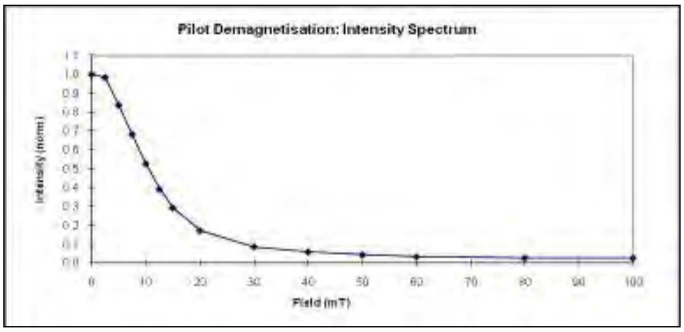
Kai = 47.98
Latitude of pole= 73.50
Beta1 = 59.58
Longitude of pole = 118.20
Geomag colat = 47.63
Corrected Inc= 61.27
Beta 2 = 60.18
Corrected Dec= 19.48

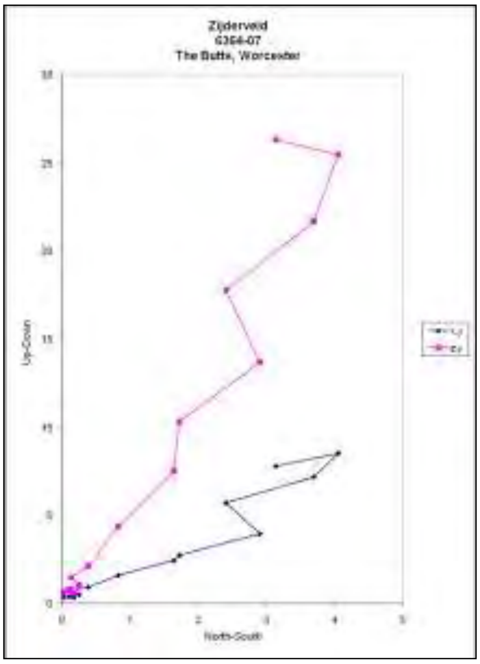
FINAL RESULT

Corrected Dec= 19.5
Corrected Inc = 61.3
Alpha95 = 5.1

PILOT DEMAGNETISATION
Sample Number 6364-07

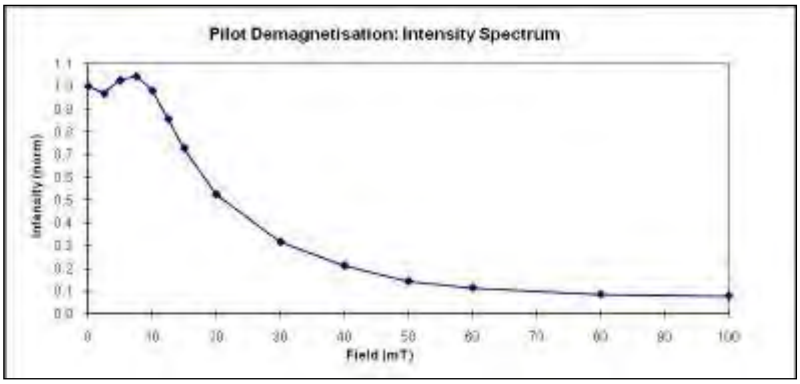
Demag Step	RM						
	D	I	Int	Int	x	y	z
mT	*degs.*	*degs.*	*arb*	*norm*			
0	21.9	72.3	27.6297	1.0	7.7891	3.1370	26.3228
2.5	25.4	69.7	27.1742	1.0	8.5255	4.0525	25.4820
5	27.2	69.6	23.1451	0.8	7.1821	3.6918	21.6906
7.5	22.8	70.8	18.8335	0.7	5.7193	2.4032	17.7824
10	36.2	70.3	14.5553	0.5	3.9630	2.9032	13.7012
12.5	32.1	72.6	10.8222	0.4	2.7465	1.7215	10.3254
15	33.8	68.6	8.0912	0.3	2.4529	1.6394	7.5341
20	27.0	67.6	4.7397	0.2	1.6121	0.8210	4.3809
30	22.2	64.7	2.3728	0.1	0.9379	0.3831	2.1457
40	10.7	63.9	1.6489	0.1	0.7140	0.1343	1.4802
50	25.9	61.8	1.2054	0.0	0.5125	0.2488	1.0623
60	14.4	63.2	0.9293	0.0	0.4055	0.1045	0.8297
80	26.2	57.5	0.7330	0.0	0.3533	0.1741	0.6182
100	4.0	61.4	0.7407	0.0	0.3533	0.0249	0.6505

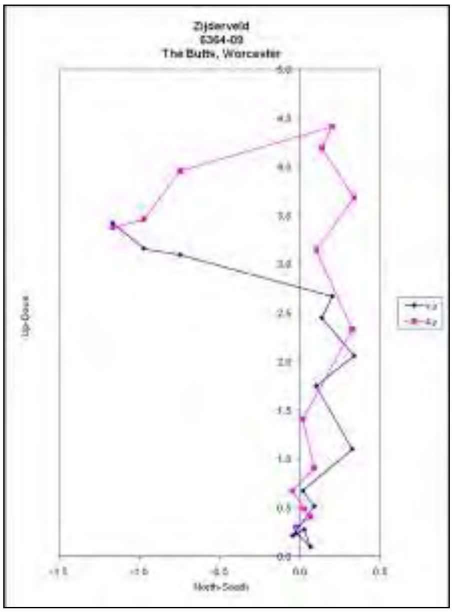




PILOT DEMAGNETISATION
Sample Number 6364-09

Demag Step	**RM**						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*arb*	*norm*			
0	341.2	43.0	4.9502	1.0	3.4257	-1.1676	3.3772
2.5	342.9	46.3	4.7919	1.0	3.1643	-0.9734	3.4643
5	346.5	51.2	5.0838	1.0	3.0996	-0.7469	3.9598
7.5	4.3	58.7	5.1647	1.0	2.6739	0.1992	4.4141
10	3.1	59.6	4.8589	1.0	2.4523	0.1344	4.1926
12.5	9.3	60.5	4.2376	0.9	2.0614	0.3361	3.6872
15	3.3	60.9	3.6045	0.7	1.7527	0.0996	3.1482
20	16.4	63.8	2.6017	0.5	1.1029	0.3237	2.3340
30	1.5	64.4	1.5636	0.3	0.6747	0.0174	1.4104
40	9.6	60.0	1.0506	0.2	0.5178	0.0871	0.9100
50	347.5	71.9	0.7071	0.1	0.2141	-0.0473	0.6722
60	5.1	60.4	0.5613	0.1	0.2764	0.0249	0.4880
80	33.0	73.8	0.4252	0.1	0.0996	0.0647	0.4083
100	354.1	51.7	0.3873	0.1	0.2390	-0.0249	0.3037

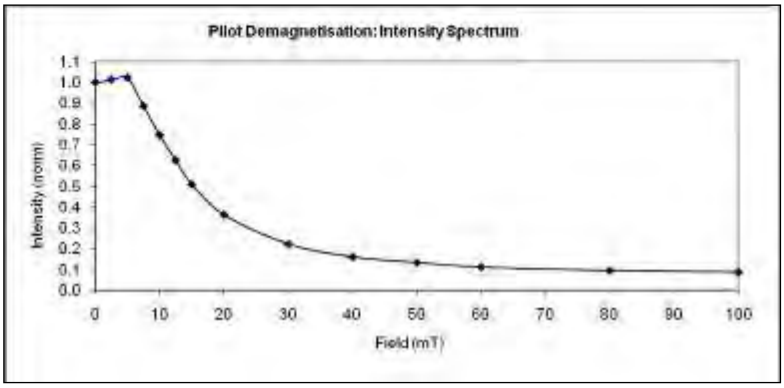


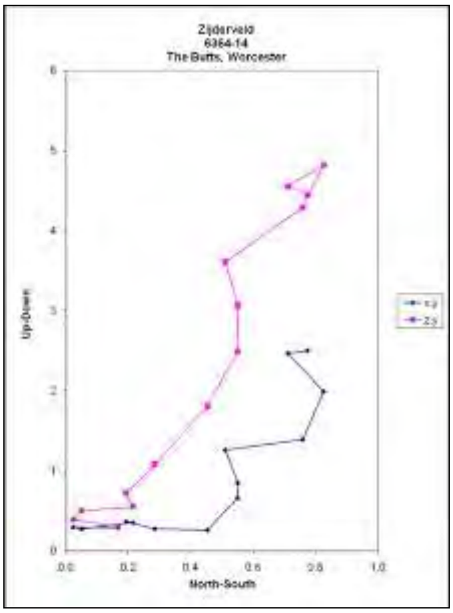


PILOT DEMAGNETISATION

Sample Number 6364-14

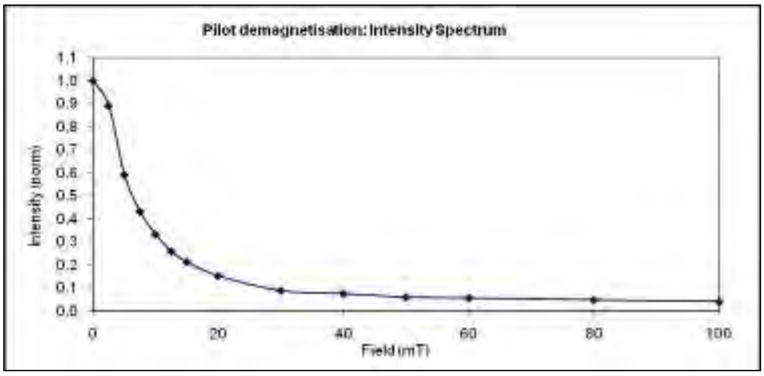
Demag Step	RM						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*arb*	*norm*			
0	17.2	59.6	5.1681	1.0	2.5019	0.7735	4.4555
2.5	16.1	60.6	5.2310	1.0	2.4671	0.7113	4.5575
5	22.5	65.9	5.2803	1.0	1.9921	0.8257	4.8198
7.5	28.6	69.7	4.5774	0.9	1.3927	0.7585	4.2938
10	22.0	69.3	3.8596	0.7	1.2634	0.5098	3.6112
12.5	32.9	71.7	3.2317	0.6	0.8506	0.5496	3.0690
15	39.6	70.9	2.6369	0.5	0.6640	0.5496	2.4920
20	60.3	73.9	1.8805	0.4	0.2587	0.4526	1.8068
30	45.8	69.9	1.1520	0.2	0.2761	0.2835	1.0819
40	27.5	60.0	0.8310	0.2	0.3681	0.1915	0.7200
50	31.2	53.3	0.6904	0.1	0.3532	0.2139	0.5534
60	10.2	60.9	0.5776	0.1	0.2761	0.0497	0.5049
80	4.3	52.8	0.4905	0.1	0.2960	0.0224	0.3905
100	30.0	42.8	0.4540	0.1	0.2885	0.1666	0.3084

