ARCHAEOLOGICAL EXCAVATION

KEMBLE HOUSE CAR PARK
AUBREY STREET
HEREFORD

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1. Executive Summary

The excavations undertaken by Border Archaeology at Kemble House Aubrey Street have revealed significant evidence of occupation and industrial activity, such as tanning and metalworking, dating back to the 10th-11th centuries AD. The site lies within the vicinity of the 'King's Ditch', presumed to be a disused watercourse which is shown on recent aerial (LIDAR) images to comprise a shallow defile running N-S roughly along the line of present-day Aubrey Street and continuing southwards across King Street towards the River Wye.

Two of the earliest pits [118] and [208] identified, probably datable to the 10th-late 11th centuries AD, produced environmental evidence indicating the presence of marshland, with areas of slow/stagnant water and marginal woodland and scrub lying either within or in immediate proximity to the pits. Although lying within the medieval town defences, this area nevertheless appears to have been marginal and used as a dumping place for domestic rubbish and ordure, as well as a convenient location for industrial practices that would normally have been on the periphery of urban settlement.

Archaeological evidence indicates that, from the from the late Saxon period through to the 13th century, the site was intensively used for dumping domestic waste, some of which may have been produced as a result of small-scale tanning activity.

There appear to have been two distinct phases of intensive pit-digging, the first possibly dated to the 10th-late 11th centuries, while a subsequent phase of activity continued through to the 13th century, based on the pottery evidence. A clearance or dumping layer (205) separating the two phases of activity may possibly be dated to the late 11th/early 12th century. Significant quantities of metallurgical debris was recovered from several of the pits indicative of metalworking on or in very close proximity to the site, possibly extending from the late Saxon period through to the 13th century.

There also appears to have been a marked cessation of occupation on the site for a prolonged period, which may have extended from the 14th century through to the 17th, or possibly later, indicated by the presence of a series of tipping or landscaping deposits.

Evidence for later 18th -century building activity, possibly identifiable with a row of cottages shown on Taylor's 1757 map of Hereford in the approximate location of the site (on the east side of Aubrey Street), was represented by several stone walls interpreted as building foundations associated with the 18th -century street frontage, together with a cobbled surface, which probably served as an entrance or alley between two adjacent properties.

2. Introduction

Border Archaeology was instructed by Speller Metcalfe Malvern Ltd on behalf of Marches Housing Association to carry out a programme of archaeological excavation of the former car park at Kemble House Aubrey Street Hereford (*fig. 1*)

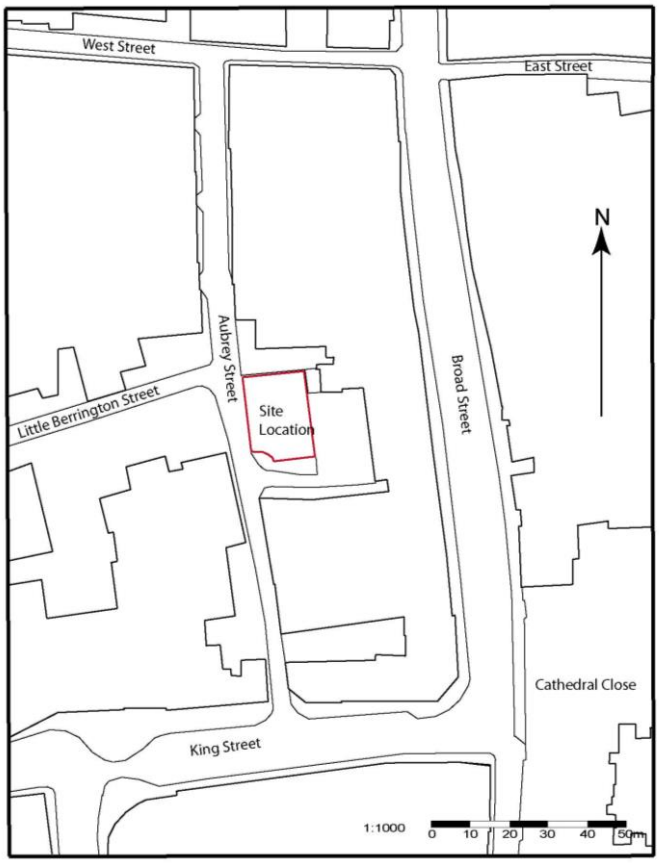

Fig. 1: Plan showing location of site

The site lies within the vicinity of the 'King's Ditch' a natural defile running north-south to the W of Broad Street which was considered by the noted Herefordshire antiquary Alfred Watkins to mark the western boundary of an early enclosure whose opposite side lay along the eastern side of the Cathedral Close. Remains of a corduroy road of oak logs were recovered during observation of service trenching on King Street in 1980 from which C14-dates of the 10th to 12th century were obtained. This appeared to represent an early medieval crossing-point over the waterlogged deposits of the King's Ditch. The possibility that earlier timbers survived at a greater depth suggested the presence of earlier surfaces (Thomas and Boucher 2002, 24-5).

Copies of this report will be submitted to Speller Metcalfe Malvern Ltd, Marches Housing Association, Julian Cotton, Archaeological Advisor Herefordshire Council and the Herefordshire Sites & Monuments Record

3. Brief Historical & Archaeological Background

The first substantial archaeological investigations of the King's Ditch were carried out in 1958 on two sections of the alignment. The first of these was the 'GPO Car Park Site' (SMR Event: 433) situated on the eastern side of Aubrey Street, which revealed the western side of a moderate sized ditch (*c.*4.5m wide estimated by 1.5m deep) or other cut feature with 12th century pottery found within its lowest strata (Heys & Norwood, 1958: 117-21). The second investigation took place at the 'Bridge Street Methodist Church Site' (SMR Event: 42710) to the south of King Street, where trenching revealed evidence of waterlogged black silts, apparently occupying a wide area and not a narrow ditch, up to 4.57m deep (Heys & Norwood, 1958: 121-2).

An opportunity to further investigate the Aubrey Street section of the ditch arose in 1997 during sewer repairs in the road close to the site of the 1958 investigation and adjacent to the current development site (SMR Event: 30314). A programme of archaeological salvage recording and sampling was carried out, the results of which raised the possibility of there being two distinct features in this area, comprising a 'prehistoric bog' with a depositional sequence suggesting fluctuating water levels and flow rates lying to the west of the later ditch feature identified by Heys and Norwood, no trace of which was found in the sewer trench. A substantial peat layer of roughly 0.4m thickness identified at the base of the sequence, which had formed under conditions of stagnant or very slow moving water and which directly overlaid natural silty sand at a depth of some 4.8m, yielded a carbon-14 date of 1875-1635 BC, while a sample from the uppermost peat layer in the sequence produced a C-14 date of AD 975-1160 (Boucher & Hoverd, 1998).

Environmental analysis obtained from the investigation supported the existence of a marshy area rather than a permanently waterlogged ditch. The samples revealed no evidence of aquatic plants but they did contain a quantity of wetland plant remains (Boucher & Hoverd, 1998). The fills within the sewer trench sequence thus appeared to be naturally deposited (flood events, peat formation) while those within the feature excavated by Heys and Norwood were all anthropogenic in origin.

4. Site Description

Hereford is classified as an unsurveyed urban area by the Soil Survey of England and Wales (SSEW 1983). However, previous studies within the urban area have observed gravels occurring relatively close to the surface in the centre of the city (Shoesmith, 1982).

The site (*figs. 1 & 2*) is located in the vicinity of the King's Ditch on heavy terracing extending along the north bank of the Wye, which is cut into by several defiles, including the Ditch itself, described as a short stream valley or defile running north-south and containing a sedimentary sequence commencing in the Bronze Age. The ditch is shown on bare-earth LiDAR imagery of the city opening towards the Wye and is most clearly visible on the ground as a depression located midway along King Street (Baker, 2010a).

5. Methodology

The programme of archaeological work was carried out in accordance with practices detailed in *Standard and Guidance for archaeological excavation* (IfA, 2008), *Standard and guidance for the collection, documentation, conservation and research of archaeological materials* (IfA, 2001), *Draft Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives* (IfA, 2008), *Environmental Archaeology: A guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage, 2002) and *Management of Research Projects in the Historic Environment* (MoRPHE) (English Heritage, 2006). Border Archaeology adheres to the IfA *Code of conduct* (2010) and *Code of approved practice for the regulation of contractual arrangements in archaeology* (2008) and to Herefordshire Archaeology's *Standards for Archaeological Projects in Herefordshire (Issue 1)* (Herefordshire Council 2004)

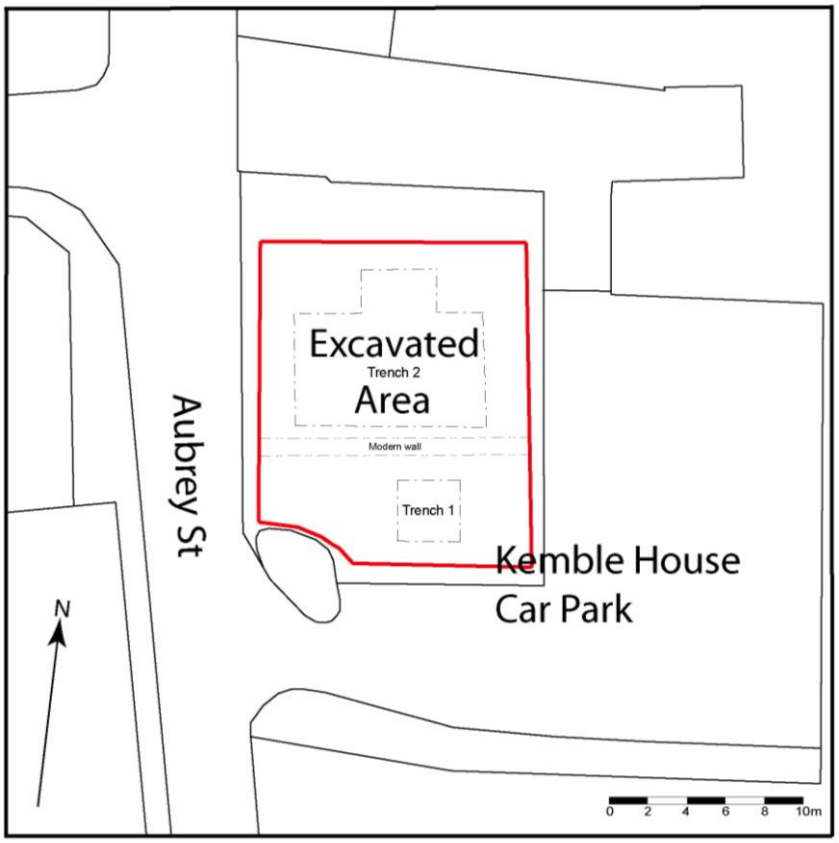

Fig. 2: Trench location plan

A 1m exclusion area was maintained around the three sides of the site except on the fourth abutting the party wall to the N. A programme of stepped excavation was then undertaken to attain the requisite depth.

A grid of 10m squares was set out using tapes, with grid north aligned as closely as possible with true north. Grid pegs were established in key locations around the perimeter of the excavation area.

An area of 17m × 13.5m was reduced by machine down to approximately 1m below the existing ground surface. All machining was carried out using a toothless grading bucket under archaeological supervision. Features of archaeological interest were revealed within this strip level and hand excavation of all deposits or features was undertaken for the recovery of stratigraphic data, with the extent and character of each archaeological deposit being defined prior to excavation.

Trench 1 measured 3m × 3m and was located at the southern extent of the excavation area. Trench 2 was located to the north of the dividing wall and measured 10.5m × 8m, with an extension incorporated to the north (*fig. 2*). Upper soil deposits and those demonstrably containing no archaeological features were removed by mechanical excavator using a toothless bucket under archaeological supervision. All archaeologically significant features and deposits were excavated manually.

Two previously unmapped gas mains running across the site were encountered during the course of the excavation

Recording

Full written, graphic and photographic records were made using *pro-forma* record forms and sheets, these being in accordance with Border Archaeology's *Field Recording Manual* (2008). The written component comprises a detailed stratigraphic record, with each unit of stratification identified by a unique context number. A 'running matrix' provided a continuous diagrammatic representation of these stratigraphic relationships as revealed during the course of the excavation, thereby maintaining control over the stratigraphic data.

The graphic record comprised plans, sections and elevations produced at scales of 1:20 or 1:10, as appropriate, on gridded archivally stable polyester film. All plans, sections and elevations contain grid and level information relative to OS data. All drawings were numbered and listed in a drawing register and cross-referenced to written site records.

A colour photographic record of all stratigraphic units was compiled using a high-resolution digital camera, comprising record views of contexts, samples and artefacts, together with representative photographs of the progress of the excavation. All photographs are numbered and cross-referred to written site records.

The progress of the excavation was recorded & assessed using the Company's ISO 9001 procedures.

Recovery, processing and curation of artefactual data

All associated artefacts recovered were retained, cleaned, labelled and stored according to *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials* (IfA 2001) and *First Aid for Finds* (Watkinson & Neal 2001).

All artefacts were bagged and labelled with the site code and context number before being removed off-site and each assemblage will be examined by an approved specialist according to typological or chronological criteria and conservation needs identified. The ceramic evidence has been identified and assessed in relation to existing national and regional

research frameworks for Saxon and medieval pottery. Conservation has been undertaken where required in accordance with United Kingdom Institute for Conservation guidelines.

Artefacts retrieved from samples were processed as above but identified by sample number.

Environmental strategy

An environmental strategy was developed in consultation with Lisa Moffett, English Heritage Regional Science Advisor for the West Midlands, who carried out regular site visits in an advisory capacity.

Environmental samples were taken for the recovery of biological material from deposits believed not to be contaminated or of mixed/secondary origin (e.g. backfills or deposits containing a high degree of residual/intrusive artefactual material); those thought or known to contain well preserved biological remains; deposits likely to be closely datable and those interpretatively important at the context or site level. These will be processed by Archaeological Services University of Durham in due course and an Assessment Report remitted to Border Archaeology together with recommendations for further Analysis.

Samples were taken from individual contexts, bulk samples comprising up to 40L or 100% of the sample. Large animal bone fragments, horn cores and carbonised materials were recovered by hand-collection and recorded through the finds system.

Additionally, as advised by Lisa Moffett, samples were taken from two contexts, comprising a lining or residue identified in pits [231] and [268], with the aim of determining possible usage based on chemical analysis.

6. Results

INITIAL REDUCTION OF EXCAVATION AREA

The excavation area measured approximately 17m × 13.5m and this area was reduced by machine to a depth of approximately 1m below existing ground level, during the course of which 29 contexts were identified.

Underlying the tarmacadam (001) and a stony sub-base material (002) was a demolition deposit (003) comprising modern brick rubble and concrete extending across the entire site area to a maximum thickness of 0.9m

Removal of (003) revealed a cement-bonded brick structural foundation and cellarage (006) within construction cut [009], measuring >13.5m × 0.95m × >0.75m and oriented east-west, with a subdivision running >5.5m to the south. The remains of two late post-medieval masonry structures were also revealed beneath (003). Exposed at the southeast extent of the reduced area was a broad north-south wall foundation (007) while the northwest area revealed a range of four walls (013, 015, 018 & 020) situated adjacent to Aubrey Street, probably representing a former street frontage (*Plates 2-4; fig. 3*).

Wall (007), within construction cut [008], was of undressed, earth-bonded irregular sandstone construction and measured >1.2m × 0.66m × 0.22m (*Plate 1*).

Plate 1: View S showing post-medieval masonry wall foundation (007)

Wall (013), oriented north-south within construction cut [014], measured 8m × 0.61m × 0.46m (*Plate 2*). Two parallel walls abutted by a cobbled surface (017) and oriented east-west were identified. These were (018), measuring >4m × 0.6m × 0.2m, to the south, and (015), measuring >5.5m × 0.75m × 0.6m representing a continuation of (013) (*Plate 3*). A wall remnant (020) oriented north-south, measuring 3.5m × 0.75m × 0.5m, with an east-west continuation measuring 2.3m × 0.49m × 0.18m, was revealed at the northwest extent of the reduced area (*Plate 4*). Underlying (003) and cut by all of the wall structures was (012), a substantial post-medieval occupation layer, extending across the reduced site area to a depth of 0.74m, which was composed of firm mid to dark brown silty clay with a charcoal content of approximately 15 per cent, frequent small stones, mortar and CBM and a substantial mixed ceramic assemblage in a wide range of fabrics. These included imported wares, such as Saintonge ware and German stoneware, Staffordshire slipware, early post-medieval Cistercian-type ware (found in Herefordshire up to the 18th century) and a number of residual medieval sherds, including examples of very early wares characterised by hand-formed cooking pots and pitchers. Also present were fragments of ridge/roof tile in fabrics spanning the late 11th to mid 14th century and a single piece of floor tile similar to Worcester

Fabric C1, although grain size was larger. An assemblage of clay tobacco pipes from this layer included earlier examples of 17th or early 18th century date together with later pieces typical of the late 18th or 19th century. A bowl fragment of *c*.1760-1820 was also recovered.

Plate 2: View S showing masonry wall foundation (013)

Plate 3: View E of cobbled surface (017) abutting walls (015) (left of picture) and (018) (right)

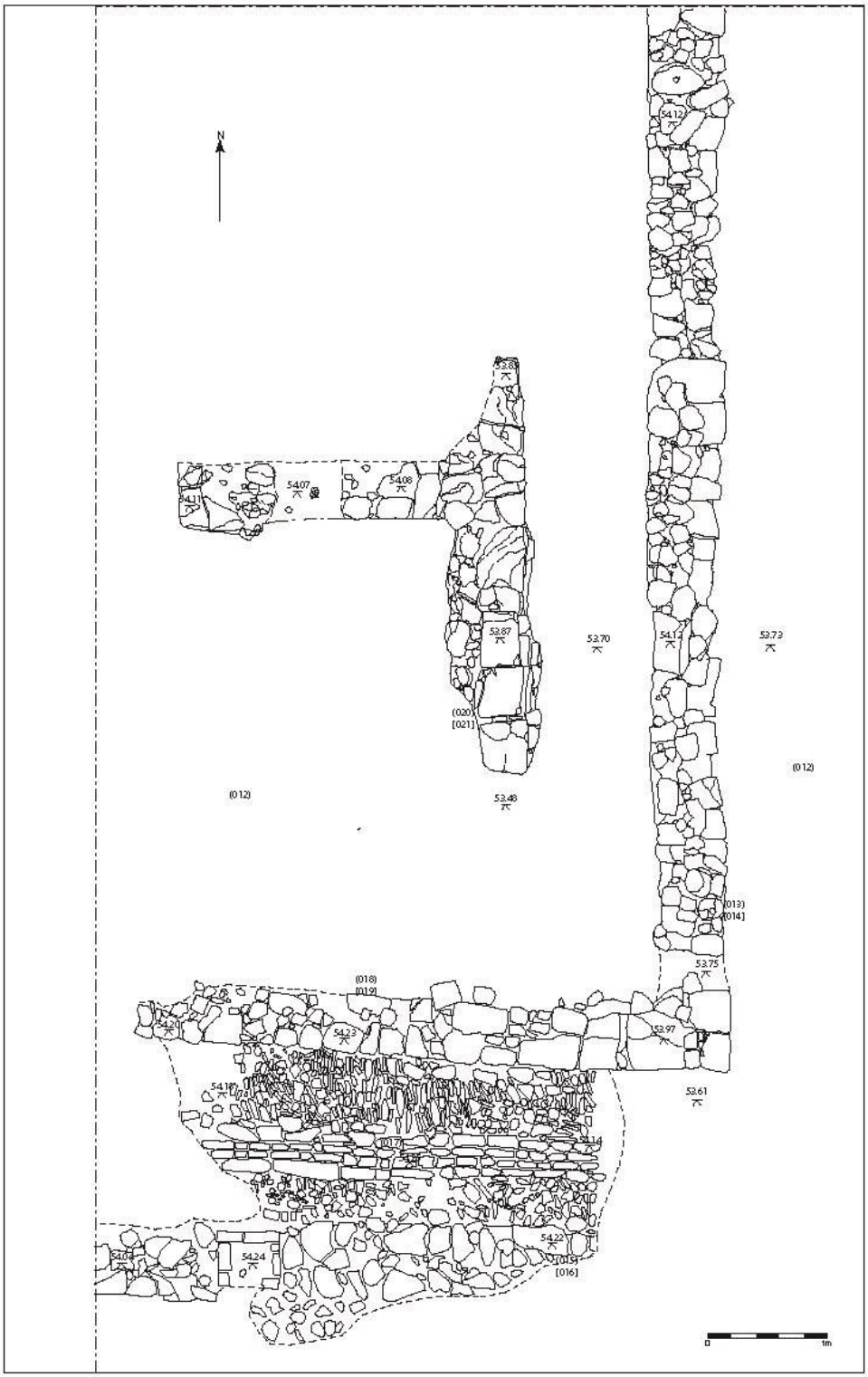

Fig. 3: Plan showing layout of post-medieval walls and cobbling

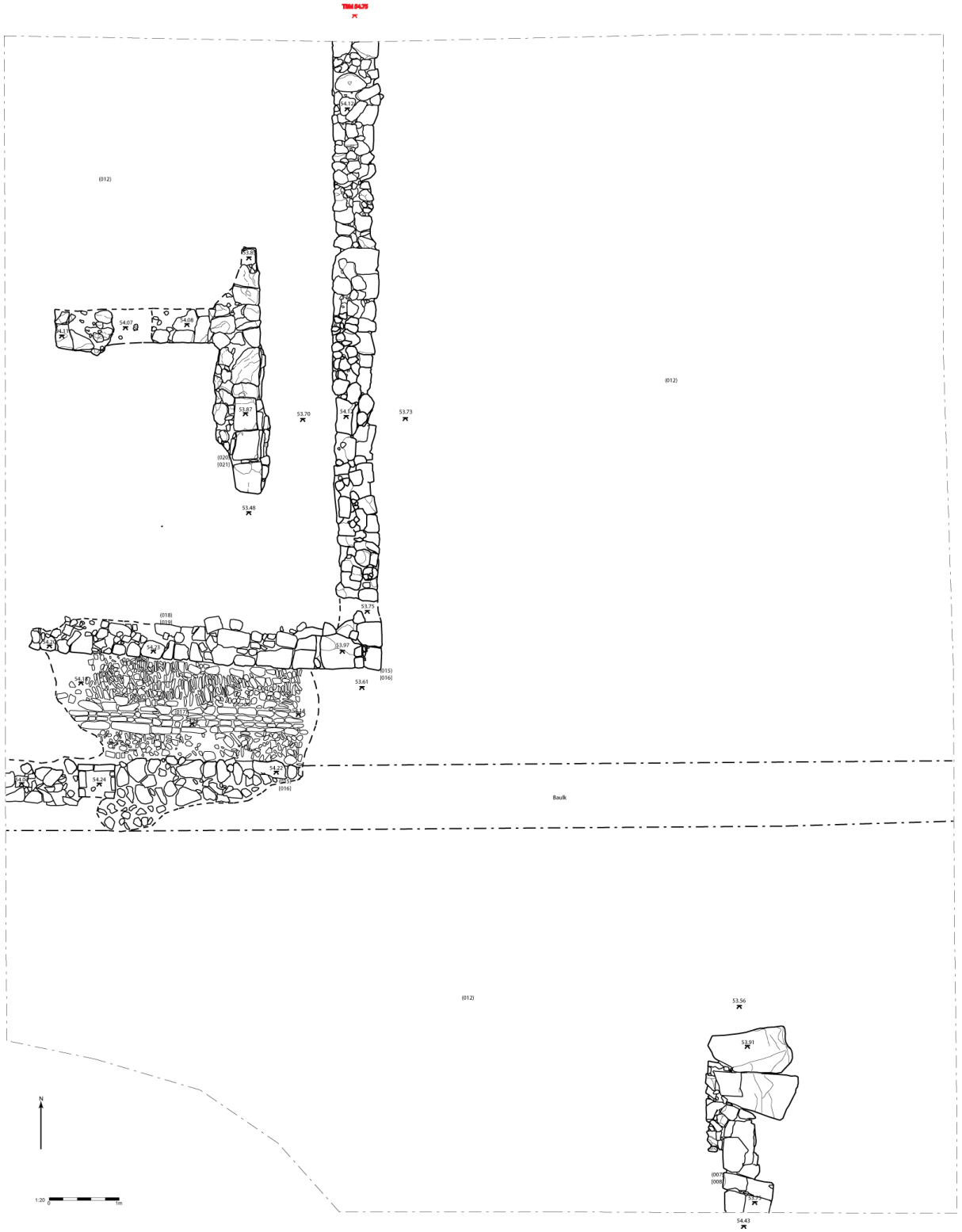

Fig.4: Site plan showing relationship of post-medieval walls and cobbling

Plate 4: View N showing wall (020)

TRENCH 1

Trench 1 was located at the southeast extent of the excavation area and measured 3m × 3m × 2.08m (maximum depth), incorporating a 0.5m step at a depth of 1.2m to give a reduced basal area of approximately 2m × 2m.

Two post-medieval pits were identified cut from (012). The first of these [101] was a sub-circular bowl-shaped feature measuring 1.36m × 0.84m, which was filled by (102), comprising 40 per cent loose gravelly sandy silt and 60 per cent CBM and brick rubble (*Plate 5*). The second pit, [105], was sub-circular in plan measuring 1.18m × 0.74m with a sharp break of slope at the top of the profile and steeply sloping sides breaking gradually to an irregular base. Pit [105] was filled by (106), a loose gravelly clayey silt containing occasional small sub-rounded stones (*Plate 5*).

Plate 5: View W showing pits [101] and [105] in E-facing section of Trench 1

Plate 6: View E of Trench 1 showing pit [103] in W-facing section

Sealed by (012) was (104), the fill of a large pit [103], partially visible within the trench, which measured >2.88m × >2m × 0.78m, with a sharp break of slope at the top and steeply sloping sides breaking gradually to a flat base (*Plate 6*). The fill, (104), consisted of loose orangey-brown gravelly clayey silt containing occasional medium-sized angular stones. An earlier pit [107] measured 1.16m × 0.64m and revealed a sharp break of slope at the top of the profile with gradually sloping sides and a flattish base (*Plate 7*). This was filled by soft

dark brown clayey silt (108). Pit [107] was heavily truncated by [101] and [103]. These features were cut from (110), a soft, dark brown silt of some 0.62m in thickness, which overlay (109), composed of soft mid brown silt measuring 0.32m in thickness. This, in turn, overlay (111), a 0.06m-thick sandy lens of material, and context (112), a soft dark greyish-brown silt measuring 0.3m in thickness. This deposit produced a single sherd of D2 fabric pottery, which occurs from the late 11th century in Hereford City (Vince 1985, 55); cooking-pots in this fabric have also been found at Kilpeck. Cess-like concretions were apparent on some of the animal bone recovered from (112)

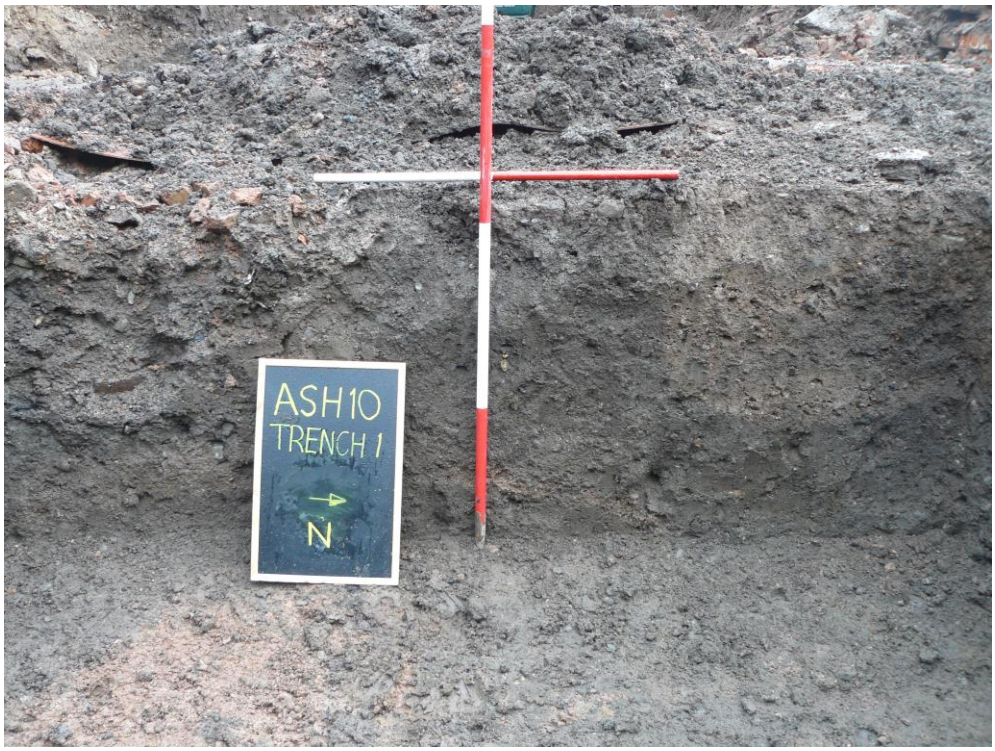

Plate 7: View W of E-facing section of Trench 1 showing pit [107]

Underlying (112) was an earlier occupation level represented by (113), (122) and (123), consisting of similar firm, almost plastic light reddish-brown silty clay deposits 0.2-0.3m thick and heavily truncated by four intercutting pits visible within the centre of the trench. The first of these features, [114], was an elliptical pit measuring 0.99m × 0.55m with a sharp break of slope at the top of the profile and steeply sloping/vertical sides breaking gradually/moderately to a flat base (*Plate 8*). The upper fill (115) contained a sherd of post-Conquest Cotswold ware (Fabric type D2) with two further sherds recovered from the secondary fill (137). (115) also showed high concentrations of crushed and broken herring vertebrae, damage characteristic of chewing and ingestion, and a roe-deer antler fragment, offering possible evidence of craft-working. Other faunal evidence included remains of cow, pig, sheep/goat, chicken and eel. A second pit, [141], was partially visible within the northwest extent of the trench and measured >0.42m × >1.13m × 0.83m, with a sharp break of slope at the top, steep sides becoming more gradual towards the base, a gradual break of slope at the base of the profile and a flat base. Ten fills were identified within this feature (*Plate 9*). One of the fills, (151), produced three sherds of late Worcester sandy ware cooking-pot (Fabric type C1) of late 11th – late 12th century date.

Plate 8: View northeast showing pit [114]

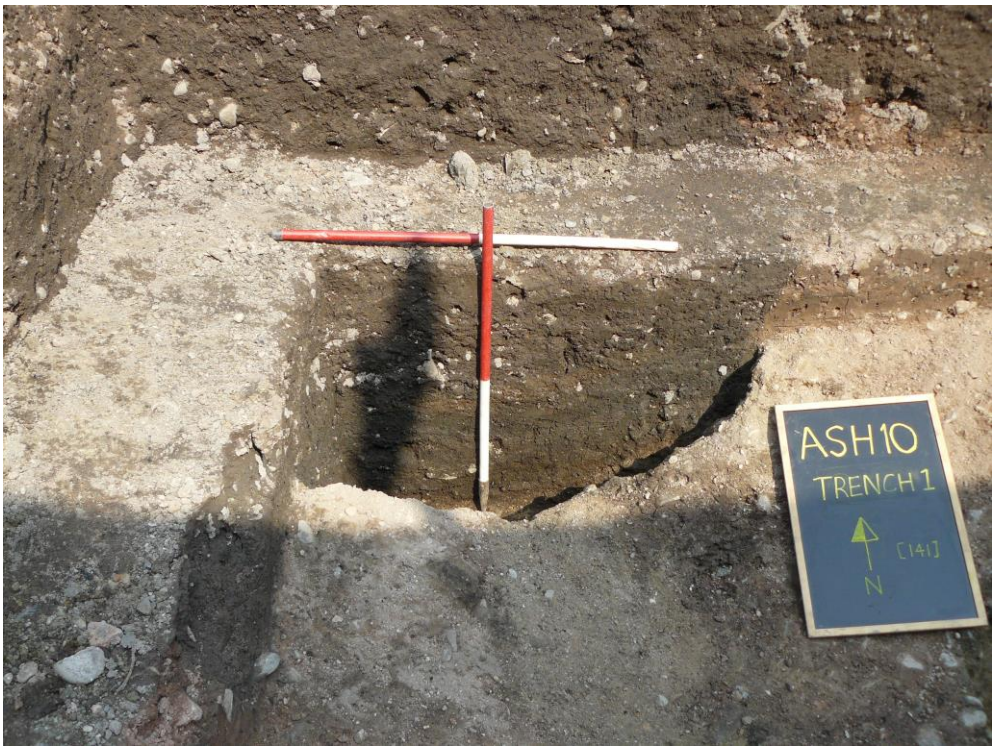

Plate 9: View N showing pit [141]

Plate 10: View N of feature [117] in Trench 1

Truncated by [141] was [117], a sub-circular pit of medieval date measuring >1.04m × >1.2m × 0.31m with a moderate break of slope at the top of the feature, becoming steeper at the eastern extent and gradually sloping on the western side to a concave base (*Plate 10*). Three fills were identified all of which were suggestive of domestic waste. The upper fill, (116), contained sherds of Saxon-period Cotswold ware and Stafford ware (fabrics D1 and G) and fragmentary fired clay. Palaeoenvironmental analysis of a sample of material from (116) contained animal bone, fish bone, charcoal, mineralised cess material, and small quantities of daub, fired clay, pottery, fuel waste, hammer-scale, mortar and *puparia*. The small charred plant macrofossil assemblage mainly comprised oat and wheat grains, with two barley grains, a rye grain, three hazel nutshell fragments and a few weed seeds also recorded. The identified charcoal included willow/poplar, alder, oak and hazel. Mineralised fruit-stones were abundant, with crab apple, elderberry, bramble and sloe represented. A single mineralised pea was also present. The presence of a substantial quantity of fruit-stones of elderberry is worthy of note as this fruit was traditionally used to dye leather and cloth blue.

A large, shallow pit [118] (*Plate 11*) was identified in the centre of Trench 1 and was heavily truncated by [114] and [117]. The feature measured >2.26m × 0.9m × 0.26m and comprised a sharp, well-defined break of slope at the top and steeply sloping, almost vertical sides breaking sharply to a flattish, slightly convex base. Five fills were identified. Palaeoenvirnomental analysis of context (130), the secondary fill of pit [118] revealed substantial evidence of animal bone, fishbone and mineralised cess material, with small amounts of hammer-scale, fired clay (also found in other fills within the pit), fuel waste, *puparia* and mineralised wood also recorded. Charcoal was abundant and was dominated by large fragments of oak timber, with some hazel roundwood also present. Vivianite, a blue mineral which indicates the former presence of organic material in wet or waterlogged

conditions was recorded. Charred plant remains comprised oat, wheat and barley grains, a hazel nutshell fragment, bramble fruit-stone and a range of weed seeds. Waterlogged/mineralised crab apple, sloe, bramble and elderberry fruitstones were abundant and a mineralised grape pip was present. Weeds from arable, ruderal and woodland habitats were also represented. A whetstone fragment was also recovered from (130). This was made of a dark grey, very hard, microcrystalline dolerite giving a fine hard even-grained surface well-suited to sharpening tools, the source of which appears to be a small Carboniferous dolerite intrusion near Bartestree. The natural gravels (140) were encountered at this level.

