Worcestershire Archaeology Research Report No.7

Archaeological investigations on the

KEMPSEY FLOOD ALLEVIATION SCHEME

Tom Vaughan and Jonathan Webster

Worcestershire Archaeology Research Report no 7

Archaeological investigations on the Kempsey Flood Alleviation Scheme

(WSM 45802)

Tom Vaughan and Jonathan Webster

With contributions by Alan Clapham, Angus Crawford, Nicholas Daffern, Laura Griffin, Robin Jackson, Peter Marshall, Andrew Millard (Durham University), Suzi Richer, and Gaynor Western (Ossafreelance)

Illustrations by Carolyn Hunt, Steve Rigby and Laura Templeton

worcestershire county council

2017

Worcestershire Archaeology Research Report no 7

Archaeological investigations on the
Kempsey Flood Alleviation Scheme

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

ISBN 978-0-9929400-7-2

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

Front cover illustration: excavation and recording an adult male burial (SK8064)

Contents

to previous view

go to contents

to previous view

Figures

go to contents

to previous view

go to contents

to previous view

Summary

A programme of archaeological investigations was undertaken on land to the south and west of St Mary's Church, Kempsey, Worcestershire (centred on NGR SO 84740 48990). It was undertaken on behalf of the Environment Agency, as part of their flood alleviation scheme that included the construction of a bund, pumping station, fish refuge and access road.

Historic documents indicate that a Minster church was established in Kempsey before 799 AD, and that a Bishop's manor house was built in the 9th century.

Initial evaluation aimed to determine if any significant archaeological remains were present and if so to indicate their location, date and character. Subsequent excavation along the northern portion of the access road aimed to identify and excavate all archaeological deposits within the 0.60m deep construction horizon. A watching brief of the groundworks was also undertaken on a number of areas of potential archaeological significance as the development progressed. Finally a topographic survey was carried out to assist interpretation of the existing terraces.

The investigations revealed that the churchyard originally extended further to the west than the present churchyard. A total of 69 grave cuts were noted, of which 55 lay within the impact depth of the access road so were fully excavated. Forty six individuals were recovered from these. The remaining 14 graves extended below the impact depth so were not fully excavated. In addition 587 disarticulated bones were recovered, representing potentially another 21 individuals. A sequence of five phases of burial was identified although more are likely to remain below the impact depth. The preservation of the bone varied dependant on their proximity to the underlying gravels and truncation by other burials.

Four individuals were radiocarbon dated, *cal AD 840–980 to cal AD 1045–1210 (68% probability).* The earlier date does not provide a *terminus post quem* for the burials, as stratigraphically earlier graves were identified but not excavated as they lay below the construction horizon. The burial soil had a 14th century *tpq,* although a 9th century Stafford ware pottery sherd was recovered from one grave. Overlying soils contained medieval building debris, largely of 14th to 15th century and later date. This may represent the demolition of a substantial medieval building, potentially the Bishop's manor house, which appears to have been demolished between *c* 1540 and 1695.

A deep vertical sided cut was recorded west of and on the same approximate north-west to south-east alignment as an existing linear bank through the current churchyard. This latter defined the southern boundary of the churchyard as indicated on the maps of 1840 and 1884-6. The hitherto unknown western arm of the linear feature is considered to have defined the southern boundary of a larger late Saxon/medieval churchyard, which extended across the plateau to the west.

The western boundary of the churchyard appears to have shifted over time; covering the entire plateau at one time; defined by a deep vertical sided cut *c* 10m west of the existing boundary at another (found in a trench excavated by the Worcestershire Archaeological Society in 1954); and a wide ditch adjacent to and west of the existing churchyard fence. Only the latter is dated; the fill has a 14th century *tpq;* and it truncated the general graveyard soil and the radiocarbon dated individuals.

Although osteological analysis was restricted by the condition of the skeletal remains and their incomplete nature caused by later burials, both females and males and all age categories were represented. This area of the burial ground therefore served the whole community and was not reserved for a specific group. Examples of congenital, metabolic, inflammatory and fibrous disease were all present in addition to lesions from trauma and degenerative joint disease. Of particular

note was the poor dental health, with a high rate of caries, calculus, periodontal disease and dental abscesses, potentially indicative of a high sucrose diet. There was one rare example of possible fibrous dysplasia, previously unrecorded in the period, and a possible case of acquired syphilis that may represent one of the earliest examples in the country.

The dietary isotopes indicate that the population had a mostly terrestrially-based diet, which is comparable with other contemporary groups nationally. However, the oxygen isotopes show a significant divergence from contemporary and local populations indicating that at least three, possibly five, of the 12 individuals analysed had spent their childhood in a warmer or more westerly location.

to previous view

Background

Reasons for the project

A programme of archaeological investigations was undertaken on behalf of the Environment Agency on land to the south and west of St Mary's Church, Kempsey, Worcestershire (centred on NGR SO 84740 48990; Fig 1).

The Environment Agency has undertaken a flood alleviation scheme that included the construction of a bund, pumping station, fish refuge and associated access road.

The investigations followed earlier project stages, comprising a desk-based assessment (Appleton- Fox 1998) and watching brief of geotechnical test pits (Lee 2007 and 2011). The desk-based assessment identified the potential for remains of prehistoric and later date, and particularly a late Saxon Minster church and Bishop's manor house (WSM 07192).

The evaluation was undertaken between 18 July and 14 September 2011. Trenches were located along the route of the access road and on visible earthworks and areas of potential interest elsewhere (Fig 2). This identified activity from the prehistoric through to the post-medieval period. Of particular interest was an area of inhumation burials to the immediate west of the present boundary of the churchyard. The burial soil had been sealed by a deposit containing building rubble of late medieval or early post-medieval date. Following discussions between Ed Wilson (Senior Archaeologist, Environment Agency), Mike Glyde (Historic Environment Planning Officer, Worcestershire County Council) and the Worcestershire Archaeology (WA), the excavation was commissioned to record and remove all inhumations within the impact depth of the new road.

The excavation was undertaken between 1 and 11 August 2011 (Figs 2 and 5). In addition, until 26 January 2012, a watching brief was undertaken of those groundworks associated with the scheme which were considered to be of potential archaeological interest (Trenches 6-8; Fig 2; Fig 16).

The assessment of the project's findings was completed on 2 March 2012 (Vaughan and Webster 2012). This identified the potential use of a topographic survey of the area immediately surrounding the church, which was duly carried out on 13 September 2012.

The fieldwork was registered by the Historic Environment Record (HER) with the reference WSM 45802.

Aims

The aims and scope for this project were identified in the assessment and updated project design (Vaughan and Webster 2012).

Original aims and objectives

The original aims of the excavation were to identify, record and excavate all inhumation remains and any other associated features, down to the impact depth (approximately 0.60m below the then ground level); to undertake osteological assessment of the remains, to determine their age, sex, and any pathology; and identify the potential for further analysis and publication of the results.