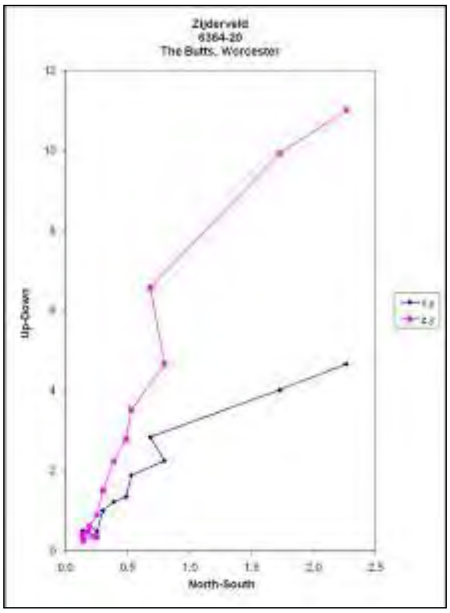




PILOT DEMAGNETISATION
Sample Number 6364-20

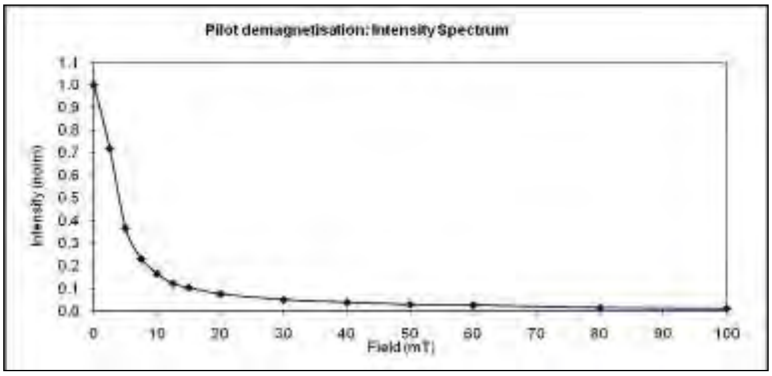
Demag Step	RM						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*arb*	*norm*			
0	25.9	64.8	12.1704	1.0	4.6667	2.2622	11.0101
2.5	23.3	66.2	10.8492	0.9	4.0150	1.7254	9.9302
5	13.5	66.0	7.1979	0.6	2.8415	0.6817	6.5781
7.5	19.4	62.9	5.2412	0.4	2.2497	0.7940	4.6667
10	15.6	61.0	4.0358	0.3	1.8852	0.5268	3.5294
12.5	19.8	62.7	3.1369	0.3	1.3533	0.4869	2.7878
15	17.6	60.1	2.5726	0.2	1.2235	0.3870	2.2297
20	16.6	55.2	1.8362	0.2	1.0038	0.2996	1.5081
30	27.6	58.9	1.0517	0.1	0.4819	0.2522	0.9001
40	17.8	45.1	0.8917	0.1	0.5993	0.1923	0.6317
50	20.9	44.8	0.7120	0.1	0.4719	0.1798	0.5019
60	15.1	38.5	0.6605	0.1	0.4994	0.1348	0.4107
80	34.7	38.5	0.5661	0.0	0.3645	0.2522	0.3521
100	20.6	33.7	0.4775	0.0	0.3720	0.1398	0.2647

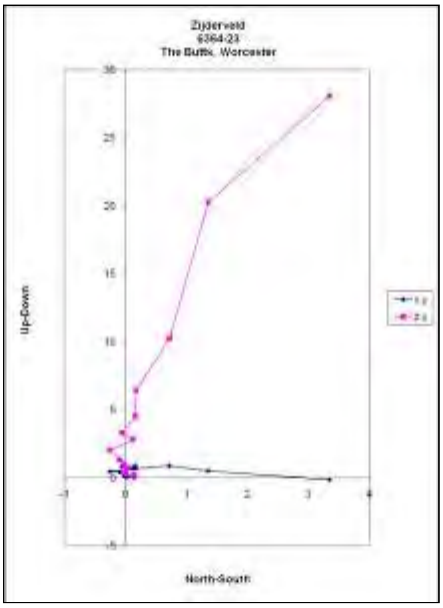




PILOT DEMAGNETISATION
Sample Number 6364-23

Demag Step	RM						
	D	I	Int	Int	x	y	z
mT	*degs.*	*degs.*	*arb*	*norm*			
0	92.1	83.2	28.2863	1.0	-0.1219	3.3463	28.0874
2.5	68.9	85.9	20.3462	0.7	0.5250	1.3584	20.2940
5	39.3	83.6	10.3361	0.4	0.8857	0.7240	10.2726
7.5	14.0	83.6	6.5021	0.2	0.7066	0.1766	6.4611
10	10.3	78.7	4.6279	0.2	0.8932	0.1617	4.5380
12.5	356.0	75.7	3.4322	0.1	0.8484	-0.0597	3.3251
15	10.3	76.4	2.8991	0.1	0.6717	0.1219	2.8176
20	332.4	74.9	2.1015	0.1	0.4851	-0.2538	2.0289
30	348.2	71.0	1.3815	0.0	0.4404	-0.0921	1.3062
40	354.1	78.0	1.0467	0.0	0.2164	-0.0224	1.0238
50	7.3	72.4	0.7780	0.0	0.2339	0.0299	0.7414
60	22.2	85.1	0.6942	0.0	0.0547	0.0224	0.6916
80	0.0	70.0	0.3640	0.0	0.1244	0.0000	0.3421
100	74.3	57.0	0.2701	0.0	0.0398	0.1418	0.2264





STATISTICS FOR DEMAG DATA

Sample no.	Dec	Inc	x	y	z
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-03	356.8	38.8	0.778123	-0.0435	0.626604
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-16	64.3	57.3	0.23428	0.486798	0.841511
6364-17	59.2	37.1	0.408397	0.685093	0.603208
6364-18	52.6	53.3	0.362983	0.474762	0.801776
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-23	14.0	83.6	0.108158	0.026967	0.993768
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

Number =	25
Sum x =	10.9
Sum y =	4.4
Sum z =	21.2
R =	24.3
x bar =	0.4
y bar =	0.2
z bar =	0.9

Mean Dec =	22.0
Mean Inc =	61.0
Alpha95 =	5.1

BECK 2-DELTA TEST

2-delta	28.2

McELHINNY & MCFADDEN DISCORDANCY TEST

STATISTICS FOR DEMAG DATA			**(N-1)**	6364-17	
Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-03	356.8	38.8	0.778123	-0.0435	0.626604
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-16	64.3	57.3	0.23428	0.486798	0.841511
6364-18	52.6	53.3	0.362983	0.474762	0.801776
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-23	14.0	83.6	0.108158	0.026967	0.993768
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

Number =	24
Sum x =	10.5
Sum y =	3.7
Sum z =	20.6
R =	23.4
x bar =	0.4
y bar =	0.2
z bar =	0.9
Mean Dec =	19.6
Mean Inc =	61.6
Alpha95 =	4.7
COS gamma(1-P)	20.1

STATISTICS FOR DEMAG DATA **(N-2)** 6364-16

Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-03	356.8	38.8	0.778123	-0.0435	0.626604
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-18	52.6	53.3	0.362983	0.474762	0.801776
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-23	14.0	83.6	0.108158	0.026967	0.993768
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

Number =	23
Sum x =	10.3
Sum y =	3.2
Sum z =	19.8
R =	22.5
x bar =	0.5
y bar =	0.1
z bar =	0.9
Mean Dec =	17.5
Mean Inc =	61.4
Alpha95 =	4.5
COS gamma(1-P)	19.3

STATISTICS FOR DEMAG DATA			(N-3)	6364-18	
Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-03	356.8	38.8	0.778123	-0.0435	0.626604
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-23	14.0	83.6	0.108158	0.026967	0.993768
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

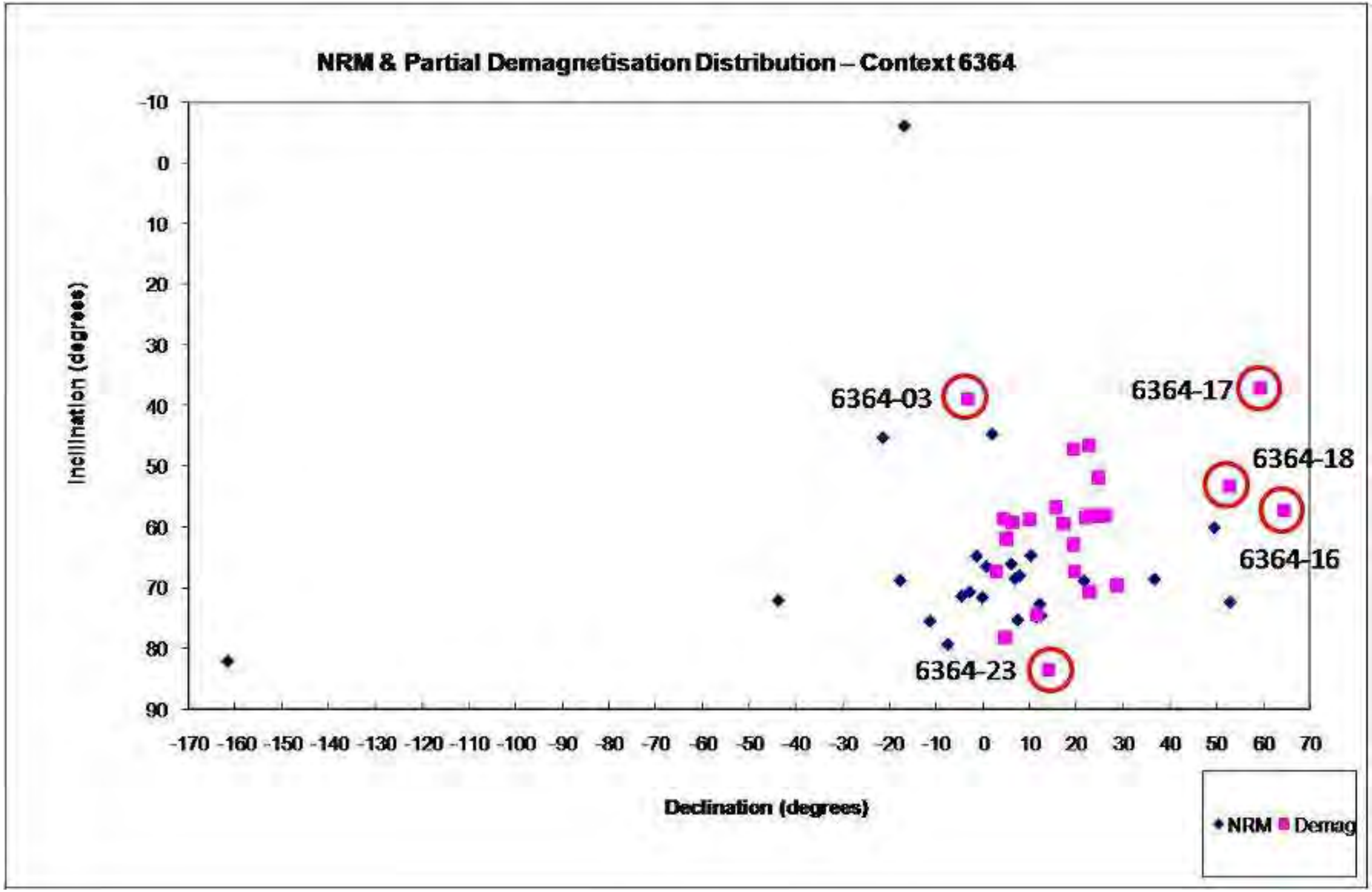
Number =	22
Sum x =	9.9
Sum y =	2.8
Sum z =	19.0
R =	21.6
x bar =	0.5
y bar =	0.1
z bar =	0.9
Mean Dec =	15.6
Mean Inc =	61.5
Alpha95 =	4.4
COS gamma(1-P)	18.6

STATISTICS FOR DEMAG DATA			(N-4)	6364-03	
Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-23	14.0	83.6	0.108158	0.026967	0.993768
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

Number =	21
Sum x =	9.1
Sum y =	2.8
Sum z =	18.4
R =	20.7
x bar =	0.4
y bar =	0.1
z bar =	0.9
Mean Dec =	17.1
Mean Inc =	62.5
Alpha95 =	4.0
COS gamma(1-P)	16.8

STATISTICS FOR DEMAG DATA			(N-5)	6364-23	
Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

Number =	20
Sum x =	9.0
Sum y =	2.8
Sum z =	17.4
R =	19.8
x bar =	0.5
y bar =	0.1
z bar =	0.9
Mean Dec =	17.2
Mean Inc =	61.4
Alpha95 =	3.7
COS gamma(1-P)	15.4


NRM & Partial Demagnetisation Distribution – Context 6364
Inclination (degrees)
Declination (degrees)
-10
0
10
20
30
40
50
60
70
80
90
-170 -160 -150 -140 -130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70
6364-03
6364-17
6364-18
6364-16
6364-23
NRM
Demag

FINAL STATS

Sample no.	Dec	Inc	x	y	z
6364-01	6.3	59.3	0.50746	0.056024	0.859852
6364-02	11.5	74.5	0.261873	0.053279	0.96363
6364-04	4.8	78.3	0.202076	0.016969	0.979223
6364-05	15.6	56.8	0.527392	0.147251	0.836764
6364-06	5.0	61.9	0.46922	0.041051	0.882127
6364-07	22.8	70.8	0.30317	0.127441	0.944376
6364-08	19.4	47.2	0.640864	0.225684	0.73373
6364-09	4.3	58.7	0.518057	0.038953	0.854459
6364-10	21.9	58.5	0.484793	0.194886	0.85264
6364-11	17.2	59.5	0.48484	0.150083	0.861629
6364-12	26.2	58.1	0.474146	0.233309	0.848972
6364-13	19.6	67.4	0.362028	0.128912	0.92321
6364-14	28.6	69.7	0.304604	0.166075	0.937889
6364-15	24.8	58.2	0.478359	0.221033	0.849893
6364-19	23.1	58.1	0.486069	0.207326	0.848972
6364-20	19.4	62.9	0.42968	0.151314	0.890213
6364-21	22.6	46.6	0.634326	0.264045	0.726575
6364-22	2.8	67.4	0.383837	0.018773	0.92321
6364-24	10.0	58.8	0.510157	0.089954	0.855364
6364-25	24.7	51.8	0.561829	0.258413	0.785857