Plate 11: View S of feature [118]

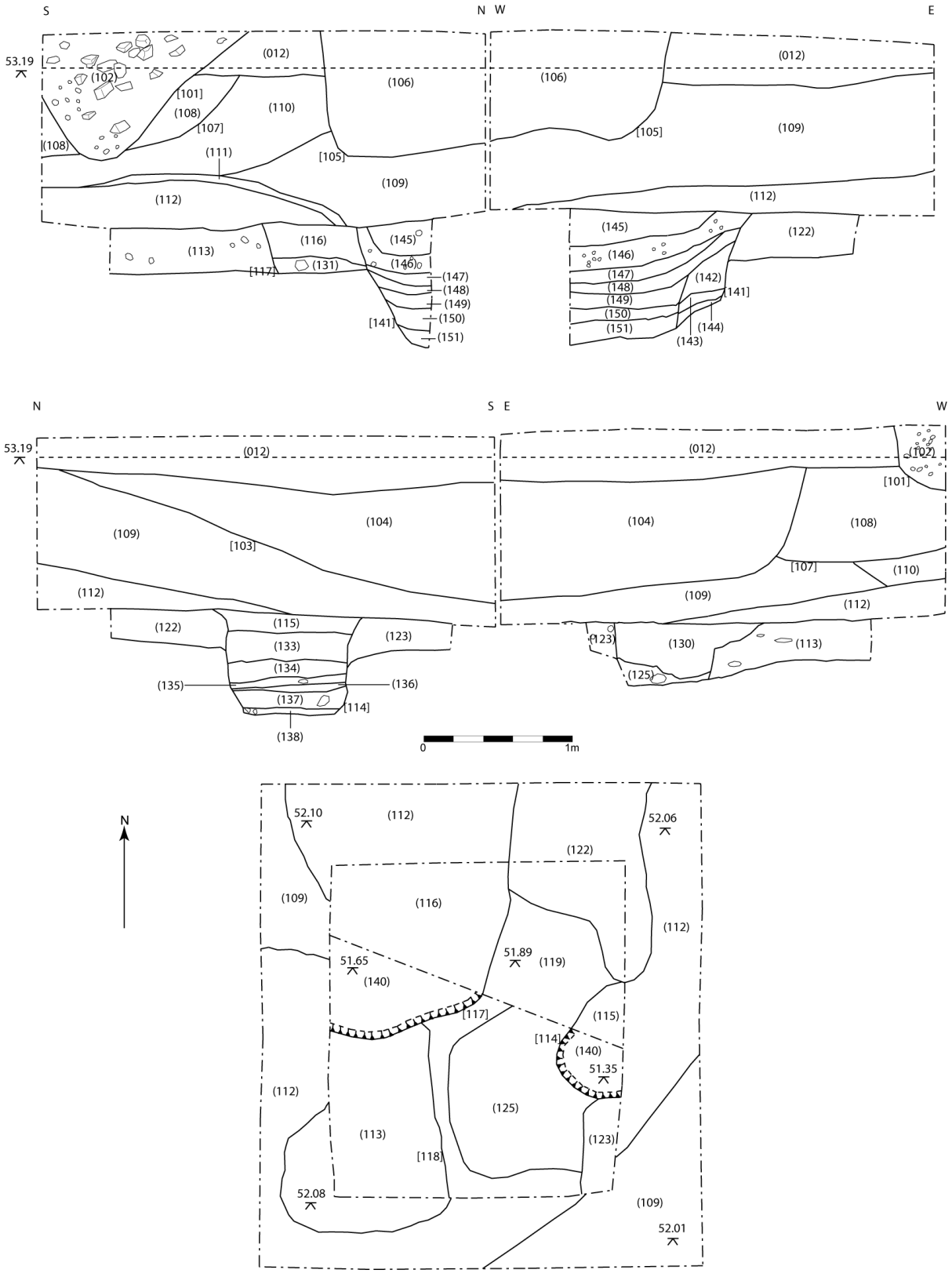

Fig.5: Plan of Trench 1

TRENCH 2

Trench 2 was located immediately north of the modern cellarage wall, (006), oriented east-west across the site, which remained *in situ* as it incorporated two gas service pipes. The trench measured 10.5m × 8m incorporating an extension to the north. The trench also incorporated a 1m wide step at a depth of 1m giving a reduced extent of 8.5m × 6m.

Sealed by (012) were a large number of tipping deposits, raising the ground level above (205) (see below) by approximately 0.8m. A large post-medieval elliptical pit [202] was cut from (025) at the eastern extent of the trench, measuring 3.2m × >1.7m × 1.52m, with a sharp break of slope at the top of the profile and steeply sloping sides becoming more gradual towards the base and breaking sharply (at the north - the southern part of the feature having been truncated by a modern drain [022]) to a flat base sloping northwards. The pit contained a single homogenous fill (201) comprising a soft mid brown humic sandy silt with frequent pebbles and evidence of animal bone.

Underlying the build-up deposits was a trench-wide layer (205) of probable 11th –early 12th century date, which was found to contain a significant concentration of hammer-scale (a total of 23g) strongly suggesting the presence of blacksmithing activity at this time either on or in close proximity to the site.

Layer (205) was composed of a soft/friable mid greyish-brown clay silt, containing moderate rounded stones and frequent inclusions of redeposited gravels 0.5m thick. This deposit contained one of the largest concentrations of hand-collected bone, a substantial proportion of which showed evidence of dog-gnawing and also produced an iron stirrup and a fragment of probable red-deer antler object, likely to represent craft-working waste, possibly a rough-out for a knife handle or similar. A substantial number of goat horncores of varying size were also recorded, many of which showed chop-marks indicative of deliberate detachment from the cranium. A high concentration of crushed/broken herring vertebrae appears to reflect damage characteristic of chewing and ingestion.

The ceramic assemblage itself comprised sherds of Stafford ware (Fabric type G1) - two of which were rouletted - Cotswold ware cooking-pot (Fabric type D1) and D2 Cotswold ware, a fabric in use possibly until the early 12th century, with examples of late Worcester sandy ware cooking-pot (Fabric type C1), identified in late 11th to early 13th century contexts in Hereford, also present. The assemblage also contained an intrusive post-medieval sherd of Midlands yellow pottery, fragments of floor tile that appeared to resemble Roman rather than later types and a piece of possible furnace lining.

Several features were cut from this level (*fig. 5*), all of which appeared to be of late 11th -12th century date. A large sub-circular medieval rubbish/cess pit measuring 2.14m × 1.25m × >1.47m was revealed at the northeast extent of the trench [204] (*Plate 12*). Its profile revealed a sharp break of slope at the top of the cut and steeply sloping, almost vertical sides. The pit was filled by three deposits - (203), (210), (211) - containing occasional pottery and a substantial quantity of small bone fragments, charcoal and organic material; the basal fill (211) was particularly rich in organic material, probably representing refuse or cess, which showed high concentrations of crushed and broken herring vertebrae, indicative of chewing and ingestion, and produced a single sherd of Cotswold ware (Fabric type D1)

representing the characteristic small globular cooking vessel found in levels in Hereford from the early 10th century (Vince 1985).

Fill (211) contained a substantial amount of hammer-scale, as did (210), which also incorporated remains of cow, sheep, sheep/goat, chicken-sized bird, small bird and crushed of broken fish bone, including herring and eel. Some of the bones were tested for parasite eggs but no evidence of intestinal parasites was identified to confirm faecal content. Two fragments of Cotswold ware cooking-pot (Fabric type D1) and fragmentary fired daub bearing organic impressions were also recovered. Fill deposit (203) produced a sherd of laminated/disintegrated Cotswold ware cooking-pot (Fabric type D1) and one of Stafford ware (Fabric type G1). D2 Cotswold ware vessels were also present and there were several examples of Herefordshire wares, including a handled sherd with engraved decoration of A2, a mixed limestone and sandstone sand tempered local fabric in use during the late 12th and early 13th centuries, and a thin glazed body sherd of possibly early pitcher (Fabric type A7a). A base sherd of heavily water-worn possible Roman Severn Valley ware (Fabric type A1) and two fragments of burnt clay were also found, together with fragments of a vitrified crucible probably used to process copper alloys.

Plate 12: View east of refuse/cess pit [204]

Context (203) also produced one of the largest assemblages of hand-collected animal bone, with evidence of dog, sheep/goat, frog/toad, herring and eel present. Evidence for burning was confined to a small number of fragments where the level of charring suggested exposure to temperatures of 525ºC - 645ºC and evidence of dog-gnawing was fairly prevalent. A small number of cat bones were also present, including a probable part skeleton from (203). Slight evidence of bony outgrowth (exostosis) was identified on what appeared to be a cattle lumbar vertebra from (203).

Plate 13: View south of domestic refuse pit [206]

Pit [204] truncated [206] a small sub-rectangular, possibly domestic refuse pit located at the northeast extent of the northern extension of Trench 2, which measured >0.85m × 1.25m × 0.8m and revealed in profile a sharp break of slope at the top of the cut, steep, almost vertical sides and a flattish, slightly irregular base (*Plate 13*). The fill (207) was composed of soft mid greyish-brown clay silt containing frequent small rounded stones, charcoal flecking, medium-sized mammal bone and remains of herring, suggestive of domestic refuse.

Pit [218] was a sub-rectangular feature partially visible in the northwest corner of the north trench extension, measuring 0.73m × 0.49m × >0.86m, with a sharp break of slope at the top and near-vertical sides (*Plate 14*) containing two fills. The upper fill (217) consisted of a firm mid greyish-brown clay silt containing frequent charcoal flecking, frequent small pebbles and occasional larger stones and remains of medium-sized mammal, chicken-size bird and herring. The deposit measured 0.5m in thickness and contained a single sherd of early medieval Stafford ware cooking pot (Fabric type G1), previously identified as 'West Midlands early medieval ware', examples of which have previously been recovered from a 10th century context in Victoria Street and also in Berrington Street, both sites also situated within the circuit of the Saxon defences. Also recovered from this fill was a sherd of Saxon small globular cooking pot (Fabric type D1). Stafford ware was also found within the lower fill (221), a soft moist greenish-grey clay silt containing very frequent charcoal, frequent fine gravel, and very frequent degraded organic material >0.66m thick. This deposit contained a range of faunal remains, including pig, cow, herring, eel, small cyprinid and small *salmonid*.

Plate 14: View north of pit [218]

Two large pits were partially visible within the eastern extent of Trench 2. The first of these was [213], a sub-rectangular feature measuring 2m × >0.7m × 1m, with a sharp break of

slope at the top of the profile and smooth, vertical, well-formed sides curving gradually to a concave base (*Plate 15*). The pit was filled by (229), a firm, greyish-brown humic clay, overlying (230), a dark brown silty clay, these deposits measuring some 0.7m and 0.3m in thickness, respectively. No datable pottery was recovered from either of these fills. Pit [213] was re-cut by [231], measuring 1.8m × >0.68m × 1.1m and comprising a gradual break of slope in the upper part of the profile and gradually sloping sides descending more steeply towards the concave base (*Plate 15*). The pit contained fills (214), (226), (227) and a light brown silty lining or residue (228), possibly ash, of some 0.04m thickness.

Plate 15: View east showing W-facing section of pit [213] and fills together with re-cut [231]

Fill (214) appeared, based on the ceramic evidence, to be *c*. 12th century in date. A small assemblage of was recovered, including fragments of Malvern Chase ware (Fabric type B1) used mainly for cooking-pots and most frequently in use during the 13th century, although also found in early 12th century contexts. Also recovered were sherds of Stafford ware (Fabric type G1), Cotswold ware cooking-pot (Fabric type D1) and late 11th-early 13th century late Worcester sandy ware cooking-pot (Fabric type C1) of a type found in Hereford and also at Kilpeck and Eardisley. Rims of glazed pitcher with heavy siltstone temper (Fabric type G) were also recovered; such fabrics have been identified in the Shropshire/North Herefordshire area and extending through Mid to West Wales. In terms of faunal evidence, remains of pig, sheep/goat, large- and medium-sized mammal, small bird, herring and eel were also recovered from (214). No datable sherds or faunal remains were recovered from the lower fills.

Plate 16: View W showing fill (223) within pit [219], which contained part of a possible wicker basket

Pit [213] truncated a feature, [219], measuring 1.6m × 1.48m × 1.06m within the eastern extent of Trench 2 comprising a square-ish pit with rounded corners, which revealed a sharp break of slope at the top of the profile and near-vertical sides breaking sharply to an uneven, sloping base. The character of the finds assemblage recovered from the pit - which included a large quantity of horn-cores and animal bone and the remains of a wicker structure, possibly a basket or similar receptacle - suggests an industrial rather than a domestic function (*Plate 16*). The tertiary fill (220) contained remains of sheep/goat, chicken, cat, herring and eel and appeared based on the ceramic assemblage to be *c*.13th century in date. The secondary fill (222) produced pottery typical of the first half of 12th century, including three sherds of late Worcester sandy ware cooking-pot (Fabric type C1) and nine body sherds, a rim and four bases of Malvern Chase ware cooking-pot (Fabric type B1) and fragments of Cotswold ware (Fabric type D2), which occurs from the late 11th century in Hereford, although the form recovered is more typical of the earlier 12th century. Faunal remains included pig, cow, sheep/goat, large and small mammal, herring and eel. A cattle metapodial recovered from (223) is tentatively interpreted as roughed-out, but evidently unfinished, bone skate; its dark colour, dense composition and battered appearance suggest it might possibly be a redeposited or residual piece (another example was found in context (209), the upper fill of an earlier pit [208] – see below).

Underlying (205) and sealed by a layer of reddish gravel (212) was [208], comprising a large rounded pit measuring >2.4m × 1.9m × >1.4m. The feature contained three fills — (209), (224) and a greenish-grey organic clay silt (225) from which were recovered fragments of preserved leather. The tertiary fill (209) contained examples of early domestic cooking pot (Fabric types D1, G1) and sherds of late Worcester sandy ware cooking-pot spanning the late 11th to early 13th century (Fabric type C1). Also recovered were two sherds of probable Saxo-Norman date (Fabric type G) with possible traces of decayed paint noted on its external

surface. A piece of burnt clay was also recovered from this deposit. In terms of dietary evidence, oyster shell was noted, together with remains of pig, cow, sheep/goat, chicken, chicken-size bird, herring and eel. Red-deer antler, probably representing waste from craft-working activity, was identified among the hand-collected faunal remains. As stated above, fill (209) also contained a cattle metapodial possibly representing an unfinished bone skate.

Assessment of the biological remains identified pig bone in both fills (209) (11 fragments) and (225) (one fragment), as well as a single fragment from (224) and based on analysis of recorded parasite remains and also the composition of the macrofossil assemblages recovered from larger sediment samples, it is considered likely that [208] was used primarily for the disposal of both human and pig faeces, reflecting the practice of keeping pigs in towns at this time. Analysis revealed no evidence to suggest that pit [208] had been used in connection with tanning activity.

However, the results of other analyses offer an interpretation somewhat at odds with this conclusion. The fills of [208] when analysed for insect remains revealed some commonalities; however, clear differences were also noted between the composition of (225) <26> and the other two, with the prevalence of spider beetle (*Ptinus fur*) and woodworm (*Anobium punctatum*) strongly suggesting the deposition of refuse from a building, possibly a cellar or cellar-like structure. The presence of herbivore dung is also strongly suggested, based on indicators such as the broad bean weevil (*Bruchus rufimanus*), which occurs in abundance throughout the feature and which presumably represents faecal material from animals fed infested pulses. This does indeed accord with the above.

However, particularly in (225), the occurrence of bark indicators (eg. the rare beetle *Corticeus unicolor*, the colydiid beetle *Cerylon histeroides* and shining fungus beetle *Scaphidium quadrimaculatum*), together with abundant remains of *Trox scaber*, a beetle frequently found in animal carcasses, and histerids, whose recognized habitats include dung and carrion, combined with the presence of the sheep ked (*Melophagus ovinus*) and numerous examples of the human flea (*Pulex irritans*), offer substantial evidence for tanning activity. This interpretation is further substantiated by the presence of bark and leather.

It is thus concluded based on the detailed analysis particularly of the material recovered from context (225) <26>, that tanning or the dumping of butchery waste or possibly a combination of the two was being carried out in this area of the site. It is suggested that, whilst the presence of numerous indicators of foul, mouldering matter similar to stable manure might argue that any presence of leather or hide was as a result of non-tanning related dumping of offcuts, the abundance of *T. scaber* makes it far more likely that this feature had been used as a tanning pit, as well as a dump for stable manure type material, particularly given the indications of bark in both substrate description and the insect fauna

This being the case, it would appear likely that the presence of significant concentrations of hammer-scale, in layer (205) with both fuel waste and metalworking residues also attested in the upper fills of some earlier pits such as [208], which could perhaps best be described as capping deposits, marks of a cessation of activities associated with tanning or butchery and the beginning of a second phase of occupation characterised more by metallurgical activity, specifically by blacksmithing, either taking place on or in close proximity to the site.

In terms of environmental conditions prevailing at this time, the plant macrofossil evidence strongly suggests the presence on site of localised bodies of open, standing or slow-moving water at this time. Fully waterlogged conditions are reflected in an abundance of humified organic material within the basal fills of pit [208] with remains including animal bone, fish bone, pottery, charcoal, leather, animal hair, bracken fronds, insect/beetle fragments, *puparia*, vivianite, moss, wood and bark.

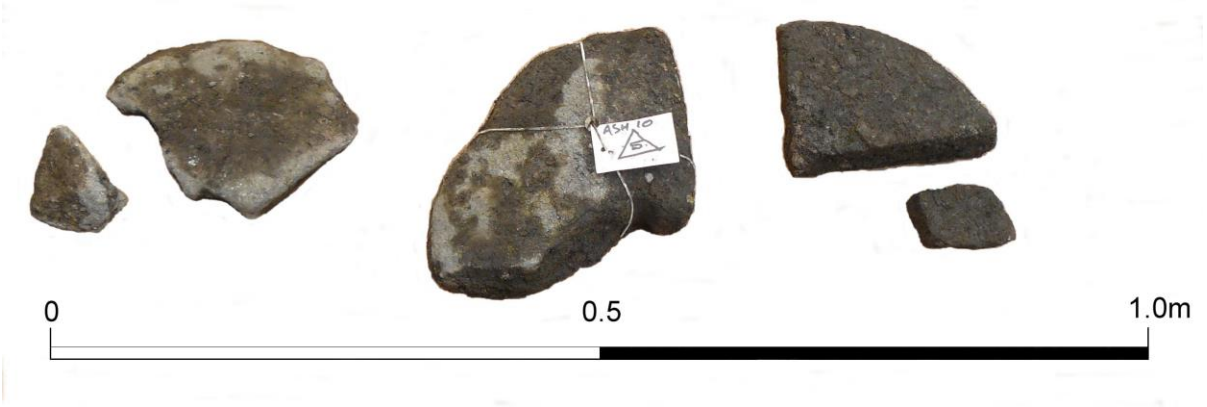

Plate 17: Fragments of quern stone from pit [215]

Plate 18: Examples of mid-11th century domestic pottery recovered from pit [215]

Bramble, sloe, crab apple, elderberry and strawberry were abundant and a few fruit-stones of dwarf cherry and wild rose hips were also noted. Significantly, it appears based on the presence of wetland plants such as sedges, spike-rushes, pale *persicaria*, celery-leaved buttercup and common club-rush that these may have been growing in standing water in the pit. Club-rush is particularly characteristic of substantial bodies of standing or slow

flowing water, typically 0.3 to 1.5m deep, although it is also observed that the presence of this and other species could indicate that vegetation was being collected from surrounding wetland areas for use perhaps as thatch.

The presence of flax seeds in both samples from context (225) may reflect a range of possible uses, such as producing fibre for clothing, ropes or sacking and the production of linseed oil for food, preservative or medicinal uses. The by-products of oil and fibre production could also have been used as fodder or fuel.

Context [208] truncated an earlier feature [215] at the southern extent of Trench 2 (*Plate 20*). [215] consisting of a sub-rectangular pit evidently for the disposal of domestic waste measuring 1.7m × 1.35m × 0.92m, with a sharp break of slope at the top of the cut and steep sides, with a moderate break to a flat base. Three fills were revealed — (216) overlying (241) above a basal fill (244). The upper fill (216) appeared based on the pottery evidence to be post-Conquest in date and contained fragments of saddle quern (*Plate 17*), mid-11th century domestic pottery (*Plate 18*) and a single small piece of coloured glass (*Plate 19*). The saddle quern is made from grey-brown-purple, hard angular heterogeneous quartz conglomerate ideally suited to producing coarse flour, which probably derives from one of the many conglomeratic horizons within the local St Maughans Formation.

The glass fragment from (216) is from a prismatic bottle made of blue/green soda glass and is thus residual or intrusive, dating either to the later 1st to 3rd century AD, when bottles of this type were common, or the 19th or 20th century.

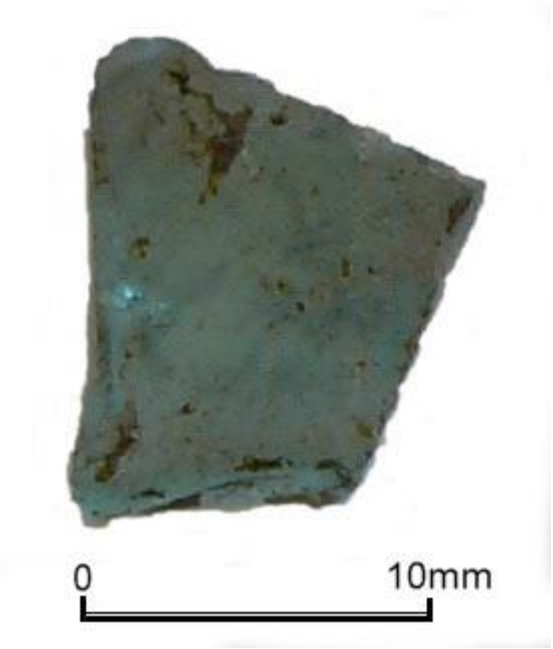

Plate 19: Fragment of coloured glass from pit [215]

A varied assemblage of faunal material was recovered, incorporating remains of cat, dog, pig, cow, sheep/goat, large and medium-sized mammal, possibly duck, chicken-sized bird, herring, eel, haddock and small *salmonid*, together with a single rabbit mandible and a hare metatarsal. Deposit (241) appeared also to be of post-Conquest origin, producing sherds of Cotswold ware (Fabric types D1 and D2), together with a small amount of fired clay. Remains

of pig, herring and eel were also recovered. The basal fill (244) produced a residual piece of worked flint, possibly resulting from initial thinning for a leaf point that had been subsequently broken and discarded; however, the piece could not easily be assigned to a cultural phase.

Plate 20: Overhead shot showing pit [208] cutting pit [215]

A large ovoid pit [232] was excavated immediately to the west of [215], measuring 2.3m × 1.66m × 1.04m, with a sharp break of slope at the top of the profile and steep/vertical sides breaking sharply to a flat base. Five fills were revealed — (256), (259), (260), (262) and (263). Deposit (262) consisted entirely of soft, cohesive blackish degraded organic material of some 0.33m in thickness. Deposit (263), the primary fill, was composed of firm mid greyish-brown silty clay with occasional medium-sized sub-rounded stones and contained a small quantity of unidentified animal bone. No datable pottery was recovered from this pit. Pit [232] was heavily truncated by [268], an ovoid pit measuring 1.1m × 1.7m × 0.6m, which revealed a sharp break of slope at the top of the cut and steeply sloping sides descending to a concave bowl-shaped base. The primary fill (264) comprised a thin burnt silty lining or residue, similar to (228) and approximately 0.05m in thickness. Again, no dates could be assigned to these deposits.

Pits [232] and [268] were truncated to the west by [266], a sub-rectangular feature of probable Saxon date, which was oriented north-south and measured 1.62m × 0.64m × 0.48m. Its profile comprised a sharp break of slope and moderately sloping sides becoming vertical before breaking to a flat base. The pit contained three fills — the upper fill (261), which contained a single sherd of Stafford Ware (Fabric type G1), overlying (267), which in turn overlay (265), consisting of soft blackish-brown silt with frequent pebbles and animal bone, measuring 0.35m in thickness, from which a further three sherds of Stafford ware and

a piece of fired clay were recovered. The primary fill also produced remains of cow, large and medium-sized mammal, chicken, chicken-size bird, herring and *cyprinid*.

Plate 21: View S showing pit [268] truncated by [245]

Pits [266] and [268] were truncated by [245], an ovoid pit feature measuring 1.55m × 1.55m × 0.6m, which revealed a sharp break of slope at the top of the cut and steeply sloping sides breaking to a concave base (*Plate 21*). [245] contained two fills. The upper fill (233) consisted of a 0.33m-thick cohesive dark greyish-brown clayey silt containing frequent charcoal and animal bone and moderate amounts of pottery and slag. The ceramic material included 11 sherds of Stafford ware pottery and a probable tile fragment (Fabric type G). Faunal remains recovered from (233) included pig, cow, sheep/goat, chicken, goose and herring. A few slightly charred fragments were recovered, suggesting exposure to temperatures of between 525ºC and 645ºC, while traces of cess noted on some of the bones were examined for parasite eggs and other microfossil remains but proved to be essentially mineral in nature; no eggs of intestinal parasites suggestive of faecal content were recorded. The primary fill of [245] – (250) – produced an assemblage of predominantly Saxon wares, including sherds of Stafford ware G1 and Cotswold ware cooking-pot (Fabric type D1) together with six fired clay fragments The material was composed of soft dark greenish-brown sandy silt containing moderate charcoal and a quantity of animal bone, including remains of pig, cow, sheep/goat, herring, eel and small *cyprinid*.

Extending across the western portion of Trench 2 and cut by [232] and [258] was a reddish gravel deposit (271) measuring 0.1m in thickness, probably consisting of redeposited natural, which overlay a light brown clay silt of 0.4m thickness, probably representing colluvial build-up within a low depression. Underlying this was the natural gravel (273).

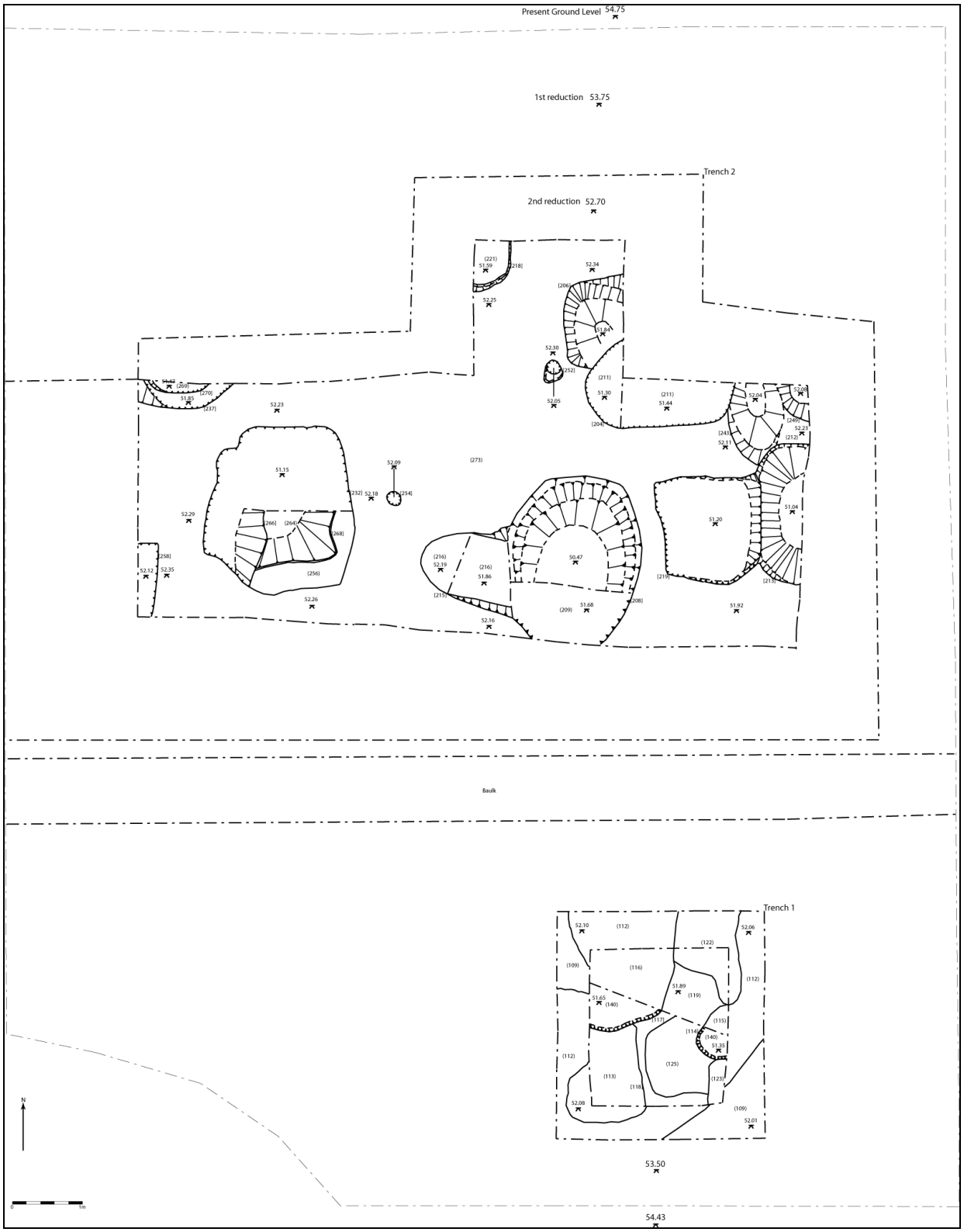

Fig. 6: Plan showing pit features revealed in Trench 2

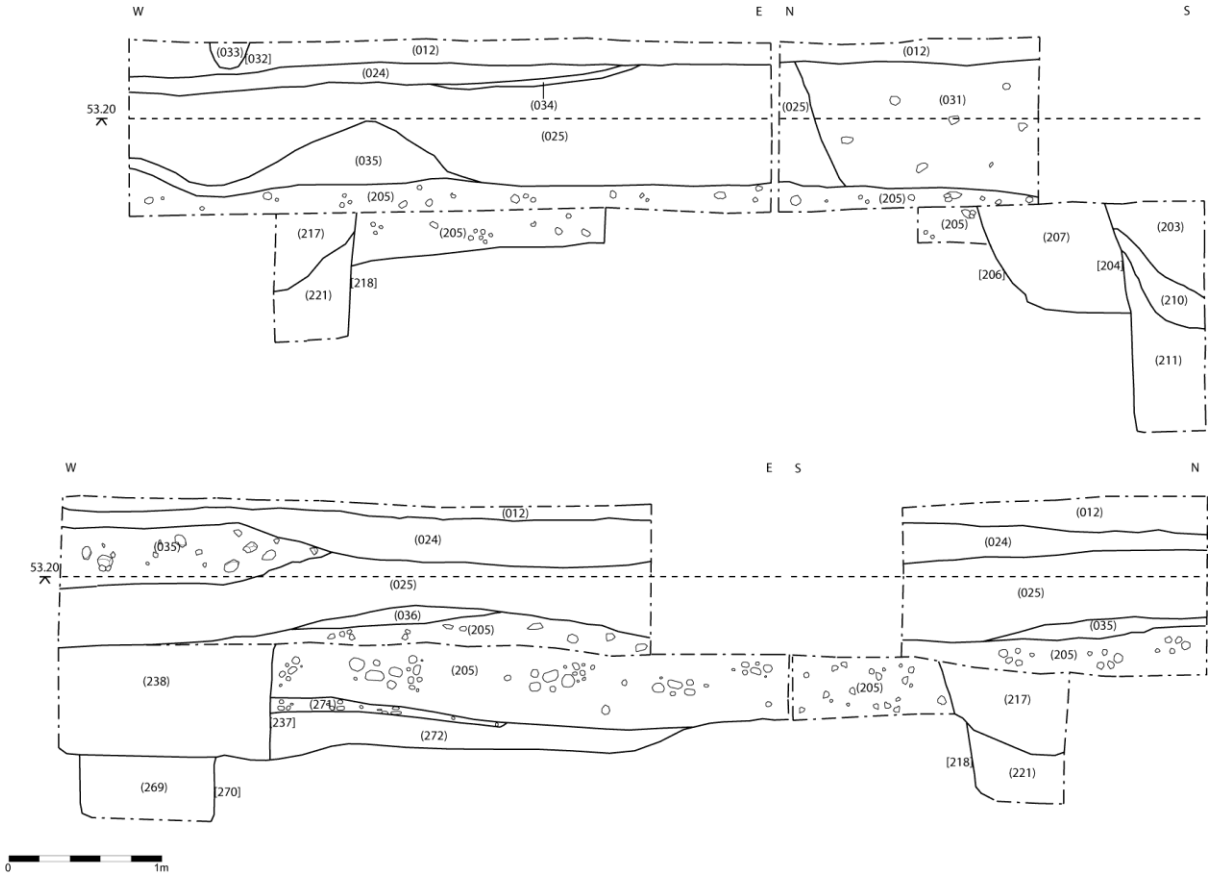

Fig.7: Trench 2 sections

7. Interpretation of Results

Essentially the programme of archaeological excavations at Kemble House, Aubrey Street has revealed evidence of four principal phases of activity, extending from the 10th century through to the late 19th century (modern demolition and landscaping deposits (001)-(003) being excluded from consideration). These phases of activity can be broadly categorised as follows:

- Phase 1: Late Saxon-early Norman (late 9th/early 10th–mid to late 11th century)
- Phase 2: Early Medieval (late 11th /early C12th -13th century)
- Phase 3: Later Medieval (14th -17th century)
- Phase 4: Post-medieval (17th -19th century)
- Phase 1 (late 9th/early 10th-mid/late 11th century)

It was difficult to determine whether any of the pits within Trench 1 could be assigned to this phase of activity, due to the limited nature of the ceramic assemblage from these pits. It appears likely that the large, roughly rectangular pit [118] in Trench 1 represents the earliest feature in this part of the site and could be of pre-Conquest date, although only two undiagnostic fragments of fired clay were recovered from the tertiary fill of the pit. Pit [117], which partially truncated [118], may also be assigned to Phase 1, based on the occurrence of sherds of Stafford ware (Fabric type G1) and Cotswold cooking-pot ware (Fabric type D1) which have been found on several other sites in central Hereford in contexts broadly dated to the late 9th/early 10th- mid/late 11th centuries (Vince 1985).

Within Trench 2, significant evidence of Phase 1 activity was identified, represented by up to 11 pits - [208], [215], [232], [243], [245], [252], [258], [266] and [268] - which were sealed by trench-wide deposit (205). It is likely that several of the features assigned to Phase 1 in this trench represent a distinct sub-phase of activity; for instance, pit [215] was truncated by [208], which in turn was truncated by pits [243] and [249], while pits [245], [266] and [268] represent successive re-cuts of the large sub-ovoid rubbish pit [232]; however, the pottery found in these re-cut features indicates that they also probably belonged to the late Saxon-early Norman period. Pottery recovered from the primary and secondary fills of several of these pits in Trench 2 suggests that they may be dated approximately to the late Saxon-early Norman period, indicated by the preponderance of Stafford ware (Fabric type G1) and Cotswold cooking pot ware (Fabric type D1) together with occasional sherds of late 11th-12th century Cotswold cooking pot/pitcher ware (Fabric type D2).

Context (205) was interpreted as a clearance or dumping layer representing the terminus of the Phase 1 activity, separating it from a subsequent period of occupation (Phase 2, broadly dated to the late 11th/early 12th – 13th century). The ceramic assemblage from (205) included sherds of late Saxon pottery including Stafford ware (Fabric type G1) and Cotswold cooking-pot ware (Fabric type D1); however, a sherd of Cotswold cooking-pot/pitcher ware was also recovered from this deposit, which first appears to occur in Hereford in late 11th century contexts and gradually decreased in usage throughout the 12th century (Vince, 1985, 55).

It is possible that (205) could represent a period of abandonment or disuse; the occurrence of gravel lenses in the deposit might possibly indicate periodic flooding of the site. However, this appears to be contradicted by the significant quantities of metalworking debris in this deposit, which strongly suggest that this layer was deliberately deposited, representing a distinct change in land use rather than abandonment of the site. It is worth noting that there was no evidence for a similar clearance layer in Trench 1, which suggests that the activity represented by layer (205) may have been localised.

Analysis of samples taken from the fills of several of the larger pits assigned to this phase of activity, specifically [117] and [118] in Trench 1 and [208], [232] and [245] in Trench 2, identified a sizeable assemblage of environmental material (e.g. insects, plant macrofossils), animal bone and metallurgical residues, which provided significant insights into the prevailing environmental conditions in this area and patterns of occupation and industrial activity on the site during the late Saxon-early Norman period.