Revised aims and objectives

The original aims have been revised in the light of the assessment. The aims and objectives have been compiled with reference to the relevant sections of the *West Midlands Regional Research Framework for Archaeology* (Watt 2011).

- What can the pathology of the burial assemblage tell us about the age, sex, health, injury and lifestyles of the population and is there variation over the time period?
- Are the individuals recovered an indigenous population or a result of migration? Look at population make-up: analyse stable isotope ratios.
- Is there a difference between the rural population here and that of the urban populations from the Chapter House, Worcester cathedral and the New Library, Hereford cathedral, excavations?
- What is the chronology of the terracing and landscaping of the site from the Late Saxon period onwards?
- Can the main north to south ditch be related to reorganisation of the church at Kempsey specifically (the Bishop's manor house, the Minster and St Mary's church) and with ecclesiastical changes generally (i.e. the reduction in the significance of minster churches and the establishment of smaller churches in each individual parish)?

Methods

Personnel

The excavation was led by Jonathan Webster. The evaluation was led by Andrew Mann and Jo Wainwright. Additional fieldwork was undertaken by Richard Bradley, Angus Crawford, Tim Cornah, Tegan Cole, Chris Gibbs, Mike Nicholson, Shelly Probert, Simon Sworn, and Steve Woodhouse. Finds analysis was undertaken by Angus Crawford, Laura Griffin and Robin Jackson, environmental processing by Adrian Robins. Environmental analysis was undertaken by Dr Alan Clapham, radiocarbon dating by Beta Analytic Ltd, SUERC, Dr Suzi Richer, Nicolas Daffern and Peter Marshall (Historic England), osteological analysis by Gaynor Western (Ossafreelance), isotope analysis by Dr Andrew Millard (Durham University) and illustration by Carolyn Hunt, Steve Rigby and Laura Templeton. The project manager responsible for the quality of the project was Tom Vaughan.

Documentary research

A brief desk-based assessment of the site was prepared prior to the fieldwork (Appleton- Fox 1998). The report indicated that there was potential for development here to disturb archaeologically significant deposits and features of prehistoric to post-medieval date, particularly early medieval and medieval activity associated with the former Minster church (page 14 below).

Fieldwork strategy

A detailed specification was prepared by Worcestershire Archaeology (HEAS 2011a and 2011b). The HER reference is WSM 45802 for all stages of fieldwork.

Evaluation

The evaluation involved the excavation of five 30m trenches, each 1.60m wide, along the route of the proposed access track and the pumping station (Fig 2).

Deposits considered not to be significant were removed using a 180º wheeled excavator, employing a toothless bucket and under archaeological supervision. Subsequent excavation was undertaken by hand. Clean surfaces were inspected and selected deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature. Deposits were recorded according to standard WA practice (CAS 1995).

On completion of the evaluation, reinstatement was undertaken by replacing the excavated material.

Excavation and watching brief

The excavation area (centred on NGR SO 84770 49060) comprised the northernmost portion of the proposed access road, 55m long by 3m wide, amounting to just over 165m² in area (Fig 5).

Deposits considered not to be significant were removed using a 360º tracked excavator, employing a toothless bucket and under archaeological supervision. Subsequent excavation was undertaken by hand. Clean surfaces were inspected and deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature. Deposits were recorded according to standard WA practice (CAS 1995).

Features were sampled as follows:

- All deposits were fully or partially excavated to determine their nature and to retrieve any artefactual remains and environmental samples to an approximate maximum depth of 0.60m below the then ground surface.

- All grave cuts and human remains within 0.60m depth of the then ground surface were fully excavated, except where they extended beyond the limits of the excavation area.

- The percentage of gullies and ditches excavated was between 10% and 20% dependant on artefactual evidence recovered.

- Layers were fully excavated down to the maximum depth of 0.60m.

On completion of the excavation a permeable membrane was laid upon the exposed surface to define the limit of the excavation area. Reinstatement was then undertaken by simple replacement of the excavated material.

A watching brief was undertaken of those areas of the groundworks which were considered to have the potential to reveal significant archaeological remains, notably the strip for the access road between the terrace plateau down to the Hatfield Brook and the substation footings adjacent (Trenches 6-8; Fig 2).

Topographic Survey

A topographical survey was undertaken after completion of the flood scheme groundworks to record visible earthworks present to the west and south of the current church (Fig 3).This was undertaken using a Leica Viva Smart Rover CS10 controller and GS08 receiver unit that produced a sub 20mm accuracy on all points taken. The results were interpreted in relation to the Environment Agency LiDAR data (dated 11 January 2006) and the 1st edition Ordnance Survey map of 1884-6 (Fig 4). It should be noted that the ground cover comprised rough long grass at the time of the survey, which would have impeded visibility of lesser topographic features.

Structural analysis

All fieldwork records were checked and cross-referenced. Analysis was effected through a combination of structural, artefactual and ecofactual evidence, allied to the information derived from other sources.

to previous view

Artefact methodology
by Laura Griffin

Artefact recovery policy

The artefact recovery policy conformed to standard WA practice (CAS 1995; appendix 2).

Method of analysis

All hand-retrieved finds were examined. They were identified, quantified and dated to period. A *terminus post quem* (tpq) date was produced for each stratified context. The date was used for determining the broad date of phases defined for the site. All information was recorded on a pro forma Microsoft Access 2007 database.

The pottery was examined under x20 magnification and referenced as appropriate by fabric type and form according to the fabric reference series maintained by WA (Hurst and Rees 1992 and www.worcestershireceramics.org).

Discard policy

The following categories/types of material will be discarded after a period of 6 months following the submission of this report, unless there is a specific request to retain them (and subject to the collection policy of the relevant depository):

- where unstratified
- modern pottery, and;
- generally where material has been assessed as having no obvious grounds for retention.

to previous view

Osteological Assessment methodology
by Gaynor Western

Methods and Process: The Articulated Assemblage

The skeletal material was analysed according to the standards laid out in the guidelines recommended by the British Association of Biological Anthropologists and Osteologists (BABAO) in conjunction with the IfA (Brickley and McKinley 2004) as well as by English Heritage (2002).

- Recording of the material was carried out using the recognised descriptions contained in *Standards for Data Collection from Human Skeletal Remains* by Buikstra and Ubelaker (1994). Full recording forms are supplied separately to be archived with any other archaeological recording forms. All skeletal data has been recorded using an MS-Access database(s).

- The material was analysed macroscopically and where necessary with the aid of a magnifying glass for identification purposes. Where relevant, digital photographs have been used for illustration and a full digital image archive of all pathologies and any other features of interest has been created.

- The material was analysed without prior knowledge of associated artefacts so that the assessment remained as objective as possible.