Number =	20		
Sum x =	9.0		
Sum y =	2.8		
Sum z =	17.4		
R =	19.8		
x bar =	0.5		
y bar =	0.1		
z bar =	0.9		
Mean Dec =	17.2		
Mean Inc =	61.4		
Alpha95 =	3.7	**Alpha 68**	2.2

CORRECTIONS

Mean Dec =	17.18
Mean Inc =	61.45

Correction for magnetic variation

Mean Dec =	14.38
Mean Inc =	61.45

Correction to Meriden (CVP)

Uncorrected Dec =	14.38
Uncorrected Inc =	61.45
Latitude =	52.19
Longitude =	-2.23

Kai =	47.42
Latitude of pole=	76.36
Beta1 =	50.87
Longitude of pole =	126.90
Geomag colat =	47.10
Corrected Inc=	61.72
Beta 2 =	51.48
Corrected Dec=	14.59

FINAL RESULT

Corrected Dec=	14.6		
Corrected Inc =	61.7		
Alpha95 =	3.7	**Alpha 68**	2.2

Appendix 3: Detailed Measurements and Statistical Analyses Of The Samples From Context 6365

Incorporating:

- Site information
- Magnetic measurements of NRM & partial demagnetisation
- Scatter plot of NRM and partial demagnetisation directions
- Statistics for NRM & partial demagnetisation measurements
- Pilot demagnetisation measurements, intensity spectra and Zijderveld plots
- Outlier test results
- Scatter plot of NRM & partial demagnetisation directions showing outliers removed
- Final statistics

Site Information:

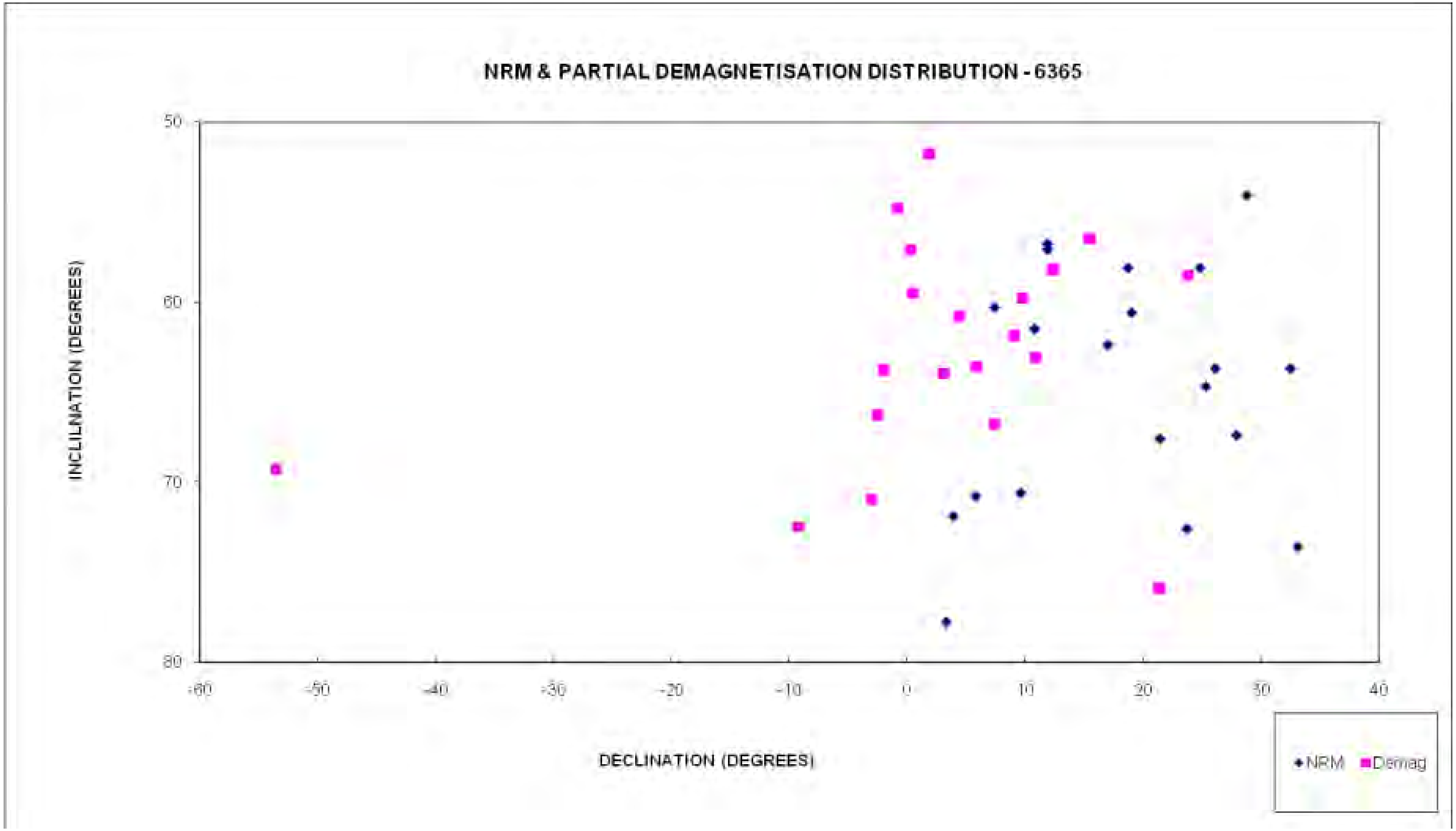
Site name: Worcester Library and History Centre, The Butts
Site code: WCM101653
Feature: Possible Romano-British bread oven
Context number: 6365
Description: Freshly exposed heat affected basal layer
Latitude (+ve N): 52.19°
Longitude (+ve E): -2.23°
Date Sampled: 2 Oct 2008
Magnetic Variation on date sampled (+ve E): -2.8°

MAGNETIC MEASUREMENTS

Sample no.	NRM			Field	After partial demag			Pilot?
	D	I	Int		D	I	Int	
	degs.	*degs.*	*arb*	*mT*	*degs.*	*degs.*	*arb*	*Y/N*
6365-01	18.7	58.1	90.5885	7.5	9.1	61.9	63.2267	
6365-02	28.8	54.1	162.2022	7.5	12.4	58.2	135.0401	
6365-03	24.8	58.1	59.7233	7.5	23.8	58.5	34.1181	
6365-04	26.1	63.7	36.5397	7.5	15.5	56.5	17.9370	
6365-05	11.9	56.8	97.1466	7.5	358.0	63.8	81.0518	Y
6365-06	21.4	67.6	23.0433	7.5	5.9	63.6	7.1282	
6365-07	17.0	62.4	61.0302	7.5	4.4	60.8	40.4436	
6365-08	32.5	63.7	30.9054	7.5	10.9	63.1	7.2017	
6365-09	10.8	61.5	62.3923	7.5	9.8	59.8	15.0675	
6365-10	9.6	70.6	42.4743	7.5	0.3	57.1	21.7725	Y
6365-11	7.4	60.3	45.3051	7.5	359.2	54.8	9.6728	
6365-12	27.9	67.4	65.6965	7.5	3.1	64.0	17.2349	
6365-13	19.0	60.6	15.9296	7.5	7.4	66.8	10.6058	
6365-14	23.7	72.6	44.0138	7.5	357.0	71.0	12.5982	
6365-15	5.8	70.8	18.5539	7.5	306.5	69.3	3.7494	Y
6365-16	3.9	71.9	42.4210	7.5	350.8	72.5	9.3220	
6365-17	3.3	77.8	21.1476	7.5	21.4	75.9	5.0451	
6365-18	11.9	57.1	57.7731	7.5	357.5	66.3	15.8565	Y
6365-19	33.1	73.6	20.2000	7.5	1.9	51.8	4.2523	
6365-20	25.3	64.7	26.5619	7.5	0.5	59.5	8.0370	

NRM DISTRIBUTION **PARTIAL DEMAG DISTRIBUTION**

Sample no.	**NRM**				**Demag**			
	D	**I**	**D**	**I**	**D**	**I**	**D**	**I**
	degs.	*degs.*	*degs*	*degs.*	*degs.*	*degs.*	*degs*	*degs.*
6365-01	18.7	58.1	18.7	58.1	9.1	61.9	9.1	61.9
6365-02	28.8	54.1	28.8	54.1	12.4	58.2	12.4	58.2
6365-03	24.8	58.1	24.8	58.1	23.8	58.5	23.8	58.5
6365-04	26.1	63.7	26.1	63.7	15.5	56.5	15.5	56.5
6365-05	11.9	56.8	11.9	56.8	358.0	63.8	-2.0	63.8
6365-06	21.4	67.6	21.4	67.6	5.9	63.6	5.9	63.6
6365-07	17.0	62.4	17.0	62.4	4.4	60.8	4.4	60.8
6365-08	32.5	63.7	32.5	63.7	10.9	63.1	10.9	63.1
6365-09	10.8	61.5	10.8	61.5	9.8	59.8	9.8	59.8
6365-10	9.6	70.6	9.6	70.6	0.3	57.1	0.3	57.1
6365-11	7.4	60.3	7.4	60.3	359.2	54.8	-0.8	54.8
6365-12	27.9	67.4	27.9	67.4	3.1	64.0	3.1	64.0
6365-13	19.0	60.6	19.0	60.6	7.4	66.8	7.4	66.8
6365-14	23.7	72.6	23.7	72.6	357.0	71.0	-3.0	71.0
6365-15	5.8	70.8	5.8	70.8	306.5	69.3	-53.5	69.3
6365-16	3.9	71.9	3.9	71.9	350.8	72.5	-9.2	72.5
6365-17	3.3	77.8	3.3	77.8	21.4	75.9	21.4	75.9
6365-18	11.9	57.1	11.9	57.1	357.5	66.3	-2.5	66.3
6365-19	33.1	73.6	33.1	73.6	1.9	51.8	1.9	51.8
6365-20	25.3	64.7	25.3	64.7	0.5	59.5	0.5	59.5



NRM & PARTIAL DEMAGNETISATION DISTRIBUTION - 6365
INCLILNATION (DEGREES)
50
60
70
80
-60
-50
-40
-30
-20
-10
0
10
20
30
40
DECLINATION (DEGREES)
NRM
Demag

STATISTICS FOR NRM DATA

Sample no.	Dec	Inc	x	y	z
6365-01	18.7	58.1	0.5005422	0.169424	0.848972
6365-02	28.8	54.1	0.513842	0.282487	0.810042
6365-03	24.8	58.1	0.4797044	0.221655	0.848972
6365-04	26.1	63.7	0.3978901	0.194924	0.896486
6365-05	11.9	56.8	0.5357955	0.11291	0.836764
6365-06	21.4	67.6	0.3547978	0.139044	0.924546
6365-07	17.0	62.4	0.4430522	0.135455	0.886204
6365-08	32.5	63.7	0.3736825	0.238062	0.896486
6365-09	10.8	61.5	0.468707	0.089411	0.878817
6365-10	9.6	70.6	0.3275096	0.055394	0.943223
6365-11	7.4	60.3	0.4913321	0.063813	0.868632
6365-12	27.9	67.4	0.339627	0.179823	0.92321
6365-13	19.0	60.6	0.4641586	0.159823	0.871214
6365-14	23.7	72.6	0.2738205	0.120199	0.95424
6365-15	5.8	70.8	0.3271831	0.033234	0.944376
6365-16	3.9	71.9	0.309957	0.021131	0.950516
6365-17	3.3	77.8	0.2109744	0.012165	0.977416
6365-18	11.9	57.1	0.5315011	0.112005	0.83962
6365-19	33.1	73.6	0.2365227	0.154187	0.959314
6365-20	25.3	64.7	0.3863668	0.182635	0.904083