Evidence of heavily waterlogged conditions was indicated by the presence of vivianite (a blue mineral indicative of organic materials) and waterside plants (including sedges, spike-rushes, pale *persicaria*, celery-leaved buttercup and common club-rush), which were

identified in samples taken from (130) the upper fill of pit [118] and (225), the basal fill of pit [208]. The abundance of organic material in these fills and the presence of wetland plants are strongly indicative of a boggy marshland environment, possibly subject to periodic flooding, with the likely presence of slow/stagnant water either within or in immediate proximity to the pit features.

Waterlogged or mineralised remains of numerous arable and ruderal weeds were also present, particularly in the fills of pits [118] and [208], including fool's parsley, corn marigold, black bindweed, black nightshade, small nettle, common hemp-nettle, henbane and common nettle, while a range of plant species including poppies, grasses, docks, buttercups, woundworts and dandelions were encountered in both the basal and upper fills of [208]; taken as a whole these appeared to indicate the presence of damp, disturbed ground or scrub, with evidence for arable cultivation (presumably of a marginal nature) being practised in the vicinity of the site. The occurrence of wood/bark fragments, a range of fruit-stones and mosses found in the upper fills of [117], [118] and the basal and upper fill of pit [208] further suggested that the site lay in close proximity to an area of marginal woodland or rough grassland, which included hazel trees and fruit-bearing small trees and shrubs.

The environmental conditions indicated by these findings may be usefully compared with the results of the two excavations undertaken in 1958 on the presumed line of the 'King's Ditch' at the GPO car park in Aubrey Street (located immediately to the south of the Kemble House site) and further to the south at Bridge Street Methodist Chapel, where evidence of heavily waterlogged deposits rich in organic material was observed in the lower levels of both excavations (Heys and Norwood, 1958, 119-23). It is also worth noting that on the Bridge Street site, the base and roots of a hewn oak tree were found *in situ* together with evidence of hazel and silver birch, indicative of a marginal woodland environment similar to that identified on the Kemble House site.

Comparisons may also be drawn with the results of the 1997 sewer trench excavations near the southern end of Aubrey Street, where evidence of peaty deposits interspersed with thin bands of gravel (indicative of episodic, fluctuating water levels) were identified (Boucher & Hoverd, 1998). The stratigraphy as revealed in Trench 2 did not strictly reflect a similar sequence of deposition, although the upper fill of [118] and the basal fills of pit [208] probably represent an episode of stagnant or slow-moving bog/marsh conditions. The gravel lenses in clearance layer (205) and stony deposit (212) sealing [208] could possibly indicate episodes of rising water levels and flooding, followed by more stable environmental conditions, however, it appears more likely that these deposits were laid intentionally as part of a redefinition of land use on the site, particularly in view of the large quantities of metallurgical debris in (205).

In spite of certain differences, the findings from this current programme of excavation at Kemble House, taken together with the results of the 1958 excavations and the 1997 sewer trench excavations, appear to confirm the presence of a discrete area of marsh or bog in the immediate vicinity of the site which extended south roughly along the line of Aubrey Street and King Street towards the river. The perceptive suggestion advanced in 1982 that this marshy area, which appears to correspond with the feature referred to in medieval and later documents as the 'King's Ditch', was in fact a disused stream course rather than a defensive ditch appears to be strongly confirmed both by the archaeological evidence and by recent LIDAR imagery produced as part of an EH-funded historic characterisation project of the townscape of central Hereford (Shoesmith, 1982, 88; Baker, 2010, 4-5).

Place-name evidence also appears to confirm the presence of a watercourse feature in this area, the street now known as Aubrey Street is first mentioned in a charter of *c*.1230 as 'Wrothale', the etymology is slightly unclear; however, it may be roughly translated as 'cattle hollow', incorporating the Old English place-name elements 'hryther' (cattle) and 'halh' (denoting a hollow, nook or sheltered place). Later medieval documents refer to the street as 'Rotholveswalle', 'Roughall' and it is marked on Speed's map of Hereford as Wroughtall; indeed the street continued to be referred to as Wroughtall Lane until the mid-19th century (Tonkin, 1966, 248).

The environmental and bone assemblage from the groups of early pits in Trench 1 and Trench 2 also provided important evidence for changes in usage during the late Saxon-early Norman period. Of particular interest is the possible evidence for noxious industrial activities, specifically tanning and flax retting, which one would usually expect to find on the periphery of a settlement (often outside the defensive circuit), although the marginal character of this area (based on the presence of marshland and scrub) and the presence of water would nevertheless appear to have made it an ideal locale for these activities.

Samples taken from (225) the basal fill of [208] contained evidence of worked leather offcuts, which taken together with the presence of certain bark indicators and an insect assemblage including abundant examples of *T. scaber* and carrion-feeding histerids, the *ectoparasite M. ovinus* and numerous examples of *P. irritans*, has been tentatively interpreted as evidence of tanning activity. It is worth noting, however, that evidence for butchered cattle bone (e.g. metapodials, horn-cores) which would normally expect to find in association with tanning activity was located not in the basal fill but in (209), the uppermost deposit of pit [208]. Fill (225) also contained evidence of flax seeds which may indicate that flax retting for fibre production was being undertaken on or very close to the site; it is worth noting that tanning/flax retting activity often (though by no means exclusively) occurred in the same location in medieval urban settlements.

It is possible that [208] may have been dug specifically as a tanning pit and later re-used as a domestic waste/cess pit, although an alternative explanation is that the pit was used from the outset both for the dumping of by-products from tanning activity nearby (e.g. butchered cattle bone, leather offcuts etc.) and as a cess pit for domestic waste, indicated by the presence of faecal matter (probably derived both from humans and pigs) both within the basal and upper fills. The relatively limited quantity of butchered bone found in (209) the upper fill of [208] and in the fills of several other early pits, most notably in (233) and (250) the fills of pit [245], and (265), the primary fill of [266] may be indicative of tanning activity on a small, domestic scale; no evidence of substantial concentrations of butchered animal bone was found to suggest that large-scale tanning was taking place on or close to the site and the presence of cess-like accretions adhering to the bones from several of the samples taken from the pit fills indicates that these features were chiefly being used for the deposition of domestic waste.

Significant evidence for smithing activity was found within the clearance layer (205) and in the fills of several pits assigned to Phase 1. The bulk of this evidence consisted of smithing hearth bottoms (material accumulating in the base of an iron smithing hearth, during the hot forging, welding etc. of iron and steel) although there was also a quantity of Fe objects (chiefly nails), along with fragments of vitrified hearth linings, un-diagnostic Fe slag and hammer-scale. The concentration of hammer-scale in (205) is particularly noteworthy as it

would appear to represent evidence of blacksmithing having been carried out in a prolonged or intensive manner in the immediate vicinity during the laying down of this deposit. Quantities of hammer-scale, smithing hearth bottoms and other metallurgical debris were also noted in the basal and upper fills of pit [118], the upper fill of pit [117] and the upper fills of pits [208], [215], [232], [245] and [266].

The occurrence of the majority of the metalworking debris in these secondary fills suggests that the smithing activity commenced (for the most part) sometime after the pits were originally dug or that some of the debris was used as part of a capping layer, sealing the domestic waste/tanning pits and representing a distinct episode of activity contemporary with the laying down of clearance layer (205). The abundance of oak timber charcoal in pits [118], [232] and [250] may also relate to metalworking activity since oak has a high calorific value, allowing it to burn for a long time and at a high temperature, and was therefore often used for processes such as metalworking.

The evidence for what appears to be intensive metalworking activity being practised either on or very close to the Kemble House site is extremely significant. Previous archaeological investigations undertaken in 1972-6 at Berrington Street (to the west of the site) immediately within the western line of the city defences, recovered significant quantities of iron smithing and tap slag although there was no actual evidence of ferrous working areas or structural remains that could be identified as a forge (Shoesmith, 1982, 100). The results of the excavations at Kemble House provide evidence for late Saxon-early Norman metalworking activity extending much further to the east of Berrington Street than perhaps had previously been supposed, with a possible focus of metalworking located somewhere along the east side of Aubrey Street in very close proximity to the site. It is worth noting the evidence for intensive smithing activity in Hereford recorded in the Domesday Survey (1086) which states that 'there were six smiths in the City, each of them paid 1d from his forge and each of them made 120 horseshoes from the King's iron…these smiths were exempt from every other service' (DB, I, f.179a).

The evidence for intensive metalworking activity on the Kemble House site further reinforces the impression that during the late Saxon-early Norman period (and probably throughout much of the later medieval period as well) this was a marginal zone within the city walls, not intensively settled. Due to the prevailing marshy environment in this specific area, it was a convenient location for dumping domestic waste and for peripheral industrial activities such as smithing or tanning that would require a convenient source of water nearby and would normally have been situated away from more densely populated areas, whether because of the risk of fire or the noxious smells generated by these practices.

Phase 2 (mid/late 11th- 13th century)

Evidence for this phase of activity, which was broadly assigned on the basis of the ceramic evidence to the mid/late 12th - 13th century, was identified in both trenches. In Trench 1, this comprised two pits [114] and [141]; [114] truncated the earlier, large rectangular pit [118] while [141] truncated [117] which itself was a re-cut of [118]. The upper fills of both pits contained pottery which can probably be dated to the late 11th/early 12th century, in the case of [114] this consisted of sherds of Cotswold cooking pot/pitcher ware (Fabric type D2) of late 11th -12th century date. The basal fill (151) of pit [141] contained three sherds of late Worcester sandy ware (Fabric type C1) of probable late 11th-early 12th century date.

In Trench 2, this phase of activity comprises those features cut from trench-wide clearance layer (205) which appeared to demarcate two distinct phases of activity, including pits [206], [218], [219] and [270], with a possible sub-phase represented by pits either truncating or re-cut from these earlier features, namely [204], [213] (and its recut [231]) and [237]. The fills of these various pits assigned to Phase 2 contained a somewhat more diverse chronological range of pottery compared to [114] and [141], suggesting that the active use of these pits could conceivably have extended from the mid/late 11th century through to the 13th century.

In the case of [204], a large sub-circular domestic rubbish pit, the basal fill contained sherds of late Saxon pottery (including Stafford and Cotswold cooking pot wares) however the uppermost fill (203) contained sherds of late 11th -12th century Cotswold cooking pot/pitcher ware (D2) and Herefordshire cooking pot ware (Fabric Type A2) of late 12th-early 13th century date. The basal and upper fills of [218] only contained two sherds of Stafford ware. Pottery recovered from the upper fills of pit [219] consisted chiefly of sherds of late 11th-early 12th century wares; no pottery was recovered from the fills of [213], the later pit truncating it, however the uppermost fill of [231] the recut of [213] yielded sherds of Malvern Chase (Fabric Type B1) cooking pot ware of early 12th-13th century date together with late Worcester sandy ware sherds of late 11th-12th century date and a number of earlier sherds of late Saxon Stafford and Cotswold cooking-pot wares which are presumably residual in context.

Analysis of environmental material, animal bone and metallurgical residues from these pits shed significant light on patterns of land use on the site during the late 11th-13th centuries. Analysis of a sample from (211), the basal fill of pit [204] identified evidence of hazel nutshell fragments and elderberry and bramble fruit-stones indicative of a marginal woodland environment, although it is noticeable that there was no obvious evidence for the heavily waterlogged conditions present in the basal fills of Phase 1 pits [118] and [208]. The occurrence of oat, rye and bread wheat grains may also indicate cereal cultivation taking place in the vicinity of the site.

Quantities of animal bone, chiefly cattle with smaller quantities of *caprine*, bird and fish bones were identified within the fills of most of the Phase 2 pits, with a particularly significant concentration of animal bone in (203) the uppermost fill of domestic waste pit [204]. The presence of relatively small quantities of butchered animal bone (including metapodials and horn-cores) indicates the continuation of small-scale butchery which may have been associated with tanning or horn-working on a limited, domestic scale.

Evidence of metalworking debris, including hammer-scale, smithing bottoms, Fe objects and iron slag was also identified in the several of the Phase 2 pit fills, with significant concentrations in the uppermost fill of pit [114] and the basal and upper fills of [204]. However it is worth noting that evidence of metalworking debris in the Phase 2 features generally occurred in smaller quantities compared to those contained in clearance/dumping layer (205) and the Phase 1 pits (such as [208]) suggesting that there may have been a decline in metalworking activity during this period.

Phase 3 (14th-17th centuries)

In both trenches, a series of landscaping or tipping deposits were identified, sealing the earlier Phase 2 features, represented by (109), (110), (111) and (112) in Trench 1 and (024), (025), (026), (027), (028), (029), (030), (031) and (034). These deposits significantly raised the level of the site in both trenches, by as much as 0.9-1.0m. It is difficult to determine precisely when this landscaping activity took place; however it is reasonable to assume that it occurred over a considerable period of time rather than as a single event.

Little datable material (i.e. pottery sherds) was recovered from these deposits, apart from a single sherd of late 11th-12th century Cotswold D2 ware in (112) which however may be residual; it appears more likely that this phase of landscaping activity began towards the end of the 13th century (based on the latest datable pottery recovered from the Phase 2 pits) and continued intermittently through to the early post-medieval period.

Significantly less evidence of occupation can be assigned to this period, compared to the intensity of activity evidenced by the Phase 1 and Phase 2 features. Within Trench 1, only two pits [103] and [107] can be assigned to this phase; while in Trench 2 only a single, large pit [202] appears to relate to this phase of activity. Due to the absence of datable material from the fills of these pits, only an approximate, late medieval-early post-medieval date can be assigned to these features. The fills of these pits appeared to be indicative of low-level activity, possibly associated with animal husbandry, suggested by the animal bone present in (201) the fill of [202].

Documentary evidence for the topography and land use of the site in the late medieval/early post-medieval period is limited; Speed's 1610 map of Hereford shows buildings lining the street frontage along the east side of Aubrey Street (then referred to as Wroughtall) however there appears to be little evidence of building activity to the rear of the street frontage. Context (012), interpreted as a post-medieval garden deposit sealing the landscaping/tipping deposits in both trenches, appears to have been deposited earlier than the 18th century, based on the occurrence of several sherds of Staffordshire Slipware (the assemblage from this deposit is somewhat mixed, including sherds ranging from late Saxon C1 fabric to German Stoneware of 17th-18th century date)

Phase 4 (18th-19th century)

A series of structural features were cut from garden deposit (012), apparently relating to 18th/19th century buildings occupying the site and possibly identifiable with structures depicted on Isaac Taylor's 1757 map of Hereford. Taylor's map shows the site as lying within the northern part of a row of six cottages with narrow garden plots extending east to the rear of the cottages.

Evidence of a cobbled surface (017) with a central drainage channel was also identified, probably representing a narrow entrance or alley running east-west between two of the properties. Abutted by the cobbles to the north and south were two masonry wall foundations of earth-bonded unworked stone, also oriented east-west. The northernmost wall (015) abutted a masonry foundation oriented north-south (013), possibly representing a property boundary along the east side of the former 18th -century street frontage. A wall

remnant (020) to the west of (013), and on a similar alignment, was possibly a building foundation of the same period.

These properties were in turn demolished and replaced in the mid-late 19th century by a large warehouse building which is visible on the OS 1st edition 1:500 map of 1885. The remains of a substantial brick, cement-mortared cellar revealed in the southern part of the site probably relate to this mid-late 19th century warehouse structure.

8. Conclusion

The results of the excavations undertaken by Border Archaeology at Kemble House, Aubrey Street have revealed significant evidence of occupation and industrial activity (including tanning and metalworking) dating back to the 10th-11th centuries AD. The site lies within the vicinity of the 'King's Ditch', a linear feature probably representing a disused watercourse which is shown on recent aerial (LIDAR) images to comprise a shallow defile running N-S roughly along the line of present-day Aubrey Street and continuing southwards across King Street towards the River Wye.

Environmental evidence from the basal fills of two of the earliest pits [118] and [208] probably datable to the 10th-late 11th centuries AD, indicates the presence of a boggy marshland environment with areas of slow/stagnant water and marginal woodland and scrub lying either within or in immediate proximity to the pit features. Although this area lies within the medieval town defences, it nevertheless appears to have been a marginal area which was not densely settled, but was utilised as a dumping place for domestic rubbish and ordure as well as a convenient location for industrial practices that would normally have been on the periphery of urban settlement.

Archaeological evidence indicates that, from the from the late Saxon period through to the 13th century, the site was intensively used for dumping domestic waste, some of which may have been produced as a result of small scale tanning activity (indicated by the preponderance of cattle horn-cores and metapodials).

There appear to have been two distinct phases of intensive pit digging activity on the site, the first possibly dated to the 10th-late 11th centuries, while a subsequent phase of activity continued through to the 13th century, based on the ceramic evidence. A clearance or dumping layer (205) separating the two phases of activity may possibly be dated to the late 11th/early 12th century. Significant quantities of metallurgical debris (including hammer-scale and smithing hearth bottoms) was recovered from several of the pit fills indicative of metalworking on or in very close proximity to the site, possibly extending from the late Saxon period through to the 13th century.

There also appears to have been a marked cessation of occupation on the site for a prolonged period which may have extended from the 14th century through to the 17th, or possibly later, indicated by the presence of a series of tipping or landscaping deposits.

Evidence for later 18th century building activity, possibly identifiable with a row of cottages shown on Taylor's 1757 map of Hereford in the approximate location of the site (on the east side of Aubrey Street), was represented by several stone walls interpreted as building

foundations associated with the 18th century street frontage, together with a cobbled surface which probably served as an entrance or alley between two adjacent properties.

9. Copyright

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11. Appendices

11.1 CERAMICS

Stephen Clarke Monmouth Archaeology

Summary

Pottery and other ceramic material were recovered from 27 contexts and these were submitted to Monmouth Archaeology for assessment. The assemblages contained significant Saxon and Norman pottery with very little attributable to periods after the 12th century (mostly post-medieval).

Method

All sherds were examined under a binocular microscope at ×8 magnification to identify inclusions while simple tests and Munsell colour checks were also carried out. All the early sherds were found to have encrusted edges which prevent identification unless thin flakes (revealing a clean break) were removed by applying pressure with a pair of pliers to the edge of the sherd.

Difficulties were experienced in separating some of the Saxon sherds of Cotswold (Gloucester) ware from Norman ones (Vale of Gloucester) so to facilitate the microscopic study the edges of some sherds were ground down and clear varnished.

Recording

The fabrics and sherd numbers from each bag (sometimes several bags for a context) were recorded on separate A4 sheets. The fabric codes are those established for Hereford by Dr. Alan Vince in his report on the Hereford ceramics in *'Hereford City Excavations'* Vol. 3 – The finds (Shoesmith 1985), which was followed by *'Hereford City Excavations'* Vol. 4 – Further Sites & Evolving Interpretations (Thomas & Boucher 2002).

The occupation

The ceramic evidence shows that there was Saxon occupation of this or a close-by site and that this occupation continued into the post-conquest period. There was very little pottery in the medieval groups which could be dated much later than the early 12th century and the main occupation might well have ended by then.

How early the Saxon occupation was cannot be ascertained from the pottery evidence alone but the Chester ware, which is well represented in the assemblages, was dominant during the 10th century and was declining around the time of the arrival of the Normans. The other well-established (mostly) pre-conquest ware is the Cotswold D1 cooking pottery which has the same fabric as that of kiln wasters discovered in Gloucester City. The present researcher is unfamiliar with a sherd from Context 209 but feels that it may be of Saxon date although from another unknown source.

That the occupation continued into the Norman period is shown by the presence of D2 Cotswold ware from the Vale of Gloucester which is followed by odd sherds of Worcester ware cooking pottery (C1) which first appears during the very late 11th century and of Malvern ware cooking pottery (B1) which is found from the early 12th century onwards, the form here being of an early style.

The odd sherds of later material, including the post-medieval pottery in Context 012, would be a normal assemblage expected in urban Hereford.

Context: (205) Bag: 3/3 Prov. Date: ?Intrusive Post medieval

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			
D2	Post-Conquest	1			
G	?Midlands yellow. Post-medieval	1			

Context: (115) Bag: 1/1 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2	Post-Conquest	3			

Context: (250) Bag: 1/2 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			

Context: (112) Bag: 1/1 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2	Post-Conquest	1			

Context: (221) 17 Bag: 2 of 4 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon				

Context: (222) Bag: 2/2 Provisional Date: First half 12th Cent

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
C1	Late 11th - late 12th century	3			
B1	Form - Earlier 12th century	9	1	4	

Context: (217) Bag: 1/1 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			

Context: (238) Bag: 1/1 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			

Context: (205) Bag: 1/3 Prov. Date: Saxon with ?intrusive late 11th early 12th century sherd

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon (2 sherds rouletted)	7	1		
D1	Saxon	1			
C1	Late 11th / late 12th	2	1		

Context: (203) Bag: 1/2 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Laminated/disintegrated Saxon	1			
D2	Post-Conquest	7	1	10	

Context: (151) Bag: 1/1 Provisional Date: Late 11th – Late 12th

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
C1		3			

Context: (216) Bag: 2/2 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2		11	1	4	

Context: (137) 6 Bag: 2 of 5 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2	Post-Conquest	2			

Context: (269) 36 Bag: 1 of 4 Provisional Date: Late 12th/early 13th

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D3	Late 12th/early 13th Century	1			
D2	Post-Conquest	1			

Context: (209) Bag: 1/1 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	6	3	1	
G	Unknown origin but probably Saxon; This sherd is in some ways similar to G1 but is not the same fabric or reduced colour. It has traces of some liquid running down the outside which may be decayed paint.	2			

Context: (233) Bag: 1/1 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	10	1		

Context: (220) Bag: 1/1 Provisional Date: ?13th Century

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
B1	Earlier 12th century rim form	3	1		

G1	Saxon	1	1	
D2	Post-Conquest	1		
G	Probably local, inclusionless, oxidized base sherd, with external pale yellow glaze splashes. Medieval	1		1
G	Inclusion free, finely micaceous, internal and external glaze. Oxidised to reddish yellow – Munsell 5YR 7/8	1		

Context: (217) 16 **Bag: 3 of 6** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	1			
-	Fired clay	1			

Context: (233) 29 **Bag: 2 of 6** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			
-	Bone fragment	1			

Context: (209) 18 **Bag: 2 of 5** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	1			
G1	Saxon	1			

Context: (265) 35 **Bag: 3 of 4** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	3			
-	Fired clay	1			

Context: (222) Bag: 1/2 **Provisional Date: ?12th Century**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
B1		5			
C1		1			

Context: (241) 31 Bag: 5 of 6 Provisional Date: Post Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	2 frags			
D2	Post-Conquest	2			
-	Fired clay	1			

Context: (205) 8 Bag: 4 of 6 Provisional Date:

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	5			
-	Fired clay ?Furnace lining	1			

Context: (203) Bag: 2/2 Provisional Date: 12th/13th

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G	Thumb crucible with dross	1			
A2	Handled sherd with engraved decoration (round ended)	2			
?A1	?Roman Severn Valley Ware; very (water) worn. Base sherd	1		1	
?A7a	Thin body sherd of possibly early pitcher but quartz not evident; glazed	1			
G1	Saxon	1			
D2	Post-Conquest	3		2	
G	Reduced, thin-walled body sherd; reduced; sooted interior				

Context: (214) Bag: 3 of 6 Provisional Date: ?12th Century

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight

B1	1
D1	1
C1	1

Context: (209) 9 Bag: 2 of 6 Provisional Date: Late 11th – late 12th

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
C1		1			

Context: (119) 3 Bag: 3 of 7 Provisional Date: -

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
-	Fired clay	2			

Context: (257) 34 Bag: 2 of 6 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2	Post-Conquest	1			

Context: (210) 11 Bag: 4 of 5 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	2 frags			
-	Fired daub with organic impressions	2			

Context: (203) 5 Bag: 5 of 6 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
?D1	?Saxon	2			
D2	Post-Conquest	3			
-	Burnt clay fragments	2			

Context: (116) 2 Bag: 2 of 8 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Fragment; Saxon	1			
G1	Fragment; Saxon	1			
-	Fragments of fired clay	1			

Context: (211) 13 **Bag: 2 of 4** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Fragment; Saxon	1			

Context: (250) 33 **Bag:** **Provisional Date: ?12th Century**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
C1	Late 11 – late 12th	1			
-	Fired clay, fragments	6			

Context: (250) **Bag: 2 of 2** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	1			

Context: (130) Bag: 3 of 7 **Provisional Date: -**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
-	Fired clay (sanded)	2			

Context: (261) **Bag: 1/1** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			

Context: (115) 1 **Bag: 2 of 7** **Provisional Date: Post-Conquest**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2	Post-Conquest	1			

Context: (250) 33 Bag: 3 of 8 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	4 frags			
?D1	Saxon	1 frag			

Context: (012) Bag: 1/1 Provisional Date:

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G8	Post-medieval	1			

Context: (222) 14 Bag: 3 OF 5 Provisional Date: ?12th Century

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
B1		1			
C1		2			
D2		1			
-	Burnt clay	1			

Context: (216) 28 Bag: 2 of 5 Provisional Date: Post-Conquest

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon, fragment	1			
D2	Post-Conquest	5			

Context: (238) Bag: 2/2 Provisional Date: Saxon

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon. The rouletting of multiple oblongs may be a previously unknown design	1			

Context: (209) 14 **Bag: 3 of 6** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Saxon	3	2		
-	Burnt clay	1			

Context: (216) 12 **Bag: 2 of 6** **Provisional Date:**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D1	Fragments; Saxon	4			

Context: (209) 10 **Bag: 1 of 7** **Provisional Date: Saxon**

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	1			

Context: (012) Bag: 1/1 Provisional Date: 14th/15th Century

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
A4	?Ridge tile	1			
C1 ?	Ridge tile				
?A	Roof tile inclusion-free; local	1			
?C	Medieval Floor tile with similar inclusions to Worcester C1 but larger grains.	1			

Context: (012) Bag: 2/2 Provisional Date: Late medieval/PM

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
B4	Ridge tile	4			
A7	Ridge tile	1			
A	Speckled gaze	2			

Context: (205) Bag: 1/1 Provisional Date: ?

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
-	Hard fired daub; local clay	1			
A	?Floor tile 3.5cms thick with lime mortar adhering to base; local fabric	1			
A	? Floor tile 3cms thick; local fabric	1			
	Both the above examples are more like Roman tiles than later				

Context: (012) Bag: 2 of 2 Provisional Date: Late Post-medieval

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
F2	German Stoneware	3			
F1	Saintonge ware	1			
E6	Staffordshire slipware	6			
E6	Staffordshire tankard	1			
G	Moulded slipware as Stem dish in Hfd City Excavations, Vol. 4; pl 7.7. p 75	1			
G8	Black glazed cups	4			
B5	Malvernian cup	1			
A	Possibly a ridge tile round sectioned spur, similar to those on Malvernian ridge tiles but split to look like a snake's open mouth, copper-speckled glaze.	1			
A/G	Miscellaneous regionally local glazed and unglazed vessels and some roof tile	22			
G	Fine sand-tempered tubular spout fragment : ?13th Century	1			
B4	Ridge tile	2			
B4	Lid seated bowl	1			
D3	?North Wiltshire fragment	1			
D2	Includes large cooking pot rim	4	1		
B1		1			
C1	With a heavy cooking pot rim	2			

Context: (205) Bag: 2/3 Provisional Date: 12th Century?

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G1	Saxon	3			
G	Rim of glazed pitcher with heavy siltstone temper. Similar fabrics come from Shropshire/North Herefordshire and Mid to west Wales. Similar fabric ?jug rim in (214) bag 1/1	1	1		

Context: (214) Bag: 1/1 Provisional Date: 12th/13th Century

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G	Rim of glazed ?jug with siltstone temper. Similar fabrics come from Shropshire/North Herefordshire and Mid to West Wales. A pitcher with a similar fabric (205) bag 2/3	1	1		
G1	Saxon	2	1		
D1	Saxon	1	1		

Context: (233) Bag: 1/1 Provisional Date: -

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
G	?Tile fragment; regionally local fabric	1			

Context: (216) Bag: 1/2 Provisional Date:

Hereford Fabric Code	Notes	Sherds	Rims	Bases	Weight
D2	Post-conquest. One large lid-seated rim	7	1	1	

11.2 THE GLASS FROM AUBREY STREET HEREFORD

H.E.M. Cool

Object

Small beads such as no. 1 tend only to be recovered where environmental sampling has been taking place. With the increasing regularity of sampling programmes, more and more of these beads are coming to light from a wide range of periods and it is difficult assign an independent typological date to them. Unpublished examples which I have seen recently have included one from a context provisionally dated to the Bronze Age from Parc Parc Cybi, Holyhead[1], and another from a late Iron Age to early Roman-British context to the west of Kempston near Bedford[2]. Both of these were of deep blue glass. A range in a variety of colours, including green were noted at *Segontium* in second to very late 4th century contexts (Allen 1993, 227 no. 63). They were also encountered in some numbers, again in a variety of colours including green, in seventeenth century and later contexts at Chester where they could be interpreted as materials for beaded embroidery (Cool 2008, 302 nos. 19-22, 26, 33-43). This example from the uppermost fill of a probable medieval domestic waste pit adds another date to the range. A larger sample than we currently have from dated contexts is needed before we will be in the position to establish which colours were most popular at different periods, if any were. An added complication is that these items are so small that intrusion into earlier contexts through animal activity is distinctly possible.

Vessel glass

The vessel glass from these excavations consists of bottle fragments. Those catalogued as no. 3 from a post-medieval make-up layer are from dark cylindrical bottles of the 18th century or later and are the sort of find to be expected in such a context. No. 2 comes from the upper fill of a possibly medieval pit. It is made from blue/green soda glass which indicates it would not be contemporary with such a context. The two periods when a fragment from a prismatic bottle made in such glass might be expected are the later 1st -3rd century when such bottles were very common or the 19th or 20th century. The fragment is thus either residual or intrusive. Given that no other Roman material has been found on this site, it has to be assumed that the latter is the case.

Window glass

Eleven fragments from two different panes were found (nos. 4-5). The type of glass is typical of the post medieval period. One fragment of no. 5 retains a grozed edge produced by using a grozing iron. Cutting panes with a diamond cutter became increasingly common during the 16th century (Brown and O'Connor 1991, 56), and so the blue green window fragments were unlikely to have been originally used in glazing much after the later 16th or earlier 17th century.

[1] Site G1701 excavated by the Gwynedd Archaeological Trust
[2] Site LWB 1289 excavated by Albion Archaeology.

Catalogue

1 Annular bead. Translucent mid green glass. Diameter 2.5mm, length 2mm, perforation diameter 1mm. Context 115 sample 1

2 Prismatic bottle, body fragment. Blue/green glass. Dimensions 15 x 12.5, thickness 3.5mm. Context 216.

3 Cylindrical bottle fragments. Dark green appearing black. Four fragments from bases and one from body. Base diameters c. 100mm and 120mm. Context 12.

4 Window glass. Yellow tinged green. Five fragments, two with fire rounded edges and one with additional blob of glass. Wall thickness 1-2.5; Area 22cm^2.

5 Window glass. Blue/green. Six fragments, one with fire rounded edge and one with grozed edge. Wall thickness 1.5; Area 12cm^2.

Refernces

Allen, D. 1993. 'Roman glass', in Casey *et al*, 219-28

Brown, S. and O'Connor, D. 1991. *Glass Painters* (London)

Casey, P.J., Davies, J.L. and Evans, J. 1993. *Excavations at Segontium (Caernarfon) Roman Fort, 1975-1979*, CBARR 90 (London)

Cool, H.E.M. 2008. 'Glass and frit beads and ornaments', in Garner, 302-3

Garner, D. 2008. *Excavations at Chester: 25 Bridge Street 2001*, Archaeological Service Excavations & Survey Report 14 (Chester)

11.3 CLAY TOBACCO PIPES FROM EXCAVATIONS AT AUBREY STREET HEREFORD

Dr D A Higgins

Introduction

This report deals with the clay tobacco pipes that were recovered by Border Archaeology during excavations at Kemble House Car Park, Aubrey Street, Hereford (centered on NGR 50859 39884) during 2010. The site code used for this work was ASH 10. The pipe finds were examined and this report prepared by the author in December 2010.

The Pipes Themselves

The excavations produced a total of 14 fragments of clay tobacco pipe, comprising 1 bowl and 13 stem fragments. All of these pieces were recovered from Context (012). The pipes from this layer include five thicker stems with larger bores, four of which are of 17th or early 18th -century date and the fifth of which is of 18th -century date. All are made of fine clay, without any obvious inclusions, and some of them have been burnished. The bowl fragment is about two-thirds complete and dates from *c*.1760-1820 (*fig 1*). The spur itself is missing and the bowl is plain, with an internally trimmed rim.

The remaining eight stems are thinner and date from the late 18th or 19th century. Three of these are stamped with a relief maker's mark, two of which are almost complete while the third comprises the second half of the mark only. The three marks are of the same form and would all probably have read J.LANGFORD / WORCESTER originally, although it is clear that at least two different stamps were used to create them. The best impression has neatly cut and sharply defined lettering and would have been about 18mm in length and 4.5mm in depth when complete (Die 1100 in the national mark catalogue that is being compiled by the author; fig 2). In contrast, the other two marks (which are not necessarily both from the same die themselves) have rather smaller lettering and are only about 15mm in length by 3.5mm in depth (fig 3; Die 2126). Research into this maker (see below) has shown that he only operated as a pipe maker in Worcester for two brief periods and that these marks can be closely dated to his second period of operation, *c.* 1848-55. These are the latest closely datable pipe fragments from this layer and show that it was still accumulating until at least the middle of the nineteenth century.

John Langford

John Langford was the son of Samuel and Susannah Langford and was baptized at Madeley in Shropshire on 15th June 1817 (IGI, accessed December 2010). Nothing is known of his early life but, by 1841, he had moved to Worcester where a trade directory of that year records that he was working as a pipe maker in partnership with Charles Hardwick (Gault 1979, 409). They cannot have been working together long, since John was only about 24 at the time, but a stem stamp reading HARDWICK & LANGFORD / WORCESTER is known that must date from this period of his life (Die 1097 in the national mark catalogue that is being compiled by the author; fig 4). This arrangement was not to last and, in September of the

same year, notice was published that the partnership of 'C. Hardwick and J. Langford, Worcester, tobacco pipe manufacturers' had been dissolved (The Morning Post (London), Saturday, September 04, 1841; Issue 22039). Assuming that John would have been about 21 before entering into a partnership, then this early venture into pipe making can be dated closely dated to *c*. 1838-41.

Signs that all was not well with the pipe making partnership were already evident earlier in 1841 when, on the night of 6 June, the census returns recorded that he was living in Spa Field, South Worcester, where he was recorded as an iron founder rather than a pipe maker. In the same household was Samuel Langford, who was aged 16 and also from Madeley, but who must have been a cousin rather than a brother, since Samuel's parents were given as Thomas and Mary when he was baptized at Madeley on 6 March 1825 (IGI, accessed December 2010). Samuel was working as a pipe maker, presumably for the 34 year old Charles Hardwick, with whom they were also living. Nearby were other pipe-makers, another member of the Langford family (Hannah, 20) and a Thomas Suter (sic), a carpenter, but possibly related to Henry Shuter, who was also a Worcester pipe maker. Presumably John worked as iron founder for a while from 1841, which may well have given him the skills and/or contacts to produce the cast iron moulds that were needed to make the pipes.

John married Mary Caroline Spooner at Whittington, about 2 miles SE of the centre of Worcester, on 22 April 1845 (IGI, accessed December 2010; Mary was the daughter of Robert and Ann Spooner and had been baptized at St Peter's, Worcester on 8 August 1823). Although the partnership with Charles Hardwick ended in 1841, John's interest in pipe making must have continued since he reappears as a pipe maker in the P.O. Directory of 1850 at St Clement's Street (with Charles Hardwick listed separately as a pipe maker in the Shambles; *cf* fig 5). The 1851 Census lists John Langford at Spa Field, living with wife Mary and a five year old son, William, and describing him as a 'tobacco pipe manufacturer'. Samuel Langford had given up pipe making and was listed as a painter and glazier by this date.