- Comparison of the results was made with published osteological data from contemporary skeletal populations. Data was compared to overall prevalence rate averages from early medieval sites as reported in Roberts and Cox (2003). Particular attention was given to comparison of St Mary's with late Saxon sites similarly associated with monastic and ecclesiastical foundations:

- *Jarrow, County Durham.* Part of a twin-foundation monastery with Monkwearmouth, founded by Benedict Biscop, and the home of Bede. Excavation south of the church revealed a Saxon burial ground consisting of 170 individuals (Anderson *et al* 2006)

- *Monkwearmouth, County Durham.* Excavation south of the church revealed an extensive burial ground (327 individuals) of three phases. The earliest were earlier than or contemporary with the Saxon monastic buildings, the latest were earlier than the full post-Conquest occupation of the site (Anderson *et al* 2006).

- *The Chapter House, Worcester cathedral.* A late Saxon assemblage thought to date to 600-*c* 1100 AD consisting of 186 individuals. There would have been a close relationship between St Mary's and Worcester cathedral in both ecclesiastical administration and economic trade. Only a cursory assessment of the skeletal assemblage had been undertaken at the time of this report (Waldron 2011).

- *North Elmham Park, Norfolk.* In the late Saxon period, North Elmham was the principal seat of the Bishops of East Anglia and the centre of a great episcopal estate. Excavations have revealed evidence for an earlier timber structure,

to previous view

probably the Anglo-Saxon cathedral, which went out of use when the seat of the Bishop was transferred to Thetford in 1071. The skeletal assemblage consists of 206 individuals (Wells and Cayton 1980).

Reasons for the Analysis

Osteological analysis was carried out to ascertain:

- Condition of Bone present
- Completeness of Inhumated Individuals
- Inventory of the skeletal material
- Sex determination
- Age Assessment
- Non-metric Traits
- Stature
- Skeletal Pathology
- Dental Pathology

Methods and Process:
The Disarticulated Assemblage

The disarticulated assemblage was analysed macroscopically and recorded using a Microsoft Access database. Each element recorded was given a unique identification number and recorded by context. In each instance the identification, side and portion of the bone was noted, along with completeness, taphonomy and observable joint surfaces. Any metrics that would provide an estimation of sex or of stature were taken where possible. The pelvic or skull bones were also analysed for sexually dimorphic traits where preservation allowed, using the criteria set out by Buikstra and Ubelaker (1994). Age determination was carried out using epiphyseal fusion, analysis of the public symphysis and of the auricular surface, where appropriate, and classified according to Brookes and Suchey (1990) and Lovejoy *et al* (1985). Grading of dental attrition was also used as a supplementary age assessment technique using the Miles method (1963) where dentition sets were complete enough to allow fair observation. Age of sub-adults was assessed using both dental development (Smith 1991) and eruption (Ubelaker 1989) as well as long bone lengths (Schaefer *et al* 2009) and epiphyseal fusion (Scheuer and Black 2004). The same methods of assessment were applied to the disarticulated as to the articulated assemblage so that fair comparisons could be made between the two samples.

The minimum number of individuals (MNI) represented by the assemblage was calculated according to the number of repeated elements or parts of elements in tandem with observations of age at death according to development.

to previous view

Isotope analysis methodology
by Andrew Millard

Isotope analyses of human and animal remains were undertaken to address questions about the diet and mobility of the people buried at the site.

The presence of a Minster and the Bishop's residence, at which at least one bishop died and others entertained kings (VCH III, 430-437), together with the proximity of a crossing or loading place on the Severn at Clevelode (Hooke 2007) suggests that Kempsey was an important site for trade and convening meetings in the past. Questions to be addressed by the isotopic investigation include:

- Did Kempsey attract people to the settlement from a wider surrounding area? Or was the ecclesiastical economic infrastructure imposed on the local community?
- Is there any evidence that burial was restricted to local individuals at this time?
- What was the relationship between the Bishop's residence and the local settlement? How is this reflected in the bioarchaeological record?
- To what extent the local population were cultivating their own agrarian foodstuffs, exploiting local riverine resources or, indeed, importing marine foods?

Principles

Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) isotope ratios are informative about the diet of past people. In a British context they allow us to distinguish between marine and terrestrial food sources, and within terrestrial food sources sometimes to distinguish diets with protein mainly derived from meat or freshwater fish from those where protein derives from plants (Lee-Thorp 2008).

People who are born and grow up in a particular geographical region have specific combination of stable isotopes preserved in the enamel of their teeth (Budd *et al* 2004). Unlike minerals in bone, these values do not change during the lifetime of the individual. Isotope ratios of oxygen are particularly useful in this kind of geographic study. The oxygen isotopes composition of teeth reflects drinking water, which is usually mostly derived from local rain water, whose composition varies systematically with climate, so that drinking water maps have been devised for Britain and Europe. Some teeth form during the period when a child is likely to still be suckling at the breast, and suckling is known to elevate $\delta^{18}O$ values (Wright and Schwarcz 1998) from what they would be if the child shared the mother's diet. This can complicate the interpretation of the isotope values, and so where possible such teeth are avoided for sampling.

Materials

For oxygen isotope analysis 23 teeth from 12 human individuals were sampled, consisting of a second premolar or second molar and a third molar, along with 6 samples from animal remains. For dietary isotopes, 15 samples from human individuals and 6 samples of animal bone were taken.

to previous view

Methods

Carbon and nitrogen isotope analysis

Samples of bone between 100 and 250 mg were taken, and processed following a modified Longin (1971) method. Samples were demineralised in 0.5M HCl for several days in a refrigerator, with a change of acid every other day. The resulting insoluble collagen was solubilised by gelatinisation at pH 3 and 75°C overnight. The purified gelatin was lyophilised and aliquots of 0.30-0.35 mg weighed into tin capsules and sealed. Duplicate stable isotope measurements were performed using a ThermoScientific Delta V Advantage isotope-ratio mass-spectrometer in the Department of Earth Sciences, Durham University.

Measurements on standard materials (IAEA 600, IAEA N1, IAEA N2, USGS 24, USGS 40, and ANU sucrose) in the same batch as the samples yielded standard deviations of <0.10 ‰ for $\delta^{13}C$, and $\delta^{15}N$. The technical error of measurement from the duplicate samples was 0.57 ‰ for $\delta^{13}C$, 0.13 ‰ for $\delta^{15}N$ and 0.02 on the C:N ratio.

Oxygen isotope analysis

Each tooth was sectioned using a flexible diamond impregnated cutting disc, and enamel and dentine separated for separate chemical processing. Where there was sufficient material, only half of the tooth was used. The crown and cut surfaces of the enamel were abraded from the surface to a depth of ~100μm using a tungsten carbide dental burr and the removed material discarded. Any adhering dentine was then removed using the burr and the resulting core enamel isolated for oxygen isotope analysis.

Samples were prepared for isotope analysis using a slightly modified version of the method of Dettmann *et al* (2001). The sample was dissolved in 2M HF and HNO_3, thus precipitating calcium as CaF_2. The solution was diluted and KOH added to bring it near to neutral pH, and the solution centrifuged. NH_3OH was added to adjust the pH and 2M $AgNO_3$ was added to precipitate the phosphate as fine-grained silver phosphate (Ag_3PO_4). The sample was centrifuged, decanted, and rinsed, repeatedly until no silver ions remained in the supernatant.