STATISTICS FOR DEMAG DATA

Sample no.	Dec	Inc	x	y	z
6365-01	9.1	61.9	0.465084	0.074494	0.882127
6365-02	12.4	58.2	0.514663	0.113156	0.849893
6365-03	23.8	58.5	0.478065	0.210852	0.85264
6365-04	15.5	56.5	0.531863	0.147499	0.833886
6365-05	358.0	63.8	0.441237	-0.01541	0.897258
6365-06	5.9	63.6	0.44228	0.045705	0.895712
6365-07	4.4	60.8	0.486422	0.037428	0.872922
6365-08	10.9	63.1	0.444272	0.085553	0.891798
6365-09	9.8	59.8	0.49568	0.085619	0.864275
6365-10	0.3	57.1	0.543167	0.002844	0.83962
6365-11	359.2	54.8	0.576376	-0.00805	0.817145
6365-12	3.1	64.0	0.43773	0.023707	0.898794
6365-13	7.4	66.8	0.390661	0.050738	0.919135
6365-14	357.0	71.0	0.325122	-0.01704	0.945519
6365-15	306.5	69.3	0.210255	-0.28414	0.935444
6365-16	350.8	72.5	0.296838	-0.04808	0.953717
6365-17	21.4	75.9	0.226819	0.088889	0.969872
6365-18	357.5	66.3	0.401565	-0.01753	0.915663
6365-19	1.9	51.8	0.618068	0.020503	0.785857
6365-20	0.5	59.5	0.507519	0.004429	0.861629

STATISTICS FOR NRM DATA

Number =	20
Sum x =	8.0
Sum y =	2.7
Sum z =	18.0
R =	19.8
x bar =	0.4
y bar =	0.1
z bar =	0.9
Mean Dec =	18.6
Mean Inc =	64.9
Alpha95 =	3.1

CORRECTIONS

Mean Dec =	18.58
Mean Inc =	64.93

Correction for magnetic variation

Mean Dec =	15.78
Mean Inc =	64.93

Correction to Meriden (CVP)

Uncorrected Dec =	15.78
Uncorrected Inc =	64.93
Latitude =	52.19
Longitude =	-2.23
Kai =	43.10
Latitude of pole=	78.51
Beta1 =	68.84
Longitude of pole =	108.93
Geomag colat =	42.77
Corrected Inc=	65.18
Beta 2 =	69.45
Corrected Dec=	15.94

FINAL RESULT

Corrected Dec=	15.9
Corrected Inc =	65.2
Alpha95 =	3.1

STATISTICS FOR DEMAG DATA

Number =	20
Sum x =	8.8
Sum y =	0.6
Sum z =	17.7
R =	19.8
x bar =	0.4
y bar =	0.0
z bar =	0.9
Mean Dec =	3.9
Mean Inc =	63.4
Alpha95 =	3.6

CORRECTIONS

Mean Dec =	3.89
Mean Inc =	63.40

Correction for magnetic variation

Mean Dec =	1.09
Mean Inc =	63.40

Correction to Meriden (CVP)

Uncorrected Dec =	1.09
Uncorrected Inc =	63.40
Latitude =	52.19
Longitude =	-2.23
Kai =	45.04
Latitude of pole=	82.73
Beta1 =	6.12
Longitude of pole =	171.65
Geomag colat =	44.80
Corrected Inc=	63.60
Beta 2 =	6.73
Corrected Dec=	1.21

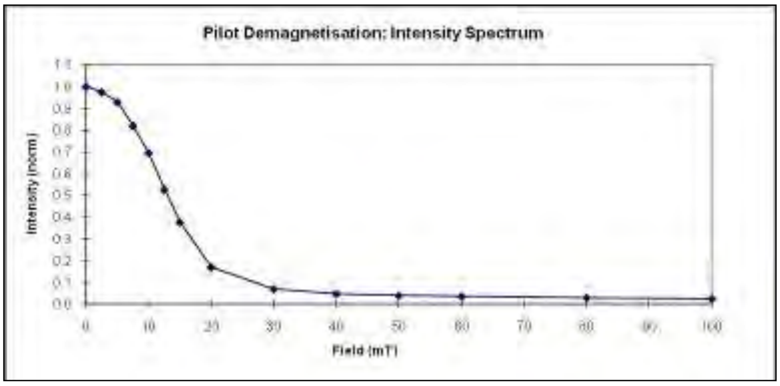
FINAL RESULT

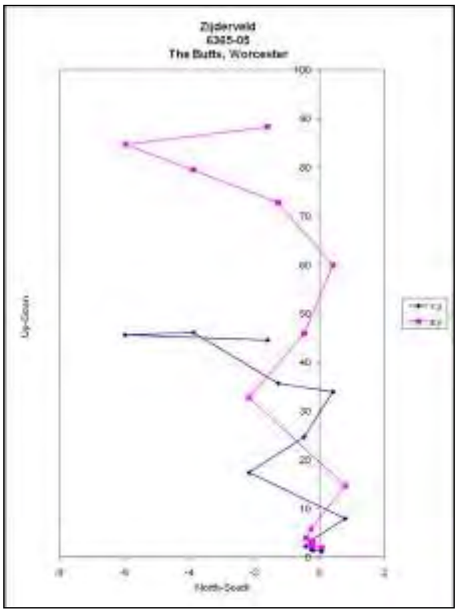
Corrected Dec=	1.2
Corrected Inc =	63.6
Alpha95 =	3.6

PILOT DEMAGNETISATION

Sample Number 6365-05

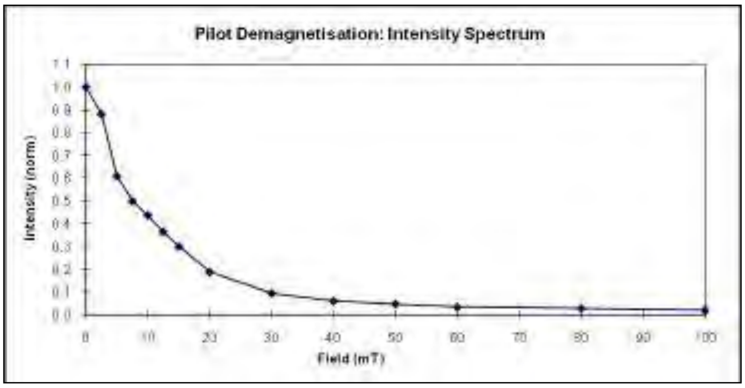
Demag Step	RM						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*arb*	*norm*			
0	358.0	63.2	98.9117	1.0	44.5525	-1.5945	88.2953
2.5	352.5	61.5	96.4167	1.0	45.6097	-5.9770	84.7361
5	355.2	59.8	91.9726	0.9	46.1222	-3.8823	79.4772
7.5	358.0	63.8	81.0518	0.8	35.7430	-1.2702	72.7339
10	0.7	60.5	68.8336	0.7	33.9256	0.4160	59.8911
12.5	358.9	61.7	52.1118	0.5	24.7101	-0.4729	45.8784
15	352.9	61.9	37.1026	0.4	17.3466	-2.1689	32.7260
20	5.7	61.4	16.7175	0.2	7.9726	0.7923	14.6726
30	355.5	59.7	6.6860	0.1	3.3673	-0.2625	5.7702
40	349.3	59.9	4.5398	0.0	2.2383	-0.4234	3.9269
50	352.5	64.0	3.7646	0.0	1.6366	-0.2154	3.3834
60	352.3	63.6	3.3501	0.0	1.4757	-0.2006	3.0009
80	350.6	57.5	2.7529	0.0	1.4583	-0.2402	2.3225
100	3.2	58.7	2.3662	0.0	1.2256	0.0693	2.0229

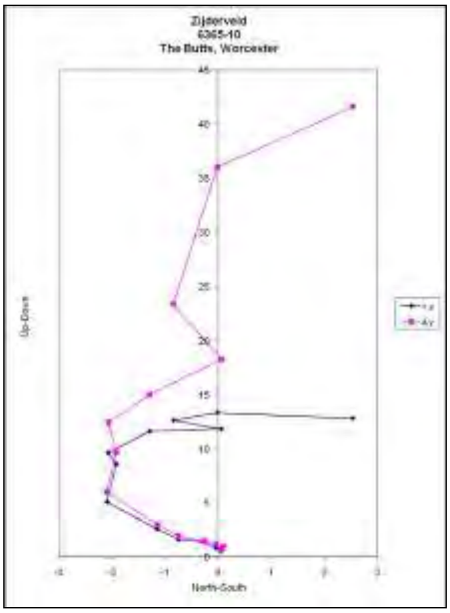




PILOT DEMAGNETISATION
Sample Number 6365-10

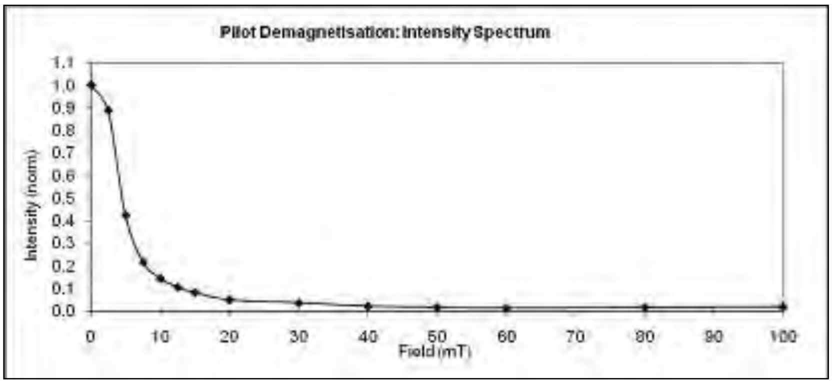
Demag Step	**RM**						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*Arb*	*norm*			
0	11.2	72.6	43.6216	1.0	12.8234	2.5373	41.6169
2.5	359.9	69.7	38.4128	0.9	13.3358	-0.0124	36.0236
5	356.2	61.6	26.5715	0.6	12.6269	-0.8433	23.3644
7.5	0.3	57.1	21.7725	0.5	11.8408	0.0622	18.2711
10	353.7	52.0	19.0330	0.4	11.6343	-1.2935	15.0075
12.5	347.9	51.6	15.8785	0.4	9.6393	-2.0721	12.4465
15	347.4	47.6	13.0800	0.3	8.6095	-1.9204	9.6580
20	337.7	47.5	8.1711	0.2	5.1070	-2.0945	6.0249
30	335.9	46.9	4.1166	0.1	2.5697	-1.1493	3.0037
40	335.4	47.0	2.6319	0.1	1.6318	-0.7463	1.9254
50	349.3	46.4	2.0477	0.0	1.3881	-0.2612	1.4826
60	357.0	55.7	1.4454	0.0	0.8134	-0.0423	1.1940
80	6.6	51.1	1.2367	0.0	0.7711	0.0896	0.9627
100	4.9	51.0	0.8725	0.0	0.5473	0.0473	0.6779

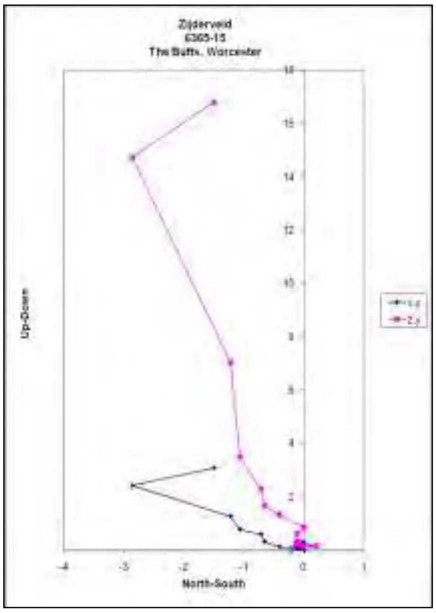




PILOT DEMAGNETISATION
Sample Number 6365-15

Demag Step	RM						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*arb*	*norm*			
0	334.2	78.4	17.1380	1.0	3.0892	-1.4962	16.7907
2.5	310.3	75.7	15.2100	0.9	2.4257	-2.8606	14.7403
5	316.4	75.9	7.2708	0.4	1.2824	-1.2203	7.0521
7.5	306.5	69.3	3.7494	0.2	0.7878	-1.0637	3.5080
10	310.4	67.9	2.4845	0.1	0.6064	-0.7133	2.3014
12.5	296.5	66.4	1.8205	0.1	0.3256	-0.6536	1.6676
15	289.3	72.2	1.4066	0.1	0.1417	-0.4051	1.3396
20	76.0	89.3	0.8662	0.1	0.0025	0.0099	0.8661
30	310.8	76.8	0.6331	0.0	0.0944	-0.1094	0.6164
40	326.1	61.1	0.3777	0.0	0.1516	-0.1019	0.3305
50	317.6	50.8	0.3032	0.0	0.1417	-0.1292	0.2349
60	332.4	59.0	0.2290	0.0	0.1044	-0.0547	0.1963
80	55.8	31.4	0.2956	0.0	0.1417	0.2088	0.1541
100	358.6	21.9	0.3296	0.0	0.3057	-0.0075	0.1230