Slater's 1851 Directory lists John as a tobacco pipe maker in Blockhouse, while Lascelles Directory of the same year gives a Joseph Langford, tobacco pipe manufacturer, at Blockhouse (presumably the same person but with the Christian name given incorrectly). Billings Directory of 1855 lists John Langford as a tobacco pipe manufacturer at Spa Fields, Blockhouse, but he gave up the trade again in this same year, as is evident from two connected advertisements placed in Berrow's Worcester Journal on Saturday, June 30, 1855 (Issue 7962). In the first advert, headed 'Blockhouse Tobacco Pipe Works, Worcester', Langford informs his friends and customers that, after seven years, he has 'disposed of the pipe trade to Messrs. Shepherd & Morgan', because he had taken on wine and spirit vault at Leominster. In the following advert, Messrs. Shepherd & Morgan announce that they have taken over the business, saying 'the whole of the premises have been rebuilt and greatly improved within the last twelve months, rendering them by far the most extensive and complete in this part of the country', and that 'every description of pipes manufactured, tipped or plain, and forwarded to any part of the United Kingdom. Sole manufacturers of the celebrated Yachting pipe.' The same adverts were reprinted in Berrow's Worcester Journal for Saturday, July 14, 1855 (Issue 7964).

These adverts make it clear that John had only traded as a pipe maker on his own account for seven years, i.e., from 1848-55. John is listed in the 1861 census for Leominster and appears to have done well at the pipe making business since not only had he raised the

capital to rebuild the works in Worcester and become a wine merchant in Leominster but he was also employing a house servant to help his wife with their three children (William Spooner, aged 15; Susannah Anne, aged 6 and Thomas Frederick, aged 3). John remained in Leominster for the next 20 years, being listed in Broad Street as a wine merchant in the census returns for both 1871 and 1881. He died in the second quarter of 1881, aged 64 (FreeBMD; accessed 12.12.10).

This outline of John's life is important since it shows that he was only working in Worcester as a pipe maker for two relatively short periods of time, both of which can be linked with known marks. He was working as a pipe maker in partnership with Charles Hardwick from *c*. 1838-41, when the pipes would have been marked HARDWICK & LANGFORD / WORCESTER and on his own account from *c*. 1848-55 at the Blockhouse Tobacco Pipe Works, when the pipes would have been marked J.LANGFORD / WORCESTER. The second pipe making enterprise must have been a relatively large and successful business since, by the time of its sale in 1855, he had raised enough capital to have rebuilt the works to make it the largest in the area, with pipes being advertised for sale anywhere in the United Kingdom. This last claim may well have been a somewhat optimistic attempt to exploit the marketing opportunity provided by the new and rapidly expanding rail network. While his products may not have ever achieved the national coverage he aspired to, they clearly found a good market in Hereford, some 25 miles to the WSW.

Discussion

Although only a small group of pipes, this assemblage is important for two reasons. First, it firmly dates context 12 to at least the middle of the 19th century. This context also contains residual pipes dating from the seventeenth century onwards and it is likely to represent an accumulation of domestic waste that built up over a period of at least 200 years. Second, this group includes three examples of J. Langford stem stamps from Worcester. Research into this maker has shown that these marks are closely datable to *c*. 1845-55 and this appears to be the first time that examples have been recorded from Hereford. These marks demonstrate that a Worcester maker was able to find a market for his products in Hereford. At least two and possibly three different dies were used to produce these marks, which underlines the scale of production and success that Langford must have achieved, and which enabled him to subsequently move to Leominster, where he set up as a wine merchant.

Reference

Gault, W. R., 1979, 'Worcestershire Clay Tobacco-Pipe Makers', in P. Davey (ed.), *The Archaeology of the Clay Tobacco Pipe*, I, British Archaeological Reports, British Series 63, Oxford, 409-11 (411pp).

Illustrations

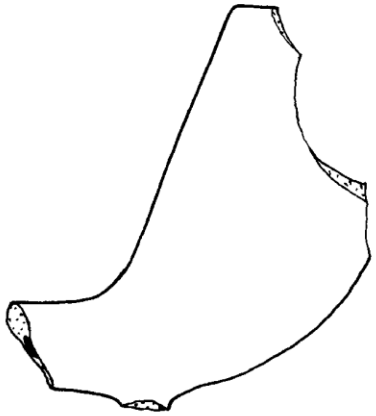
1 – Plain pipe bowl of *c.*1760-1820 with a cut and internally trimmed rim. There is no internal bowl cross and the stem bore measures 5/64". ASH 10 (012).

2 – Large J. Langford mark of *c*.1848-55 from the national pipe stamp catalogue (Higgins Die 1100). This is the same type as an example from ASH 10 (012).

3 – Smaller J. Langford mark of *c*.1848-55 from ASH 10 (012). The mark has been applied to the left hand side of the quite a narrow stem with a bore of 4/64". This is a previously unrecorded mark that has been added to the national pipe stamp catalogue as Higgins Die 2126.

4 – Mark reading HARDWICK & LANGFORD / WORCESTER that dates from the partnership of *c*.1838-41 (from the national pipe stamp catalogue; Higgins Die 1097).

5 – Partial mark that would have read C.HARDWICK / WORCESTER. This mark probably dates from *c*.1841-55 (from the national pipe stamp catalogue; Higgins Die 1104).



1

2

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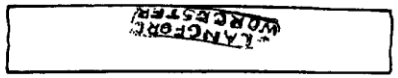

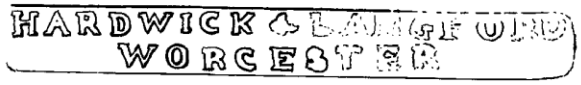

4

5

Pipe fragments shown at 1:1 with mark details at 2:1.

Drawings by D A Higgins.

11.4 PETROLOGY AND FUNCTION OF THE STONE

Dr Kevin Hayward

Introduction

This report examines the geological character and (where possible) the source of two examples of worked stone recovered from an evaluation at Aubrey Street, Hereford ASH10 NGR SQ 50859 39884. These were from the fill of a possible medieval domestic waste pit [130] from trench 1 and the middle/upper fill of possible medieval pit [232] from trench 2.

Methodology

Consultation of local geological maps of Hereford (Sheet 198) and Ross-on-Wye (Sheet 215) and accompanying memoir (Brandon 1989) provided an understanding of the geology of the immediate vicinity and local surroundings. Hand specimen comparative analysis using a hand lens (Gowland x10) and binocular microscope (Brunel x 25) will then be undertaken in order to identify the geological character of the assemblage.

Local Geology

Heavily folded and faulted Lower Devonian sandstones; mudstones conglomerates and limestones (Raglan Mudstone Formation; St Maughans Formation; Brownstones Formation) dominate the geology surrounding Hereford. Direct access to these outcrops via the River Wye and River Lugg permits easy supply to medieval Hereford. Many of these sandstones e.g. Hereford Stone; Withington Stone and Lyde Stone have been used in masonry structures in Hereford (Brandon, 1989, 45). On top of this there are cornstone conglomerates and Bishop's Frome Limestone (Brandon, 1989, 45-6) as well as Carboniferous dolerite (Brandon, 1989, 21) all of which are hard enough to be worked.

Petrological Character and Function

Hand specimen comparative analysis of the two examples of worked stone shows them to be of very different origins.

Whetstone fragment [130] <4> fill of a possible medieval domestic waste pit 139g 41mm wide

This rubstone is made of a dark grey, very hard, microcrystalline rock. Closer inspection of the fabric using a binocular microscope (×25 Brunel) identified olive green flecks. This rock is an intermediate basic igneous rock. The only igneous material local to Hereford is a small Carboniferous dolerite intrusion (dyke) [5633 4045] near Bartestree who's description 'green dolerite without olivine' (Brandon, 1989, 21) fits with this material.

The fine hard even grained surface of this dolerite is an ideal medium with which to sharpen tools.

Saddle quern [222] <4> from the middle/upper fill of possible medieval pit from trench 2. 2791g 91mm thick

The rock is a grey-brown-purple, hard angular, heterogeneous quartz conglomerate. Poorly sorted (4-10mm) examples of quartz dominate the clasts but there are numerous fragments of dark brown Devonian sandstone.

Quartz conglomerates from the Basal Brownstone of the Forest of Dean (Saunders 1998) were used in saddle and rotary querns in Roman and Iron Age but this lithology is much lighter and has fractured quartz. However, there are numerous conglomeratic horizons within the local St Maughans Formation including examples with a purple-brown tinge (Brandon, 1989, 18). The quern is almost certainly one of these units

Hard angular gritstones and quartz conglomerates provide an ideal medium with which to grind corn into coarse flour. The availability of suitable stone close to Hereford is not surprising given the age and terrigenous nature of the local Devonian deposits.

Summary

The material used in the whetstone and the quernstone are both local. The abundance of suitable, local hard stone for whetstone and quernstone manufacture is facilitated by the proximity of the River Wye and Lugg to these outcrops.

References

Brandon, A. (1989). 'Geology of the country between Hereford and Leominster'. *Memoir of the British Geological Survey*, Sheet 198 (England and Wales). London, HMSO.

Saunders, R. (1998). *The use of Old Red Sandstone in Roman Britain: a Petrological and Archaeological Study*. (Unpublished PhD thesis, Department of Archaeology, University of Reading

Slate - Evaluation at Aubrey Street ,Hereford			
Site Code: ASH10 Job No: BA1010ASH			
Context Number	**Find Type**	**Context Description**	**No. of Items**
130	Stone	Fill of possible medieval domestic waste pit [118]	1 pieces (1 bags)
222	Stone	Middle/Upper Fill of Possible Medieval Pit [219]	1 pieces (1 bags)

11.5 FLINT REPORT

R Donahue

ASH10 244 Δ8 worked flint

This piece has gone through a few processes of modification. It is a medial flake portion, the proximal end has snapped away – this may have occurred when it was produced. The distal end has snapped away. The dorsal surface has a patch of heavy patination/cortication. The remainder of the surface is patinated to a lesser extent. Some flaking around the edge (ventral surface on the left margin, single flake on the dorsal surface on the right margin) is relatively fresh – it may have occurred during excavation. The remainder of the edge damage is historic and appears randomly arranged. This type of piece can occur naturally and especially as a single piece it is hard to assign it to a cultural phase.

Analysis of a single flint item

This is a flint flake measuring 20mm wide 16mm long. The proximal and distal ends are absent. The distal end has been removed by a snap to the base. The proximal end is snapped and is fractured down the plane of the flake along its right margin. On the ventral surface there are multiple flat flake removals across the surface, one large removal from the, and two originating from the right margin. Damage can be seen on the ventral surface on the left margin. A small spot of patination is present on the dorsal surface. Given the lack of patination on the remainder of the piece and the location of this spot of patination, one can suggest that the flake was originally knapped from the outer part of a new core that itself was recovered from a secondary deposit. The nature of the modification does not help identify the timeframe of its production. The flat flake removals could be the result of initial thinning for a leaf point (Neolithic) that has subsequently broken and discarded but it could equally result from bipolar flake production. No temporal assignment can be made.

11.6 ASSESSMENT OF METALWORKING DEBRIS FROM AUBREY ST. HEREFORD

David Starley

Summary

Ironworking debris, totalling 21kg and including hammerscale, from the site of Kemble House car park, Aubrey St, Hereford (NGR SO 50859 39884) was examined. Although the excavation found no structural evidence, the debris shows that a medieval ironworking smithy was operating in the immediate vicinity.

Background to the excavation

Archaeological excavation was carried out in June 2010 by Border Archaeology at Kemble House car park, Aubrey St, Hereford (NGR SO 50859 39884). The site was in the immediate vicinity of a known medieval feature, the King's Ditch, which lay at the boundary between two parishes. Following mechanical removal of overlying material of no significant archaeological interest, two trenches of 3×3m and 10.5×8m were excavated. All archaeologically significant features were dug by hand. In the smaller, southernmost, Trench 1 a medieval occupation layer had been cut, and re-cut by a series of pits. Despite the apparently domestic nature of most of these others contained quantities of animal bone and horn cores, indicative of butchery or tanning. A substantial amount of material had been dumped above this, before a further post-medieval occupation layer became evident. In Trench 2, below similar tipping deposits, five large deep sub-rectangular pits, dating to the medieval period, were thought to have served as industrial storage pits, for an, as yet unidentified, industry. Below these nine earlier medieval pits contained cessy deposits and may have been involved in the tanning process.

On-site methodology and sampling

All artefacts were reported to have been retained. The hammer-scale samples are assumed to derive from the sieve residues of environmental flotation samples. The original size of these was up to 40l or 100% of the sample (Border Archaeology 2010).

Assessment of metalworking debris

Methodology for assessment

All bulk slag provided by Border Archaeology, amounting to two boxes, was visually examined. This material was classified into the standard categories used by the specialist, based on those developed by the former English Heritage Ancient Monuments Laboratory. Visual observation of the exterior was backed up where necessary, by the examination of fresh fracture surfaces, the use of a geological streak plate and a magnet. Table 1 presents a summary of these findings, based on the categories. A full listing, by context, can be found in Appendix I.

Classification of debris

Some forms of slag are visually diagnostic, providing unambiguous evidence for a specific metallurgical process. Other debris is less distinctive and it is not possible to determine which metallurgical, or other high temperature process, it derives from. At Aubrey St, Hereford, by far the bulk of the diagnostic material derived from iron smithing, but crucible fragments also showed some evidence of non-ferrous alloy melting, probably copper alloy for casting. Occasional pieces of fayalitic slag were reminiscent of those associated with iron smelting. However, the small quantities, lack of supporting evidence in the form of furnace remains, ore residues etc, tend to suggest these are just fragments of particularly well consolidated smithing debris.

Table 1. Bulk slag summary from Aubrey St., Hereford

Activity	Classification	Total weight (g)	Total contexts
Smelting	Dense slag?	375	2
Smithing	Smithing hearth bottoms	10665	14
	Flake hammerscale*	Not quantified	6
	Spheroidal hammerscale*	Not quantified	4
	Ferruginous concretion containing hammerscale	122	1
	Fayalitic run slag	48	5
Copper alloy melting	Crucible fragments	3	1
Undiagnostic ironworking	Undiagnostic ironworking slag	6346	20
	Iron-rich cinder	286	3
Metalworking or other high-temp process	Vitrified hearth/furnace lining	850	17
	Cinder	471	16
	Fired clay	125	6
	Fuel ash slag	70	1
	Glassy slag	55	1
	Burned stone	8	1
Artefacts	Copper Alloy	1	2
	Ferrous objects	981	13
Non-slag	Shell fragment	2	1
	Stone	98	2
	Ferruginous concretion	415	4
Total		**20922**	**27**

Table 1. Bulk slag summary from Aubrey St., Hereford			
Activity	**Classification**	**Total weight (g)**	**Total contexts**
*Hammerscale noted within bulk slag bags. Hammerscale samples from sieving have been quantified in Table 2			

1. Diagnostic – iron smithing

Evidence for iron smithing comes in two forms; bulk slags and micro slags. Of the bulk slags, the most easily recognisable are **smithing hearth bottoms** which have a characteristic plano-convex section, typically having a rough convex base and a vitrified upper surface which is flat or even slightly hollowed as a result of the downward pressure of air from the *tuyère*. Compositionally, smithing hearth bottoms are predominantly fayalitic (iron silicate) and form as a result of high temperature reactions between the iron, iron-scale and silica. The silica can derive from the hearth lining, where this is made of clay, or possibly sand used as a flux by the smith, or from silica in coke, where this was used as a fuel. At Aubrey St., smithing hearth bottoms comprised just over half the assemblage. Statistical analysis of the mass and dimensions of these 38 slag blocks show them to be of small size for the medieval period.

Table 2. Smithing hearth bottom dimensions, Aubrey St., Hereford				
	Weight (g)	**Length (mm)**	**Width (mm)**	**Depth (mm)**
range	48-643	55-130	45-95	20-60
mean	281	86	71	43
std dev	136	16	12	10

In addition to bulk slags, iron smithing also produces micro slag of two types (Starley 1995): **Flake hammerscale** consists of fish-scale like fragments of the oxide/silicate skin of the iron dislodged during working. **Spheroidal hammer-scale** results from the solidification of small droplets of liquid slag expelled during hot working, particularly when two objects are being fire-welded together or when the slag-rich bloom of iron is first worked into a billet or bar. Hammer-scale is considered important in interpreting a site not only because is highly diagnostic of smithing but, because it tends to build up in the immediate vicinity of the smithing hearth and anvil, it may give a more precise location of the activity than the bulk slags which may be transported elsewhere for disposal (Mills and McDonnell 1992). Occasional flakes and spheroids of hammer-scale were noted in the small quantities of detached soil in the bags of bulk debris. These were not quantified, but noted in table 1 above. In one instance hammerscale was found in a lump of **ferruginous concretion**, an iron-pan type material, but in this case not entirely natural but enhanced by the presence of iron from smithing debris.

Hammer-scale from the environmental samples, presumably extracted using a magnet from the sieve residues, allowed quantification to be carried out. A significant proportion of this material may not be hammer-scale; fired clay, iron-rich slag and some heated iron-rich minerals, may also be attracted to a magnet. The proportion of flake and spheroidal hammer-scale in each bag was therefore estimated and this was multiplied by the total weight to give a weight of the scale in grams, as listed in Table 3. The ratio of flake to

spheroidal hammer-scale is also important. Certain processes, such as the initial consolidation of blooms and fire welding together of two parts tend to produce a greater proportion of spheroidal scale.

Table 3. Hammer-scale

Context	Sample No	Sample Wt. (g)	Hf %	Hs %	Hammer-scale Wt. (g)	Context description
115	1	35	20	5	8.8	ditch/pit (114) fill
116	2	8	40	5	3.6	pit (117) fill
119	3	7	5	2	0.5	domestic waste pit (118) fill
130	4	11	20	2	2.4	domestic waste pit (118) fill
137	6	1	2	0	0	domestic waste pit (114) fill
203	5	53	20	5	13	domestic waste pit (204) fill
205	8	41	50	5	23	clearance layer
207	15	35	20	1	7.4	domestic waste pit (206) fill
209	9	88	30	2	28	cess/tanning pit (208) fill
209	14	146	30	2	47	cess/tanning pit (208) fill
209	25	14	20	1	2.9	cess/tanning pit (208) fill
210	11	100	30	1	31	dumped material in rubbish/cess pit (204)
211	13	135	30	2	43	basal fill of rubbish/cess pit (204)
214	21	51	30	2	16	uppermost fill of pit (213) of unknown function
216	28	168	12	1	22	uppermost fill of cess/rubbish pit (215)
216	28	101	5	1	6.1	uppermost fill of cess/rubbish pit (215)
216	12	4	15	1	0.6	uppermost fill of pit (218) of unknown function
217	16	40	1	0	0.4	uppermost fill of pit (218) of unknown function
217	16	97	20	5	24	uppermost fill of pit (218) of unknown function
220	20	23	30	2	7.4	uppermost fill of rubbish pit (218)
222	19	46	30	3	15	fill of pit (219)
223	23	12	20	1	2.5	fill of industrial pit (219)
225	26	6	10	1	0.7	primary fill of poss. Tanning pit
229	27	2	20	1	0.4	firm clay fill of pit (213)
233	29	18	<1	0	Not quatified	uppermost fill of pit (232)
233	29	110	20	2	24	uppermost fill of pit (232)
240	30	6	10	2	0.7	Organic material in silty matrix
241	31	25	20	0	5	fill of pit (215)
248	32	5	30	5	1.8	fill of pit (249)
250	33	2	40	1	0.8	primary fill of feature (245). Prob. re-cut of (232)
257	34	7	80	0	5.6	fill of rubbish/cess pit (258)
262	37	2	40	2	0.8	fill of pit (232)
265	35	32	5	1	1.9	fill of pit (266)
269	36	64	20	2	14	upper fill of cess pit (270)
Total		1495			361	

Fayalitic run slag consists of small dribbles of liquid slag, which can be formed during iron smelting or smithing. For Aubrey St, the lack of diagnostic evidence for the former suggests the runs also derive from smithing.

2. Diagnostic non-ferrous metal melting

Two small fragments of ceramic with a black glaze on the outside are clearly fragments of **crucible**. However, no traces of corrosion were visible internally which might provide the means of determining the nature of the alloy being melted, although given the extent of vitrification, the temperatures to which it was heated would appear to be those associated with copper alloys rather than lead or tin alloys.

3. Non-diagnostic ironworking.

One major category of material found at Aubrey Street was that recorded as **un-diagnostic ironworking slag.** Such irregularly shaped fayalitic slags are produced by both iron smelting and iron smithing processes. However, given the predominance of diagnostic smithing evidence on site it would seem likely that this also derives from smithing. **Iron-rich cinder** was distinguished by its significant content of iron not chemically combined as silicates, but visible as rust-orange coloured hydrated iron oxides and iron hydroxides.

4. Undiagnostic – metalworking or other high temperature process

Several of the categories of material can be produced by a wide range of high temperature activities and are of little help in distinguishing between these processes. Material listed as **vitrified hearth/furnace lining** may derive from either iron smelting or smithing or from non-ferrous metal working. This material forms as a result of a high temperature reaction between the clay lining of the hearth/furnace and the alkali fuel ash or fayalitic slag and is often present in significant quantities, though it survives less well than more robust slags. It may show a compositional gradient from unmodified fired clay on one surface to an irregular cindery material on the other. A material associated with vitrified lining was classed as **cinder.** This comprises only the lighter portion of this, a porous, hard and brittle slag formed by the reaction between the alkali fuel ash and fragments of clay that had spalled away from the heath/furnace lining. The **fired clay** without any surface vitrification could have derived from structures associated with metallurgical purposes, or from those used for other high temperature activities.

A single fragment of **fuel ash slag** was of light-weight, light-coloured, porous nature and could be a waste product from a range of high temperature processes. One of the more puzzling pieces of debris, recorded as **glassy slag** was dark coloured, like much early blast furnace slag, except that its high porosity was untypical of waste from this process. Other options might be the smelting of lead or tin, but the slag was untypically dense for this operation. The extent of heat modification on the **burned stone** suggests more than domestic hearth temperatures, but no industrial process could be identified.

5. Artefacts

A number of metal artefacts were present with the slag at the time of examination. Some visual examination of these was made, particularly to determine whether the items included metallurgically relevant items such as bar ends or part finished artefacts. A small strip of

ferrous metal, measuring 48 × 11 × 4mm might be one of the former, but generally speaking the assemblage was dominated by broken tools and used nails.

6. Non slags

The **stones** and a fragment of (possibly oyster) **shell** have no metallurgical significance. The **ferruginous concretion** may simply be iron pan, although the presence of iron minerals from ferrous metalworking may have contributed to its formation.

Conclusions

The archaeological excavation recovered significant amounts of metalworking debris, totalling 21kg, from a reasonably compact area. The largest component of this was a type of slag classified as smithing hearth bottoms. This forms in the base of an iron smithing hearth, during the hot forging, welding etc. of iron and steel. A small amount of material was carefully examined, because it displayed features reminiscent of iron smelting i.e. the production of metal from its ores. However, on balance there it is felt that this and the vast majority of the un-diagnostic material derived from iron smithing. The other diagnostic material comprised two small sherds of crucible. Suggesting that copper alloy casting was also taking place in the vicinity.

The slag itself is not datable by any typological means. Although no fuel was identified associated with the debris, the well-consolidated nature of the latter suggests that the fuel used was charcoal rather than coal or coke.

No hearths or other means of heating were identified during the investigation. However, smithing hearths only very rarely become incorporated into the archaeological stratigraphy, normally being built at a raised level and subsequently demolished. The evidence of hammer-scale is often of significance here because it falls around the hearth and anvil during smithing and often remains in situ, rather than being disposed of, as the bulk slag tends to be.

Although samples were taken from pit fills in Trench 1, none showed more than occasional flakes of hammer-scale except perhaps fill (115) of pit [114]. In Trench 2, the larger 'industrial storage' pits generally contained only modest amounts of hammer-scale. Again, we have an exception in pit [204], where fills (210) and (211) both contained much hammer-scale. The underlying cess-pits, particularly [208] also contained high levels of hammer-scale. Perhaps the most significant result was the 23g of hammer-scale from a sample of layer (205), reported as being trench wide and 0.5m thick. If the environmental sample was typical of the whole context, then this layer alone provides evidence of blacksmithing having been carried out in a prolonged or intensive manner in the immediate vicinity.

On the basis of this evidence it would seem likely that a blacksmith was working in the immediate vicinity of the site, at the time that layer (202) was being laid down.

The evidence from the micro slags is to some extent backed up by the bulk slags, although it is apparent that most of this material must have been disposed of away from the area under excavation. Typically, large pieces of slag are used for road metalling and hard-core. What remains appears largely as a 'background count' of bulk debris, generally larger for large

contexts such as layer (205). However, certain contexts do show distinct concentrations. Interestingly these seem to be the uppermost fills (214), (216), (218), (233) of pits [213], [215], [220], [232], which often contain the larger pieces of hearth bottoms and un-diagnostic debris, suggesting that this material was deliberately added to help cap off the softer fill below.

The nature of the smithing is suggested partly by the smallish size of the hearth bottoms, but also the relatively low proportion of spheroidal hammer-scale. This would point to the manufacture and repair of small ferrous tools or other objects. It would normally be expected that the casting of copper alloys, which utilised the crucible, would be part of a separate trade. However, the facilities of a small blacksmiths shop could easily have been utilised for this craft also.

In terms of resources, the ironworking is likely to have utilised locally produced charcoal and iron brought from a nearby iron smelting centres such as the Forest of Dean. No evidence of iron smelting within the city is known to the specialist, although smithing evidence is recorded at sites such as Bewell St (Archaeological Investigations Ltd.) and Gaol St. (Herefordshire Council 2007).

Suggestions for Future work

Physico-chemical analysis might help identify the alloy melted in the crucible, but accuracy is likely to be limited due to lack of adhering deposits, and it therefore not recommended in the absence of more evidence of this activity.

All metalwork should be removed from bags of slag, for more appropriate archival storage. Ferrous artefacts should be X-radiographed for identification and recording purposes.

Retention of finds

It is recommended that all finds be saved.

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Appendix 1 Full Listing of Metalworking Debris by Context

Con-text	Sample No.	Slag type	Weight (g)	Dimensions and comments	Date	Context description
12	6	Cu alloy object	<1	pin	post-med.	make up deposit
12	6	Fe object	31	including modern wire nail	post-med.	make up deposit
12		flake hammerscale	nq		post-med.	make up deposit
12		smithing hearth bottom	175	80x60x40mm	post-med.	make up deposit
12		smithing hearth bottom	159	80x65x30mm	post-med.	make up deposit
12		smithing hearth bottom	200	80x70x45mm	post-med.	make up deposit
12		smithing hearth bottom	120	55x45x40mm	post-med.	make up deposit
12		smithing hearth bottom	103	60x50x30mm	post-med.	make up deposit
12		spheroidal hammerscale	nq		post-med.	make up deposit
12		cinder	25		post-med.	make up deposit
12		vitrified hearth lining	165		post-med.	make up deposit
12		ferruginous concretion	30		post-med.	make up deposit
12		fayalitic run slag	16		post-med.	make up deposit
12		iron-rich cinder	53		post-med.	make up deposit
12		undiagnostic ironworking slag	622		post-med.	make up deposit
115	1	cinder	20		medieval	ditch/pit (114) fill
115	1	fired clay	15		medieval	ditch/pit (114) fill
115	1	vitrified hearth lining	10		medieval	ditch/pit (114) fill
115	1	undiagnostic ironworking slag	60		medieval	ditch/pit (114) fill
115		undiagnostic ironworking slag	15		medieval	ditch/pit (114) fill
116	2	cinder	23		medieval	pit (117) fill
116	2	vitrified hearth lining	17	contains organic material. Not	medieval	pit (117) fill
116		fuel ash slag?	70	metallurgical	medieval	pit (117) fill
119	3	fired clay	13		medieval	domestic waste pit (118) fill
119	3	vitrified hearth lining	10		medieval	domestic waste pit (118) fill
119	3	undiagnostic ironworking slag	15		medieval	domestic waste pit (118) fill
130	4	spheroidal hammerscale	1		medieval	domestic waste pit (118) fill
130	4	cinder	5		medieval	domestic waste pit (118) fill
130	4	undiagnostic ironworking slag	13		medieval	domestic waste pit (118) fill
137	6	cinder	9		medieval	domestic waste pit (114) fill
137	6	fired clay	10		medieval	domestic waste pit (114) fill
137	6	vitrified hearth lining	6	incomplete nail, square	medieval	domestic waste pit (114) fill
203	5	Fe object	9	sectioned 45mm	unknown	domestic waste pit (204) fill
203	5	cinder	80		unknown	domestic waste pit (204) fill
203	5	vitrified hearth lining	34		unknown	domestic waste pit (204) fill
203	5	undiagnostic ironworking slag	80		unknown	domestic waste pit (204) fill
203		Fe object	29	3 nails one large round head, 45mm shaft,16g; 60mmx3.5g, 70mmx35g.	unknown	domestic waste pit (204) fill
203		glassy slag	55	unknown origin. Too porous for blast furnace, too light for lead smelting	unknown	domestic waste pit (204) fill
203		vitrified hearth lining	72		unknown	domestic waste pit (204) fill
205	1	Fe object	214	stirrup (small)	unknown	clearance layer
205	3	Cu-alloy object	1	small hook with ferrule	unknown	clearance layer
205	8	Fe object	1	small tack	unknown	clearance layer
205	8	cinder	30		unknown	clearance layer
205	8	vitrified hearth lining	7		unknown	clearance layer
205	8	undiagnostic ironworking slag	50		unknown	clearance layer
205		Fe object	62	not identified	unknown	clearance layer
205		flake hammerscale	nq		unknown	clearance layer
205		flake hammerscale			unknown	clearance layer
205		smithing hearth bottom	279	100x80x35mm	unknown	clearance layer
205		smithing hearth bottom	270	90x80x35mm	unknown	clearance layer
205		smithing hearth bottom	265	130x80x60mm (double)	unknown	clearance layer
205		smithing hearth bottom	367	100x80x55mm	unknown	clearance layer
205		smithing hearth bottom	230	70x70x35mm	unknown	clearance layer

Context	Sample No.	Slag type	Weight (g)	Dimensions and comments	Date	Context description
205		smithing hearth bottom	152	70x70x35	unknown	clearance layer
205		smithing hearth bottom	357	90x80x50mm	unknown	clearance layer
205		vitrified hearth lining	95	black glaze	unknown	clearance layer
205		undiagnostic ironworking slag	416		unknown	clearance layer
205		undiagnostic ironworking slag	375		unknown	clearance layer
207	15	Fe object	4	incomplete nail, square sectioned 40mm	medieval	domestic waste pit (206) fill
207	15	vitrified hearth lining	9		medieval	domestic waste pit (206) fill
207	15	undiagnostic ironworking slag	18		medieval	domestic waste pit (206) fill
207		undiagnostic ironworking slag	46		medieval	domestic waste pit (206) fill
209	9	Fe object	1	nail 10mm	medieval	cess/tanning pit (208) fill
209	9	Fe object	25	complete nail, square sectioned 45mm, bent from use	medieval	cess/tanning pit (208) fill
209	9	cinder	5		medieval	cess/tanning pit (208) fill
209	9	vitrified hearth lining	40		medieval	cess/tanning pit (208) fill
209	9	undiagnostic ironworking slag	50		medieval	cess/tanning pit (208) fill
209	10	Fe object	3	incomplete nail, square sectioned 45mm	medieval	cess/tanning pit (208) fill
209	10	vitrified hearth lining	32		medieval	cess/tanning pit (208) fill
209	10	undiagnostic ironworking slag	32		medieval	cess/tanning pit (208) fill
209	14	Fe object	4	incomplete nail, square sectioned 25mm	medieval	cess/tanning pit (208) fill
209	14	cinder	35		medieval	cess/tanning pit (208) fill
209	14	vitrified hearth lining	10		medieval	cess/tanning pit (208) fill
209	14	fayalitic run slag	14		medieval	cess/tanning pit (208) fill
209	14	undiagnostic ironworking slag	120		medieval	cess/tanning pit (208) fill
209	18	smithing hearth bottom	48	55x45x20mm	medieval	cess/tanning pit (208) fill
209	18	fired clay	8		medieval	cess/tanning pit (208) fill
209	18	vitrified hearth lining	10		medieval	cess/tanning pit (208) fill
209	18	undiagnostic ironworking slag	20		medieval	cess/tanning pit (208) fill
209		Fe object	29	tang end of knife blade. Needs X-radiography to confirm	medieval	cess/tanning pit (208) fill
209		ferruginous concretion with hammerscale	122	contains flake hammerscale	medieval	cess/tanning pit (208) fill
209		vitrified hearth lining	33		medieval	cess/tanning pit (208) fill
209		undiagnostic ironworking slag	21		medieval	cess/tanning pit (208) fill
210	11	Fe object	15		unknown	dumped material in rubbish/cess pit (204)
210	11	Fe object	3	nail, square sectioned, 24mm	unknown	dumped material in rubbish/cess pit (204)
210	11	cinder	20		unknown	dumped material in rubbish/cess pit (204)
210	11	vitrified hearth lining	6		unknown	dumped material in rubbish/cess pit (204)
211	13	smithing hearth bottom	196	95x70x45mm	unknown	basal fill of rubbish/cess pit (204)
211	13	cinder	19		unknown	basal fill of rubbish/cess pit (204)
211	13	ferruginous concretion	10		unknown	basal fill of rubbish/cess pit (204)
211	13	undiagnostic ironworking slag	40		unknown	basal fill of rubbish/cess pit (204)
214	21	Fe object	5	nail, square sectioned, 28mm	unknown	uppermost fill of pit (213) of unknown function
214	21	fired clay	7		unknown	uppermost fill of pit (213) of unknown function
214	21	vitrified hearth lining	20		unknown	uppermost fill of pit (213) of unknown function
214	21	undiagnostic ironworking slag	100		unknown	uppermost fill of pit (213) of unknown function
214		Fe object	8	probable nail x5mm	unknown	uppermost fill of pit (213) of unknown function
214		flake hammerscale			unknown	uppermost fill of pit (213) of unknown function
214		smithing hearth bottom	298	95x70x45mm	unknown	uppermost fill of pit (213) of unknown function
214		smithing hearth bottom	422	80x75x55mm	unknown	uppermost fill of pit (213) of unknown function
214		smithing hearth bottom	106	75x50x25mm	unknown	uppermost fill of pit (213) of unknown function
214		smithing hearth bottom	341	95x70x45mm	unknown	uppermost fill of pit (213) of unknown