Measurements on the resulting yellow-brown precipitate were conducted in the Laboratoire de Géologie de Lyon, CNRS-UMR 5276 Université Claude Bernard Lyon following the methods of Fourel *et al* (2011). Replicates of NBS120c prepared with the samples yielded a $\delta^{18}O$ value of 22.19±0.63 ‰ (1σ, n=3), and on NBS120c prepared in the Lyon laboratory by the method of Lécuyer *et al* (1993) gave a value of 21.77±0.37 ‰ (1σ, n=11) which are both within error of the accepted value of 21.7 ‰ (summarized in Chenery *et al* 2010). The technical error of measurement calculated from duplicate measurements on samples prepared in Durham was 0.27 ‰. Drinking water values ($\delta^{18}O_{DW}$) were derived from phosphate ($\delta^{18}O_P$) values using the calibrations of equation 6 of Daux *et al* (2008) for humans, equation 5 of Longinelli (1984) for pigs, equation 3 of D'Angela and Longinelli (1990) for cows and equation 1 of Delgado Huertas *et al* (1995) for sheep and goats.

go to contents

to previous view

Environmental archaeology methodology
by Alan Clapham

Sampling policy

The environmental sampling strategy conformed to standard WA practice (CAS 1995, appendix 4). Large animal bone was hand-collected during excavation. Twenty-seven samples of up to 40 litres were taken from 20 contexts from grave fills and later linear features (Vaughan and Webster 2012, 10, table 11).

Method of analysis

Animal bone

Animal bone was hand-picked from the features and then washed, dried, bagged and labelled. The animal bone was then weighed and the different elements noted.

Macrofossil analysis

A single sample from primary fill (8109) of an east to west aligned linear feature was fully analysed for charred plant remains.

The sample was processed using the standard WA flotation techniques. The flots were dried and sent to the author for analysis. The coarse fraction of the residue was sorted and the finer fractions (those less than 4mm) were sent to the author in order for the charred plant remains and other biological material to be extracted. The results of which can be seen in Table 1.

The flots were sorted using a low-powered stereomicroscope (x8-x56 magnification). The plant remains were identified using the author's own modern reference collection and (Cappers *et al* 2006). Nomenclature of the wild plant taxa follows that of Stace (2010). The results are shown in Table 17.

Radiocarbon dating methodology
by Nicholas Daffern and Suzi Richer

Five samples were submitted for Accelerator Mass Spectrometry (AMS) dating to Beta Analytic Ltd radiocarbon dating laboratory and the Scottish Universities Environmental Research Centre (SUERC) radiocarbon dating laboratory.

Four samples were of human skeletal remains taken from individuals excavated during the initial evaluation (Trench 1), from Skeletons 1004 (Beta-303445), 1005 (Beta-303446), 1007 (Beta-303447) and 1008 (Beta-303448).

The final sample (SUERC-42606 (GU28518)), a charred *Triticum* sp grain, was taken from context 8102, the probable primary fill of the roughly north to south aligned ditch [8103] which truncated many of the inhumations encountered and the general burial soil.

No sources of contamination or non-contemporaneous carbon were evident during the fieldwork or during the sub-sampling.

All calibrated dates are identifiable by the prefix ‘Cal’. Where calibrated date ranges are cited in the text, these are identified with the appropriate degree of confidence (68% or 95%).

Statement of confidence in the methods and results

The methods adopted allow a high degree of confidence that the aims of the project have been achieved.

to previous view

The application site

Topography, geology and archaeological context

The village of Kempsey is situated 5.5km south of the city of Worcester on a gravel terrace that overlooks the floodplain north-east of a bend in the River Severn (Fig 1).

The main area of investigations lay within the large field to the south and west of St Mary's Churchyard on the south-west edge of the village (Figs 1 and 2) where the ground steps down to the south and west across a series of landscaped terraces to the floodplain of the River Severn and the confluence with the Hatfield Brook (Fig 3). It extended southwards across the Hatfield Brook into the adjacent field on the floodplain.

The main excavation area lay on the upper terrace, at approximately 16.20m AOD (Above Ordnance Datum). It was 3m wide by 55m in length (an area of approximately 165m^2), aligned north-north-east to south-south-west, adjacent and parallel to the current western boundary of St Mary's Churchyard (Fig 2).

The soils are typical brown earths of the Hall and Wick series. Brown earths of this subgroup (541) are permeable, well-drained, non-calcareous loams or clays (Beard *et al* 1986; Ragg *et al* 1984; Soil Survey of England and Wales 1983). The underlying geology consists of Pleistocene and recent drift deposits of glacial origin forming the third terrace of the River Severn, overlying Upper/Middle Triassic Mercia Mudstone (formerly Keuper Marl; BGS 1976 and 1990).

The name Kempsey has been recorded in various forms over time: as *Kemsei* in 799, *Cymesig* in 977, *Kymesei, Chemeshege, Kemesige, Chemesege, Camesi* and *Cameseia* in the 11th century, *Kemeseia* and *Kemeseye* in the 13th century and *Kemsey* in 1615 (Mawer and Stenton 1927, 144). The current spelling appears to have been in common usage by the time of the tithe plan of 1840.

The archaeological background is derived from the HER, the desk-based assessment (Appleton-Fox 1998) and watching brief reports (Lee 2007 and 2011).

The 1954 investigations

In May 1954 members of Worcestershire Archaeological Society (WAS) and the Piers Plowman Club, Malvern, excavated a trench within the same field as the present excavation area. The trench lay 104' (31.70m) south of the gate into the field; 5'6" out from the churchyard boundary; and was 56' (17.07m) long. Although it '… extended towards the river…' (Webster 1955, 13) the exact orientation is unclear; it may have been at right-angles to the churchyard (i.e. north-west to south-east), parallel to the field boundary to the north (i.e. west-north-west to east-south-east), or even due west.

Within the trench a '…well-rammed gravel bank…' was revealed where there was a '…distinct change of level…'(*ibid*.) in the ground, 32' (9.75m) out from the present churchyard boundary. On its west side the bank had a vertical face, 9' (2.74m) deep to the natural. It was '…of very solid construction and layered horizontally' (*ibid*.), which is indicative of deliberate construction. The natural was 4' (1.22m) deep at the east end of the trench. The existing flat terrace was clearly therefore man made, at least at this point.

No dating evidence was apparently found in association with the bank. All pottery recovered was unstratified, including ‘some interesting fragments of medieval pottery from the upper levels and considerable quantities of roof tile. Some half-dozen pieces of Roman pottery… of 2nd century date or later.’ (*ibid*.).

Two inhumation burials were revealed at the west end of the trench, 61’ 6” (18.75m) west of the modern churchyard boundary. They were considered by the Vicar to ‘…have been victims of the Battle of Worcester, since skeletal remains are very extensive at the west end of the church’ (Webster 1955, 13). There was apparently no associated dating evidence, so the Vicar’s assertion must be considered as conjecture.