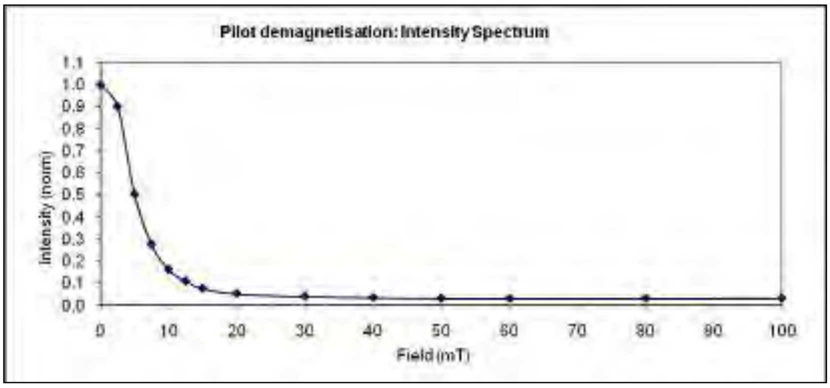


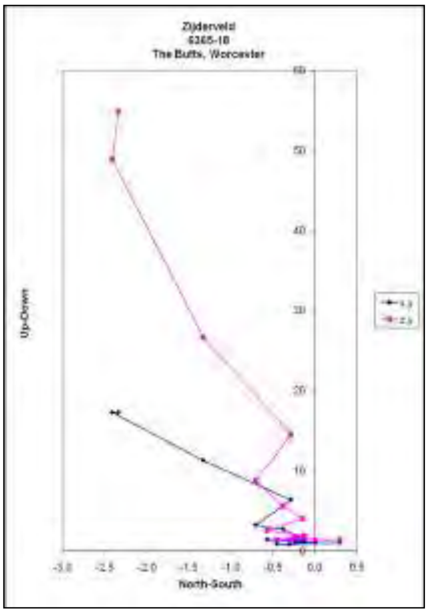


PILOT DEMAGNETISATION

Sample Number 6365-18

Demag Step	RM						
	D	**I**	**Int**	**Int**	**x**	**y**	**z**
mT	*degs.*	*degs.*	*arb*	*norm*			
0	352.3	72.4	57.5945	1.0	17.2912	-2.3357	54.8879
2.5	352.1	70.3	51.9680	0.9	17.3086	-2.4104	48.9416
5	353.3	66.9	29.0047	0.5	11.3025	-1.3272	26.6789
7.5	357.5	66.3	15.8565	0.3	6.3746	-0.2814	14.5160
10	347.7	69.3	9.3311	0.2	3.2247	-0.7047	8.7278
12.5	352.1	64.1	6.2593	0.1	2.7092	-0.3760	5.6301
15	354.8	68.6	4.3406	0.1	1.5737	-0.1444	4.0427
20	338.1	59.2	2.9634	0.1	1.4069	-0.5653	2.5461
30	354.3	55.9	2.2225	0.0	1.2401	-0.1245	1.8402
40	347.0	57.3	1.9465	0.0	1.0259	-0.2366	1.6372
50	0.7	52.4	1.7144	0.0	1.0458	0.0125	1.3583
60	339.6	58.7	1.6467	0.0	0.8018	-0.2988	1.4069
80	332.1	55.4	1.6950	0.0	0.8516	-0.4507	1.3945
100	16.6	52.7	1.7269	0.0	1.0035	0.2988	1.3733


Pilot demagnetisation: Intensity Spectrum
Intensity (norm)
Field (mT)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
10
20
30
40
50
60
70
80
90
100


Zijderveld
The Butts, Worcester
Up-Down
North-South
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5

STATISTICS FOR DEMAG DATA

Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6365-01	9.1	61.9	0.465084	0.074494	0.882127
6365-02	12.4	58.2	0.514663	0.113156	0.849893
6365-03	23.8	58.5	0.478065	0.210852	0.85264
6365-04	15.5	56.5	0.531863	0.147499	0.833886
6365-05	358.0	63.8	0.441237	-0.01541	0.897258
6365-06	5.9	63.6	0.44228	0.045705	0.895712
6365-07	4.4	60.8	0.486422	0.037428	0.872922
6365-08	10.9	63.1	0.444272	0.085553	0.891798
6365-09	9.8	59.8	0.49568	0.085619	0.864275
6365-10	0.3	57.1	0.543167	0.002844	0.83962
6365-11	359.2	54.8	0.576376	-0.00805	0.817145
6365-12	3.1	64.0	0.43773	0.023707	0.898794
6365-13	7.4	66.8	0.390661	0.050738	0.919135
6365-14	357.0	71.0	0.325122	-0.01704	0.945519
6365-15	306.5	69.3	0.210255	-0.28414	0.935444
6365-16	350.8	72.5	0.296838	-0.04808	0.953717
6365-17	21.4	75.9	0.226819	0.088889	0.969872
6365-18	357.5	66.3	0.401565	-0.01753	0.915663
6365-19	1.9	51.8	0.618068	0.020503	0.785857
6365-20	0.5	59.5	0.507519	0.004429	0.861629

Number =	20
Sum x =	8.8
Sum y =	0.6
Sum z =	17.7
R =	19.8
x bar =	0.4
y bar =	0.0
z bar =	0.9

Mean Dec =	3.9
Mean Inc =	63.4
Alpha95 =	3.6

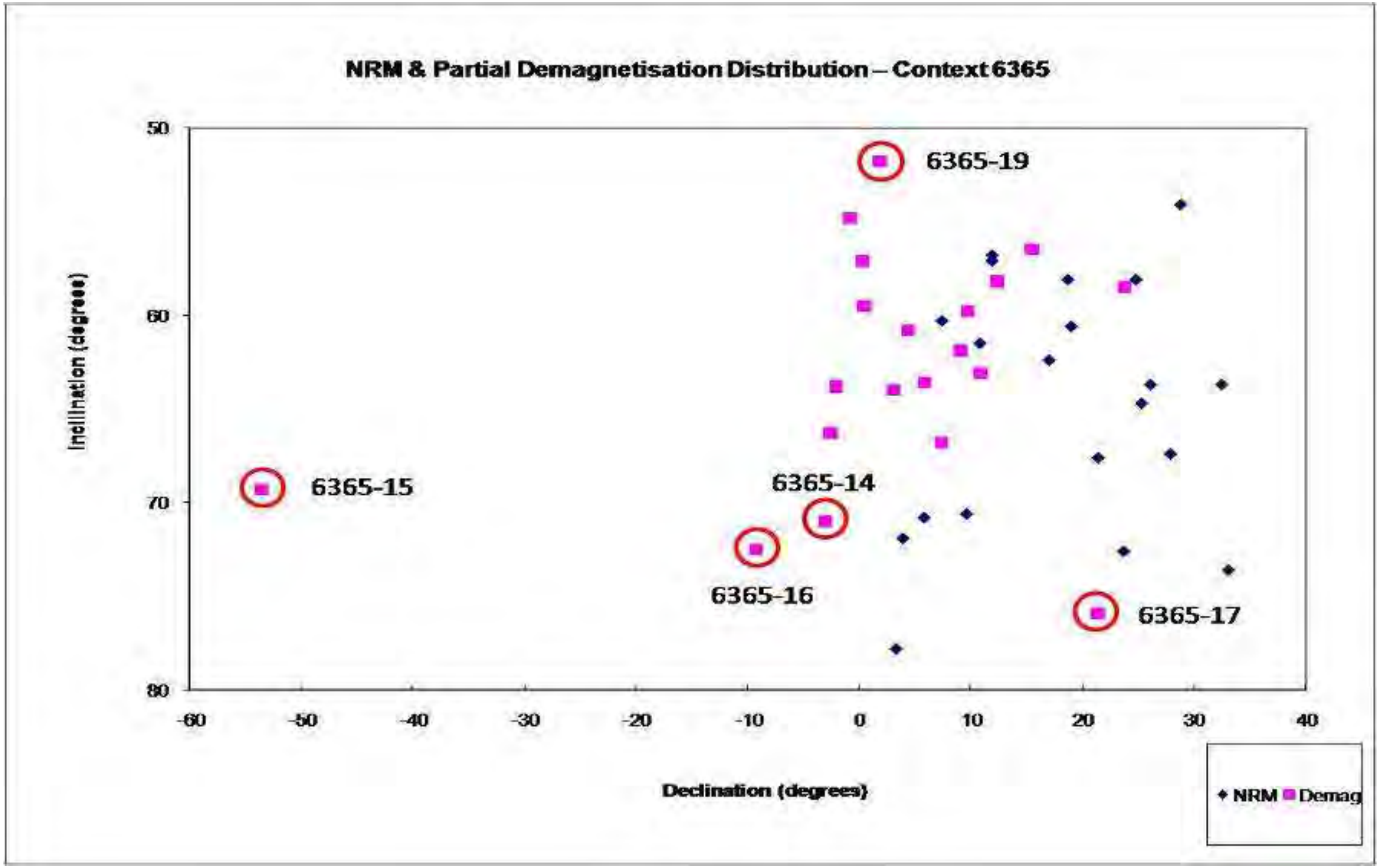
BECK 2-DELTA TEST

2-delta	17.6

McELHINNY & McFADDEN DISCORDANCY TEST

STATISTICS FOR DEMAG DATA			**(N-1)**	6365-15	
Sample no.	**Dec**	**Inc**	**x**	**y**	**z**
6365-01	9.1	61.9	0.465084	0.074494	0.882127
6365-02	12.4	58.2	0.514663	0.113156	0.849893
6365-03	23.8	58.5	0.478065	0.210852	0.85264
6365-04	15.5	56.5	0.531863	0.147499	0.833886
6365-05	358.0	63.8	0.441237	-0.01541	0.897258
6365-06	5.9	63.6	0.44228	0.045705	0.895712
6365-07	4.4	60.8	0.486422	0.037428	0.872922
6365-08	10.9	63.1	0.444272	0.085553	0.891798
6365-09	9.8	59.8	0.49568	0.085619	0.864275
6365-10	0.3	57.1	0.543167	0.002844	0.83962
6365-11	359.2	54.8	0.576376	-0.00805	0.817145
6365-12	3.1	64.0	0.43773	0.023707	0.898794
6365-13	7.4	66.8	0.390661	0.050738	0.919135
6365-14	357.0	71.0	0.325122	-0.01704	0.945519
6365-16	350.8	72.5	0.296838	-0.04808	0.953717
6365-17	21.4	75.9	0.226819	0.088889	0.969872
6365-18	357.5	66.3	0.401565	-0.01753	0.915663
6365-19	1.9	51.8	0.618068	0.020503	0.785857
6365-20	0.5	59.5	0.507519	0.004429	0.861629

Number =	19
Sum x =	8.6
Sum y =	0.9
Sum z =	16.7
R =	18.9
x bar =	0.5
y bar =	0.0
z bar =	0.9
Mean Dec =	5.9
Mean Inc =	62.6
Alpha95 =	3.0
COS gamma(1-P)	12.5


NRM & Partial Demagnetisation Distribution – Context 6365
Inclination (degrees)
Declination (degrees)
50
60
70
80
-60
-50
-40
-30
-20
-10
0
10
20
30
40
6365-19
6365-15
6365-14
6365-16
6365-17
NRM
Demag

FINAL STATS

Sample no.	Dec	Inc	x	y	z
6365-01	9.1	61.9	0.465084	0.074494	0.882127
6365-02	12.4	58.2	0.514663	0.113156	0.849893
6365-03	23.8	58.5	0.478065	0.210852	0.85264
6365-04	15.5	56.5	0.531863	0.147499	0.833886
6365-05	358.0	63.8	0.441237	-0.01541	0.897258
6365-06	5.9	63.6	0.44228	0.045705	0.895712
6365-07	4.4	60.8	0.486422	0.037428	0.872922
6365-08	10.9	63.1	0.444272	0.085553	0.891798
6365-09	9.8	59.8	0.49568	0.085619	0.864275
6365-10	0.3	57.1	0.543167	0.002844	0.83962
6365-11	359.2	54.8	0.576376	-0.00805	0.817145
6365-12	3.1	64.0	0.43773	0.023707	0.898794
6365-13	7.4	66.8	0.390661	0.050738	0.919135
6365-14	357.0	71.0	0.325122	-0.01704	0.945519
6365-16	350.8	72.5	0.296838	-0.04808	0.953717
6365-17	21.4	75.9	0.226819	0.088889	0.969872
6365-18	357.5	66.3	0.401565	-0.01753	0.915663
6365-19	1.9	51.8	0.618068	0.020503	0.785857
6365-20	0.5	59.5	0.507519	0.004429	0.861629

Number = 19
Sum x = 8.62
Sum y = 0.88
Sum z = 16.75
R = 18.86
x bar = 0.46
y bar = 0.05
z bar = 0.89

Mean Dec = 5.86
Mean Inc = 62.63
Alpha95 = 2.99 **Alpha 68** 1.80

CORRECTIONS

Mean Dec = 5.9
Mean Inc = 62.6

Correction for magnetic variation
Mean Dec = 3.1
Mean Inc = 62.6

Correction to Meriden (CVP)

Uncorrected Dec = 3.1
Uncorrected Inc = 62.6
Latitude = 52.2
Longitude = -2.2

Kai =	45.99
Latitude of pole=	81.57
Beta1 =	15.19
Longitude of pole =	162.58
Geomag colat =	45.73
Corrected Inc=	62.85
Beta 2 =	15.80
Corrected Dec=	3.20

FINAL RESULT

Corrected Dec=	3.20		
Corrected Inc =	62.85		
Alpha95 =	2.99	**Alpha 68**	1.80

Appendix 8: Osteological Analysis of the Human Remains from The Butts

Appendix 8 Osteological Analysis of the Human Remains from The Butts, Worcester City, December 2013 (Gaynor Western, Ossafreelance)

Introduction
The aim of this report is to present the data collated from the osteological analysis of human skeletal remains recovered during an excavation at the site of The Butts, Worcester city, Worcestershire (Grid reference: SO8467 5509, site reference WCM101653). The excavation was carried out by Worcestershire Historic Environment and Archaeology Services from 2008 to 2009 on behalf of the Worcester Library and History Centre Joint Project Team in advance of construction in the area.