Con-text	Sample No.	Slag type	Weight (g)	Dimensions and comments	Date	Context description
						function
214		smithing hearth bottom	178	80x50x40mm (not complete)	unknown	uppermost fill of pit (213) of unknown function
214		undiagnostic ironworking slag	261		unknown	uppermost fill of pit (213) of unknown function
216	12	Fe objects	5	nails, incomplete, square sectioned, 50 & 11mm. One clenched (used)	medieval	uppermost fill of cess/rubbish pit (215)
216	12	spheroidal hammerscale	nq		medieval	uppermost fill of cess/rubbish pit (215)
216	12	vitrified hearth lining	5		medieval	uppermost fill of cess/rubbish pit (215)
216	12	undiagnostic ironworking slag	6		medieval	uppermost fill of cess/rubbish pit (215)
216	28	cinder	20		medieval	uppermost fill of cess/rubbish pit (215)
216	28	fayalitic run slag	5		medieval	uppermost fill of cess/rubbish pit (215)
216	28	undiagnostic ironworking slag	72		medieval	uppermost fill of cess/rubbish pit (215)
216		Fe object	265	unidentified	medieval	uppermost fill of cess/rubbish pit (215)
216		Fe object	17	2 nails:40mmx8g, 30mmx9g	medieval	uppermost fill of cess/rubbish pit (215)
216		Fe object	154	?tool with split ferrule, end missing	medieval	uppermost fill of cess/rubbish pit (215)
216		flake hammerscale			medieval	uppermost fill of cess/rubbish pit (215)
216		smithing hearth bottom	244	80x70x40mm	medieval	uppermost fill of cess/rubbish pit (215)
216		smithing hearth bottom	143	70x65x25mm	medieval	uppermost fill of cess/rubbish pit (215)
216		cinder	14		medieval	uppermost fill of cess/rubbish pit (215)
216		vitrified hearth lining	14		medieval	uppermost fill of cess/rubbish pit (215)
216		burned stone	8		medieval	uppermost fill of cess/rubbish pit (215)
216		iron-rich cinder	31		medieval	uppermost fill of cess/rubbish pit (215)
216		undiagnostic ironworking slag	219		medieval	uppermost fill of cess/rubbish pit (215)
216		undiagnostic ironworking slag	231		medieval	uppermost fill of cess/rubbish pit (215)
217	16	Fe object	6	flat strip 48x11x4mm	medieval	uppermost fill of pit (218) of unknown function
217	16	cinder	20		medieval	uppermost fill of pit (218) of unknown function
217	16	vitrified hearth lining	20		medieval	uppermost fill of pit (218) of unknown function
217	16	undiagnostic ironworking slag	64		medieval	uppermost fill of pit (218) of unknown function
217		vitrified hearth lining	34		medieval	uppermost fill of pit (218) of unknown function
217		undiagnostic ironworking slag	129	One piece with copper alloy corrosion products	medieval	uppermost fill of pit (218) of unknown function
220	20	Fe object	1	2 nails bent from use 12mm & 15mm	medieval	uppermost fill of rubbish pit (218)
220	20	flake hammerscale	nq		medieval	uppermost fill of rubbish pit (218)
220	20	fired clay	11		medieval	uppermost fill of rubbish pit (218)
220	20	vitrified hearth lining	28		medieval	uppermost fill of rubbish pit (218)
220	20	undiagnostic ironworking slag	34		medieval	uppermost fill of rubbish pit (218)
220		flake hammerscale	nq		medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	411	100x95x50mm	medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	318	90x80x50mm	medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	219	85x70x40mm	medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	562	125x90x55mm	medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	238	80x60x30mmm (incomplete)	medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	169	70x60x40mm	medieval	uppermost fill of rubbish pit (218)
220		smithing hearth bottom	238	70x70x45mm	medieval	uppermost fill of rubbish pit (218)
220		cinder	36		medieval	uppermost fill of rubbish pit (218)
220		fired clay	61	Tile	medieval	uppermost fill of rubbish pit (218)
220		vitrified hearth lining	146	large angular/blocky frag.	medieval	uppermost fill of rubbish pit (218)
220		dense slag	299	Possibly smelting	medieval	uppermost fill of rubbish pit (218)
220		undiagnostic ironworking slag	1435		medieval	uppermost fill of rubbish pit (218)
222	19	Fe objects	13	2 nails bent from use 7g x 12mm & 7g x 15mm	medieval	fill of pit (219)
222	19	cinder	20		medieval	fill of pit (219)
222	19	vitrified hearth lining	5		medieval	fill of pit (219)

Con-text	Sample No.	Slag type	Weight (g)	Dimensions and comments	Date	Context description
222	19	ferruginous concretion	12		medieval	fill of pit (219)
222	19	undiagnostic ironworking slag	153		medieval	fill of pit (219)
222		smithing hearth bottom	465	or small furnace bottom. Unusually dense and well consolidated. 90x75x50mm	medieval	fill of pit (219)
222		smithing hearth bottom	432	or small furnace bottom. Unusually dense and well consolidated. 90x60x50mm	medieval	fill of pit (219)
222		dense slag	76		medieval	fill of pit (219)
222		undiagnostic ironworking slag	148		medieval	fill of pit (219)
229	27	undiagnostic ironworking slag	6		medieval	firm clay fill of pit (213)
233	29	Fe object	21	hook?	medieval	uppermost fill of pit (232)
233	29	Fe object	5	nail 5gx25mm	medieval	uppermost fill of pit (232)
233	29	ferruginous concretion	23		medieval	uppermost fill of pit (232)
233	29	stone	5		medieval	uppermost fill of pit (232)
233	29	fayalitic run slag	8		medieval	uppermost fill of pit (232)
233	29	undiagnostic ironworking slag	209		medieval	uppermost fill of pit (232)
233		smithing hearth bottom	158	90x85x40mm	medieval	uppermost fill of pit (232)
233		cinder	14		medieval	uppermost fill of pit (232)
233		ferruginous concretion	340		medieval	uppermost fill of pit (232)
233		stone	33		medieval	uppermost fill of pit (232)
233		undiagnostic ironworking slag	1006		medieval	uppermost fill of pit (232)
241	31	vitrified hearth lining	4		medieval	fill of pit (215)
241	31	shell	2		medieval	fill of pit (215)
241	31	undiagnostic ironworking slag	4		medieval	fill of pit (215)
241		iron-rich cinder	202		medieval later	fill of pit (215)
248	32	vitrified hearth lining	13		medieval	fill of pit (249)
250		Fe object	39	probably 2 nails; 22g x 65mm & 17g x55mm	medieval	primary fill of feature (245). Prob. Recut of (232)
250		flake hammerscale	nq		medieval	primary fill of feature (245). Prob. Recut of (232)
250		smithing hearth bottom	410	85x80x50mm	medieval	primary fill of feature (245). Prob. Recut of (232)
250		stone	60		medieval	primary fill of feature (245). Prob. Recut of (232)
250		undiagnostic ironworking slag	228		medieval	primary fill of feature (245). Prob. Recut of (232)
255		smithing hearth bottom	643	100x90x60mm	medieval	fill of recut (268)
255		smithing hearth bottom	365	100x70x45mm	medieval	fill of recut (268)
255		smithing hearth bottom	520	105x70x60mm	medieval	fill of recut (268)
257	34	flake hammerscale	nq		medieval	fill of rubbish/cess pit (258)
257	34	spheroidal hammerscale	nq		medieval	fill of rubbish/cess pit (258)
257	34	undiagnostic ironworking slag	20		medieval	fill of rubbish/cess pit (258)
261		smithing hearth bottom	176	85x75x40mm	medieval	no info
265	35	smithing hearth bottom	427	95x90x50mm	medieval	fill of pit (266)
265		cinder	76		medieval	fill of pit (266)
265		vitrified hearth lining	5		medieval	fill of pit (266)
269	36	Fe object	7	Unidentified	medieval	upper fill of cess pit (270)
269	36	Fe object	5	Nail 32mm	medieval	upper fill of cess pit (270)
269	36	crucible fragments	3	black glaze externally no metallic corrosion products visible	medieval	upper fill of cess pit (270)
269	36	fayalitic run slag	5		medieval	upper fill of cess pit (270)
269	36	undiagnostic ironworking slag	28		medieval	upper fill of cess pit (270)
269		smithing hearth bottom	261	80x65x40mm		
			20922			

11.7 PALAEOENVIRONMENTAL ASSESSMENT

Charlotte O'Brien

Summary

The project

1.1 This report presents the results of palaeoenvironmental assessment of 37 bulk samples taken during archaeological works at Aubrey Street, Hereford.

1.2 The works were commissioned by Border Archaeology and conducted by Archaeological Services Durham University.

Results

1.3 Many of the pit fills contain evidence of domestic and/or small scale industrial waste. Mineralised cess-like material comprising fruit-stones and pips of bramble, sloe, elderberries, and apple, were present in many of the primary and lower fills. Mineralised weed seeds, wood fragments and bracken fronds were also noted. Humified organic material and small fragments of leather occurred in primary fill samples 25 and 26, and may indicate a function such as tanning.

1.4 Charred plant macrofossil assemblages typical of the medieval and post-medieval periods were noted, with cereal grains of *cf*. bread wheat, barley, oats and rye all recorded.

1.5 Many of the upper fills comprised an abundance of fuel waste and metalworking residues, which may be evidence of backfilling.

Recommendations

1.6 The assessment has shown that the palaeoenvironmental samples provide an important source of information about aspects of diet and possible industrial activities, during the medieval period in Hereford. In order to provide additional information about diet, trade and economy, and evidence indicating the function of the features, full plant macrofossil analysis is recommended for several of the pit fills (1, 2, 4, 10, 13, 17, 25, 26, 27 and 33). Fish bone analysis (including further recovery of small fish bones from the residues) is recommended in order to provide information about the fishing industry and whether freshwater or marine resources were exploited. Analysis of invertebrates from the primary pit fills, particularly samples 25 and 26, which contain humified organic material and fragments of leather, is also recommended. This will allow reconstruction of the local palaeoenvironment and will help to establish the activities associated with this feature (e.g. tanning). Assessment of the lower pit fills for the presence of eggs of gut parasites is recommended in order to confirm the presence of human and/or animal faecal material.

Project background

Location

2.1 Bulk palaeoenvironmental samples were taken by Border Archaeology during archaeological works at Aubrey Street, Hereford. This report presents the results of palaeoenvironmental assessment of an occupation layer and 36 pit fills, of medieval origin.

Objective

2.2 The objective of the assessment was to establish the potential of the samples to provide information about diet, land use and palaeoenvironment of the site, as well as provide any evidence of industrial activities within the vicinity.

Dates

2.3 Samples were received by Archaeological Services Durham University on 14th June 2010. Assessment and report preparation was conducted between 8th September and 7th October 2010.

Personnel

2.4 Sample processing was carried out by Janet Beveridge. Palaeoenvironmental assessment and report preparation was undertaken by Lorne Elliott.

Archive

2.5 The site code is ASH10 for Aubrey Street, Hereford, 2010. The flots and small finds are currently held in the Environmental Laboratory at Archaeological Services Durham University. The small finds have been returned to Border Archaeology.

Methods

3.1 The bulk samples were manually floated and sieved through a 500µm mesh. The residues were examined for shells, fruit-stones, nutshells, charcoal, small bones, pottery sherds, flint and industrial residues, and were scanned using a magnet for ferrous fragments. The flots were examined at up to x60 magnification for charred and waterlogged botanical remains using a Leica MZ7.5 stereomicroscope. Identification of these was undertaken by comparison with modern reference material held in the Environmental Laboratory at Archaeological Services Durham University. Plant nomenclature follows Stace (1997).

Results

4.1 All of the samples produced some evidence of burning, with the flots and residues comprising varying amounts of charcoal. Taxa observed from the initial scanning of the charcoal included oak, hazel, ash, birch, cherry family and woody legumes such as gorse. Charred plant remains occurred in all of the samples including cereal grains, hazel nutshells and various weed seeds. Varying amounts of animal bone (burnt, unburnt and calcined), and small fish bones were also present in all of the samples, and fragments of animal tooth occurred in 23 of the samples. Fuel waste and metalworking residues, including fragments of hammer-scale, were also common throughout. Hardened mineralised cess-like material occurred in many samples and was particularly abundant in samples 4, 17, 23, 25, 27 and 30. Twenty three of the samples also comprised fragments of pottery. A fragment of oyster shell

occurred in sample 10 and a trace of mussel shell was noted in sample 34. Ferrous metal objects, mainly nails, were present in 13 of the samples and a glass bead occurred in sample 1.

[F114]

4.2 Charred plant macrofossils and mineralised fruit-stones were present in samples 7, 6 and 1 (the primary, secondary and upper fills respectively of an elliptical medieval rubbish/cess pit [F114]). Charred remains included grains of cf. bread wheat, oats, barley and rye, fragments of hazel nutshell and weed seeds of cleavers. Mineralised fruit-stones included elder, bramble and apple pip. These remains occurred in lower numbers within the primary fill (sample 7). Fragments of mineralised bracken fronds were noted in the upper fill (sample 1). Insect puparia were present in samples 1 and 6. There was an increase in metal working residues, and animal and fish bone in the upper fills.

[F118]

4.3 Charred plant macrofossils were present in low numbers for samples 3 and 4, the uppermost and tertiary fills of a truncated medieval pit [F118]. These included grains cf. bread wheat, barley and slender oats, weed seeds of dock, stinking chamomile and sedge family, and culm nodes of the grass family. A charred sloe fruitstone was also recorded in sample 3. Mineralised/waterlogged remains were abundant in sample 4, including fruit-stones and pips of bramble, elder and sloe, apple and grape. Weed seeds of cleavers, grass and dock were also common. Apart from a few elder fruit-stones, uncharred remains were absent from sample 3. Fragments of charcoal were abundant in both samples and mineralised cess-like material occurred in abundance in sample 4. Fish and animal bone were also more common in sample 4.

[F204]

4.4 Charred remains commonly occurred in all three samples (5, 11, and 13) of medieval pit [F204]. These included grains of cf. bread wheat, oats, barley and rye, fragments of hazel nutshell, weed seeds of sedge, nipplewort, cleavers and stinking chamomile and fruit-stones of sloe and apple pips. Charred monocot stems and culm nodes were present in the uppermost fill (sample 5), and charred bark occurred in the secondary fill (sample 11). Charcoal was common in all three samples, with many fragments in sample 11 comprising insect degradation, indicating the wood was rotten before charring occurred. Mineralised/waterlogged remains including fruit-stones of bramble, elder and apple were abundant in the primary fill (13), but were absent from the secondary (11) and uppermost (5) fills. Mineralised vegetative material was also only common in the primary fill. Similar amounts of animal and fish bone, along with fuel waste and metalworking residues, were present in all of the samples.

[F208]

4.5 The primary fill samples 25 and 26 from context (225), of a possible medieval tanning pit [F208], comprised mineralised cess-like material and humified organic material in abundance. Remains of moss and fragments of bark (possibly birch), and small fragments of fine leather were also present. Insect fragments including *puparia*, and bracken fronds were noted in <26>. Mineralised/waterlogged remains including fruit-stone and pips of sloe,

bramble, elder and apple were common in both samples, with weed seeds of buttercup, knotgrass and stinking chamomile and uncharred hazel nutshell fragments also present. Many sloes had the flesh remaining. Fragments of charcoal and charred plant remains occurred in very low numbers with a few grains of cf. bread wheat and barley recorded. Animal and fish bones were absent or in low numbers.

4.6 Of the six samples representing the uppermost fill, context (209), samples 10, 18, 24 and 25 comprised large amounts of mineralised cess-like material, with <25>, also comprising humified organic material similar to the primary fill samples. Mineralised/uncharred fruit-stones and pips such as bramble, elder, sloe and apple were abundant for the four samples. Insect remains and *puparia* were also noted for these samples. Charcoal and charred plant macrofossils occurred in larger numbers for all six samples, with cf. bread wheat, oats, rye and barley all noted. Weed seeds of poppy, cleavers, goosefoot and vetch were noted. Samples 9 and 14 comprised larger amounts of hammer-scale and metalworking residues and the mineralised cess-like material was absent. Uncharred fruit-stones were also sparse or absent. Charcoal of woody legumes such as gorse was noted in sample 14. Animal and fish bones were more abundant, particularly for samples 10, 14 and 18.

[F215]

4.7 The secondary fill of pit [F215] (sample 31) comprised small amounts of mineralised material and fruit-stones including elder, sloe, and apple, with flesh visible on some of the fruit-stones. These remains were absent from the upper fill samples 12 and 28. Fuel waste and metalworking residues, including hammer-scale, were present throughout and were particularly abundant in <28>, although this may be due to the larger sample size. Charcoal and charred grains commonly occurred, with *cf*. bread wheat and oats noted in all three samples. Charred hazel nutshells were present in samples 28 and 31.

[F218]

4.8 The primary fill of medieval pit [F218] (sample 17) comprised large numbers of uncharred fruit-stones and pips such as elder, bramble and apple. Mineralised cess-like material was also present in abundance. The secondary fill (sample 16) included large amounts of hammer-scale, metalworking residue and fuel waste material. Mineralised cess-like material and uncharred fruit-stones were absent from this sample. Small fish bones, commonly recorded in the primary fill, were also absent from the secondary fill. Charcoal was common in both fills with charred grains of rye and barley noted in the primary fill and grains of *cf*. bread wheat and barley recorded in the secondary fill.

[F219]

4.9 The primary fill (sample 23) of a medieval pit [F219], possibly associated with tanning, comprised uncharred fruit-stones of bramble, elder and sloe with mineralised vegetative material occurring in abundance. These mineralised remains were absent from the secondary (sample 19) and uppermost (sample 20) fills. An increase in the number of animal and fish bones, and the presence of fuel waste and metalworking residues was noted for samples 19 and 20. A larger number of charred grains of *cf*. bread wheat and barley were also recorded for these upper fills.

[F245]

4.10 The primary fill of pit [F245] (sample 33) comprised large amounts of mineralised cess-like material, containing uncharred fruit-stones of bramble, elder and sloe. This material was absent from the uppermost fill (sample 29). An increase in the amount of animal bone, charcoal, fuel waste and metalworking residue was noted in the uppermost sample, although some of the increase may be due to the larger sample size for sample 29. Charred grains occurred in both samples with oats recorded in sample 33 and cf. bread wheat, oats and barley noted in sample 29.

Other features

4.11 Of the remaining samples, five comprised mineralised cess-like material: the upper fill of rubbish pit [F117] (sample 2), the uppermost fill of pit [F213] (sample 27), the secondary fill of pit [F243] (sample 30), the single fill of pit [F249] (sample 32) and the secondary fill of pit [F232] (sample 37). This material was abundant in samples 27 and 30, with only a trace recorded in sample 37. Mineralised/uncharred fruitstones of bramble, elder and sloe were abundant in samples 2 and 27, but were sparse in sample 30. *Puparia* were present in all but sample 37. Charcoal was common in all five of these samples and was abundant in sample 37, with hazel roundwood noted in this sample. Charred plant macrofossils were recorded in all five samples and occurred, most commonly in sample 32, with grains of cf. bread wheat, rye, barley and oats noted. Animal and fish bone occurred in all five samples, although only small amounts were recorded in samples 30 and 37.

4.12 Mineralised material was absent from the following samples: a possible medieval occupation layer (sample 8), the single fill of pit [F207] (sample 15), the uppermost fill of pit [F231] (sample 21), the single fill of pit [F258] (sample 34), the primary fill of earlier medieval pit [F266] (sample 35) and the single fill of a heavily truncated pit [F270] (sample 36). The presence of charcoal was common throughout, with fuel waste material and metalworking residues also occurring. Unburnt animal bone was common, although fish bone was generally sparse apart from sample 8. Charred grains of oats and *cf*. bread wheat were recorded throughout, with grains of barley and rye also noted.

4.13 The results are presented in Appendix 1. Material suitable for radiocarbon dating is available for all of the samples, although there may be insufficient weight of carbon for <24>. The possibility of charred remains not being contemporary with some primary fills due to processes such as bio-turbation should be considered.

Discussion

5.1 Many of the fills contain evidence of domestic and/or small scale industrial waste, with fragments of animal bone and teeth, fish bone, pottery, marine shell, charred and mineralised plants macrofossils, nails, hammer-scale, a glass bead, fuel waste material and metalworking residues all recorded. Many of the primary and lower fills of the pits comprised mineralised vegetative material, with the mineralised remains of elderberries, bramble, sloe, apple, grape, weed seeds, wood fragments and bracken fronds all noted. Due to mineral replacement most of these remains did not float during processing and were recorded within the residues. The replacement of plant material by inorganic substances is commonly encountered during archaeological excavations, with the main constituent being calcium phosphate (Green 1979). Calcium may derive from lime deliberately thrown into the

pit or from plant remains. Calcium phosphate might also have originated from mammal or fish bone or even from human faecal material. Most mineralised botanical evidence has been recovered from faecal deposits, in particular cess pits (Green 1979); however, tanning or tawing using the vegetable extract of berries may also be indicated by the presence of mineralised fruit-stones. Due to the presence of large quantities of animal bones and horn cores and a fragment of preserved leather it has been tentatively suggested by the excavator (Logan 2010) that several of the pits may have been associated with butchery and tanning. Small fragments of leather were present in primary fill samples 25 and 26, from context (225) pit [F208]. Further analysis of the fills is required to determine whether the features were cess, rubbish and/or tanning pits.

5.2 The charred plant macrofossil assemblages were generally small in size; however, a range of cultivated crops, wild food sources and weeds were represented. Apart from a 2-row barley rachis fragment from Sample 6, diagnostic chaff was absent. Cereal grains of wheat, oats, barley and rye and fragments of hazel nutshell were recorded. The wheat grains generally had the characteristic shape associated with *Triticum aestivo-compactum* (bread wheat), whilst the oat grains were often small and slender and may be of the wild variety *Avena fatua* or bristle oats *Avena strigosa*. These assemblages are typical of medieval and post-medieval periods (Greig 1991).

5.3 The upper fills of many of the pits comprised an increase or abundance of fuel waste material and metalworking residues, including both ball and flake hammer-scale. This tended to coincide with a decrease or absence of the mineralised cess-like material. This is apparent for pits [F118], [F204], [F215], [F218], [F219], [F245] and to a lesser extent [F208], suggesting a similar and possibly contemporary change in the use of these pits and/or an indication of backfilling.

Recommendations

6.1 The assessment has shown that the palaeoenvironmental samples provide an important source of information about aspects of diet and possible industrial activities, during the medieval period in Hereford. In order to provide additional information about diet, trade and economy, and evidence indicating the function of the features, full plant macrofossil analysis is recommended for several of the pit fills (1, 2, 4, 10, 13, 17, 25, 26, 27 and 33). Fish bone analysis (including further recovery of small fish bones from the residues) is recommended in order to provide information about the fishing industry and whether freshwater or marine resources were exploited. Analysis of invertebrates from the primary pit fills, particularly samples 25 and 26, which contain humified organic material and fragments of leather, is also recommended. This will allow reconstruction of the local palaeoenvironment and will help to establish the activities associated with this feature (e.g. tanning). Assessment of the lower pit fills for the presence of eggs of gut parasites is recommended in order to confirm the presence of human and/or animal faecal material.

Sources

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Appendix 1: Data from palaeoenvironmental assessment

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Context	115	116	119	130	203	137	138	205	209	209	210	216	211	209	207	217	221	209	222
Feature No.	F114	F117	F118	F118	F204	F114	F114	-	F208	F208	F204	F215	F204	F208	F206	F218	F218	F208	F219
Feature	pit	pit	pit	pit	pit	pit	pit	layer	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit
Material available for radiocarbon dating	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Full analysis recommended	✓	✓	-	✓	-	-	-	-	-	✓	-	-	✓	-	-	-	✓	-	-
Volume processed (l)	20	21	9	28	32	10	5	22	20	18	20	20	31	23	22	22	21	22	19
Volume of flot assessed (ml)	150	200	1100	1200	550	100	25	330	150	160	300	300	500	270	200	150	150	350	50
Residue contents																			
Bone (burnt)	-	(+)	+	(+)	(+)	+	-	(+)	(+)	-	(+)	(+)	-	(+)	-	+	(+)	-	(+)
Bone (calcined)	+	+	+	+	+	(+)	-	+	(+)	-	(+)	++	+	+	+	+	(+)	(+)	+
Bone (unburnt)	+++	+++	++	+++	+++	++	(+)	+++	++	++	+++	+++	+++	+++	++	++	++	+++	+++
Bone (fish)	+++	+++	(+)	+++	+++	++	(+)	+++	++	++	++	+	+++	++	(+)	-	+++	++	++
Charcoal	+	++	+++	+++	+	++	(+)	+	+	+++	+++	++	++	++	+	++	++	++	+++
Daub	-	(+)	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Fired clay	+	++	(+)	(+)	-	-	-	(+)	-	-	-	-	-	+	-	+	-	-	(+)
Flint (no. of fragments)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fuel waste/metalworking residue	+++	++	++	+	+++	++	-	+++	++	++	++	+	++	+++	+	+++	+	+	++
Glass (bead)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hammerscale (ball/flake)	+++	++	+	++	++	(+)	-	+++	+++	++	+++	+	+++	+++	++	+++	(+)	+	+++
Leather	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metal object (Fe) (no. of fragments)	-	-	-	-	1	-	-	1	1	1	1	3	-	1	-	1	-	-	2
Mineralised cess-like material	+++	+++	-	++++	-	+++	(+)	-	-	+++	-	-	+++	-	-	-	++++	+++	-
Mortar	-	(+)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pot (no. of fragments)	14	1	-	-	8	2	-	6	1	1	4	5	1	5	-	-	1	2	4
Shell – marine (mussel)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shell – marine (oyster)	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Tooth - animal (no. of fragments)	8	2	1	3	-	-	-	6	2	-	7	3	3	6	2	-	-	1	5
Wood	+	-	(+)	+	-	+	(+)	-	-	-	-	-	-	-	-	-	-	-	-
Flot matrix																			
Bark	-	-	-	-	-	-	-	-	-	-	++	-	-	-	-	-	-	-	-
Bone (unburnt)	+	+	+	+	+	+	-	+	+	(+)	-	+	+	+	+	+	+	+	-
Bone (fish)	+	+	+	++	(+)	(+)	(+)	+	+	+	(+)	+	++	+	-	+	+	+	+
Bracken (uncharred)	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Charcoal	+++	+++	++++	++++	+++	+++	++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
Humified organic material	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insect/beetle	-	-	-	-	-	-	(+)	-	-	-	-	-	-	-	-	-	-	-	-
Monocot stem/culm node (charred)	+	-	-	++	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moss	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puparia	+	+	+	++	-	+	-	-	-	+	+	-	+	-	-	+	+++	++	-
Wood	-	-	-	-	-	-	-	-	-	(+)	-	-	-	-	-	-	-	-	-
Charred plant remains (abundance)																			
Fruitstones	-	-	1	-	1	1	-	-	-	-	2	-	-	-	-	-	1	-	-
Grains	4	3	2	2	3	3	2	3	4	3	3	3	3	3	2	2	2	3	3
Hazel nutshell fragments	3	1	1	-	1	-	1	2	1	2	1	-	-	1	1	2	1	2	2
Legumes (pea/bean)	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-
Weed seeds	1	-	2	2	2	2	-	-	1	1	2	2	1	-	-	-	1	1	-
Waterlogged/mineralised plant remains (abundance)																			
Fruitstones	4	5	1	5	-	4	2	-	1	5	-	-	5	-	1	-	4	4	1
Hazel nutshell fragments	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Weed seeds	1	-	-	3	-	2	1	-	-	1	-	-	1	-	-	-	-	-	-

[(+): trace; +: rare; ++: occasional; +++: common; ++++: abundant. Charred and waterlogged/mineralised remains are scored from 1-5 where 1: 1-2; 2: 3-10; 3: 11-40; 4: 41-200; 5: >200. (✓) there may be insufficient weight of carbon available for radiocarbon dating]

Appendix 1: continued

Sample	20	21	23	24	25	25	26	27	28	29	30	31	32	33	34	35	36	37
Context	220	214	223	209	209	225	225	229	216	233	240	241	248	250	257	265	269	262
Feature No.	F219	F231	F219	F208	F208	F208	F208	F213	F215	F245	F243	F215	F249	F245	-	-	-	-
Feature	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit	pit
Material available for radiocarbon dating	✓	✓	✓	(✓)	✓	(✓)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Full analysis recommended	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-	✓	-	-	-	-
Volume processed (l)	10	19	18	5	6	5	11	10	82	62	21	11	15	20	19	20	18	5
Volume of flot assessed (ml)	150	200	150	120	350	1400	1600	50	800	1000	30	15	125	400	150	550	200	800
Residue contents																		
Bone (burnt)	+	+	(+)	-	-	-	-	(+)	+	-	-	-	+	+	+	-	-	+
Bone (calcined)	+	+	-	-	-	-	-	+	++	+	-	+	-	+	+	+	+	+
Bone (unburnt)	+++	+++	++	+	+	-	+	++	++++	++++	++	++	+++	++	+++	++	+++	+
Bone (fish)	+	++	-	-	-	-	+	+++	++	+	(+)	++	+++	++	+	+	-	(+)
Charcoal	(+)	++	++	+	+	-	++	+++	+++	++	+	+++	-	++	+	+++	+++	+
Daub	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Fired clay	(+)	-	-	-	-	-	-	(+)	-	+	-	(+)	-	+	-	+	-	-
Flint (no. of fragments)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fuel waste/metalworking residue	++	++	-	-	-	-	+	+	++++	++++	-	+	+	++	++	++	++	(+)
Hammerscale (ball/flake)	+++	+++	+	(+)	+	-	(+)	+	+++	+++	+	++	++	+	++	++	++	++
Glass (bead)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leather	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
Metal object (Fe) (no. of fragments)	2	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Mineralised cess-like material	-	-	++++	+++	+++	++++	+++	++++	-	-	++++	++	++	+++	-	-	-	(+)
Mortar	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Pot (no. of fragments)	2	5	-	-	-	-	-	-	8	1	-	5	-	7	1	3	2	-
Shell – marine (mussel)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(+)	-	-	-
Shell – marine (oyster)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tooth - animal (no. of fragments)	4	-	-	-	1	-	-	-	16	5	-	2	4	1	3	2	4	-
Wood	-	-	++	-	++	-	-	++	-	-	-	+++	-	++	-	-	-	-
Flot matrix																		
Bark	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
Bone (unburnt)	+	+	+	+	+	-	-	-	+	++	+	+	+	+	+	+	(+)	+
Bone (fish)	+	+	-	+	-	(+)	(+)	-	+	+	+	-	++	++	-	-	-	+
Bracken (uncharred)	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Charcoal	+++	+++	++	++	++	+	+	++	+++	++++	++	++	++	+++	+++	+++	+++	++++
Humified organic material	-	-	-	-	+++	++++	++++	-	-	-	-	-	-	-	-	-	-	-
Insect/beetle	+	+	-	++	++	++	++	+	-	-	-	-	-	-	-	-	-	-
Monocot stem/culm node (charred)	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	+
Moss	-	-	-	-	-	++	+	-	-	-	-	-	-	-	-	-	-	-
Puparia	-	-	++	+	++	++	+	++	-	-	+	+	+	+	-	-	-	-
Wood	-	-	+	+	-	++	++	-	-	-	-	-	-	+	-	-	-	-
Charred plant remains (abundance)																		
Fruitstones	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Grains	3	3	1	1	2	1	1	3	4	3	3	3	4	3	2	4	2	2
Hazel nutshell fragments	2	1	1	-	-	-	-	-	2	2	-	2	-	2	-	2	1	1
Legumes (pea/bean or pea family)	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	1	-	-
Weed seeds	1	-	-	-	-	-	-	-	1	-	-	-	-	1	-	1	1	3
Waterlogged/mineralised plant remains (abundance)																		
Fruitstones	-	-	3	3	5	3	4	5	2	1	1	3	2	4	1	2	2	2
Hazel nutshell fragments	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-
Weed seeds	-	-	1	2	-	2	-	-	-	-	-	2	2	-	-	-	-	-

[(+): trace; +: rare; ++: occasional; +++: common; ++++: abundant. Charred and waterlogged/mineralised remains are scored from 1-5 where 1: 1-2; 2: 3-10; 3: 11-40; 4: 41-200; 5: >200. (✓) there may be insufficient weight of carbon available for radiocarbon dating]

11.8 PALAEOENVIRONMENTAL ANALYSIS

Charlotte O'Brien

Summary

The project

1.1 This report presents the results of plant macrofossil, insect and intestinal parasite egg analysis of samples taken during archaeological works at Aubrey Street, Hereford.

1.2 The works were commissioned by Border Archaeology, and conducted by Archaeological Services Durham University.

Results

1.3 The plant macrofossil assemblages indicate that bread wheat, barley, oats, rye and legumes formed part of the Saxo-Norman diet at Hereford. A range of fruits and nuts was also available, including imported dried grapes. The pits were used for the disposal of domestic rubbish and cess, with other likely sources of waste being from metalworking, leather-working and butchery. The possibility that pit [208] had an original function as a tanning pit is discussed.

1.4 Eggs of intestinal parasitic nematodes were positively identified in the upper and basal fills of pit [208], indicating significant faecal content to the deposits. The eggs were broadly consistent in size with those of the whipworms and maw worms of humans and/or pigs; most likely both were present. The results suggest that the pit had been used primarily for the disposal of foul waste, i.e. as a cess pit; however, the pit may originally have had another purpose, with these fills reflecting waste disposal after it had ceased to be used in that way.

1.5 The three insect assemblages from pit [208] have much in common, being dominated by taxa of refuse and foul organic accumulations. The presence of herbivore dung within the pit is indicated, and the abundance of seed beetles may represent faecal material from animals fed infested pulses. Carrion indicators were abundant, in addition to a small waterside and woodland component. The material recovered from context (225) Sample 26 has some clear differences from the other analysed samples, having elements that are strongly suggestive of either tanning, dumping of butchery waste or some combination of the two.

Project background

Location and background

2.1 Archaeological works were conducted by Border Archaeology on the site of a former car park in Aubrey Street, Hereford. A number of large pits and an occupation layer were excavated. Provisional dating from the pottery evidence suggests occupation from the late Saxon period continuing into the post-conquest period (Clarke 2010). Preliminary assessment of 37 bulk environmental samples showed the samples to have a high potential for providing important palaeoenvironmental information about the site (Archaeological Services 2010). This report presents the results of plant macrofossil analysis of fills from pits

[117], [118], [204], [208], [232] and [245]. The results of insect analysis and intestinal parasite egg analysis of fills from pit [208] are also presented.

Objective

2.2 The objective of the scheme of works was to undertake plant macrofossil, insect and parasite egg analysis in order to provide information about the function of the pits, the palaeoenvironment of the site, and diet and patterns of consumption. This scheme of works also included the retrieval of additional fish bone from the bulk sample residues and conservation of hand-recovered leather from pit [208].

Dates

2.3 Samples were received by Archaeological Services on 14th June 2010. Analysis and report preparation was conducted between March and May 2011.

Personnel

2.4 Plant macrofossil analysis and report preparation was conducted by Charlotte O'Brien. Insect analysis was undertaken by Stephen Davis (University College Dublin), and intestinal parasite egg analysis was by John Carrott (Palaeoecological Research Services Ltd). Retrieval of fish bone from the residues was by Carrie Drew and leather conservation was by Jennifer Jones.

Archive

2.5 The site code is ASH10 for Aubrey Street, Hereford, 2010. The flots, fish bone and leather are currently held in the Environmental Laboratory at Archaeological Services Durham University awaiting collection. Other small finds have been returned to Border Archaeology.

Acknowledgments

2.6 Stephen Davis would like to thank Eileen Reilly for assistance in the identification of Corticeus unicolor and helpful discussion on *Orthocerus clavicornis*, in addition to the National Museum of Ireland for access to their reference collections.

Plant macrofossil analysis

Methods

3.1 The bulk samples were manually floated and sieved through a 500µm mesh. The residues were examined for shells, fruitstones, nutshells, charcoal, small bones, pottery sherds, flint and industrial residues, and were scanned using a magnet for ferrous fragments. The flots were examined at up to ×60 magnification for charred and waterlogged botanical remains using a Leica MZ7.5 stereomicroscope. The <4mm residue fractions were also examined using a stereomicroscope to ensure all fishbone and mineralised seeds were recovered. Identification of plant remains was undertaken by comparison with modern reference material held in the Environmental Laboratory at Archaeological Services Durham University. Plant nomenclature follows Stace (1997). Habitat classifications follow Preston *et al*. (2002). The results of the plant macrofossil analysis are presented in Appendix 1.

3.2 A selection of the largest wood and charcoal fragments from the samples was identified, in addition to 12 hand-recovered wood fragments from context (225). The transverse, radial and tangential sections were examined at up to ×600 magnification using a Leica DMLM microscope. Identifications were assisted by the descriptions of Hather (2000) and Schweingruber (1978), and modern reference material held in the Environmental Laboratory at Archaeological Services Durham University.

Results

Preservation

3.3 A proportion of the plant remains in the samples was preserved through charring, with most of the charred remains comprising cereal grains, chaff, nutshells and weed seeds. A large number of plant remains was also preserved as a result of anaerobic conditions provided by waterlogging, which was particularly true of the basal fills of pit [208]. Mineralised remains were also recorded in the samples. Mineralisation involves the replacement of plant material with soluble phosphates and carbonates and commonly occurs in cess pits (Green 1979), but can occur wherever these minerals are present and there is sufficient moisture to transport them into plant tissues (English Heritage 2002). A few 'globular objects' were noted, which are frequently recorded associated with mineralisation (*cf*. Carruthers 1988). There is ongoing debate as to the nature of these objects, but they are widely believed to have a chemical rather than biological origin.