Prehistoric

There is evidence of activity in the vicinity from at least the Bronze Age. A late Neolithic/Early Bronze Age handled beaker (WSM 02119) was recovered from a gravel pit in the 1930s and further Bronze Age pottery (WSM 10421) was noted from unstratified contexts during the widening of the M5 motorway, 1.5km to the west. In addition thirty-one cropmarks have been noted around the village that are thought to be prehistoric in date and three are located in the fields to the south of the Hatfield Brook (WSM 02109, 02111 and 02112). There are also three round barrows to the north-east of the village.

An Iron Age promontory fort (WSM 02113) is conjectured to partially lie within the development area. It has been argued that it used the natural slope of the gravel terrace on three sides with an additional ditch and bank constructed to complete the ‘defensive’ circuit to the north-east, adjacent to Court Meadow. Some of the cropmarks noted above are thought to be of Iron Age origin, related to field systems and settlement sites, although until excavation of these features can be undertaken this remains unconfirmed.

Romano-British

Little Romano-British activity is recorded from around the village, although the Roman road between the towns of *Vertis* (Worcester) and *Glevum* (Gloucester) runs north to south to the east (WSM 30539). Pottery has been recorded to the north of the church in Lyf’s Lane (WSM 02125); a milestone inscribed with the name of the Emperor Constantine (306-337) and tiles have been built into an early 20th century wall adjacent (WSM 02121). Further afield pottery was noted during the widening of the M5 motorway 1.5km to the east of the village (WSM 10422).

AEE Jones has suggested that ‘…a Roman camp of great antiquity…’ occupied the terraced area around the church (Jones 1958, 26-28), which was excavated by the boys of King’s School, Worcester, in the summer term of 1954. He describes how they recovered pottery, coins, parts of a Roman flue and a large flagstone bearing a Latin inscription (possibly the same as WSM 02121 above). However it would appear that the author has mistaken and combined a number of different sites that lie within the current development (see below) and apparently to the north-east, on the opposite side of the church, which is described in an article by Brown (1954). The 1954 excavation appears to be that reported by Webster (1955), as described above. The description of the location and date of the excavations matches that described by Jones and Brown although the results are somewhat less impressive. There is no indication that the gravel bank revealed related to a Roman camp as no dating evidence was found in association. The only mention of Romano-British material is of ‘Some half-dozen pieces of Roman pottery…' from later deposits (Webster 1955, 13). Jones' discussion of an apparently rich Romano-British cemetery to the north-east of the church is unsubstantiated by any other authorities and there is no reference within the HER, so its existence must remain questionable (Jones 1958, 26-28).

Late Saxon

Kempsey contained a Minister church during the Anglo-Saxon period (WSM 02123). It would have been an important ecclesiastic centre performing or supporting pastoral work for the surrounding *Parochiae* (variously meaning a large parish or bishop's diocese; Blair 1988, 1) of Kempsey, Norton-juxta-Kempsey and Stoulton, receiving all burials from these parishes until individual chapels were constructed from around the 12th century. Originally founded as an Anglo-Saxon family monastery, the Bishop of Worcester obtained its lands before the end of the 8th century (Bassett 1989, 235).

A charter of 799 indicates that King Coenwulf (796-821) granted 30 manses of the *'monasterium'* at Kempsey to Abbot Balthun of Kempsey. This was followed by the granting of all the monasteries and minsters of Worcestershire to the priests of Worcester in 814. Kempsey Minster failed during the early 9th century and the church of Worcester obtained its endowment (Bassett 1989, 238). It was then given to Bishop Denebehrt (798-822; also recorded as Denebeorht), and then passed to his successors Bishops Eadbehrt (also recorded as Heahbeorht or Heahberht) and Aelhun (also recorded as Alchun and Ealhhun). Bishop Aelhun gave the manor back to the monks of Worcester in 844 in a 'show of piety', although this was returned to him in 847 (VCH III, 431). Bishop Aelhun is also recorded as having consecrated a chapel dedicated to St Andrew at Kempsey, although the exact location is unknown (WSM 02123; Bond 1988, 123, fig 25: 84 and 85).

The earliest reference to a Bishop's 'Palace' is in 868, when a domestic oratory (a private family chapel attached to a manor house) is said to have been built there (Bond 1988, 138). This may be the same as the chapel to St Andrew mentioned above. The exact date of the earliest manor house is unknown, although it thought to have been built in the 9th century and it was here that Bishop Leofric is recorded to have died in 1033 (VCH III, 431; WSM 07192). The 'Site of Bishop's Palace' is recorded on the 1st edition Ordnance Survey map of 1884-6 to the west of St Mary's church (NGR SO 84751 49068), although the exact location remains unknown. The description of the Bishop's manor house as a 'Palace' appears to be a misnomer (Bond 1988, 138). It has possibly derived from a house in the village which was known as 'the Palace' and identified in the Victoria County History as the location of the Bishop's manor house (VCH III, 431). The exact location of this house is not recorded on the tithe plan of 1840 or the 1st edition Ordnance Survey, and it no longer exists.

It is considered likely that the church was rebuilt at around the same time as the Bishop's manor house, early in the 9th century, although at present there is no evidence for this (Wichbold 1996, 3). The oldest surviving fabric in the current St Mary's Church is Norman (11th to 12th centuries) and indicates it to have been quite a large building by *c* 1200 (Brooks and Pevsner 2007, 390-1; Bond 1988, 141). Although no earlier structures have been identified, there has only been very limited archaeological investigation within the churchyard to date (WSM 29693; Wichbold 1996). It should be noted that the church is orientated west-north-west to east-south-east, rather than east to west.

to previous view

Medieval

In the Domesday Survey Kempsey is noted within the Oswaldslow hundred, and is described as follows:

In this hundred the bishop of this church holds Kempsey

24 hides which pay tax, of these hides 5 are waste.

In the lordship 2 ploughs.

15 villagers and 27 smallholders with 16 ploughs

a priest, 4 male and 2 female slaves.

Meadow, 40 acres, woodland 1 league long and half league wide.

In lordship 13 hides

Value before 1066 £16, now £8. (Thorn and Thorn 1982)

The mention of only one priest is unexpected, given that many minsters had more than one priest to attend to their large *Parochiae* (Blair 1988, 2), although this may be due to the failure of the Minster in the early 9th century (pers comm Robin Whittaker).

Henry II (1154-1189) held court in Kempsey and it is probable that this was at the Bishop's manor house. During this time he issued a charter concerning Inkberrow that was witnessed by the Archbishop of Canterbury, three other bishops and several nobles (Appleton-Fox 1998, 2).

King John's (1199-1216) advisor John de Marisco became the rector of Kempsey in 1212, after which he became the Lord Chancellor in 1214 and the Bishop of Durham in 1217 (*ibid*.).