Three contexts from negative features contained human remains; [8659], [8676] and [8892], associated with cut numbers [8664], [8677] and [8876] respectively. The articulated remains of skeleton [8853] were contained in cut [8677], a pit-like feature identified as a grave. Context [8659] was the middle fill of a pit ([8864]), into which a well had been cut, and contained a single disarticulated element. Disarticulated elements were also found in the primary fill ([8892]) of pit cut [8876]. These contexts are all thought to date to the Roman period according to the stratigraphic evidence. A disarticulated human bone was also recovered from a further fourth context [8802], consisting of tillage soil stripped by machine from the site.

Methods and Process
The skeletal material was analysed according to the standards laid out in the guidelines recommended by the British Association of Biological Anthropologists and Osteologists in conjunction with the IFA (Guidelines to the Standards for Recording Human Remains, Brickley and McKinley (eds) 2004) as well as by English Heritage (Human Bones from Archaeological Sites: Guidelines for producing assessment documents and analytical reports, Centre for Archaeology Guidelines, 2002).

Recording of the material was carried out using the recognised descriptions contained in Standards for Data Collection from Human Skeletal Remains by Buikstra and Ubelaker (1994). Full recording forms are supplied separately to be archived with any other archaeological recording forms. All skeletal data has been recorded using an MS-Access database(s) which can be found on the CD-Rom provided.

The material was analysed macroscopically and where necessary with the aid of a magnifying glass for identification purposes. Where relevant, digital photographs have been used for illustration and a full digital image archive of all pathologies and any other features of interest has been provided on the CD-Rom enclosed with this report.

The material was analysed without prior knowledge of associated artefacts so that the assessment remained as objective as possible.

Comparison of the results was made with published osteological data from contemporary skeletal populations.

Reasons for the Analysis
Osteological analysis was carried out to ascertain:

- Condition of bone present

- Completeness of the skeleton
- Inventory of the skeletal material
- Sex Determination
- Age Assessment
- Non-metric Traits
- Stature
- Skeletal Pathology
- Dental Pathology

Inventory of Skeletal Material

Introduction

An inventory of the skeletal remains present is undertaken to identify the skeletal elements present and to assess the minimum number of individuals represented. Each element is recorded as present or absent. The long bones are recorded according to the presence or absence of the proximal, middle and distal sections and also the proximal and distal joint surfaces. The completeness of the bones of the axial skeleton (with the exception of the spine) is recorded according to the categories of <25%, 25-50%, 50-75% and 75%>.

Observations

An inventory of the human skeletal remains present in SK[8853] recorded in tabular form on Sheet P (see Appendix) and on the articulated skeletal remains accession database. The elements present from contexts [8659], [8802] and [8892] were recorded separately on the disarticulated skeletal remains accession database.

Results

SK[8853] contained associated skeletal elements representing the remains of one individual deposited in an articulated state. Elements present included a small fragment of skull (temporal bone), the proximal (upper) portions of left and right humerii, the left scapula, eight vertebral bodies (one cervical, three thoracic, three lumbar and one sacral), 23 vertebral arches (some fragmented), six ribs (three left and three right) and one right femur (See Plate 1). No dentition was present.

Only one skeletal element was contained in each of contexts [8659] and [8802]. Context [8802] contained one left femur while one right tibia was present in context [8659]. These remains represent elements deposited in a disarticulated state, likely to have been re-deposited from other disturbed features, such as pits or graves.

Context [8892] contained two seemingly associated elements, one left femur and tibia. Given the lack of further associated human skeletal elements, it is probable that these were also deposited in a disarticulated state, re-deposited from a disturbed feature.

Plate 1: *Articulated Remains of SK[8853]*

Condition of the Bone Present
Introduction
The condition of the bone was assessed macroscopically according to the categories and descriptions provided by the Guidelines to the Standards for Recording Human Remains (Brickley and McKinley, eds, 2004). Since most skeletons exhibit more than one grade of state of preservation, these categories are simplified into 4 main groups of preservation: Good (grades 0-2), Fair (grades 2-4), Poor (grades 4-5+) and Varied (more than 4 grades of condition). The preservation of human bone from archaeological assemblages can vary according to soil and environmental conditions, to the age of the individual (where adult bones are more robust and resilient to taphonomic changes) and to the morphology of the individual bone (long bones, for example, are more robust than rib bones) (Henderson 1987).

Observations
The bone present was generally well preserved in all contexts. Some erosion to the distal ends of the long bones was noted in SK[8853] and some post-deposition damage had occurred to the more fragile elements, such as the ribs and scapula, leading to their fragmentation. The ends of the long bones from context [8892] had undergone some post-deposition damage, causing them to be incomplete.

Results
All the skeletal remains were categorised as being in a state of ‘good’ condition.

Completeness of Skeletons
Introduction
This is a guide to the overall completeness of the individual’s skeletal remains and is calculated according to the percentage of the bones present in relation the total number of bones in a complete human skeleton. Completeness of remains is gauged through an assessment of the amount of material representing different areas of the body. A complete skeleton comprises of:

Skull = 20%
Torso = 40%
Arms = 20%
Legs = 20%

Each area of the skeleton was assessed and then placed into the following four categories of completeness: <25%, 25-50%, 50-75% and 75%> (Buikstra and Ubelaker 1994).

Recording the completeness of the individual can allow an insight to be gained into how much post-depositional activity has occurred as well as to assess how much information can potentially be gained from the remains.

Observations
Completeness was assessed via the tabular recording carried as part of the inventory compilation on Sheet P for context [8853] (See Appendix). Completeness of skeleton was not recorded for contexts [8659], [8802] or [8892] due to these elements being interred in a disarticulated state.

Little of the skull had survived from SK[8853] and also absent from the skeleton were the lower arm bones (radius and ulna), left leg (femur, tibia and fibula) as well as the lower right leg (tibia and fibula). Approximately a third of the torso was also absent and few elements containing a high proportion of the more fragile cancellous (spongy) bone had survived.

Results
Approximately 40% of SK[8853] was present and was categorised as 25-50% complete.

Age Assessment
Introduction
Establishing the age and sex of individuals from an archaeological assemblage not only provides an insight into the demographic profile of the population but can also be used to inform us of patterns in pathological distributions in a skeletal assemblage.

The age of sub-adults is assessed using both dental development (Smith 1991) and eruption (Ubelaker 1989) as well as long bone lengths (Schaefer *et al*. 2009) and epiphyseal fusion (Scheuer & Black 2004). These methods can usually provide a reasonably accurate age estimation due to a relatively narrow range of variation in normal sub-adult development. Thus, sub-adults can be placed into the following age categories: Foetal (<36 weeks), Neonate (0-1 month), Young Infant (1-6 months), Older Infant (6-12 months), Child (1-5 years), Juvenile (6-12 years) and Adolescent (13-19 years).

Assessment of adult age at death, unfortunately, results in much less specific age estimates due to a much greater individual variation in the features exhibited by the examined elements at particular ages (Cox 2000). Age estimation of adults was assessed from analysis of the auricular surface (Lovejoy *et al*. 1985) and the pubic symphysis (Brookes and Suchey, 1990). Each of these methods examines the deterioration of these surfaces and categorises them accordingly. This deterioration is due in part to due to the health status of the individual but can also be influenced by life-style and so the variation produced by these factors results in much wider age categories: Young Adult (20-34), Middle Adult (35-49) and Old Adult (50+) (Buikstra and Ubelaker, 1984). Grading of dental attrition was also used as a supplementary age assessment technique using the Miles method (1963) where dentition sets were complete enough to allow fair observation.

Observations
Age assessment for SK[8853] was carried out using metric analysis of the left scapula and right femur, both elements being sufficiently preserved to allow measurements to be taken. Assessment of age from dental eruption and development was not possible due to the lack of dentition present.

Metric analysis was also undertaken on the elements present in contexts [8659], [8802] and [8892] where preservation of the elements was suitable.

Results
Data obtained from the metric analysis is presented in Table 1 below.

The metric analysis of both the femur and scapula from SK[8853] indicated an age of death at around 40 weeks old. This individual was therefore categorised as a neonate (0-1 month). Metric analysis of the femur from context [8802] indicated an age at death of 36-38 weeks whereas that of the tibia from [8659] suggested an age at death of 38-40 weeks. Both elements were also classified as belonging to neonates.

	SK[8853]	*[8659]*	*[8802]*	*[8892]*
Scapula Length (mm)	38.6	-	-	-
Scapula Width (mm)	28.7	-	-	-
Femur Length (mm)	76.6	-	65.3	c.196
Femur Distal Width (mm)	21.4	-	17.9	-
Tibia Length (mm)	-	64.1	-	-
Age Assessment	40+ weeks	38-40 weeks	36-38 weeks	3-4+ years

Table 1: *Metric Analysis*

The metric analysis of the femur present in context [8892], however, was clearly indicative of an older child. The distal end, or metaphyseal area, of the femur had sustained some damage but the measurement taken of the bone present suggested an age of approximately 3-4 years old to be taken as a minimum estimate. This individual was, therefore, categorised as a child (1-5 years).

Sex Determination

Introduction

Sex is assessed using the criteria laid out by Buikstra and Ubelaker (1984) in the analysis of morphological features of the skull and pelvis. In addition, metric data is also used where possible, taking measurements of sexually dimorphic elements such as the femoral and humeral head (Bass 1995). Categories ascribed to individuals on the basis of this data were 'Male', Possible Male', 'Indeterminate', 'Possible Female', 'Female' and 'Unobservable'. Sex may be ascribed on the basis of metrics alone where no sexually dimorphic traits are observable. Where sex was not observable by either metric or morphological observations, it was recorded as 'Unobservable'. No sexing of sub-adult material is attempted due to the lack of reliable criteria available.

Observations

The sex of the individuals present could not be assessed due to all the skeletal elements present being noted as sub-adult.

Results

The sex of the individuals present was unobservable.

Non-Metric Traits

Introduction

Non-metric traits are morphological features that occur both in bone and dentition. These features have no specific functional purpose and occur in some individuals and not in others. The origins of non-metric traits have now been shown to be highly complex, each having its own aetiology and each being influenced to differing extents by genetics, the environment and by physical activity. A review of the current literature suggests that the undetermined specific origins of these traits and the fact that there is more genetic variation within populations than between them can prevent useful conclusions regarding their presence or absence in skeletal remains from being drawn (Tyrell 2000).

Observations

Observable skeletal non-metric traits do not occur in infant and neonate individuals due to their lack of development at this age. Therefore, no non-metric traits were observed.

Results

No non-metric traits were recorded due to the very young age of the individuals present.