Pit [117]

3.4 Plant macrofossil analysis was undertaken on context (116), the upper fill of pit [117]. The sample comprised animal bone, fishbone, charcoal, mineralised cess material, and small quantities of daub, fired clay, pottery, fuel waste, hammer-scale, mortar and *puparia*. The small charred plant macrofossil assemblage mainly comprised oat and wheat grains, with two barley grains, a rye grain, three hazel nutshell fragments and a few weed seeds also recorded. The identified charcoal included willow/poplar, alder, oak and hazel. Mineralised fruitstones were abundant, with crab apple, elderberry, bramble and sloe represented. A single mineralised pea was also present.

Pit [118]

3.5 Context (130), the tertiary fill of pit [118] was analysed. Animal bone, fish bone and mineralised cess material were common in the sample, with small amounts of hammer-scale, fired clay, fuel waste, *puparia* and mineralised wood noted. Charcoal was abundant, and was dominated by large fragments of oak timber, with some hazel round-wood also present. Vivianite, a blue mineral which indicates the former presence of organic material in wet or waterlogged conditions (McGowan & Prangnell 2006), was recorded. Charred plant remains comprised oat, wheat and barley grains, a hazel nutshell fragment, bramble fruit-stone and a range of weed seeds. Waterlogged/mineralised crab apple, sloe, bramble and elderberry fruit-stones were abundant, and a mineralised grape pip was present. Weeds from arable, ruderal and woodland habitats were also represented.

Pit [204]

3.6 Context (211), the basal fill of pit [204] was analysed. The sample comprised animal bone, fish bone, hammer-scale, pottery, mineralised cess material and *puparia*. The identified charcoal included willow/poplar, hazel, oak and ash. Oat grains, wheat grains, hazel nutshell fragments and elderberry fruit-stones were the most frequently recorded charred plant macrofossils. Two rye grains, a bread wheat rachis fragment, two possible peas, a bramble fruit-stone and a few weed seeds were also recorded charred. Mineralised elderberry and bramble fruit-stones were common, with remains of sloe, crab apple and weed seeds also noted. A mineralised pea/bean hilum was present.

Pit [208]

3.7 Plant macrofossil analysis was undertaken on the basal fill, context (225) (samples 25 and 26) and the upper fill, context (209) (samples 9, 24 and 25) of pit [208]. Waterlogged conditions in the lower sections of the pit were indicated by an abundance of humified organic material and diverse range of waterlogged seeds in context (225) (samples 25 and 26) and context (209) (<25>). Context (225) comprised abundant mineralised cess material, with animal bone, fish bone, pottery, charcoal, leather, animal hair, bracken fronds, insect/beetle fragments, *puparia*, vivianite, moss, wood and bark also recorded. Waterlogged fruit-stones were abundant with bramble, sloe, crab apple, elderberry and strawberry present, with a few fruit-stones of dwarf cherry and wild rose hips also noted. A number of the sloe fruit-stones were noted to have the flesh remaining on the fruit-stones, and some had holes made by small mammals. A range of arable, ruderal and damp ground weeds were recorded and hazel nutshell fragments were numerous. Flax seeds were also present in both samples from context (225). Charred plant remains in context (225) were few in number and included oat grains, wheat grains, peas, grass seeds and a rye grain.

3.8 Sample 25 from context (209) was very similar in nature to the basal fill samples, and comprised humified organic material, mineralised cess, insect/beetle fragments, *puparia*, wood, bark, a few charred oat and wheat grains, and a diverse range of waterlogged seeds dominated by fruit-stones of elderberry, crab apple, sloe and bramble. Sample 24 from context (209) was also similar, although a less diverse range of waterlogged plant remains was noted. Sample 9 differed markedly from samples 24 and 25, in predominantly composing charcoal, charred plant macrofossils, hammer-scale and fuel waste, with an absence of humified organic material and mineralised cess. The only uncharred plant remain was a single mineralised crab-apple pip. The charred plant macrofossils were dominated by wheat grains, with oats, barley, rye, hazel nutshells, grasses and a possible pea present. Oak charcoal was noted.

Pit [232]

3.9 Analysis was undertaken on context (262), the secondary fill of pit [232]. Charcoal was abundant in the flot and predominantly comprised large pieces of oak timber, with some hazel round-wood present. Animal bone, fishbone, hammer-scale and fuel ash were noted. The charred plant macrofossil assemblage was dominated by oat grains, cleavers seeds and hazel nutshell fragments, with a few barley, rye and wheat grains, fruit-stones of sloe, elderberry and bramble and a diverse range of weed seeds also present. The low numbers of uncharred remains comprised crab-apple pips and fruit-stones of bramble and elderberry.

Pit [245]

3.10 Context (250), the primary fill of pit [245] was analysed. This sample comprised animal bone, fish bone, daub, fired clay, pottery, mineralised cess material, hammer-scale, wood, *puparia* and fuel ash. Charcoal was abundant in the flot and was predominantly oak timber, with some hazel and willow/poplar noted. The charred plant macrofossil assemblage comprised oat grains, hazel nutshell fragments, a wheat grain, a sloe fruit-stone and weed seeds. Mineralised remains included crab-apple pips, bramble and elderberry fruit-stones and a few weed seeds.

Discussion

Cereals

3.11 Oats and wheat were the most frequently recorded cereal remains in the pit fills. Although diagnostic oat chaff was absent, the large size of a number of the oat grains suggests that the common cultivated oat, *Avena sativa*, was represented. Some small, slender oat grains were occasionally noted, particularly in context (262), fill of pit [232]. These may also derive from *Avena sativa*, as this species usually has two fertile florets, the first producing larger grains than the second (Jacomet 2006). However, bristle oats (*Avena strigosa*), wild oats (*Avena fatua*) or large-seeded grasses cannot be ruled out.

3.12 The variability of wheat grain morphology prevents the identification of wheat grains to species with certainty, but the majority of the grains at Aubrey Street had the characteristic compact shape associated with *Triticum aestivo-compactum* (bread wheat). A fragment of the diagnostic chaff in context (211) confirms that bread wheat was present on the site. Additional cereal crops were barley and rye, whose remains were generally present in lower numbers than the other crops. These cereal crops are all typical of early and later medieval sites throughout Britain (Greig 1991). For example, barley, wheat (*Triticum aestivo-compactum*), oats and rye were identified from mid-10th century to late medieval deposits at 16-22 Coppergate, York (Kenward & Hall 1995) and late Saxon ovens from Stafford produced rye, wheat, oats (common and bristle) and barley (Moffett 1994).

Other edible and economic plants

3.13 Peas formed part of the human and/or animal diet at the site, which is confirmed both by the presence of charred and mineralised peas and remains of pests of stored pulses (see section 4).

3.14 The charred and waterlogged/mineralised remains indicate that fruits and nuts were readily available. These included crab apples, brambles, elderberries, hazelnuts, cherries, strawberries, rose hips and sloes. Some of these may have been home-grown or were collected from scrub woodland or opportunistic shrubs growing in and around the town. A mineralised grape pip was noted in context (130), which points to the use of introduced food plants. Although there is historical evidence for viticulture in England, especially in the 11th and 12th centuries (Roach 1985), it has been suggested that most archaeological finds of grape seeds probably derive from imported dried fruits (Greig 1996).

3.15 Flax seeds were present in the basal fill of pit [208]. In addition to producing fibre for clothing, ropes or sacking, flax may have been used to make linseed oil for food, preservative

or medicinal uses. The by-products of oil and fibre production could also have been used as fodder or fuel (Bond & Hunter 1987).

3.16 Wild celery was identified in pit [208] and probably grew on damp disturbed ground at the site. Its fruit may have been collected for use as a flavouring. Many weeds may have been gathered for the medicinal properties associated with them, such as henbane, which has narcotic, analgesic and sedative constituents (Stuart 1989). Small numbers of bracken fronds were also noted, which may have been used for bedding or as a source of potash or yellow dye (Gale & Cutler 2000).

Palaeoenvironment

3.17 The assemblages of weed seeds provide details of the palaeoenvironment at the site and surrounding areas. Many of the charred weed seeds are likely to have been growing with the crops, and this is particularly true of the arable weeds corncockle, stinking chamomile, fat-hen, wild radish and corn spurrey. The ruderal species, cleavers, nipplewort, redshank, ribwort plantain and common chickweed may also have grown in the fields, or on areas of waste disturbed ground. Some wet-ground species, such as sedges, spike-rushes, pale *persicaria* and lesser spearwort were also recorded charred, which may reflect cultivation of damp, heavy soils and/or the burning of peat, dung or hay for fuel or kindling. The sheep's sorrel seeds may derive from dung of animals grazed on acid heath or short, open grassland on poor soils. Seeds of vetch were recorded charred and mineralised. These were not identified to species, but may include hairy tare (*Vicia hirsuta*), which was once a troublesome arable weed (Garrard & Streeter 1983), or common vetch (*Vicia sativa*), which may have been deliberately grown as a fodder crop (Preston *et al*. 2002).

3.18 Waterlogged remains of wet ground and waterside plants were recorded in the basal fills of pit [208]. These included sedges, spike-rushes, pale *persicaria*, celery-leaved buttercup and common club-rush. The latter is a tall herb of standing or slow flowing water, which is usually between 0.3-1.5m deep (Preston *et al*. 2002). The abundance of organic material in the basal fills of pit [208] reflects fully waterlogged conditions within this feature and therefore the emergent wetland plants may have been growing in standing water in the pit; a few beetles of slow/stagnant water were also recorded (section 4). However, vegetation could also have been collected from surrounding wetland areas for use as thatch, or the remains could have arrived at the site in fen-peat turves used for fuel or walls/roofing.

3.19 Waterlogged or mineralised remains of numerous arable and ruderal weeds were also present, particularly in pit [208], with fool's parsley, corn marigold, *cf*. shepherd's needle, black bindweed, black nightshade, small nettle, common hemp-nettle, henbane, dead-nettles and common nettle adding to the list of those already recorded charred. A fruit of *cf*. upright hedge-parsley was noted, which is a plant of woodland margins and rough grassland (Preston *et al*. 2002). Burred fruit such as these are commonly found attached to livestock and may have been brought to the site on livestock or animal pelts (Hall & Kenward 2011). The presence of weeds such as nettles and redshank indicate nutrient-enriched conditions, either at the site or in surrounding fields (Preston *et al*. 2002), probably as a result of the presence of manure. Archaeophytes such as henbane and shepherd's needle, were formerly much more widespread, but have decreased due to modern agricultural practice, particularly the use of herbicides (*ibid*.). Plants which include species from a range of habitats, such as poppies, grasses, docks, buttercups, woundworts and dandelions, are likely to have mainly occupied arable, disturbed ground and damp meadow environments.

3.20 The wood/bark fragments and range of fruit-stones recorded on the site suggests there were probably areas of woodland or scrub near the town, which included hazel trees and fruit-bearing small trees and shrubs. Charcoal identifications suggest that oak, willow/poplar and alder trees were also growing locally. The mosses in the basal fills of pit [208] appear to derive from woodland, as a cursory scan of the moss flora indicated that *Eurhynchium praelongum*, a woodland species, was the most common moss present. Mosses may have been deliberately collected or brought to the site attached to bark. The presence of wood-sorrel also reflects a woodland component, as this is the usual habitat of this shade-loving plant.

Uses of the pits

3.21 The presence of quantities of animal bone, fishbone, pottery and edible plant remains suggests that the pit fills largely comprise deposits of domestic waste. Intestinal parasite egg analysis of the fills of pit [208] indicates that faecal material was a significant component, suggesting that this pit also functioned as a cess pit (section 5). Although parasite egg analysis was only undertaken on pit [208], cess was probably also disposed of in many of the other pits, as mineralised concretions believed to be cess, were noted in all of the analysed samples except that from pit [232]. The presence of hammer-scale in many of the fills suggests that metalworking may have been undertaken near the site, with waste from this industry also deposited in the pits. The abundance of oak-timber charcoal in pits [118], [232] and [250] may also relate to metalworking; oak has a high calorific value, allowing it to burn for a long time and at a high temperature and was therefore often used for processes such as metalworking (O'Donnell 2007). Oak probably also formed an important structural timber on the site, as it is easy to work and has durable heartwood (*ibid*.) and some of the oak charcoal may relate to burnt structural timbers. Insect analysis suggests that other likely sources of refuse in pit [208] were butchery waste, floor-sweepings and stable manure (section 4).

3.22 The plant macrofossil assemblages from Aubrey Street have similarities with other medieval urban rubbish/cess pits. Fruit-stones in particular are frequently recorded from such features, as was evident in a 10th century cess pit at Coppergate, York (McCobb *et al* 2001), which yielded abundant edible plant remains, including those of sloe, plum, blackberry, hawthorn and crab apple. Fruit remains were also the main plant macrofossil component of a 15th century barrel latrine at Worcester, which comprised strawberry, bramble, rose, sloe, cherry, plum, crab apple, fig, gooseberry, elderberry and grape, among others (Greig 1981). Waterlogged pits at Cartergate Grimsby, dating predominantly from the 12th-14th centuries, comprised a similar plant macrofossil assemblage to that at Aubrey Street, with abundant remains of fruits and nuts including imported dried produce, a small charred crop assemblage mainly comprising bread wheat, barley, oats, rye and legumes, and evidence for the use of fibre plants in the form of flax and hemp (Archaeological Services 2011).

3.23 A dual function for both rubbish and cess disposal is a common feature of many medieval pits. This was the case for the pits at Cartergate Grimsby (*ibid.*), and a mixture of latrine waste and rubbish was also a feature of many of the medieval pits analysed from Causeway Lane, Leicester (Monckton 1999).

3.24 All of the pits were at least damp enough that they allowed mineralisation to occur, but pit [208] stands out as having been particularly waterlogged, with evidence from the plants and

insects that it may have held standing water. The insect assemblage from one of the basal fill samples of this pit (context 225 - <26>) had a number of differences from the later fills of [208], and has been tentatively interpreted as possible evidence for tanning activity (section 4). This may reflect an original use of this feature as a tanning pit, prior to its reuse as a rubbish/cess pit when it went out of use for tanning. The presence of leather off-cuts, horn-cores, metapodials, and animal hair, strongly suggests that leather-working was undertaken at or near the site, as these are typical waste products of various stages of leather-working (Shaw 2011).

3.25 It might be expected that a former use as a tanning pit may be reflected in the botanical remains in the basal fill. Bark is typically, although not exclusively, the traditional agent for tanning leather (Hall & Kenward 2011), and some bark was noted in samples 25 and 26, however it was not abundant. Although the current author is unfamiliar with *sclereids* (small clusters of lignified cells which form within the bark of many trees), structures resembling their description were not observed. An absence of significant quantities of bark could result from the bark having been pulverized or milled, however in this case *sclereids* should still be present. Spent tan bark had various uses including as a fuel and fertiliser, and in the production of white lead, and was not considered a waste product (ibid.). Bark may therefore have been removed from the pit for its reuse elsewhere.

3.26 A lack of abundant remains of bark could also indicate that other material was used as the tanning agent, as vegetable tannins are present in most of the parts of practically all wood and shrubby vegetation (Kay 1958). Howard (1674) claimed that every part of an oak tree will tan leather, just as well as the bark alone. Wood was a common component of the basal fills of pit [208], with the 12 fragments of hand-recovered wood from context (225) being identified as oak timber (2 fragments) and hazel round-wood (10 fragments, all with their bark present). Oak timber and hazel round-wood were also identified as the main species of wood from the bulk samples. If not used as a tanning agent, the hazel round-wood could have formed a wattle lining within the pit.

3.27 As mentioned previously, remains of fruits and berries were abundant in pit [208], with many of the sloes noted to have their flesh remaining on the stones. While many of these remains probably derive from cess or rubbish, it is feasible that some of the fruits could have been used as a source of tannins. Numerous fruit-stones of elderberry were recorded in several of the pits, particularly [117] and [204], which is a fruit traditionally used to dye leather (and cloth) blue (Charlotte 1996). As they were not particularly abundant in <26>, it is perhaps unlikely that leather dyeing was undertaken in pit [208], but this activity may have been occurring elsewhere on the site.

3.28 The presence of flax seeds in pit [208] may indicate that flax retting for fibre production was undertaken nearby. As with tanning, flax retting is a particularly foul smelling activity, which may indicate that such unpleasant processes were tolerated in this area of Hereford. Tanning and retting have been found to occur together at other sites such as at Layerthorpe Bridge, York (Hall *et al*. 2000) and The Pavement, Brewood, Staffordshire (Ciaraldi *et al*. 2004).

Insect analysis

Methods

4.1 Four samples were examined for insect remains from feature [208]. Context (225) (samples 25 and 26) represent the primary fill of the pit and are reported to have included 'remains of moss and fragments of bark…small fragments of fine leather were also present' (C. O'Brien, pers. comm.). Context (209)(<25>) represented the upper fill of the pit and was described as 'humified organic material similar to the primary fill'. Context (209) (<24>) proved entirely devoid of insect remains.

4.2 Insect remains were extracted using a standard paraffin flotation technique as described by Kenward *et al*. (1980). Briefly, the samples were disaggregated, washed over a 300 µ sieve and the residues mixed well with paraffin. The addition of cold water was followed by decanting and washing with detergent to remove excess paraffin. The resultant 'flots' were examined for insect remains. These were stored in absolute ethanol, and identified with reference to standard entomological literature and comparative material housed at the National Museum of Ireland (Natural History), Dublin. Taxonomy follows that adopted by the computer package BugsCEP (Buckland & Buckland 2006) which is based upon Lucht (1987), revised by Böhme (2005), and Gustafsson (2005). BugsCEP also provided invaluable assistance in providing ecological information. A full species list is provided in Appendix 2.1.

Results

4.3 The three samples which yielded insect remains exhibited a significant degree of similarity to each other. However, important differences were apparent, particularly as regards <26>, context (225).

Context (209) <25> (26 identifiable taxa)

4.4 This sample was dominated by taxa of refuse and foul organic accumulations, which comprised 12 of the 26 taxa identified. These included a range of *staphylinids*, such as *Micropeplus fulvus*, *Megarthrus bellevoyei* and *Coprophilus striatulus*, all of which are common in rotting vegetation (e.g. Duff 1993; Tottenham 1954) with *C. striatulus* often synanthropic in habit (Koch 1989a). Two possible dung taxa were also recovered, the scarabaeids *Aphodius granarius* and *Oxyomus sylvestris*. Neither of these is a dung specialist and there is a strong likelihood that these species are merely inhabiting the same foul organic accumulation as those taxa mentioned previously. Two primarily refuse taxa, *Platystethus arenarius* and *Staphylinus caesareus*, may also be found in carrion, which is also the primary habitat for *Trox scaber* (Appendix 2.2), in archaeological context usually considered a specialist on dry and well decayed carcasses (Payne & King 1970; see Hall & Kenward 2011 for a more complete discussion). The assemblage included several elements of Kenward's 'house fauna' (Kenward & Hall 1995), including the woodworm, *Anobium punctatum*, an occasionally serious pest of structural timbers (e.g. Buck 1958), the spider beetle *Ptinus fur*, common to a range of decomposing organic substrates, particularly within built environments (Lindroth *et al*. 1973; Horion 1953) and the tiny endomychid *Mycetaea subterranea*, often found in cellars, barns or stables particularly in mouldering organic material (Horion 1961). Such mouldering organic material is also the home to the mould beetle *Latridius minutus*.

4.5 A single woodland taxon was also recovered, the cerambycid *Gracilia minuta*. In non-archaeological contexts *G. minuta* generally inhabits small twigs, particularly of rosaceous plants (e.g. Denton 2000), it has previously been suggested to be a specialist on wicker-work (Kaufmann 1948; Palm 1959), suggesting a possible pit lining or nearby industrial activity.

Context (225) <25> (42 taxa)

4.6 While more diverse than context (209) <25>, the character of the assemblage recovered is very similar. The assemblage was again dominated by taxa of foul, rotting organic matter, which comprised c. 30% of all species identified. These are typified by the staphylinids *Micropeplus fulvus*, *Megarthrus bellevoyei*, *Anotylus inustus*, *Anotylus complanatus*, Philonthus *politus* and *Crataraea suturalis*, amongst others. The majority of these taxa are indicative of hay-like or straw-like decomposing vegetable matter, with some taxa (e.g. *C. suturalis*) being more or less synanthropic in habit (Larsson & Gígja 1959). Of these, at least four taxa are recorded from carrion (*Gyrohypnus fracticornis*, *Philonthus politus*, *A. complanatus* and *A. inustus* – *cf*. Donisthorpe 1939; Koch 1989a). Furthermore, Trox *scaber* is again recorded, alongside the nitulid *Nitidula rufipes* which shares a similar preference for bones and dry carcasses (Koch 1989b).

4.7 In addition to a similar suite of synanthropic taxa as that recorded from context (209) <25>, several human fleas (*Pulex irritans*) were also noted. Although generally regarded as a human ectoparasite, the human flea has also been recorded from animal hosts and has been found in large numbers on red fox (*Vulpes vulpes* var *fulva* – *cf*. Buckland & Sadler 1989) and has recently been reported as the most common taxa infesting farm animals in Iran (Rahbari *et al*. 2008). As in the previous sample, *Bruchus rufimanus* is very abundant (Appendix 2.2), suggesting the deposition of an infested seed crop.

4.8 One final aspect of this assemblage is a small component of waterside taxa, including the hydrophilids *Helophorus grandis* and *Coelostoma orbiculare*, both taxa of slow/stagnant waters, the small carabid *Bembidion properans*, typical of damp, often clayish soils, often near rivers, and the staphylinid Tetartopaeus *terminatus*, typical of swampy bankside locations (Donisthorpe 1939). These may suggest an element of standing water or have possibly arrived through grazing activity and their ingestion at a distant location. Once again, the small cerambycid *Gracilia minuta* was recorded, suggesting the presence of twigs or possible use of wickerwork.

Context (225) <26> (75 taxa)

4.9 This sample yielded a diverse assemblage, comprising 75 taxa, including 25 which are indicative of foul organic matter and up to eight potential carrion indicators, several of which were present in some abundance. Many of the refuse taxa mirrored those recovered from the other samples, *including the staphylinids A. inustus, A. complanatus, P. arenarius* and *M. bellevoyei*. Also recovered were the staphylinids *Megalinus glabratus*, *Quedius cinctus*, *Q. nemoralis* and many individuals of the tiny histerid *Acritus nigricornis*, typical of decaying vegetation. Both *Q. cinctus* and *M. glabratus* are also characteristic of decaying, fungoid grassy vegetation (e.g. Duff Archaeological Services Durham University 10 1993; Koch 1989a), with the latter perhaps suggesting herbivore dung (*cf*. Skidmore 1991).

4.10 Four strong carrion indicators were recovered: the histerids *Gnathoncus nannetensis*, *Margarinotus brunneus*, *Margarinotus striola* and the scarabaeid *Trox scaber*. Of these *T. scaber* and both *Margarinotus* spp. were abundant. While none of these are obligate carrion taxa (e.g. *M. striola* has also been recorded from grass cuttings Duff 1993) their diversity and abundance argues strongly for a carrion substrate. Both *T. scaber* and *M. brunneus* are particularly abundant on late-stage corpses (i.e. skins and bones – Donisthorpe 1939; Payne & King 1970). The predaceous staphylinid *Philonthus politus* was also extremely abundant and is once again, frequently recorded from carrion (e.g. Hinton 1945) as well as dung or other fungoid matter.

4.11 Five taxa indicative of pasture or dung were recovered. These included the hydrophilid *Cercyon melanocephalus*, considered a strong indicator of herbivore dung (particularly of sheep, but also of cattle – *cf*. Hansen 1987) and the nitulid *Brachypterus urticae*, which is indicative of stinging nettle (*Urtica* spp. – Bullock 1993). The local presence of grassland is also indicated by the elaterid *Agrypnus murinus*, usually taken from vegetation in grassland environments (Duff 1993).

4.12 Synanthropic taxa were well represented, with a great many individuals of the human flea, *P. irritans* recovered. Other synanthropic taxa included the large tenebrionid *Blaps lethifera*, characteristic of cellars, outbuildings and granaries (Duff 1993), and environment shared by the carabid *Laemostenus terricola* (Lindroth 1974) and many individuals of *Bruchus rufimanus*. The abdomen of a single sheep ked, *Melophagus ovinus* was also recovered. *M. ovinus* is a member of the *Hippoboscidae*, a family of flightless, parasitic dipterans and was formerly a pest of economic importance, reducing weight gain and transmitting bacterial pathogens in sheep populations (Small 2005).

4.13 A similar woodland component to that previously recovered was once again present (i.e. the cerambycid *G. minuta*). Three other woodland taxa were also recovered: the Notable B colydiid *Cerylon histeroides*, usually taken from beneath bark, in particular of oak (Alexander 1985), the staphylinid *Scaphidium quadrimaculatum*, again, typical of decomposing wood (Koch 1989a) and the tenebrionid *Corticeus unicolor* (Appendix 2.2). C. unicolor is currently categorised as RDB3 (rare) in the UK, although one of the few localities it has been recorded since 1970 is Herefordshire (Hyman 1992), and is generally found beneath the decaying bark of beech, oak, and birch (Brendell 1975). It is also likely that the striking Notable B colydiid *Orthocerus clavicornis* (Appendix 2.2) may, in this context, be derived from bark. While it is most frequently recorded in sparsely vegetated, sandy environments, it has also been recorded from lichen-covered tree trunks (Koch 1989b). This woodland component therefore echoes the bark noted within the sample description.

Discussion

4.14 The three samples have much in common, although context (225) <26> also possesses some clear differences from the other two. The presence of *P. fur* and *A. punctatum* throughout strongly suggests that the refuse arriving in this feature is building-derived, with some elements (e.g. *L. terricola*; *B. lethifera*) suggesting a cellar-like environment. Other taxa are somewhat related to Kenward's stable manure indicator group (*cf*. Kenward & Hall 1997), although not strongly so (particularly the case in context (225) <25>), with the presence of some waterside taxa of a more 'rural' character. The abundance of indicators of foul environments and rotting grass-like matter would seem to strongly suggest the presence of herbivore dung within the feature. This may also serve as an explanation for the abundant

remains of *B. rufimanus* throughout the feature, with these perhaps representing faecal material from animals fed infested pulses.

4.15 The assemblage has some clear parallels with that reported by Grieg (1981) from a 16th century barrel latrine from Worcester, in particular the presence of multiple examples of *B. rufimanus*, *A. punctatum* and *P. fur*, alongside records of *B. lethifera* and *L. terricola*. However, while *M. subterranea* is present in the current samples it is not so frequent as at Worcester, and the dominant taxon at Worcester, the ptinid *Tipnus unicolor*, is entirely absent at Hereford, as is the grain weevil, *Sitophilus granarius*, also common in the Worcester assemblage. The presence of some bark indicators (e.g. *C. unicolor*; *C. histeroides*; *S. quadrimaculatum*) in combination with the abundance of T. *scaber* and carrion-feeding histerids, the presence of the ectoparasite *M. ovinus* and numerous examples of *P. irritans* may tentatively be interpreted as evidence for tanning activity, particularly given the presence of both bark and leather within the context. This evidence is substantially more robust in context (225) <26> than in the other contexts examined and is comparable with the strongest examples cited by Hall & Kenward (2011).

4.16 In summary, the assemblage as it stands, in particular the material recovered from context (225) <26>, has elements that are strongly suggestive of either tanning, dumping of butchery waste or some combination of the two. The presence of numerous indicators of foul, mouldering matter similar to stable manure might argue that any presence of leather or hide was as a result of non-tanning related dumping of offcuts (a similar interpretation was suggested for a possible tannery pit of Roman age in Alcester, Warwickshire by Osborne 1971; 1994). However, the abundance of *T. scaber* in the Hereford material (this taxon is entirely absent at Alcester) makes it far more likely that this feature has been used as a tanning pit, as well as a dump for stable manure type material, particularly given the indications of bark in both substrate description and the insect fauna.

Intestinal parasite egg analysis

Methods

5.1 Four small sediment subsamples, two from each of two fills of a possible tanning pit [208], were submitted for an investigation of their content of the eggs of intestinal parasitic nematodes. All of the samples were assessed using the 'squash' technique of Dainton (1992), with provision for more detailed analysis of two of the four if warranted. Although primarily for the detection of intestinal parasitic nematode eggs the 'squash' technique routinely reveals other microfossil remains, and where present, these have also been noted. Measurements were made using a calibrated eyepiece graticule at 600× magnification and determined to the nearest one quarter of a graticule division which calibrated to 0.63 of a micron; this may be taken as a standard +/- error for all quoted measurements.

5.2 Methods for the concentrating of parasite eggs (see, for example, MAFF 1971) were not employed and, consequently, numbers of parasite eggs per gram of deposit were not calculated. Dainton (1992) discusses the problems of adopting the quantitative methods of parasitology (employed to determine the level of infestation of an individual) for use on archaeological deposits but also provides a comparison of the numbers of eggs seen from the semi-quantitative 'squash' and calculated counts of eggs per gram of sample from corresponding subsamples of the same material prepared following the modified Stoll

method (MAFF 1971) sometimes employed by environmental archaeologists (for example, Jones & Hutchinson 1991). He concludes that the semi-quantitative 'squash' records accord well with data obtained using the alternate method and that numbers of eggs seen in the 'squash' samples, recorded as 'trace' (1 to 5), 'few' (6-10), 'some' (11-20), 'many' (20-100), 'very many' (more than 100), may therefore be used as an estimate of the degree of faecal content/contamination of deposits in the manner outlined by Jones (1985).

5.3 The size range quoted for the human whipworm *Trichuris trichiura* (Linnaeus) follows that given by Ash & Orihel (1984); although significantly larger *T. trichiura* eggs are occasionally reported in modern parasitological samples this is usually in response to the use of anthelmintics, or may on occasion be a confusion with *T. vulpis* (of dogs) which children sometimes acquire through geophagia. Size ranges for the eggs of *trichurids* of common domestic animals are from several sources including Kassai (1998) and the WWW pages of the College of Veterinary Medicine, University of Missouri-Columbia.

Results

5.4 The results of the initial investigations to determine the presence/absence and state of preservation of parasite eggs are presented below in stratigraphic order (lowermost first). For the two subsamples selected for further analysis the results of any additional work undertaken are also given. Archaeological information provided by the excavator is presented in square brackets.

Context (225) <25>

5.5 The initial 'squash' was mostly organic detritus, with some inorganic content. Plant tissue fragments were numerous and there were some pollen grains/spores, fungal hyphae and fungal spores present, together with a single live soil nematode. Twenty-eight rather well-preserved *Trichuris* eggs were recorded, eight of which retained both polar plugs, ten had a single plug remaining and ten had lost both. There were also 43 *Ascaris* eggs noted, all of which were probably fertile but unembryonated when deposited and exhibited varying degrees of decortication. Detailed measurements were not recorded for the parasite eggs remains but some 'spot' measurements taken were consistent with the whipworms and round (maw) worms of humans (Trichuris *trichiura* (Linnaeus) and *Ascaris lumbricoides* (Linnaeus), respectively) and/or pigs (*Trichuris suis* (Schrank) and *Ascaris suum* (Goeze), respectively). No further investigation of this sample was undertaken.

Context (225) <26>

5.6 The initial 'squash' was mostly organic detritus, with some inorganic content. Plant tissue fragments were numerous and there were some pollen grains/spores and fungal hyphae present, together with a few ?phytolith fragments. Seventeen very well-preserved *Trichuris* eggs were recorded, eight of which retained both polar plugs, four had a single plug remaining and five had lost both. There were also 23 *Ascaris* eggs noted, all of which appeared to have been fertile but unembryonated when deposited and exhibited varying degrees of decortication. Spot measurements revealed the eggs to be consistent in size with the whipworms and maw worms of humans and/or pigs and a series of additional slides was prepared to allow detailed measurements to be made (see below).

5.7 Eight additional 'squash' slides were prepared and provided a further 65 records of well-preserved Trichuris eggs. Over half of these eggs (36) retained both of their polar plugs, with ten others retaining one. Thirty-one of the eggs were measured of which 23 were amongst those with both polar plugs (Appendix 3.1). The corresponding count for *Ascaris* eggs totalled 234, almost all of which were fertile but unembryonated when deposited (these exhibiting varying degrees of loss of the external mammilated layer – decortication), with occasional infertile eggs; six measurements were taken from these remains, two of which were of infertile eggs (Appendix 3.2).

Context (209) sample 24

5.8 The initial 'squash' was approximately equal parts organic detritus and inorganic material, with some fungal hyphae present. Forty-two rather poorly preserved *Trichuris* eggs were recorded, none of which retained both polar plugs; two had a single plug remaining and the other 40 had lost both. There were also 20 *Ascaris* eggs noted, all of which were probably fertile but unembryonated when deposited and exhibited varying degrees of decortication. Detailed measurements were not recorded for the parasite eggs remains but spot measurements again revealed the eggs to be consistent in size with those of the whipworms and maw worms of humans and/or pigs. No further investigation of this sample was undertaken.

Context (209) <25>

5.9 The initial 'squash' was approximately three parts organic detritus to one part inorganic, with some plant tissue fragments and ?phytolith fragments, together with a few fungal spores, very degraded ?diatoms and pollen grains/spores. Forty-one quite well-preserved *Trichuris* eggs were recorded, three of which retained both polar plugs, eight had a single plug remaining and 30 had lost both. There were also 71 *Ascaris* eggs noted, all of which appeared to have been fertile but unembryonated and exhibited varying degrees of decortication. Spot measurements revealed the eggs to be consistent in size with the whipworms and maw worms of humans and/or pigs and a series of additional slides were prepared to allow detailed measurements to be made (see below).

5.10 Eight additional 'squash' slides were prepared and revealed a further 89 records of moderately well-preserved *Trichuris* eggs. Approximately one in six of these eggs (15) retained both of their polar plugs, with 14 others retaining one. Thirty-one of the eggs were measured of which nine were amongst those with both polar plugs (Appendix 3.1). The corresponding count for *Ascaris* eggs totalled 173, all of which were fertile but unembryonated and exhibited varying degrees of loss of the external mammilated layer (decortication); six measurements were taken from these remains (Appendix 3.2).

Discussion

5.11 Remains of the eggs of intestinal parasitic nematodes were identified from all four of the samples, two from the primary fill and two from the uppermost fill of the large, deep, sub-circular, pit [208] which it was thought by the excavator may have been used for tanning. Whipworm (*Trichuris*) eggs consistent in size with those of the human parasite (*T. trichiura* (Linnaeus)) and/or that of pigs (*T. suis* (Schrank)) appeared most numerous in the samples from the uppermost fill (context 209) but were best preserved in the primary fill

(context 225). In three of the four samples examined the number of maw worm (*Ascaris*) eggs recorded was greater than those of whipworm; the exception being <24> (context 209) which exhibited the poorest preservation and where the initial 'squash' revealed approximately twice as many whipworm as maw worm eggs (this ratio was more or less reversed in the second sample from this context, however). Clearly, there was a significant faecal component to each of the two fills.

5.12 One sample from each of the deposits (<25> from context 209 and <26> from context 225) was selected for further study in an attempt to determine the origin(s) of the faecal content. For *Trichuris* eggs, both of these deposits gave useful numbers of positively identified and measurable remains. However, identification of *trichurids* to species from their eggs is problematic even for well-preserved remains in that the size ranges for different species often overlap significantly (Appendix 3.3). In the case of these medieval remains the problem was to distinguish between *Trichuris trichiura*, the whipworm of humans, and *T. suis*, of pigs (although some egg measurements fell outside the usual size ranges for both, see discussion below) – a particularly difficult task given that the usual size range for the eggs of *T. trichiura* is a wholly contained subset of that for *T. suis*.