In 1255 Henry III (1216-1272) permitted the bishop of Worcester 'free warren' in his manor providing that it did not lie within the King's forest. On the eve of the Battle of Evesham in 1265 Henry III was brought to the Bishop's manor house as a prisoner of Simon de Montfort where he spent the night. Edward I (1272-1307) was a frequent visitor to Kempsey and guest of Bishop Giffard. In 1288 Bishop Giffard made the church at Kempsey a prebendal church of the college of Westbury, near Bristol, and this link was strengthened further when the Bishop John Carpenter gave the college control of the living in Kempsey in 1473. In 1316 a chantry of one chaplain was founded in the church by John de Kemesey, who was treasurer of Hereford cathedral during the reign of Edward II (1307-1327; VCH III, 436).

Post-medieval

With the dissolution of the monasteries in 1538 during the Reformation instituted by Henry VIII (1509-1547), the rectory of Kempsey fell to the crown and was given to Sir Ralph Sadler, although in 1547 this was restored to the Dean and Chapter of Worcester Cathedral (Appleton- Fox 1998, 3). It is thought that the Bishop's manor house was demolished by 1695 (WSM 07192: 'Kempsey Book', Worcester Cathedral Library), but could have occurred at any point after the Reformation.

go to contents

During the English Civil Wars (1642-1651) Kempsey was a Parliamentarian stronghold. During the Siege of Worcester in the summer of 1646 towards the end of the First English Civil War, Kempsey was a strategic base controlling access to the south. It was the scene of an intense skirmish in early July when Royalist forces from Worcester unsuccessfully attempted to capture the Parliamentarian Colonel Betsworth, who was based in the village (Atkin 1995, 113). Shrapnel and musket ball scars from this skirmish can still be seen on the walls of St Mary's Church, particularly on the south wall of the tower.

Modern

St Mary's remained an important church until the 19th century when the previously subordinate parishes of Norton-juxta-Kempsey and Stoulton were separated off (Bassett 1989, 235).

The earliest large scale map of the development area is the tithe plan of 1840 (WRO BA 248 s269/84). It depicts two small buildings on the south side of Lane's End, a small enclosed field or paddock at its south-east end, the surrounding field boundaries in their present locations and the outline of the churchyard. At this time the churchyard extended westwards from the church to the same distance as it is at present. However it only extended southwards approximately half the distance, to the present north-west to south-east path. The majority of the fields along the east bank of the River Severn are recorded as meadows. Although that to the immediate south-east of the church is not identified it is conjectured to have been put to meadow or pasture. The 1st edition Ordnance Survey map (scale 25":1 mile) of 1884-6 also shows the smaller churchyard boundary (populated with trees and with a break of slope on the southern border), the north to south footpath across the field, the irregular course of the Hatfield Brook and the break of slope of the triangular terrace conjectured to be an Iron Age or Romano-British promontory fort as discussed above (WSM 02113).

The Ordnance Survey map (scale 25":1 mile) of 1904 indicates that the graveyard had been extended to its present area by this time. The north-west to south-east aligned break of slope at the former southern boundary is shown as more pronounced, although this may only be as the tree cover is no longer depicted.

Osteological Context
by Gaynor Western

Health, Disease and Medical Treatment in the Anglo-Saxon Period

Numerous approaches to the treatment of medical conditions were taken by Anglo-Saxons. The perceived aetiology of some diseases was complex, involving both the biological and psychosocial aspects of conditions. In addition, several historical traditions of medical practice underpin Anglo-Saxon methods of treatment. Bald's Leechbook contains chapters categorised by the main methods employed, namely the use of prescribed drugs, bloodletting, surgery and gynaecology and obstetrics (Cameron 1993). Unfortunately, this latter chapter is incomplete. Of course, a number of surgical procedures involve the use of salves and medicaments and it was the use of medication that was by far the most commonly employed method taken in the curing of illness, as it is today.

Unfortunately, many of the plants used by Anglo-Saxons and described in Bald's Leechbook cannot be accurately identified and it is, therefore, difficult to quantify how effective some of these treatments were. However, some of the other plants that can be identified are clearly of high therapeutic value and the way in which certain medicines were being prescribed demonstrates that through empirical knowledge the Anglo-Saxon physician potentially had access to a valuable pharmacopeia. For example, plantain is commonly referred to for use in the treatment of wounds and skin conditions (Cameron 1993). Plantain is now known to contain aucubin and emulsion, which together form an antibiotic capable of acting against *staphylococci* and *streptococci,* two bacteria most commonly causing acute infections (Roberts and Manchester 1997) as well as *cloistridia*, which causes tetanus; furthermore 1ml of 2% aqueous solution of aucubin in the presence of emulsion has the same effect as 600 I.U. of penicillin against the *Staphylococcus aureus* bacteria (Cameron 1993). Such studies are increasingly demonstrating the potential effectiveness of ancient herbal remedies.

This is not to say, however, that all treatments were successful or that medicines were used purely for their pharmacological qualities. Medicines comprised of not only plants but also animal products including blood, urine and faeces (Cameron 1993; Meaney 1992). It is also known that the understanding of the body as a microcosm of the social and physical surrounding environment led to the use of incantations, amulets and 'magic' in treatments and indeed, invocations were frequently recited to herbs prior to their medical applications (Cameron 1993). Some treatments required the patient to wear an amulet (which could be an everyday object such as a spindle whorl that had been immersed in some potent concoction) but also for the patient to take certain herbal infusions at the same time. Thus, the Anglo-Saxon approach rested on the use of not only the practical application of drugs and salves, empirically observed as being therapeutic, but also in some treatments was intertwined with more ritualistic behaviour of invoking perceived 'magical' powers of these medicines or warding off external threats. Until the recent discoveries of the chemical constituents of herbs and plants such as plantain and lichen, the instructions for the use of some of these medicines had been misunderstood and misconstrued as irrational and bizarre by some authors. Although several treatments described still appear to have no rational grounds, it is clear that others were undoubtedly as beneficial as some medicines available today.

Treatment with drugs, as with the initial attempts of diagnosis of a disease, was carried out taking the underlying physical constitution of the individual into account, including reference to age and sex:

> *And always observe when you are applying powerful medicines, what the strength is and what the body of the patient is like; whether it is strong and hardy and may bear strong medicines easily or whether it is delicate and tender and thin and may not bear these medicines. Apply the medicines according to how you see the bodies, for there is a great difference between a man's and a woman's and a child's bodies and in the constitution of a daily labourer and of the idle, the old and the young and of one used to suffering and of one unused to such things. Also pale bodies are softer and weaker than the dark and red.* (Cameron 1993, 170; Cockayne II, 85, after Crawford 1999, 98)

Though probably receiving the same medicines as adults, it was clearly intended that the dosage should be modified for sub-adults. The leechbook specifies treatments for sub-adult conditions such as 'matter in the neck', children's worms, 'water sickness' and 'scabby head', as well as for teething, children's tapeworm and constipation (Crawford 1999, 98). Interestingly, the leechbook also advises on diet for children:

to previous view

About children's stomachs, and overfilling them and if they do not digest their food properly and if they sweat and stink. When this is diagnosed, then they will be offered a variety of foods rather than one kind, so that the novelty of food may be good for them. (Cockayne II, 241, after Crawford 1999, 98)

Besides treatments with drugs, both minor and major surgical procedures are described in Bald's Leechbook. These include bloodletting and cupping in order to redress the balance of humours in the body. Bloodletting or phlebotomy was practiced with the aim of removing bad blood carrying 'factors of disease' though the body. Cameron (1993) observes that many of the conditions for which bloodletting is suggested are in actual fact amongst those which cause abnormal clotting of the blood. It was certainly not seen as a panacea and specific conditions were attached to its practice with regards to timing of bloodletting, such as the seasons and phases of the moon, as well as the concomitant treatment of the patient to ensure their wellbeing and adequate preparation for the procedure (Cameron 1993). Cupping was practiced with the same motive as bloodletting but was restricted to a specific location in the body, one that was usually inflamed, for example, in order to draw out localised infection.