Stature and Morphometric Analysis

Introduction

Stature of adult individuals can be reconstructed from measurements of long bones of the skeleton. Since the long bones of sub-adults have not yet fully developed it is not possible to provide an estimate of stature for immature remains. Stature is the result of many factors including genetics and environmental influences (Floud *et al*. 1990), such as malnutrition and poor health. Height can be used as an indicator of health status and there is a wide range of literature on the relationships between height, health and social status. Estimated stature was calculated by taking the measurements of the individual long bones and using the formula provided by Trotter (1970). Variation in estimated stature can be up to 3cm.

Metric analysis of the long bones, cranium and mandible may also be undertaken on adult remains to provide comparative information on morphological variability.

Observations
The sub-adult age of the human remains present precluded any estimation of stature or morphometric analysis.

Results
Stature was not estimated due to all individuals being of sub-adult age and no morphometric analysis was undertaken.

Skeletal Pathology
Introduction
Palaeopathology is the study of diseases of past peoples and can be used to infer the health status of groups of individuals within a population as well as indicate the overall success of the adaptation of a population to its surrounding environment (Roberts and Manchester 1997; Roberts and Cox 2003). Pathologies are categorised according to their aetiologies; e.g. congenital, metabolic, infectious, traumatic, neoplastic etc. (Ortner 2003; Salter 1999). Artificial modifications to skeletal elements, such as surgical cutmarks, may also be recorded. Any pathological modifications to the bone are described. The size and location of any lesion is also noted. Distribution of lesions about the skeleton should be noted to allow diagnosis. A differential diagnosis for any pathological lesions should also be provided.

Observations
No skeletal pathology was observed.

Results
No skeletal pathology was present.

Dental Pathology
Introduction
Dental diseases include conditions that not only directly affect the teeth but also the soft tissue surrounding them, sometimes observable in changes to the underlying alveolar bone (Hillson 1986). Each condition can give an indication of different aspects of lifestyle and health of the individual. For example, caries is associated with diets high in sucrose content. The presence of calculus can inform us about dental hygiene whilst enamel hypoplastic defects testify to developmental stresses that an individual has undergone in childhood (Dobney and Goodman 1991; Goodman and Armelagos 1985). The analysis of dental disease, therefore, not only informs us of specific oral conditions but provides complimentary data regarding overall health status and cultural practices.

Observations
Neither dentition nor alveolar bone was present and therefore no observations of dental pathology could be made.

Results
No dental pathology was observed due to the lack of observable elements.

Conclusion
A summary of the findings from the osteological analysis are presented in Table 2 below:

Context	***SK[8853]***	***[8659]***	***[8802]***	***[8892]***
Condition	Good	Good	Good	Good
Completeness	25-50%	-	-	-
Elements	Temporal bone, 6 Ribs, 8 Vertebral Bodies (1 cervical, 3 thoracic, 3 lumbar and 1 sacral), 23 Vertebral Arches (cervical, thoracic and lumbar), Left Scapula, Proximal Humerii, Right Femur.	Right Tibia	Left Femur	Left Femur, Left Tibia
Age	40+ weeks	38-40 weeks	36-38 weeks	3-4+ years
Sex	-	-	-	-
Stature	-	-	-	-
Skeletal Pathology	-	-	-	-
Dental Pathology	-	-	-	-

Table 2: *Summary of the Human Remains*

The remains of four individuals were excavated from the site of The Butts, Worcester city centre. The bone present was well preserved though some fragmentation had occurred as a result of post-mortem damage. SK[8853] was assessed as being approximately 40% complete and deposited in an articulated state where as the skeletal elements recovered from contexts [8659], [8802] and [8892] were disarticulated elements, likely to be re-deposited from other, disturbed features. Articulated skeleton SK[8853] was recovered from a pit-like feature identified as a burial, whereas the disarticulated elements [8659] and [8892] were retrieved from rubbish pit fills. One element was recovered from the tillage soil [8802]. All the remains were thought to date to the Roman period, possibly the 3-4rd centuries.

All the remains represented sub-adults; three individuals were identified as neonates and one as a child. As indicated by the metric analysis undertaken, the disparity present between the size of the disarticulated neonate elements present in contexts [8659] and [8802] and those present in articulated skeleton SK[8853] suggests that they do not originate from this latter individual. Furthermore, the disparity in size observed between the disarticulated elements themselves suggests that these also belong to separate individuals. The age of the 'neonates' spans from 36 to 40 weeks, suggesting that these individuals were peri-natal; it is not possible from the osteological evidence to infer whether these babies were stillborn or whether they died shortly after birth.

Other infant remains dating to the Roman period have been found in Worcester. An infant aged less than 2 months old contained in an inverted urn, thought to date to the 2nd or 3rd century AD, was discovered in the bottom of a ditch associated with a major

Roman rampart (WSM01276). A Roman burial ground excavated at the site of King’s school, (St. Albans) (WSM08817) contained four sub-adult individuals, although poor preservation prevented a precise age estimation being made for most of the skeletal remains. However, one individual was noted as being approximately 4 years of age at death and another was thought to represent a ‘very young child’ (Brown and Wichbold 1991, p.11). A second Roman burial ground at Deansway, Powick Lane, North in the city centre also contained sub-adult remains including one East-West aligned interment of a neonate, radiocarbon dated to AD60-400 (Dalwood and Edwards 2002, p.105). The evidence of burial practice for infants and neonates in Worcester to date indicates that remains could either be treated in a similar fashion to adults, with interment in a formal cemetery, or that they could be deposited in seemingly more secular contexts such as ditches and rubbish pits, though perhaps in special circumstances.

Variation in the post-mortem treatment of neonates and infants in Roman Britain is subject to much debate, particularly in light of the recent analysis of a large number of peri-natal human remains at Yewden villa, Hambleden, Buckinghamshire where the high proportion of deaths of infants at or around the time of birth has been suggested as indicative of the practice of infanticide (Mays and Eyers 2011). A comprehensive analysis of Roman burials from the South East of England, however, indicates that 22.3% of all burials containing remains that could be assessed for age at death were identified as neonate (Smith nd), a figure consistent with and in some cases lower than other skeletal and historic populations (Chamberlain 2006). The survey also found that in comparison to the 22% of burials from nucleated settlements and 21% of burials from farms, 77% of burials from villas contain the remains of neonates and infants (Smith nd). Three major deposits of infant remains in Roman Britain occur within infant ‘cemeteries’ at villa sites (Yewden, Barton Court Farm and Keston); other infant remains at villas are deposited in small numbers and are dispersed in and around the villa and its outbuildings (Smith nd). One infant excavated from Yewden villa exhibited cutmarks on the right femur, suggesting that the practice of embryotomy had been undertaken in the case of an obstructed labour by a dead or dying foetus (Mays *et al*. 2012); in context of the large numbers of perinates found there, this perhaps points to the villa forming a base for the administration of obstetric medical aid.

At other settlement sites across the country, such as Baldock (Hertfordshire), Woodcuts Common (Dorset), Poxwell (Dorset), Radwinter (Essex) and Porchester Castle (Sussex), infant remains have been discovered in ditches, gullies and rubbish pits (Brødholt 2012). It is likely in these cases that the age of the infant was a significant factor in its post-mortem treatment. For example, an analysis of the infant burials from the Roman Lankhills cemetery, Winchester by Brødholt (2012, p.40) illustrates that children over 2 years old were more likely to receive visible grave goods whereas neonate and infants were much more likely to be buried without any visible items.

Neonate and infants clearly received very different burial treatment than adults in many cases during the Roman period and the form of these treatments was numerous. This variation in funerary rites and customs for neonates and infants in Roman Britain is reflected in this newly discovered evidence from The Butts, Worcester.

Future Recommendations

No further analysis of the human remains is required at this time.

Acknowledgements
Thanks are due to Liz Pearson of Worcester Archive and Archaeology Service for the provision of contextual data.

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The Archive

Type	No	Type	No
Skeleton Recording Form A	1	Skeleton Recording Form L	0
Skeleton Recording Form B	0	Skeleton Recording Form P	1
Skeleton Recording Form D	0	Skeleton Recording Form Q	1
Skeleton Recording Form E	0	Skeleton Recording Form R	1
Skeleton Recording Form F	0	Skeleton Recording Form S	0
Skeleton Recording Form G	0	Skeleton Recording Form V	0
Skeleton Recording Form H	0	Articulated Skeletal Remains Inhumated Db	1
Skeleton Recording Form I	0	Disarticulated Skeletal Remains Db	1
Skeleton Recording Form J	0		
Skeleton Recording Form K	0		

Appendix 9: Radiocarbon dating reports

Appendix 9 Radiocarbon dating reports (Beta Analytic and Scottish Universities Environmental Research Centre)

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Nick Daffern — Report Date: 11/24/2010

University of Worcester — Material Received: 11/4/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 287692	1830 +/- 40 BP	-23.8 o/oo	1850 +/- 40 BP

SAMPLE : P3031/6908
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (leather): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 70 to 250 (Cal BP 1880 to 1700)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number: **Beta-287692**

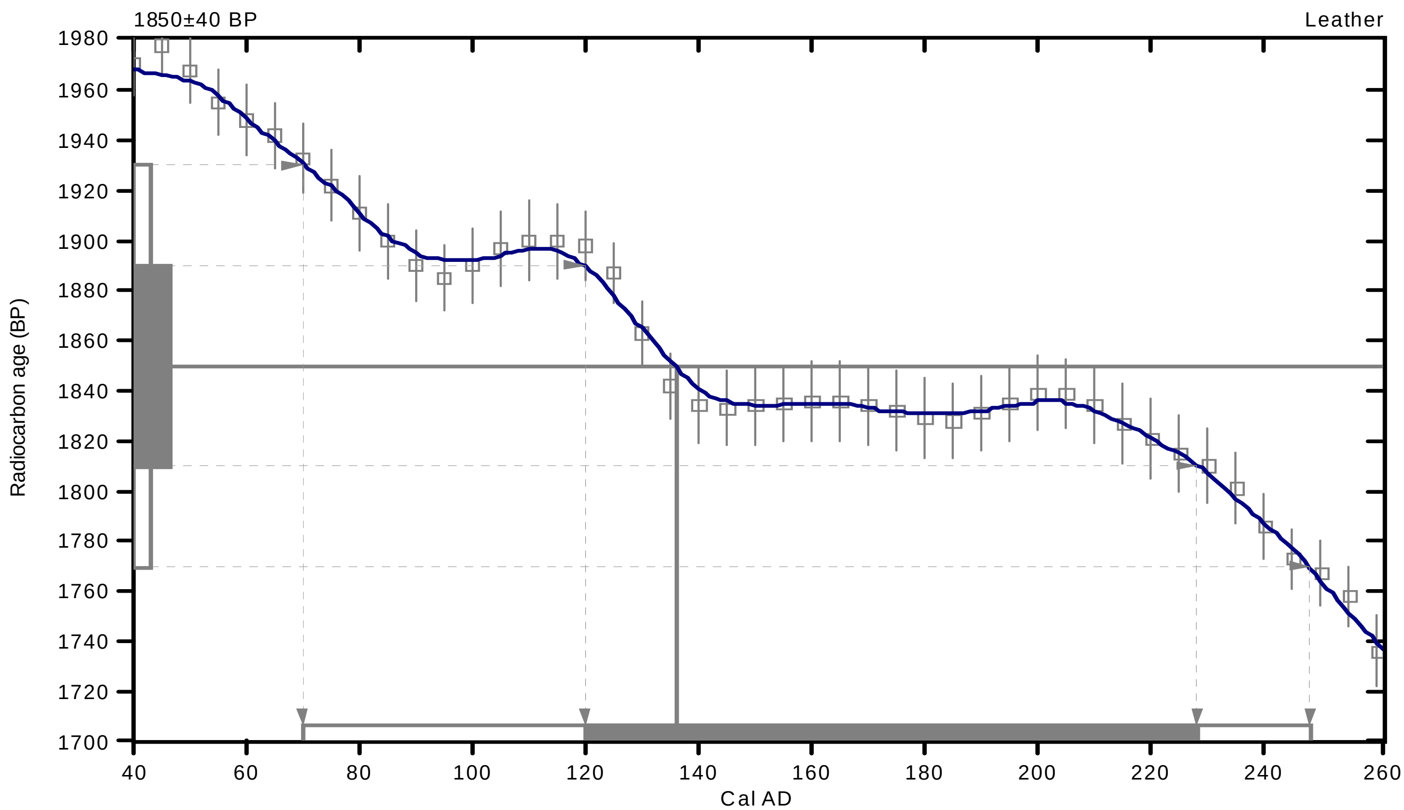
Conventional radiocarbon age: **1850±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 70 to 250 (Cal BP 1880 to 1700)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 140 (Cal BP 1810)