5.13 By comparison with records for complete eggs, it was possible to extrapolate an approximation of total length for those eggs present which had lost one or both polar plugs as, on average, 13.3% greater than their maximum length without plugs for context (209) and 14.0% greater for context (225). A similar exercise undertaken on data from eggs in medieval deposits at another archaeological site (Brayford North, Lincoln – Carrott 2002), where similar numbers of well-preserved eggs both with and without polar plugs were present, gave a corresponding value of 12.6%, whereas the figure for poorly preserved (and mineralised) eggs seen from deposits at Vine Street, Leicester (Carrott 2008) was 15.1%. The slightly higher value from the Vine Street material may be a reflection of the nature of the preservation, the limited data available or some combination of these and other factors. Clearly, the calculated values for total length including polar plugs should be viewed with some caution given that even for complete eggs changes in morphology resulting from taphonomic factors are (to the author's knowledge) un-researched; this may account for those measurements which fall wholly outside the usual size ranges quoted (Appendix 3.3-3.5) but see further discussion below and also unusually large *T. trichiura* eggs (up to 78 by 30 microns) are not unheard of (Center for Food Security and Public Health, College of Veterinary Medicine, Iowa State University 2005). Appendix 3.3 shows the measurements (with extrapolated plug to plug values used for maximum length where applicable), with commonly quoted size ranges for *T. trichiura* and other *trichurids* of some common domesticated animals given as boxed overlays (these being based on limited sets of published 'modern' data). Appendix 3.4 shows the same measurements on shorter scale axes including error bars.

5.14 As previously noted with regard to calculating the original lengths inclusive of polar plugs, no real study of changes in egg morphology caused by varying ground conditions and states of preservation has been undertaken and comparison with modern data, though valid, must, of necessity, be cautious. However, most of the measurements fall within the range for modern *T. suis* and most of the plotted values that fall within the range for *T. trichiura* lie within the upper quadrant of the comparative modern size range (Appendix 3.3-3.4) for eggs of this species which might hint that they actually also represent *T. suis*. Histogram and cumulative percentage plots for the maximum width and length data for the eggs from each deposit (Appendix 3.6) and for the data from both samples combined (Appendix 3.7)

revealed the possibility of the presence of two populations (i.e. a bi-modal distribution), with discontinuities in the gradient of the cumulative percentage curve for the length data shown in each between 56 and 59 microns (particularly for context 225 though this was exaggerated by the empty data 'bin' at 57 microns so perhaps more convincingly in the combined data). This total length value is slightly high to mark an overlap between populations of eggs of the parasites of both humans and pigs when compared with the usual modern size ranges but the discrepancy could perhaps be explained by unknown in-ground morphological changes. (For example, a slight 'swelling' of the eggs may result from their being preserved in waterlogged deposits for several hundred years producing a small increase in both length and width and a consequent systematic displacement of the measurements; this was not evident from eggs preserved in waterlogged deposits from Brayford North, Lincoln – Carrott 2002 – however, and clearly requires further investigation).

5.15 A similar problem exists in the separation of the *ascarids Ascaris lumbricoides* (Linnaeus) and *A. suum* (Goeze), the maw worms of humans and pigs, respectively (though some parasitologists believe(d) that there is just one species of *Ascaris* that infests both humans and pigs), as their eggs are almost identical (also, Kassai 1998 notes that cross-infection between humans and pigs is possible though patent infections very rarely develop in the alternate host). The small number of measurements taken for the largely fertile (when deposited) but unembryonated *Ascaris* eggs (see Appendix 3.2) seen in these samples could indicate the presence of either human or pig faeces, or perhaps both. Taylor (1955) has remarked that a high ratio of *Ascaris* to *Trichuris* eggs as seen here (overall) may indicate pig rather than human faeces – though taphonomic factors, such as differential preservation, may again have a role to play and one should consider that although a single female *Trichuris* may produce 1,000 to 7,000 eggs per day a single *Ascaris* may produce 200,000 (Schmidt & Roberts 1981).

5.16 Although it has not been possible to definitively determine the source of the faecal content by comparison with modern data, the recorded parasite remains strongly imply human and/or pig faeces to be present, and most probably both. There was no evidence to suggest that pit [208] had been used for tanning but rather that it had been used primarily for the disposal of foul waste, i.e. as a cess pit (from the numbers of parasite eggs seen and also the composition of the macrofossil assemblages recovered from larger sediment samples, Charlotte O'Brien pers. comm.); the pit may originally have had another purpose with these fills reflecting waste disposal after it had ceased to be used in that way, however. That medieval faecal waste would contain a mix of both human and pig excrement is not surprising as pigs were often kept in towns at this period (see Albarella 2006). In York in 1498 (and repeated in 1574), an ordinance was issued forbidding butchers to keep swine in the City, because of 'the fould corruption and stench that proceeds of the same', but an exception was made in respect of 'little ones' (The Company of Butchers of York 1975). Evidence of the presence of pigs at the site from the hand-collected vertebrate assemblage was limited (101 fragments) but, for dated contexts, concentrated in deposits thought to be medieval (51 fragments; 46 fragments were from undated deposits) and pig bone was identified from both context 209 (11 fragments) and context 225 (one fragment), as well as the third fill of pit [208], context 224 (one fragment) (Foster & Carrott 2010; Foster pers. comm. from preparatory records).

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Appendix 1a: Data from plant macrofossil analysis – residue/flot contents and charred plant remains

Feature		117	118	204	208	208	208	208	208	232	245
Context		116	130	211	209	209	209	225	225	262	250
Sample		2	4	13	9	24	25	25	26	37	33
Volume processed (l)		21	28	31	20	3	11	12	11	18	20
Volume of flot analysed (ml)		200	1200	300	150	120	600	2600	1600	3400	400
Residue contents											
Bone (burnt)	indet. frags	+/-	+/-	-	+/-	-	+	-	-	+	+
Bone (calcined)	indet. frags	+	+	+	+/-	-	-	-	-	+	+
Bone (unburnt)	amphibian	-	-	-	-	-	-	-	-	+	-
Bone (unburnt)	mammal	+++	+++	+++	++	+	+	++	+	++	++
Bone (unburnt)	fish	+++	+++	++++	++	-	+	++	+	+/-	+++
Charcoal		++	+++	++	+	+	+	-	++	+	++
Daub		+/-	-	-	-	-	-	-	-	-	+
Fired clay / CBM		++	+/-	-	-	-	-	-	-	-	+
Fuel waste / metalworking residue		++	+	++	++	-	-	-	+	+/-	++
Hammerscale		++	++	+++	+++	+/-	+	-	+/-	++	+
Leather		-	-	-	-	-	-	+	+	-	-
Metal object (no. of fragments)		-	-	-	1	-	-	-	-	-	-
Mineralised cess material		+++	++++	+++	-	+++	+++	++++	+++	-	+++
Mortar		+/-	-	-	-	-	-	-	-	-	+/-
Pot (no. of fragments)		1	-	1	1	-	-	-	-	-	7
Tooth - animal (no. of fragments)		2	3	3	2	-	2	1	-	-	1
Wood		-	+	-	-	-	++	++	+	+/-	++
Flot matrix											
Bark		-	-	-	-	-	++	+	+	-	-
Bone (unburnt)	indet. frags	+	+	+	+	+	+	-	-	+	+
Bone (unburnt)	fish	+	++	++	+	+	+	+/-	+/-	+	++
Bracken (uncharred)		-	-	-	-	-	-	+	+	-	-
Charcoal		+++	++++	+++	+++	++	++	+	+	++++	++++
Fuel ash		-	-	-	-	-	-	-	-	++	+
Globular objects		+	-	+	-	+	-	-	+	-	-
Hair		-	-	-	-	-	-	+	-	-	-
Humified organic material		-	-	-	-	-	+++	++++	++++	-	-
Insect/ beetle		-	-	-	-	++	++	++	++	-	-
Leather		-	-	-	-	-	-	+	-	-	-
Moss		-	-	-	-	-	-	++	+	-	-
Puparia		+	++	+	-	-	++	++	+	-	+
Vivianite		-	+	-	-	-	-	+/-	+	-	-
Wood		-	-	-	-	+	+++	+++	++	-	+
Charred remains (total count)											
(a) *Agrostemma githago* (Corncockle)	seed	-	-	-	-	-	-	-	-	-	1
(a) *Anthemis cotula* (Stinking Chamomile)	achene	-	-	1	-	-	-	-	-	4	-
(a) *Chenopodium album* (Fat hen)	seed	-	-	1	-	-	-	-	-	24	4
(a) *Raphanus raphanistrum* (Wild Radish)	pod	-	-	-	-	-	-	-	-	1	-
(a) *Spergula arvensis* (Corn Spurrey)	seed	-	-	-	-	-	-	-	-	2	-
(c) *Avena* sp (Oats species)	floret base	-	-	-	-	-	-	-	-	12	-
(c) *Avena* sp (Oats species)	grain	13	58	33	4	-	3	1	2	37	41
(c) Cerealia indeterminate	culm node	-	10	-	-	-	-	-	-	2	1
(c) Cerealia indeterminate	grain	-	-	-	7	-	1	-	-	-	-
(c) *Hordeum* sp (Barley species)	grain	2	1	-	7	-	1	-	-	1	-
(c) *Pisum sativum* (Pea)	fruit	-	-	-	-	-	-	2	-	-	-
(c) cf. *Pisum sativum* (cf. Pea)	fruit	-	-	2	1	-	-	-	-	-	-
(c) *Secale cereale* (Rye)	grain	1	-	2	2	-	-	1	-	3	-
(c) *Triticum aestivum* (Bread Wheat)	rachis frag.	-	-	1	-	-	-	-	-	-	-
(c) *Triticum* cf. *aestivum* (cf. Bread Wheat)	grain	10	7	31	45	2	5	8	-	3	1
(c) *Triticum* sp (Wheats species)	grain	5	-	-	-	-	-	-	-	-	-
(h) *Rumex acetosella* (Sheep's Sorrel)	nutlet	1	-	-	-	-	-	-	-	1	-
(r) *Galium aparine* (Cleavers)	seed	-	1	3	1	-	-	-	-	27	1
(r) *Lapsana communis* (Nipplewort)	achene	-	2	-	-	-	-	-	-	2	2
(r) *Persicaria maculosa* (Redshank)	nutlet	-	-	-	-	-	-	-	-	7	-
(r) *Plantago lanceolata* (Ribwort Plantain)	seed	-	1	-	-	-	-	-	-	1	-
(r) *Stellaria media* (Common Chickweed)	seed	-	-	-	-	-	-	-	-	1	-
(t) *Corylus avellana* (Hazel)	nutshell frag.	3	1	12	3	-	-	-	-	23	12
(t) *Prunus spinosa* (Sloe)	fruitstone	-	-	-	-	-	-	-	-	1	1
(t) *Rubus fruticosus* agg. (Bramble)	fruitstone	-	1	1	-	-	-	-	-	1	-
(t) *Sambucus nigra* (Elder)	fruitstone	-	-	10	-	-	-	-	-	4	-
(w) *Carex* sp (Sedges)	biconvex nutlet	-	1	-	-	-	-	-	-	-	-
(w) *Carex* sp (Sedges)	trigonous nutlet	-	-	-	-	-	-	-	-	1	-
(w) *Eleocharis* sp (Spike-rushes)	nutlet	-	1	-	-	-	-	-	-	4	-
(w) *Persicaria lapathifolia* (Pale Persicaria)	nutlet	-	-	-	-	-	-	-	-	1	-
(w) *Ranunculus flammula* (Lesser Spearwort)	achene	-	-	-	-	-	-	-	-	1	-
(x) Poaceae undiff. (Grass family)	>1mm caryopsis	-	38	7	17	1	-	3	-	7	20
(x) *Ranunculus* subgenus *Ranunculus* (Buttercup)	achene	1	-	-	-	-	-	-	-	3	-
(x) *Rumex* sp (Docks)	nutlet	-	16	-	-	-	-	-	-	13	-
(x) *Vicia* sp (Vetches)	seed	1	1	4	-	-	-	-	-	4	1

(a-arable; c-cultivated; h-heathland; r-ruderal; t-tree/shrub/woodland; w-damp ground; x-wide niche. [+]: trace; +: rare; ++: occasional; +++: common; ++++: abundant)

Appendix 1b: Data from plant macrofossil analysis – waterlogged/mineralised plant remains

Feature		117	118	204	208	208	208	208	208	232	245
Context		116	130	211	209	209	209	225	225	262	250
Sample		2	4	13	9	24	25	25	26	37	33
Volume processed (l)		21	28	31	20	9	11	12	11	18	20
Volume of flot analysed (ml)		200	1200	500	150	120	600	2600	1600	3400	400
Waterlogged / mineralised remains (abundance)											
[a] *Aethusa cynapium* [Fools Parsley]	fruit	-	-	-	-	-	2	-	-	-	-
[a] *Agrostemma githago* [Corncockle]	seed	-	1	-	-	-	2	2	1	-	-
[a] *Anthemis cotula* [Stinking Chamomile]	achene	-	-	-	-	-	-	3	2	-	-
[a] Apiaceae cf. *Scandix pecten-veneris* [cf. Shepherd's Needle]	fruit	-	1	-	-	-	-	-	-	-	-
[a] *Chenopodium album* [Fat-hen]	seed	-	-	-	-	1	2	2	2	-	-
[a] *Chrysanthemum segetum* [Corn Marigold]	achene	-	-	-	-	1	-	2	2	-	-
[a] *Fallopia convolvulus* [Black Bindweed]	nutlet	-	-	1	-	-	-	-	-	-	-
[a] *Raphanus raphanistrum* [Wild Radish]	pod frag.	-	-	-	-	-	-	2	-	-	-
[a] *Solanum nigrum* [Black Nightshade]	seed	-	-	-	-	-	-	-	1	-	-
[a] *Urtica urens* [Small Nettle]	achene	-	-	-	-	-	-	2	-	-	-
[c] *Linum usitatissimum* [Flax]	seed	-	-	-	-	-	-	3	2	-	-
[c] *Pisum sativum* [Pea]	fruit	1	-	-	-	-	-	-	-	-	-
[c] *Pisum sativum / Vicia faba* [Pea / bean]	hilum	-	-	1	-	-	-	-	-	-	-
[c] *Vitis vinifera* [Grape-vine]	seed	-	1	-	-	-	-	-	-	-	-
[g] Apiaceae cf. *Conopodium majus* [Pignut]	fruit	-	2	-	-	-	-	-	-	-	-
[r] Apiaceae cf. *Torilis japonica* [cf. Upright Hedge-parsley]	fruit	-	1	-	-	-	-	-	-	-	-
[r] *Galeopsis tetrahit* [Common Hemp-nettle]	nutlet	-	-	-	-	-	-	1	-	-	-
[r] *Galium aparine* [Cleavers]	seed	-	2	-	-	-	-	-	-	-	-
[r] *Hyoscyamus niger* [Henbane]	seed	-	-	-	-	-	1	1	-	-	-
[r] *Lamium* s.p. [Dead-nettles]	nutlet	-	-	1	-	-	1	-	-	-	-
[r] *Lapsana communis* [Nipplewort]	achene	-	-	-	-	-	2	2	2	-	-
[r] *Stellaria media* [Common Chickweed]	seed	-	-	-	-	-	-	2	2	-	-
[r] *Urtica dioica* [Common Nettle]	achene	-	-	-	-	-	2	2	2	-	-
[t] *Corylus avellana* [Hazel]	nutshell frag.	-	-	-	-	-	1	3	3	-	-
[t] *Malus sylvestris* [Crab Apple]	pip	3	4	2	1	-	2	3	3	2	3
[t] *Oxalis acetosella* [Wood-sorrel]	seed	-	1	-	-	-	-	-	-	-	-
[t] *Prunus cerasus* [Dwarf Cherry]	fruitstone	-	-	-	-	-	-	-	1	-	-
[t] *Prunus spinosa* [Sloe]	fruitstone	2	2	-	-	-	3	2	4	-	-
[t] *Rosa* s.p. [Wild Roses]	fruitstone	-	-	-	-	-	-	1	1	-	-
[t] *Rubus fruticosus* agg. [Bramble]	fruitstone	4	3	4	-	3	4	4	4	2	2
[t] *Sambucus nigra* [Elder]	fruitstone	3	2	3	-	2	4	4	2	2	2
[w] *Apium graveolens* [Wild celery]	fruit	-	-	-	-	-	1	-	-	-	-
[w] *Carex* s.p. [Sedges]	bicomvex nutlet	-	-	-	-	-	-	1	1	-	-
[w] *Carex* s.p. [Sedges]	trigonous nutlet	-	-	-	-	-	2	2	-	-	-
[w] *Eleocharis* s.p. [Spike-rushes]	nutlet	-	-	-	-	-	2	3	-	-	-
[w] *Persicaria lapathifolia* [Pale Persicaria]	nutlet	-	-	-	-	-	-	1	-	-	-
[w] *Ranunculus sceleratus* [Celery-leaved Buttercup]	achene	-	-	-	-	-	-	1	-	-	-
[w] *Schoenoplectus lacustris* [Common Club-rush]	nutlet	-	-	-	-		-	1	1	-	-
[x] Apiaceae undiff. [Carrot family]	fruit	-	1	-	-	-	-	-	-	-	1
[x] Asteraceae undiff. [Daisy family]	achene	-	-	-	-	-	-	1	1	-	-
[x] Brassicaceae undiff. [Cabbage family]	seed	-	1	-	-	-	-	-	-	-	-
[x] *Chenopodium* s.p. [Goosefoots]	seed	-	1	-	-	-	-	-	-	-	-
[x] *Fragaria vesca* [Wild Strawberry]	achene	-	-	-	-	-	2	3	-	-	-
[x] *Papaver* s.p. [Poppy]	seed	-	1	-	-	-	-	-	-	-	-
[x] Poaceae undiff. [Grass family]	>1mm caryopsis	-	2	-	-	-	1	-	-	-	-
[x] *Prunella vulgaris* [Selfheal]	nutlet	-	-	-	-	-	-	1	1	-	-
[x] *Ranunculus* subgenus *Ranunculus* [Buttercup]	achene	-	-	-	-	-	2	3	2	-	-
[x] *Rumex* s.p. [Docks]	nutlet	-	1	2	-	-	2	2	2	-	-
[x] *Rumex* s.p. [Docks]	tepal	-	-	-	-	-	-	-	-	-	2
[x] *Stachys* s.p. [Woundworts]	nutlet	-	1	-	-	-	1	-	-	-	-
[x] *Stellaria graminea* [Lesser Stitchwort]	seed	-	-	-	-	-	2	2	-	-	-
[x] *Taraxacum officinale* agg. [Dandelion group]	achene	-	-	-	-	1	-	-	-	-	-
[x] *Vicia* s.p. [Vetches]	seed	-	-	1	-	-	1	-	-	-	-
[x] *Viola* s.p. [Violets]	seed	-	-	-	-	-	-	1	-	-	-

[a-arable; c-cultivated; g-grassland; t-tree/shrub/woodland; w-damp ground; x-wide niche.
Waterlogged / mineralised remains are scored from 1-5 where 1: 1-2; 2: 3-10; 3: 11-40; 4: 41-200; 5: >200]

Appendix 2.1: Insect species list from pit [208]

Approximate abundances are indicated using '+' signs: '+' signifies presence, '++' abundant presence (several individuals)

	Context (209)	Context (225)	Context (225)
Species Name	Sample 25	Sample 25	Sample 26
Carabidae			
Clivina fossor (L.)			+
Trechus quadristriatus (Schrank)	+	+	+
Bembidion properans (Steph.)		+	
Pterostichus melanarius (Ill.)			+
Calathus fuscipes (Goeze)			+
Loemostenus terricola (Hbst.)			+
Hydraenidae			
Ochthebius bicolon Germ.			+
Hydrophilidae			
Helophorus grandis Ill.		+	
Coelostoma orbiculare (F.)		+	
Cercyon obsoletus (Gyll.)	+	+	+
Cercyon melanocephalus (L.)			++
Cercyon sp.	+		+
Histeridae			
Acritus nigricornis (Hoff.)	+		++
Gnathoncus nannetensis (Mars.)			+
Margarinotus brunneus F.			++
Margarinotus striola (Sahl.)			++
Catopidae			
Choleva sp.		+	++
Clambidae			
Clambus sp.		+	+
Corylophidae			
Corylophus sp.		+	+
Ptiliidae			
Ptenidium sp.		++	++
Staphylinidae			
Scaphidium quadrimaculatum Ol.			+
Micropeplus fulvus Er.	+	+	+
Megarthrus bellevoyei Saulcy	+	++	++
Omalium rivulare (Payk.)			+
Omalium caesum Grav.			+
Xylodromus concinnus (Marsham)	+	+	+
Philorinum sordidum (Steph.)			+
Lesteva longoelytrata (Goeze)			+
Coprophilus striatulus (F.)	+	+	++
Carpelimus bilineatus (Steph.)	+		+
Anotylus rugosus (F.)		+	+
Anotylus inustus (Grav.)		++	++
Anotylus complanatus (Er.)		++	++
Platystethus arenarius (Geoff.)	+		+
Platystethus nitens (Sahl.)		+	+
Stenus sp.	+	+	+
Suniusp propinquus (Bris.)			+
Tetartopeus terminatus (Grav.)		+	
Gyrohypnus fracticornis (Müll.)		+	
Megalinus glabratus (Grav.)			+
Philonthus politus (L.)		+	++
Philonthus sp.	+	+	+
Staphylinus caesareus Ced.	+		
Quedius cinctus (Payk.)			+
Quedius nemoralis Steph.			+
Quedius sp.	+	+	+
Tachinus rufipes (L.)	+		
Crataraea suturalis (Mann.)		+	+
Aleocharinae indet.	+	+	+

	Context (209)	Context (225)	Context (225)
Species Name	Sample 25	Sample 25	Sample 26
Pselaphidae			
Bryaxis bulbifer (Reich.)			+
Elateridae			
Agrypnus murina (L.)			+
Athous haemorrhoidalis (F.)		+	+
Nitulidae			
Brachypterus urticae (F.)			+
Meligethes sp.			+
Nitidula rufipes (L.)		+	
Cryptophagidae			
Cryptophagus sp.		+	+
Atomaria sp.		+	+
Latridiidae			
Latridius minutus (grp.) (L.)	+	+	++
Dienerella sp.			+
Corticaria sp.			+
Colydiidae			
Orthocerus clavicornis (L.)			+
Cerylon histeroides (F.)			+
Endomychidae			
Mycetaea subterranea (Marsham)	+	++	++
Anobiidae			
Anobium punctatum (Deg.)	+	++	++
Ptinidae			
Ptinus fur (L.)	+	++	++
Anthicidae			
Omonadus floralis (L.)			+
Tenebrionidae			
Blaps lethifera Marsham			+
Corticeus unicolor (Pill. & Mitt.)			+
Scarabaeidae			
Trox scaber (L.)	+	++	++
Oxyomus sylvestris (Scop.)	+	+	+
Aphodius sphacelatus (Panz.)			+
Aphodius granarius (L.)	+	+	+
Aphodius sp.	+	+	
Cerambycidae			
Alosterna tabacicolor (Deg.)		+	
Gracilia minuta (F.)	++	++	++
Chrysomelidae			
Longitarsus sp.			+
Chaetocnema concinna (Marsham)		+	
Bruchidae			
Bruchus rufimanus Bohe.	++	++	++
Curculionidae			
Ceutorhynchus sp.			+
Siphonaptera			
Pulex irritans L.		+	++
Diptera			
Melophagus ovinus (L.)			+
Muscidae indet.			+
Sphaeroceridae indet.		+	++
Formicidae indet.			+

Appendix 2.2: Beetle images

Right elytron and head of the seed beetle *Bruchus rufimanus*

Left to right: left elytron of *Corticeus unicolor;* left elytron of *Orthocerus clavicornis;* head and pronotum of *Trox scaber*

Appendix 3.1: Measurements for trichurid eggs in microns

Where possible all measurements were taken directly from the eggs but polar plug to polar plug measurements are calculated from the length excluding polar plugs where asterisked. Key: p-p = polar plug to polar plug maximum length; xpp = maximum length excluding polar plugs; w = maximum width.

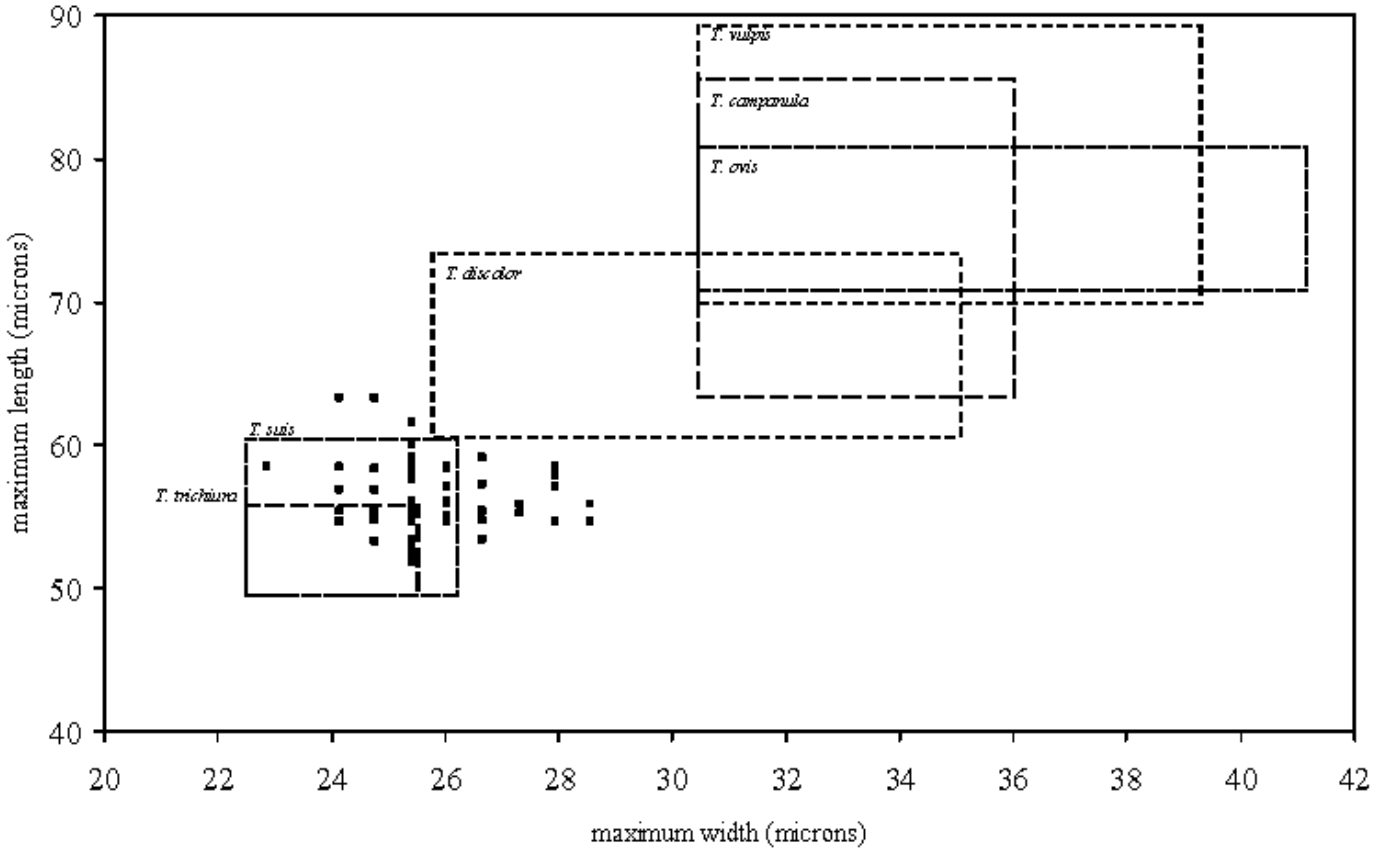
Context 209, Sample 25			Context 225, Sample 26		
p-p	xpp	w	p-p	xpp	w
53.33	44.44	26.67	58.41	52.06	26.03
*51.81	45.71	25.40	59.05	50.16	25.40
55.87	51.43	27.30	58.41	50.79	24.13
*54.68	48.25	26.67	*54.6	47.62	24.13
*56.12	49.52	25.40	55.87	45.71	26.03
*63.32	55.87	24.76	61.54	53.97	25.40
*54.68	48.25	25.40	*57.14	53.33	26.03
58.41	45.71	24.13	57.14	49.52	27.94
55.24	49.52	25.40	60.09	52.70	25.40
54.60	49.52	26.03	55.24	50.79	25.40
*57.56	50.79	25.40	55.87	49.52	25.40
*56.84	50.16	24.76	54.60	51.43	25.40
*55.4	48.89	24.76	57.14	49.52	27.94
*55.4	48.89	25.40	57.78	50.79	27.94
*54.68	48.25	24.76	58.41	51.43	26.03
*53.24	46.98	24.76	*55.24	45.71	27.30
*55.4	48.89	26.67	57.78	50.79	25.40
*63.32	55.87	24.13	*58.64	51.43	25.40
*56.12	49.52	25.40	53.33	48.25	26.67
*56.12	49.52	26.03	*60.09	52.70	25.40
*54.68	48.25	25.40	54.60	48.25	27.94
*55.4	48.89	24.13	57.20	50.16	26.67
58.41	52.06	25.40	*54.6	48.25	28.57
55.24	49.52	25.40	58.41	49.52	25.40
52.70	48.89	25.40	*55.02	48.25	24.76
*57.56	50.79	25.40	*58.41	49.52	27.94
*56.84	50.16	24.13	52.13	45.71	25.40
*58.28	51.43	26.03	55.02	48.25	26.03
*58.28	51.43	24.76	53.33	47.62	25.40
*59.00	52.06	25.40	59.05	50.79	26.67
58.41	52.06	22.86	55.87	48.89	28.57

Appendix 3.2: Measurements of Ascaris eggs from all samples

	Ascaris measurements (microns)			Egg fertile/infertile	Fertile egg embryonated/unembryonated
Context 209, Sample 25	66.03	by	48.25	Fertile	Unembryonated
	71.11	by	46.98	Fertile	Unembryonated
	71.11	by	58.41	Fertile	Unembryonated
	58.41	by	58.41	Fertile	Unembryonated
	68.57	by	45.71	Fertile	Unembryonated
	73.65	by	58.41	Fertile	Unembryonated
Context 225, Sample 26	76.19	by	45.71	Fertile	Unembryonated
	78.73	by	55.87	Fertile	Unembryonated
	88.89	by	49.52	Infertile	-
	82.54	by	48.25	Infertile	-
	73.65	by	59.68	Fertile	Unembryonated
	76.19	by	57.14	Fertile	Unembryonated

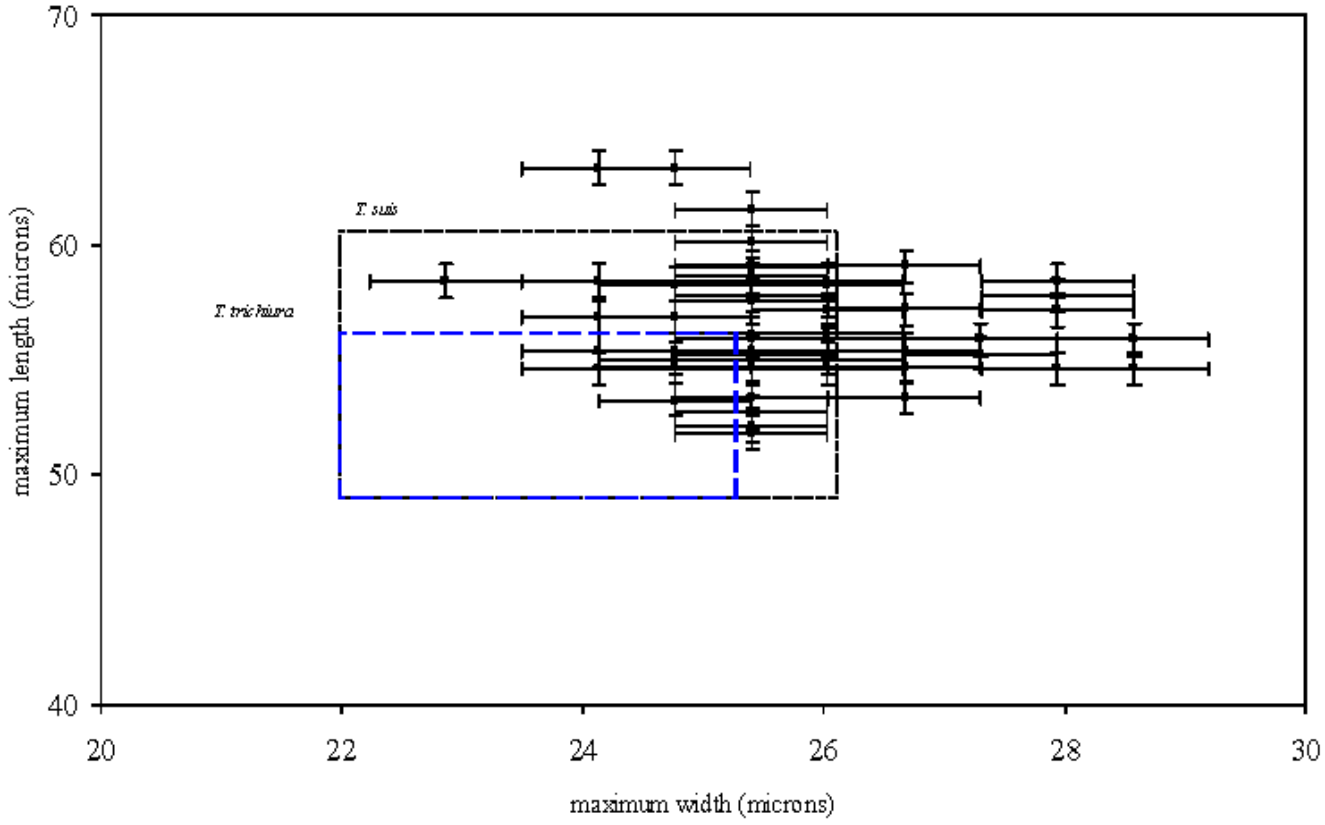
Appendix 3.3: Plotted trichurid egg measurements with overlay of size ranges for eggs of trichurids of several common domesticated animals and *Trichuris trichiura*

Some maximum lengths are calculated values for the original length including both polar plugs (see text). Note: there are some coincident measurements