Only a handful of surgical procedures are mentioned in Bald's Leechbook and peculiarly none describe the act of trephination, which is the one of the most commonly observed evidence of surgical intervention in human remains in the period (Roberts and Cox 2003). This may in part be due to the aims of the Leechbook, the author perhaps intending the text to be read by medical practitioners who did not regularly carry out surgery. The three operations Bald describes are cosmetic surgery of hare-lip, amputation of limbs and removal of pus from the pleural cavity (Cameron 1993). The evidence of surgical intervention observed in human remains is, therefore, paramount to creating a more informed perspective on medical treatments and it is clear that documentary evidence should be used in conjunction with palaeopathological analyses in order to achieve this.

Many conditions, particularly mental illnesses and congenital diseases, could not be treated physically or physiologically and help was often sought by way of pilgrimage to places of worship to visit saints, shrines and monks. Some children with disabilities and diseases that were incurable at the time, such as 'pestilence', 'distemper', 'ague' and 'paralysis' are recorded as living at monasteries and nunneries under the care of the resident orders (Crawford 1999, 39). Pilgrimages for adults were also commonplace in the hope that the miraculous healing powers of God for the sick could be imbued through touching relics and shrines, and praying to incumbent saints (Binski 1996, 12). During the later Anglo-Saxon periods, the physical body in Christian doctrine was the seat of the soul and an outward sign of its state. In this context, seeking medical aid from monks was a natural step, who were perceived as 'guardians of spiritual and ritual health' (Binski 1996, 27).

Burial Practices

Funerary rituals during the mid-late Saxon period would have been varied and complex due to this period seeing the re-introduction of the Christian religion into the country. The archaeological evidence for the period suggests that burial sites and graves show diversity according to the varying nature of the conversion process to Christianity and localised adoption of the new religious practices. In contrast to the early Saxon period, characterised by migrating occupation, recent syntheses of archaeological data from sites so far excavated suggest that several contemporary shifts in socio-economic and political developments co-occurred with the wide-spread introduction of the new faith in the after during the latter half of

go to contents

the 8th century (Rippon 2010, 47; Hadley 2010, 103). The period saw the formation of more stable socio-political infrastructure including the establishment of new administrative units, nucleated settlements, trading centres and religious foundations, with investment in large-scale landscape management systems (including mills, leats, strongholds, bridges, etc.) under the control of wealthy patrons of royal or religious houses. The establishment of the community parish was, therefore, intimately bound up with the foundation of manorial estates of the laity and the Minster church; 'even the ordinary parochial burial thus exemplified quite basic relations of territory and so power' (Binski 1996, 56). It is clear, then, that interpretations of cemeteries and burials during the mid-late Saxon period must be holistic, reflecting the mosaic of local socio-economic and political contexts within the broader, regional developments. Nonetheless, as Binski (1996, 51) points out, a theoretical shift towards displacing religion from being a 'primary motivation of social expectations' is unhelpful, as religion and society are inextricably linked and 'Christianity's great strength was that it could assimilate and re-articulate ideas, which were both religious and social', as is made testament to by the fact that what are essentially Christian rites have come to dominate funerary practice in England for the past 1200 years. It is, however, important to recognise the diversity of practices in the early Christian faith that manifest themselves in the archaeological record in the face of a possible assumption that the rites of one religious body and the processes of conversion were uniform.

From archaeological excavations, we can now demonstrate that there was continuation of some earlier burial grounds into the middle Saxon period whereas other cemeteries ceased to function. Some cemeteries are located near churches and other sites reveal no evidence for church construction (Hoggett 2010, 206; Buckberry 2010, 3), though it is still possible that these unaccompanied cemeteries were under episcopal administration. Minsters of the 8th and 9th centuries were composed of dispersed elements, such as multiple churches, and cemeteries may have been included in these scattered assets (Cherryson 2010, 62). In some areas, there was a co-existence of 'pagan' burial grounds, indicated by burials accompanied by grave goods, and 'churchyard' cemeteries. In the conversion to Christianity in East Anglia from 630 AD, Hogget (2010, 206) suggests that sites for Christian burials were deliberately located in isolation to the existing, pagan cemeteries and the re-use of Roman sites is noted. Some settlements founded during this time were short-lived and the churches founded therein became separated from later, more successful Saxon villages (Rippon 2010; Hadley and Buckberry 2005, 125-6); the church, in these cases, was not the determining factor in the establishment or continuation of settlement and the success of the church was dependent on the thriving of the community according to other aspects of life. This includes the siting of churches on low hills, promontories or islands in marshy floodplains, where, whilst 'being topographically separate from the surrounding landscape', they were, 'fully integrated into riverine communication routes, ideally suited to those seeking to combine a traditional life of monastic devotion with the pro-active conversion of the surrounding population' (Hoggett 2010, 201). It is also not uncommon for churches, however, to be constructed on the same site as pre-existing burial grounds (Cherryson 2010, 61, Buckberry 2010, 8).

Only from the 10th century are cemeteries consistently located next to churches as churchyards (Buckberry 2010, 11). Possession of burial rites was paramount to the status of a church and at this time, burial of the dead normally took place in the place of birth of the individual, whereupon a 'soul-tax' was due to the church (though 'soul-tax' could also be demanded for parishioners upon death even if they were buried elsewhere) (Binski 1996, 56; Hadley and Buckberry 2005, 122). The form of the burial, however, was not prescribed. The early church, though having no apparent desire to dictate the manner of burial (Buckberry 2010, 2) was keen to extinguish contemporary pagan practices and rites. The Christian church viewed pagan rites as praying to and worshipping the dead in order to appease spirits for protection according to a cyclical pattern of life-events. Christian doctrine preferred prayers for the dead so that the soul could continue along its spiritual, linear journey after death until the 'Last Things' (Binski 1996, 23-24). In this sense, for Christians, the dead were not kept as separate from the living but were integrated into a communal existence with them; prayers were offered up at Mass in church for souls as commemoration. 'Christianity acted slowly, in effect, to de-marginalise the dead' (Binski 1996, 11) and it is through this effect that the dead increasingly are interred in burial grounds within the community during the Anglo-Saxon period. Later on, Mass rituals specifically for the dead, unsuited to open cemeteries, were performed at the altars of the accompanying churches.