1 Sigma calibrated result: (68% probability) Cal AD 120 to 230 (Cal BP 1830 to 1720)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Nick Daffern — Report Date: 1/11/2011

University of Worcester — Material Received: 12/28/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 290593	1740 +/- 30 BP	-23.8 o/oo	1760 +/- 30 BP

SAMPLE : P3031/7050/3
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 220 to 350 (Cal BP 1730 to 1600)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number: **Beta-290593**

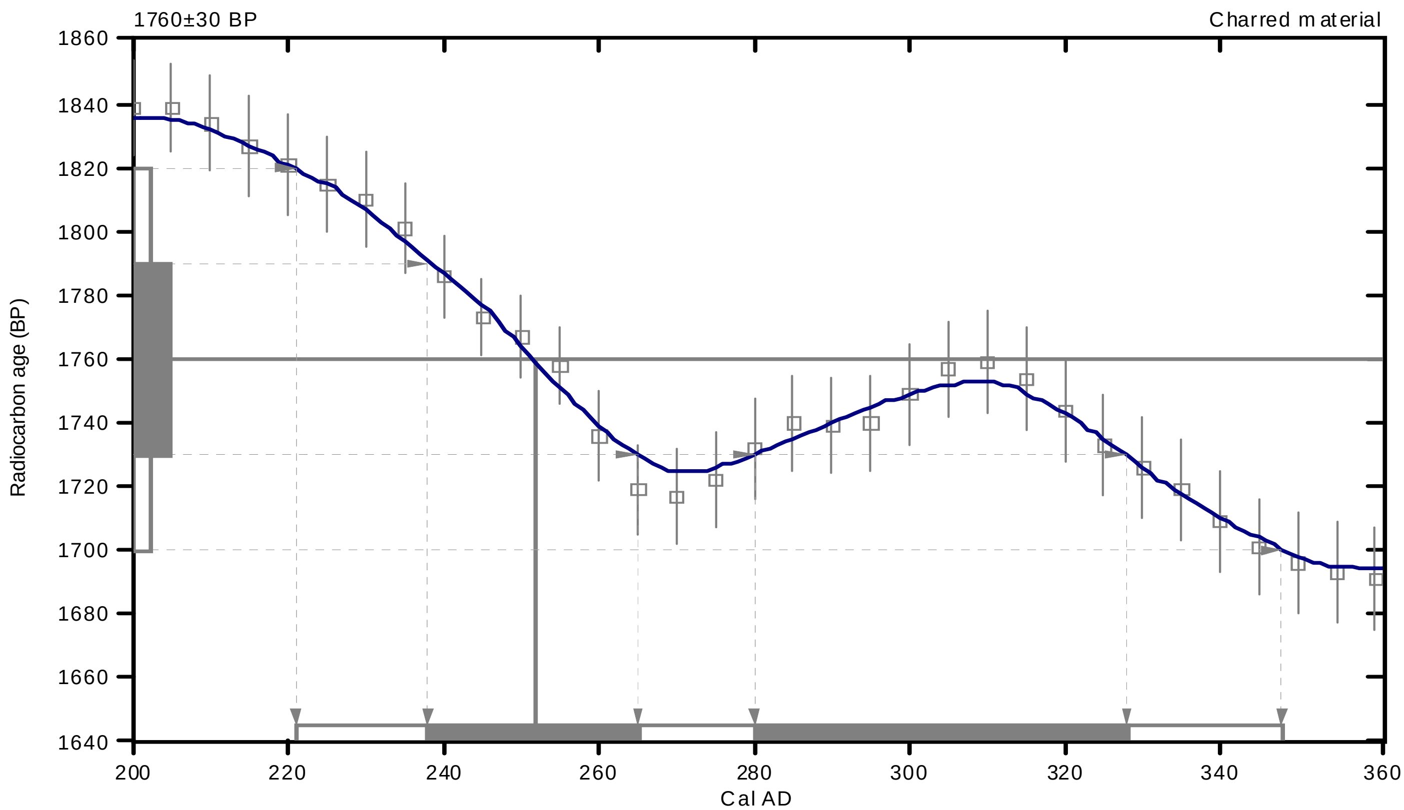
Conventional radiocarbon age: **1760±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 220 to 350 (Cal BP 1730 to 1600)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 250 (Cal BP 1700)

1 Sigma calibrated results: (68% probability) Cal AD 240 to 260 (Cal BP 1710 to 1680) and Cal AD 280 to 330 (Cal BP 1670 to 1620)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

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East Kilbride, Glasgow G75 0QF, Scotland, UK
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RADIOCARBON DATING CERTIFICATE

29 February 2012

Laboratory Code	SUERC-38442 (GU26302)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	The Butts (Watching Brief) Worcester
Sample Reference	P3419/115/10
Material	Wood : Quercus (oak)
δ^{13}C relative to VPDB	-28.3 ‰
Radiocarbon Age BP	1865 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

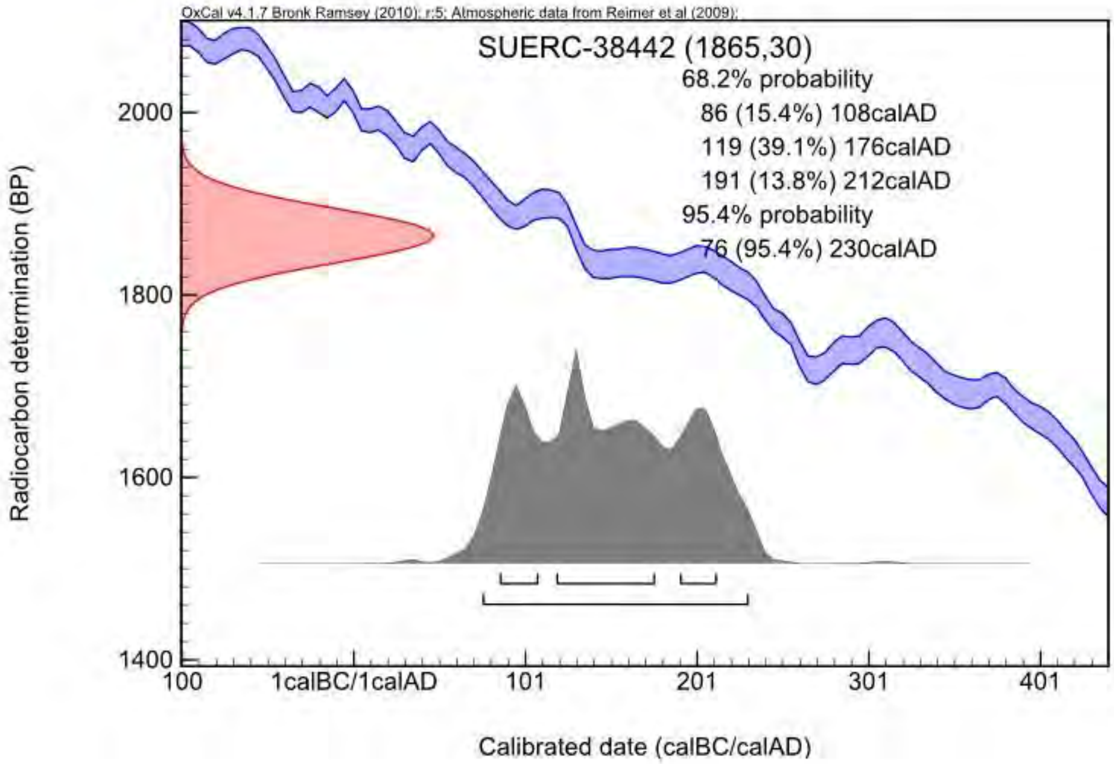
The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



BETA

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Nick Daffern — Report Date: 11/30/2010

University of Worcester — Material Received: 11/17/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 288284	250 +/- 40 BP	-27.7 o/oo	210 +/- 40 BP

SAMPLE : P3031 /6597
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1640 to 1690 (Cal BP 310 to 260) AND Cal AD 1730 to 1810 (Cal BP 220 to 140)
Cal AD 1920 to 1950 (Cal BP 30 to 0)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.7:lab. mult=1)

Laboratory number: **Beta-288284**

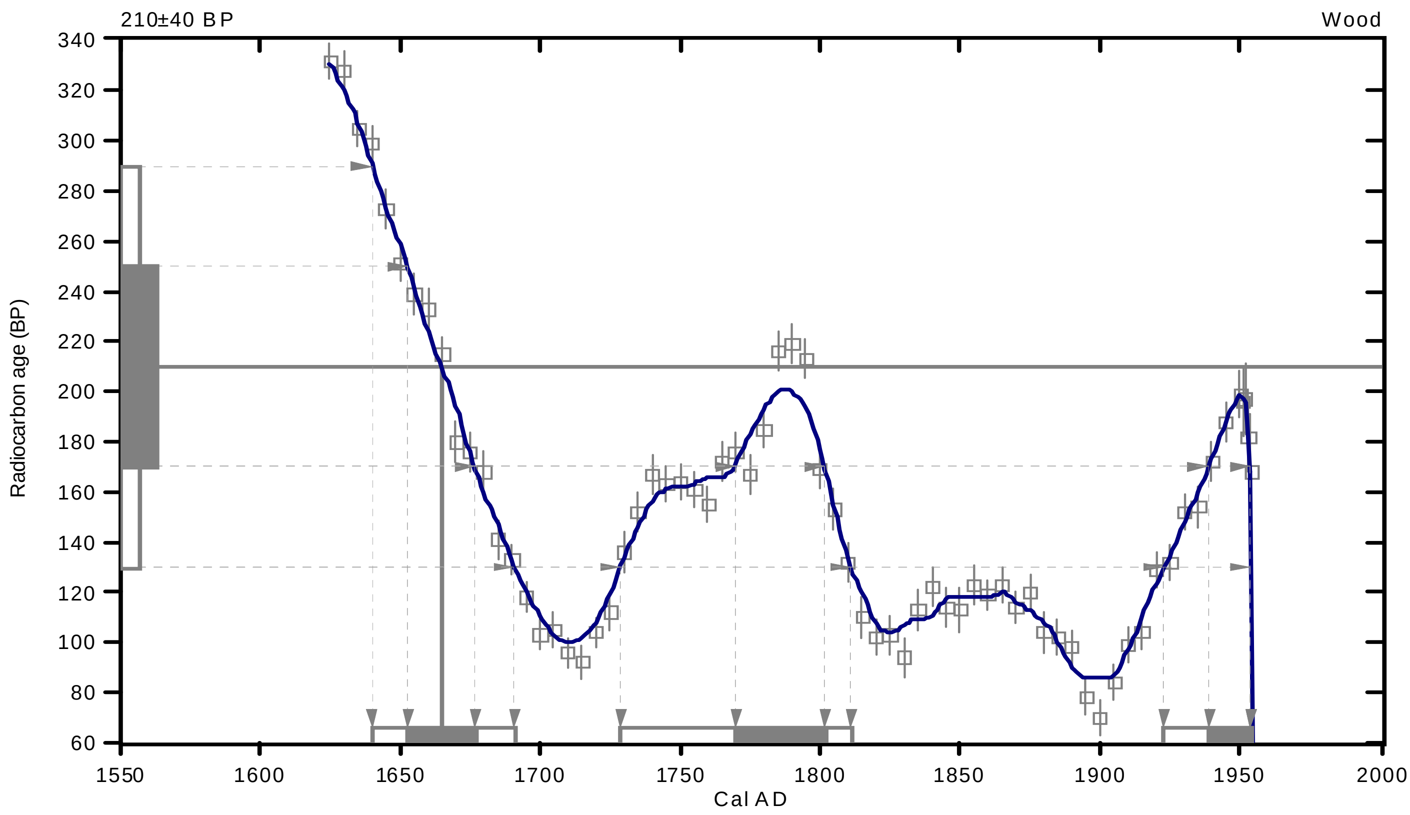
Conventional radiocarbon age: **210±40 BP**

2 Sigma calibrated results: **Cal AD 1640 to 1690 (Cal BP 310 to 260) and**
(95% probability) **Cal AD 1730 to 1810 (Cal BP 220 to 140) and**
Cal AD 1920 to 1950 (Cal BP 30 to 0)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1660 (Cal BP 280)

1 Sigma calibrated results: Cal AD 1650 to 1680 (Cal BP 300 to 270) and
(68% probability) Cal AD 1770 to 1800 (Cal BP 180 to 150) and
Cal AD 1940 to 1950 (Cal BP 10 to 0)



References:

Database used
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Calibration Database
INTCAL04 Radiocarbon Age Calibration
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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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