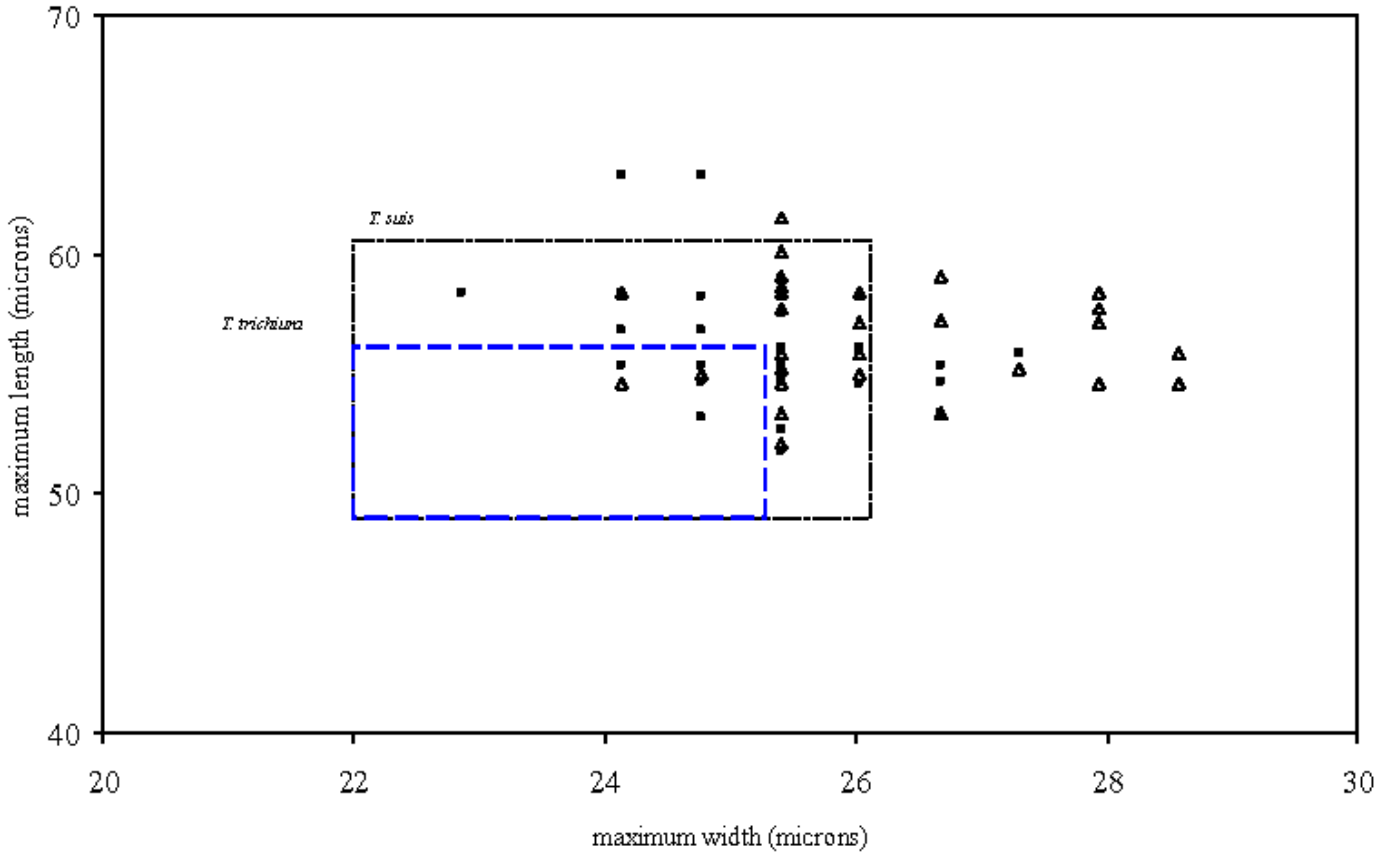
Appendix 3.4: Plotted trichurid egg measurements with overlay of size ranges for eggs of *Trichuris trichiura* and *T. suis*

Some maximum lengths are calculated values for the original length including both polar plugs (see text). Error bars are +/- 0.25 of a graticule division or 0.63 of a micron for maximum width and 0.72 microns for maximum length (i.e. 0.63* 1.14) representing the resolution of the measurements and, for calculated lengths, also their scaling. Note: there are some coincident measurements

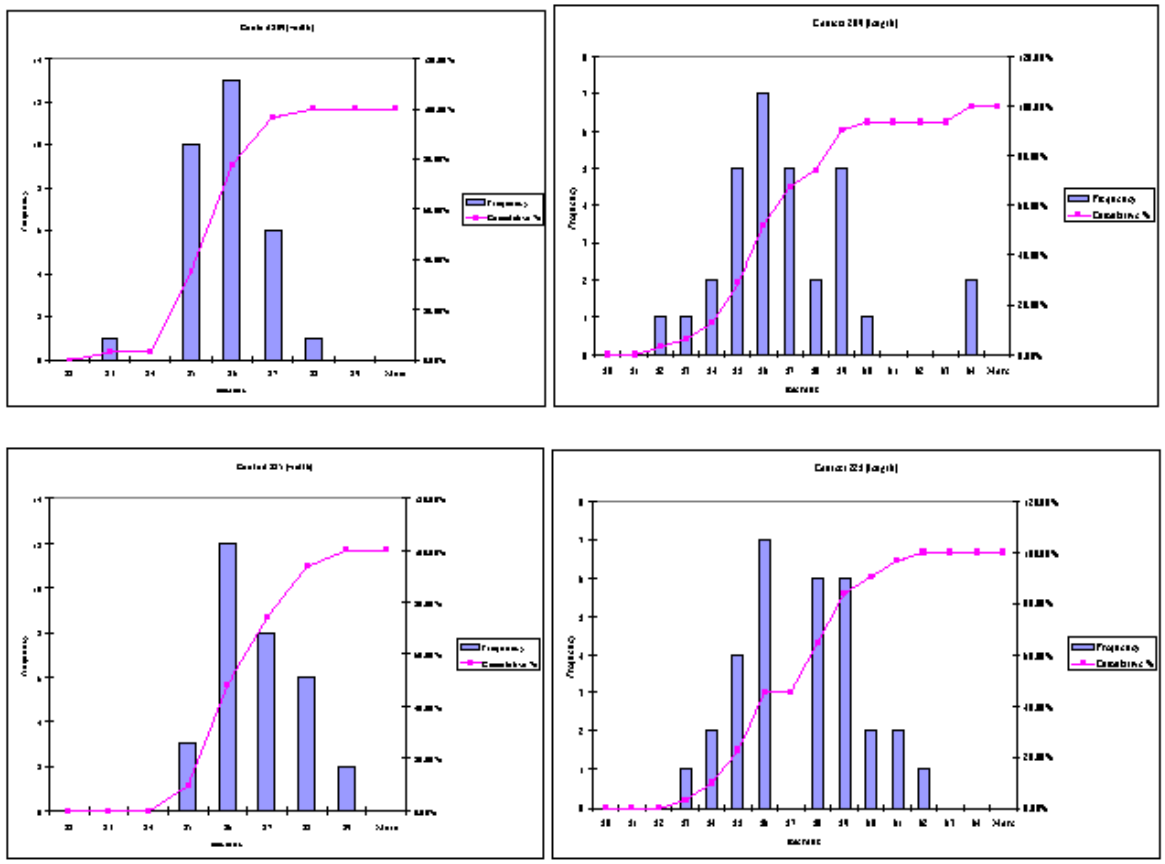


Appendix 3.5: Plotted trichurid egg measurements for remains from Context 209 (solid squares) and Context 225 (outline triangles) with overlay of size ranges for eggs of *Trichuris trichiura* and *T. suis*

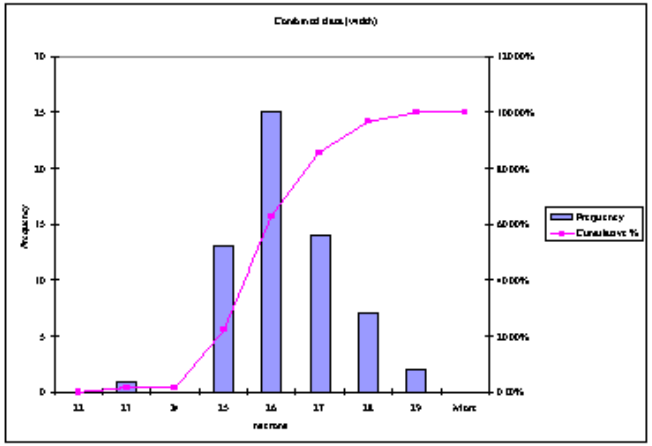
Some maximum lengths are calculated values for the original length including both polar plugs (see text). Note: there are some coincident measurements

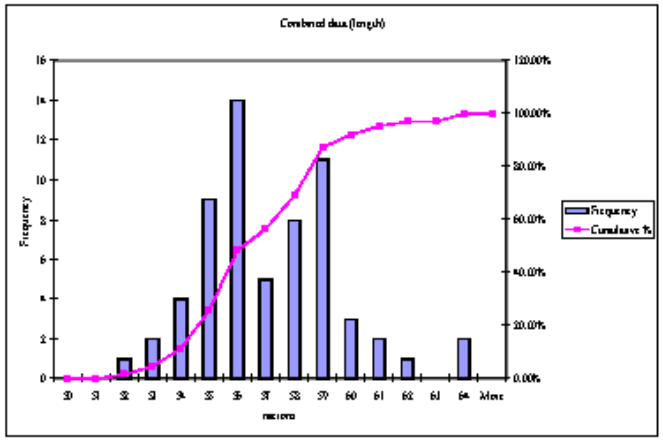


Appendix 3.6: Histograms of the distributions of trichurid maximum width and polar plug to polar plug maximum length measurements (some calculated – see text) for Context 209 (Sample 25) and Context 225 (Sample 26)



Appendix 3.7: Histograms of the distributions of trichurid maximum width and polar plug to polar plug maximum length measurements (some calculated – see text) for the combined data from Context 209 (Sample 25) and Context 225 (Sample 26)





11.9 ASSESSMENT OF BIOLOGICAL REMAINS

Alison Foster and John Carrott

Summary

Vertebrate remains (recovered by hand-collection and from bulk sediment samples) and a few fragments of shell from deposits encountered during an excavation at Kemble House Car Park, Aubrey Street, Hereford, were submitted for an assessment of their bio-archaeological potential. Archaeological features of medieval and post-medieval date were revealed at the site, including a series of medieval pits interpreted as tanning or cess pits.

The hand-collected vertebrate assemblage was dominated by the remains of cattle and caprines, with smaller numbers of fragments from pigs and occasional horse bones. A preliminary examination of the skeletal element representation suggested a bias in favour of cranial elements, lower limb and minor meat-bearing bones. A significant proportion of the material carried chop marks to the proximal and distal ends of the bones, indicative of primary butchery. Of particular interest were the accumulations of sheep, goat and cattle horn-cores, which were likely to represent from horn-working. The sieved assemblage contained considerable quantities of fish bone, some of which was crushed and broken; this type of damage was probably the result of mastication and passage through the gut, and, these remains, therefore, suggest the presence of human faeces which supports the initial interpretation of many of the features as cess pits.

The very small quantities of shell recovered were too few to be of any real interpretative value; although oyster remains in both of the contexts from which these were recovered showed possible indications of having been opened using a knife or similar implement and probably derive from human food waste.

The vertebrate material shows some potential for providing both archaeological and zooarchaeological information. A more detailed examination of assemblages from individual features and context types may help with the interpretation and identification of some of the activities being undertaken.

KEYWORDS: AUBREY STREET; HEREFORD; ASSESSMENT; MEDIEVAL; POST-MEDIEVAL; MARINE SHELL; VERTEBRATE REMAINS; FISH BONE; TANNING WASTE; HORN-WORKING

Introduction

An archaeological excavation was carried out by Border Archaeology at Kemble House Car Park, Aubrey Street, Hereford (NGR SO 50859 39884) in June 2010, prior to the development of the site for social housing.

Aubrey Street forms part of the early street system within the historic medieval city of Hereford, and is also in the vicinity of the King's Ditch, a Bronze Age feature which may have been used as a property boundary in the medieval period. A one metre reduction of the site was undertaken, revealing building foundations and a cobbled surface which were

probably associated with the 18th century street frontage. Two trenches excavated within this area uncovered earlier features including several large pits containing animal bone and horn-cores; pottery from these has been provisionally dated to 12th–14th centuries. Domestic pottery and glass recovered from another feature may indicate early settlement activity, possibly dating back to the mid 11th century.

Five boxes of hand-collected bone (approximately 170 litres in total) from the excavations, vertebrate remains from 36 sediment samples, and a few fragments of shell were submitted to Palaeoecology Research Services Limited (PRS), Kingston upon Hull, for an assessment of their bio-archaeological potential.

Methods

Shell remains

All of the shell fragments recovered were identified as closely as possible, principally with reference to Hayward and Ryland (1995) for marine shell; nomenclature follows this work. The weights (in grammes), numbers of fragments and maximum dimensions of shell of different taxa from each context were recorded (where determinable) and the minimum numbers of individuals (or individual valves for bivalve taxa) represented calculated where possible.

For oyster (*Ostrea edulis* L.) shell additional notes were made (where possible) regarding: numbers of left and right valves; evidence of having being opened using a knife or similar implement; measurability of the valves; damage from other marine biota (e.g. polychaete worms and dog whelks); encrustation by barnacles. Preservation was recorded using two, subjective, four-point scales for erosion and fragmentation—scale points were: 0 – none apparent; 1 – slight; 2 – moderate; 3 – high.

Hand-collected and sieved vertebrate remains

Subjective records were made of the state of preservation, colour of the bone fragments, and the appearance of broken surfaces ('angularity'). Other information, such as fragment size, dog gnawing, burning, butchery and fresh breaks, was noted, where applicable.

Hand collected fragments were identified to species or species group using the PRS modern comparative reference collection and published works (Hillson 1990; Schmid 1972; Cohen and Serjeantson 1996). The bones which could not be identified to species were described as the 'unidentified' fraction. Within this fraction, fragments were grouped into a number of categories: large mammal (assumed to be cattle, horse or large *cervid*), medium-sized mammal 1 (assumed to be *caprine* (sheep/goat), pig or small *cervid*), medium-sized mammal 2, (from a cat or hare-sized animal), and totally unidentifiable.

Vertebrate remains from samples were separated into categories comprising: mammal, bird, amphibian, small mammal (rat-sized or smaller) and fish. Fragments were identified as closely as possible to species or species group using the PRS and University of York modern comparative reference collections, together with published works (Lawrence and

Brown 1973; Lepiksaar 1981; Ratnikov 2001; Watt *et al*. 1997). Remains from the five categories were recorded semi-quantitatively.

Nomenclature for mammal species follows Corbet and Southern (1977), fish follow Wheeler (1969) and birds follow Walters (1980).

Results

Shell remains

A few fragments of oyster (*Ostrea edulis* L.) shell were recovered from two deposits. Context 012 (post-medieval make up deposit) gave one left oyster valve (to 61 mm; 19.3g) and a single fragment of a right valve (to 38 mm; 5.2g). Both were very poorly preserved and there were also a few mm-flakes of shell (indicating that the remains had continued to deteriorate post-recovery). A single, slightly better preserved, left valve (to 73 mm; 20.8g) was also recovered from Sample 10 (Context 209 – upper fill of ?medieval tan/cess pit). There was also a trace of mussel (*Mytilus edulis* L.) shell from the sample from Context 257 (Sample 34).

Summary details for the oyster remains are given in Table 1.

Hand collected vertebrate remains

Excavations at Aubrey Street produced a moderate-sized assemblage of hand-collected bone, amounting to 1724 fragments. Of these, 225 were measurable and 34 were mandibles with teeth *in situ* of use for providing biometrical and age-at-death data. The material was derived from 36 deposits representing 25 provisionally dated (medieval and post-medieval) and 11 as yet undated contexts; the two deposits producing the largest concentrations of bone were from (203) and (205), both of which were undated.

Preservation of the bones was good, although the colour and condition of many of the fragments was difficult to assess as a large proportion of the material was unwashed and wet when delivered to PRS [it was dried, prior to examination]. However, the condition of the bones appeared to be reasonably consistent throughout, but a degree of variable preservation was noted in a late medieval pit fill (242). Evidence for burning was limited to (203) and (233); a few slightly charred fragments suggesting exposure to temperatures between 525ºC and 645ºC (Shipman *et al*. 1984). Cess-like concretions were apparent on some of the bones from (112). The degree of fragmentation in all of the deposits was low, and the angularity of elements broken or butchered in antiquity had been mostly maintained. Fresh breakage damage was minimal in the earlier deposits, being largely confined to the post-medieval layers, (012 and 112). Dog gnawing was prevalent in the assemblages from (203) and (205) (as yet undated), amounting to approximately 8% of the bones; from other contexts it was either absent or negligible. Scavenging by other animals was not evident, with the exception of a goose humerus from Context 242 which had been chewed by a cat.

The number of identified fragments by date group is shown in Table 2. The assemblage was dominated by cattle and large mammal bones which together made up almost half of the total number of fragments. (130) produced three very battered cattle skulls, with

mandibles, and a large number of smaller fragments, most of which had almost certainly broken off the more fragile parts of the skulls. It is reasonable to assume that the majority of the bone assigned to the large mammal component was cattle, although a small number of red deer and horse bones were also present. Sheep and goat remains were common; almost 30% of these were horn-cores, however. Identified goat bones were restricted almost entirely to horn-cores, although several other fragments (a metapodial from (214) and a cranial fragment from (115) were also possibly goat. Pig bones were also common, with almost half of the identified fragments being cranial elements (skull, mandible fragments or isolated teeth). The large number of 'medium-sized mammal 1' bones (296 fragments) would, if it were possible to identify them more closely, almost certainly augment the totals of sheep and pig bones considerably. A single dog tooth was recovered from an undated deposit (214) and a small number of cat bones were also present, including a probable part skeleton from (203) (undated) and a skull from a medieval pit fill.

Remains of wild mammals included a red deer (*Cervus elaphus* L.) metatarsal from a post-medieval make-up deposit (Context 12) and four pieces of antler. One of the antler fragments, from a medieval pit fill (Context 115), was identified as roe deer (*Capreolus capreolus* (L.)), the others (from Contexts 205 and 209) were likely to represent craft-working waste and were almost certainly of red deer. A single rabbit (*Oryctolagus cuniculus* (L.)) mandible and a hare (*Lepus* sp.) metatarsal were found in Context 216. Bird bones were scarce, and limited to goose and domestic fowl, and although the remains assigned to the unidentified bird category were probably sub-adult chickens, the entire hand-collected bird bone assemblage only amounted to a total of 24 bones, most of which were from medieval/late medieval contexts.

Evidence of butchery was observed on approximately 25% of the fragments from medieval deposits. Cattle long bones had been chopped at the joints, and pelves and scapulae were also heavily chopped, indicating disarticulation and division of the carcass into smaller pieces. Many of the cervical vertebrae were chopped axially, possibly indicating that carcasses were divided into sides. The rib articulations of the thoracic vertebrae and the transverse processes of the lumbar vertebrae had, in many cases, also been chopped through, to separate the spine from the rest of the carcass. Evidence for possible marrow extraction was indicated by the presence of split long bones. The medieval assemblage was also notable for relatively large numbers of cattle, sheep and goat horn-cores. The goat horn-cores, especially those from (205), were of differing sizes, whereas those from sheep and cattle showed less variation. Many of the horn-cores had chop marks indicating that they had been deliberately detached from the cranium.

A smaller proportion (approximately 16%) of the post-medieval bone, had been butchered, again, these were mostly cattle or large mammal fragments. Similar modifications to those on the medieval assemblage were observed, with chops indicating disarticulation, splitting of long bones and removal of horn-cores from the skull.

As well as the worked antler fragments, occasional modifications to other bones indicated possible craft-working activity on site or nearby. Two cattle metapodials, from medieval (209) and (223), may have been roughed-out bone skates, abandoned in the early stages of manufacture. The latter was dark in colour, dense and battered, and may be representative of re-deposited or residual material.

There was little evidence of pathological conditions on the bones. A vertical ridge, formed by an expansion of the cortical bone, had developed on the anterior aspect of an adult caprine metatarsal from Context (012). This condition has been previously noted in sheep metatarsals from Yorkshire and Lincolnshire, as well as in cattle and deer (Brothwell *et al.* 2005). The aetiology is unknown, but it may be linked to biomechanical stress as a result of lameness or walking on rough ground (*ibid*). Other modifications included slight exostosis to the periphery of the (posterior) articulation of a ?cattle lumbar vertebra from (203) and a cattle metacarpal with a worn and porous proximal articulation from (205). A non-biometrical trait was noted on two cattle mandibles from (130) (both from the same animal) which displayed reduced third molars due to partial absence of the distal column. This is a relatively common genetic anomaly (Dobney *et al.* 1996) but the cause is unclear.

Vertebrate remains from environmental samples

The sieved assemblage contained fragments of large mammal bone (some identifiable to species) as well as bones from smaller taxa, including a significant amount of fish bone. The condition of much of the bone was consistent with that from the hand-collected assemblage in that preservation was generally good, colour was mainly uniformly brown and most of the fragments could be described as 'angular'. An exception to this was a degree of differential preservation present in several of the fish assemblages, in which pale-coloured, well preserved bones and fragile scales were recovered along with much darker or less well preserved material. It was also noted that, although the amount of burnt bone from the hand-collected material was negligible, a significant percentage of much smaller burnt fragments was present in almost all of the sieved contexts (Table 4); burnt bone is fragile and fractures much more easily, and the resultant smaller pieces are less likely to be recovered by hand-collection, which probably accounts for the inconsistency.

Table 3 gives details of the species identified. Much of the evidence for large, domestic mammals duplicates that from the hand-collected material, with cattle, caprine and pig bones present, together with a few from cat and dog. Chicken, chicken-sized and goose bones were present in 20 of the deposits.

Butchery marks on the bones from larger mammals were consistent with those on the hand-collected material, including split vertebrae and chops to the ends of long bones to disarticulate the carcasses. Only two bones with pathologies were noted; a caprine scapula from Context 223 with a possible example of osteochondritis to the glenoid, and a pig thoracic vertebra with an anomalous posterior articulation from Context 209.

Preliminary examinations of the fish assemblage suggested it was composed almost entirely of herring (*Clupea harengus* L.) and eel (*Anguilla anguilla* (L.)) bones, mostly vertebrae, although some cranial bones were also identified. Bones from other species included occasional small salmonid (salmon family) vertebrae, some tiny cyprinid (carp family) infrapharyngeal bones (possibly carp – cf. *Cyprinus carpio* L. or tench – cf. *Tinca tinca* (L.)), a single haddock (*Melanogrammus aeglefinus* (L.)) vertebra and one butchered vertebra from a large gadid (over one metre in length), probably a cod (cf. *Gadus morhua* L.).

Contexts 115, 116, 130, 205 and 211 showed high concentrations of crushed and broken herring vertebrae, damage characteristic of chewing and ingestion. Most of the other fills which produced fish bone also contained a percentage of these modified vertebrae (see Table 4). Cess-like concretions were seen adhering to the bones from a number of the samples. Small quantities of this material (from bones from Contexts 209, 210, 217, 233 and 269) were examined for parasite eggs and other microfossil remains using the 'squash' technique of Dainton (1992). However, all were essentially mineral in nature, although this included material which appeared to be mineralised organic detritus, and no eggs of intestinal parasites (which would have confirmed a faecal content) were recorded. A few ?phytolith fragments were present in the material from Contexts 217 and 269.

Several of the contexts contained frog and/or toad remains; these had probably been attracted to pits of cess and decaying rubbish by flies and other invertebrates. The small mammals present, including wood mice and house mice, would have been a normal feature of the urban medieval environment; there was no evidence for voles, however, which suggests they were discouraged by intense human activity and a lack of overgrown vegetation which would have provided cover.

Discussion and statement of potential

The very small quantities of shell recovered were too few to be of any real interpretative value; although oyster remains in both of the contexts from which these were recovered showed possible indications of having been opened using a knife or similar implement and probably derive from human food waste.

The vertebrate material from Aubrey Street was well preserved with a relatively low incidence of fragmentation. Slight variations in preservation, colour and angularity noted for some of the assemblages may indicate the presence of re-deposited or residual material but, with the exception of some of the sieved fish bone, the condition of the remains was generally consistent. Most of the bones were from medieval, post-medieval or as yet undated deposits, with only a few from 11th century or later medieval contexts. On the basis of this preliminary examination, where comparisons were able to be made, no significant differences were noted between the material from the different phases, although there was slightly less evidence for butchery on the post-medieval bones.

The assemblage was dominated by cattle and large mammal bone, with much of the material suggesting refuse from slaughter, primary butchery and secondary carcass preparation. There was some evidence for domestic household rubbish (including meat-bearing bones and those of birds), but evidence for kitchen waste generally was sparse, and although the sieved material contained a higher percentage of caprine, pig and bird bones, few of these were major meat-bearing elements.

Many of the contexts contained metapodials and horn-cores, which are often associated with tanning as there is documentary and archaeological evidence for hides delivered to tanners with the feet and horns still attached. There were no substantial concentrations typical of industrial, large-scale late medieval and post-medieval tanning sites, but it is possible that small-scale, non-specialist tanning activity was taking place, as suggested by Albarella (2003). The frequency of horn-cores, many of which had been deliberately

chopped at the base for removal from the cranium, supports this interpretation, but may also be evidence for horn-working on site. Many of the horncores were from goats, and although there has been no attempt during the assessment to distinguish between sheep and goat post-cranial elements, the impression was that the assemblage did not contain significant amounts of other goat bones. A complete absence of post-cranial elements could indicate either that goat hides were being delivered to the site with horns but without feet, or that there was trade specifically in goat horns (*ibid*).

The quantities of fish remains from the samples show considerable potential for the interpretation of the features from which they were recovered. Initial observations of the fish assemblage showed a high frequency of crushed herring vertebrae from several of the pit fills. These are usually interpreted as indicators of human faecal material, as experiments have shown that a significant proportion of ingested herring bones can survive passage through the gut (Jones 1986), although they are often damaged by mastication. Such evidence supports the excavator's interpretation of these features as cess pits. Whilst the marine fish (gadids, herring) would have been imported to the site, it is likely that the freshwater and migratory fish (cyprinids, salmonids, eels) were caught locally, the small cyprinid remains perhaps representing the gut contents of the eels (Jen Harland pers. comm.). A further more detailed study of the remains would give some further insight into the utilisation of both marine and riverine resources.

Evidence from the hand-collected vertebrate remains, together with the remains from the sediment samples, suggests that although some of the features may have initially functioned as tanning pits, they were subsequently used as cess pits and for the disposal of noxious waste from primary butchery, and possibly tanning and horn-working activities.

Recommendations

No further study of the recovered shell is warranted.

Although this is not a particularly large vertebrate assemblage, it does show some potential for providing both archaeological and zooarchaeological information. A more detailed examination of assemblages from individual features and context types, especially if the dating evidence can be expanded and refined, may help with the interpretation and identification of some of the activities being undertaken at the site.

It is recommended that a detailed archive be made, including age-at-death and biometrical data, for the main domesticates for the purposes of inter-site comparison. A particular examination should be made of the caprine remains to distinguish, if possible, between sheep and goats. Any remaining sediment samples should be processed for the retrieval of additional fish and small mammal remains. Given that there is uncertainty concerning the dating of some of the deposits, only material from well dated contexts should be recorded.

The vertebrate assemblage will need to be thoroughly, but carefully, washed and dried prior to analysis.

Retention and disposal

All of the current material should be retained as part of the physical site archive for the present.

Archive

All material is currently stored by Palaeoecology Research Services (Unit 4, National Industrial Estate, Bontoft Avenue, Kingston upon Hull), pending return to the excavator, along with paper and electronic records pertaining to the work described here.

Acknowledgements

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Table 1. Aubrey Street, Hereford: Shell, by context. Key: 'CN' = context number; 'l' = number of left (or lower) valves; 'r' = number of right (or upper) valves; 'i' = number of valves of indeterminate side; 'e' = erosion score for valves; 'f' = fragmentation score for valves; 'meas' = estimated number of valves intact enough to be measured; 'kn' = number of valves showing damage characteristic of the oyster having been opened using a knife or similar implement; 'fr' = number of valves showing fresh breakage; 'biota' = number of valves with evidence of damage or encrustation from/by other marine biota (e.g. polychaete worms, dog whelks, barnacles); 'wt' = total weight of shell (in grammes). Erosion and fragmentation scores were recorded, subjectively, as: 0 – none apparent; 1 – slight; 2 – moderate; 3 – high.

		Oyster valves										
CN	**Context details**	**l**	**r**	**i**	**e**	**f**	**meas**	**kn**	**fr**	**biota**	**Notes**	**wt**
012	post-medieval make up deposit	1	?1	0	3	3	?1	?1	1	0	Left oyster vale to 61 mm (19.3 g); ?right oyster valve fragment to 38 mm (5.2 g); a few mm-flakes of shell	24.5
209	upper fill ?medieval tan/cess pit); from Sample 10	1	0	0	2	1	?1	?1	1	0	Left oyster valve to 73 mm (20.8 g)	20.8
		2	?1	0			?2	?2	2	0		45.3

Table 2. Aubrey Street, Hereford: Hand-collected vertebrate remains by period group. Key: ?med= ?medieval; Lmed = Late medieval; Lmed/pmed = Late medieval/post-medieval; pmed = post-medieval; ND = not dated.

Species		**11th C**	**?med**	**Lmed**	**Lmed/pmed**	**pmed**	**ND**	**Total**
Lepus sp.	hare	-	1	-	-	-	-	1
Oryctolagus cuniculus (L.)	rabbit	-	1	-	-	-	-	1
Canis f. domestic	dog	-	-	-	-	-	1	1
Felis f. domestic	cat	-	3	-	-	-	7	10
Equus f. domestic	horse	-	6	-	-	1	8	15
Sus f. domestic	pig	-	51	2	1	1	46	101
cf. *Cervus elaphus* L.	red deer	-	-	-	-	1	1	2
Capreolus capreolus (L.)	roe deer	-	1	-	-	-	-	1
Cervid	deer	-	1	-	-	-	1	2
Bos f. domestic	cow	1	170	5	4	30	139	349
Ovis f. domestic	sheep	-	23	-	-	2	12	37
Capra hircus L.	goat	1	18	-	-	3	13	35
Caprine	sheep/goat	1	72	2	2	20	70	167
Large mammal		5	240	16	11	69	169	510
Medium-sized mammal 1		6	162	3	2	37	86	296
Medium-sized mammal 2		-	15	-	1	-	12	28
Anser sp.	goose	-	1	1	-	-	1	3
Gallus f. domestic	chicken	2	9	-	-	1	3	15
Unidentified bird		-	3	-	-	2	1	6
Fish		-	-	-	-	-	1	1
Unidentified		3	82	3	-	4	51	143
Total		**19**	**859**	**32**	**21**	**171**	**622**	**1724**

Table 3. Aubrey Street, Hereford: Semi-quantitative record and identifications of remains (principally of vertebrates) from environmental samples, by context. Key: Semi-quantitative record of fragments from each category and context: '+' = present (1-3); '++' = occasional (4-20); '+++' = common (21-50); '++++' = abundant (51-200); '+++++' = super-abundant (201+). 'lm' = large mammal; 'mm1' = medium-sized mammal 1; 'mm2' = medium-sized mammal 2; 'ch/sz' = chicken-sized; 'mnv' = minimum number of valves; 'mni' = minimum number of individuals.

Context	Sample	Mammal	Bird	Amphibian	Small mammal	Fish	Species
115	1	+++++	+	++	+	++++	cow, pig, sheep/goat, lm, mm1, ?cat, chicken, common frog, frog/toad, mouse/vole, herring (*Clupea harengus* L.), eel (*Anguilla anguilla* (L.)), small cyprinid, small salmonid
116	2	++++	++	++	++	++++	pig, sheep/goat, mm1, chicken, small bird, common frog (*Rana temporaria* L.), frog/toad, ?wood mouse (*Apodemus sylvaticus* (L.)), mouse/vole, herring, eel
119	3	+++				+	eel
130	4	+++	++	+		++++	cow, sheep/goat, mm1, chicken, ch/sz bird, small bird, common frog, frog/toad, herring, eel, small cyprinid
137	6	+++	++	++		++	mm1, ch/sz bird, common frog, frog/toad, herring, eel
138	7	+				+	sheep/goat, herring
203	5	+++++	+	+		++++	dog, sheep/goat, lm, mm1, frog/toad, herring, eel
205	8	++++	+	+	+	++++	pig cow, sheep/goat, lm, mm1, chicken, frog/toad, herring, eel, small cyprinid
207	15	+++				+	mm1, herring
209	9	+++	+	+		+++	pig, cow, sheep/goat, mm1, chicken, frog/toad, herring, eel, small cyprinid
209	10	+++				+++	pig, lm, mm1, chicken, small bird, herring, eel
209	14	++++				+++	pig, cow, sheep/goat, lm, mm1, herring, eel
209	18	++	+		+	+++	cow, ch/sz bird, mouse, mouse/vole, herring, eel
209	24					++	herring, eel
209	25	++				+	sheep/goat, mm1, herring
210	11	++++	+			++	cow, sheep, sheep/goat, lm, ch/sz bird, small bird, herring eel

Context	Sample	Mammal	Bird	Amphibian	Small mammal	Fish	Species
211	13	++++	+	+	+	++++	pig, cow, sheep/goat, lm, mm1, mm2, small bird, frog/toad, herring, eel, small cyprinid
214	21	+++++	+	+	+	+++	pig, sheep/goat, mm1, mm2, small bird, herring, eel
216	28	+++++	+	+	+	+++	cat, dog, pig, cow, sheep/goat, lm, mm1, ?duck, ch/sz bird, frog/toad, house mouse (*Mus musculus* L.), herring, eel, haddock (*Melanogrammus aeglefinus* (L.), small salmonid
217	16	++++	++			++	mm1, ch/sz bird, herring
220	20	+++++	+		+	++	cat, sheep/goat, chicken, small bird, mouse/vole, herring, eel
221	17	++	++	+	+	++++	pig, cow, lm, mm1, common frog, herring, eel, small cyprinid, small salmonid
222	19	++++			+	+++	pig, cow, sheep/goat, lm, mm1, herring, eel
223	23	+++			+		sheep/goat
225	25					+	herring, eel
225	26		+		+	++	?wood mouse, herring, eel
229	27	+++	+		+	+++	ch/sz bird, small bird, mouse/vole, herring, eel, small cyprinid
233	29	++++	++	+	+	++	pig, cow, sheep/goat, lm, mm1, mm2, chicken, goose, ch/sz bird, frog/toad, mouse, mouse/vole, herring
240	30	+++	+			++	lm, chicken, herring, eel
241	31	++	+	++	+	++	pig, mm1, frog/toad, herring, eel
248	32	++++	+	++		++++	pig, cow, sheep/goat, lm, mm1, frog/toad, herring, eel
250	33	+++	+		+	+++	pig, cow, sheep/goat, lm, mm1, mouse/vole, herring, eel, small cyprinid
257	34	++++	++			++	pig, sheep/goat, lm, chicken, goose, ch/sz bird, herring, large ?cod (*Gadus morhua* L.), mussel (*Mytilus edulis* L.) shell (mnv = mni = 1)
262	37			+		+	frog/toad, eel
265	35	+++	+			+	cow, lm, mm1, chicken, ch/sz bird, herring, cyprinid
269	36	++++	+				pig, cow, mm1, chicken

Table 4. Aubrey Street, Hereford: Semi-quantitative record of frequency of burnt bone fragments, and presence/absence of cess concretions and crushed/broken fish bone from the environmental samples, by context. Semi-quantitative scale as for Table 3.

Context	Sample	Context type	Burnt bone fragments	Cess concretions	Crushed/broken fish bone
115	1	?medieval fill of small ditch/pit	++	n	y
116	2	?medieval fill of domestic waste pit	++	n	y
119	3	upper fill of ?medieval domestic waste pit	++	n	y
130	4	fill of ?medieval domestic waste pit	++	n	y
137	6	fill of ?medieval rubbish pit	+	n	n
138	7	?medieval rubbish pit fill	none	n	n
203	5	upper fill, undated pit	+++	n	y
205	8	general clearance - ?date	++	n	y
207	15	?medieval refuse pit fill	++	n	n
209	9	upper fill ?medieval tan/cess pit	+	n	y
209	10	upper fill ?medieval tan/cess pit	none	n	y
209	14	upper fill ?medieval tan/cess pit	++	y	y
209	18	upper fill ?medieval tan/cess pit	+	n	y
209	24	upper fill ?medieval tan/cess pit	none	n	y
209	25	upper fill ?medieval tan/cess pit	+	n	n
210	11	deposit in domestic rubbish/cess pit	+++	y	y
211	13	basal fill of cess pit	++	n	y
214	21	upper fill of undated pit	++	n	y
216	12	upper fill of ?medieval cess/rubbish pit	++++	n	y
216	28	upper fill of ?medieval cess/rubbish pit	+++	n	y
217	16	upper fill of undated pit	++	y	n
220	20	upper fill of ?medieval rubbish pit	+++	n	n
221	17	?primary fill of rubbish pit	++	n	y
222	19	mid/upper fill of ?medieval pit	++	n	y
223	23	?medieval industrial pit	+	n	n
225	25	?medieval tanning pit	+	n	y
225	26	?medieval tanning pit	none	n	n
229	27	base of pit	++	n	y
233	29	upper fill of ?medieval pit	++	y	n
240	30	organic preservation	none	n	y
241	31	?medieval rubbish pit fill	++	n	y
248	32	late medieval pit fill	+	n	y
250	33	primary fill	+	n	y
257	34	rubbish/cess pit fill	++	n	y

262	37	carbonised/degraded wood	++	n	n
265	35	fill of recut pit	+	n	n
269	36	?upper fill of cess pit	+	y	n

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