Burial in churchyards in the very early periods has been shown to a 'minority rite' in some places (Cherryson 2010, 55). Who was buried in churchyards, how and where, are questions that the archaeological evidence is best poised to answer due to a lack of historical evidence at this time. It is suggested that an elite minority may have first selected church and churchyard burial as a means of expressing their status (Cherryson 2010, 54). Over time the practice became increasingly desirable to the lay people, with a growing concern of receiving a proper burial, a concept existing from the time of Bede, in consecrated ground (Binski 1996, 56). During the 13th century, the Bishop of Mende stated that the dead were to be buried with their heads to the west and the feet to the east so that all people, 'regardless of station', were facing the right direction at the 'Last Things' (Binski 1996, 56), though it is clear from the archaeological evidence that east to west grave orientation was a well-established practice within churchyards well before this date. St Augustus, in a similar vein, preached that elaborate funeral rituals and tombs were redundant in the Christian faith (Binski 1996, 26). Elitism, however, was certainly a factor in the type and nature of interment and more elaborate burials have been observed to occur in higher frequencies in high status, urban minsters, including St Oswald's Gloucester, Durham and York (Holloway 2010, 86). A lack of legislation dictating the form of churchyard burial (Hadley and Buckberry 2005, 123) allowed a certain amount of individual expression in interment rites. Variation in burial is demonstrated by the inclusion of substantial charcoal deposits, burial in wooden and lead coffins or plain earth cut graves, in addition to the inclusion of pillow stones, ordinary stones, stone linings or accompaniment with coins or personal items of adornment (see Hadley and Buckberry, 2005, for a detailed survey). Evidence for above ground markers of both stone and wood has also been revealed. Whilst elaboration in funerary rites spans all ages and sexes (Hadley and Buckberry, 2005; Holloway 2010, 88), at St Oswald's, Gloucester, males were more frequently found with elaborate coffin fittings (Hadley 2010, 104), indicating that social status was an important factor in burial treatment.

In churchyard burial, the location of the grave rather than its form appears to be the primary means of conveying prominence within the community. This is particularly apparent taking into account the bio-archaeological evidence in assessing social status. Hadley (2010, 104) notes that males were most often in prominent locations in some parish churchyards dating to the 9th, 10th and 11th centuries. Clustering of more elaborate or non-normative graves has also been identified within cemeteries (Hadley and Buckberry 2005, 144), suggesting status or kin ties. Bio-archaeological evidence also suggests that individuals of lower social status, indicated by high prevalence rates of health stress indicators, were buried in less prominent areas in the cemetery at Raunds (Craig and Buckberry 2010, 138). However, significance was not only conferred on individuals due to socio-economic status. Also of note is the clustering of infant burials within cemeteries. Although some authors suggest there is an increase of numbers of infants in mid-late Saxon burial grounds (i.e. Hadley 2010, 108-9; Crawford 1999,

88) analysis of the data from a recent survey of Anglo-Saxon cemeteries throughout the east of England from Northumbria to Kent (Gowland and Western, 2012) suggested no overall average difference in the percentage of infants present within assemblages dating to the early-mid (30%) or mid-late Anglo-Saxon periods (33.7%). What is apparent, however, is a clustering of infant burials on some sites within specific areas of the cemetery, often located close to church walls or even intra-murally (Hadley 2010, 109; Hadley and Buckberry 2005, 144-5; Crawford 1999, 88; Thompson 2004, 11). This may mirror an early practice of the Church on the continent where all but the sainted dead, otherwise the 'very special dead' (Binski 1996, 12) were buried extramurally. Souls of the freshly baptised infants were regarded as being pure (Hadley 2010, 109) and may have warranted extra care or protection from proximity to the church. Indeed, Thompson suggests that particular care was taken to the burial of infants, following Aelfric of Eynsham's (*c* 955-1010 AD) distinction of death according to age: death of the old was 'natural', the death of the young 'unripe' and the death of children 'bitter' (Thompson 2004, 0-11). In the medieval period, however, infants were believed to be in Limbo and were buried at the peripheries of churchyards (Binski 1996, 56).

Special burials were also accorded, at the other end of the social spectrum, to those who were deviant from the Christian community. The earliest law codes excluding the burial of criminals within consecrated churchyards date to the 10th century (Buckberry 2010, 13) and exclusion also extended to the unbaptised, heretics, lepers, Jews and suicides who were all buried elsewhere (Binski 1996, 56). In contrast, the archaeological evidence suggests that deviant burials are present within earlier Saxon cemeteries and churchyards. Prone burials were present at Jarrow and possibly represent a penitential rite (Hadley 2010, 108). At North Elmham cemetery, one burial was located in the boundary ditch that was found to contain an individual who had undergone sharp-force trauma, likely to have been carried out with a sword, to the head and upper body (Hadley 2010, 105). Such an individual would have exemplified that notion of a sudden and violent 'bad death' in Christian doctrine, contrasting with a 'good', tame, lingering one (Binski 1996, 47). Bio-archaeological analysis of burials similarly located in boundary ditches has shown that some of these individuals suffered from leprosy (Hadley 2010, 107). The accordance of non-normative burial rites to some of those who were physically afflicted is important. Christian doctrine emphasises the metaphorical division of the body and soul, with the body reflecting the condition of the soul. In the context of the fact that the soul continues on its spiritual journey after death, funerary rites during this period can be understood to be an extension of healing rituals undertaken in medical practice (Binski 1996, 30).

There is no evidence of what funerary rituals took place prior to interment during the mid-late Saxon period, though traditional Christian rites during the medieval period consisted of a ritual cleansing and covering in incense, ivy and laurel (Binski 1996, 56). The dead were generally laid out and wrapped in a shroud for burial. Transportation of the body was usually in a coffin, even if burial was not. The final rites at the churchyard carried out by a priest were paramount and included the marking of the burial spot with a cross and breaking the ground (Binski 1996, 56) (Fig 9). The physicality of the individual after death and burial presented a challenge to theologians, however. Purposeful exhumation could confer heresy in the medieval period yet at the same time, division of the body, particularly the removal of the heart and intestines, for multiple burial was increasingly popular amongst the aristocracy in an effort to promote widespread commemoration (Binski 1996, 57). Medieval medicine also rarely involved the opening of the body, which was a taboo. Collecting bones as relics from saintly bodies, however, was an ancient practice and bodily division for this purpose was widely acceptable, a part of the individual representing the whole (Binski 1996, 15) and the reduction of the body to its bony frame conferring perpetual existence on the dead person represented (Binski 1996, 64).

The early church under St Augustus was a proponent of his argument that Christians went on to the other world irrespective of the burial of their bodies (Binski 1996, 26). It is perhaps as a result of this belief that the excavation of late Anglo-Saxon cemeteries, though present in some dating to the mid-Anglo-Saxon period, reveal intercutting of graves and substantial quantities of disarticulated material. In the later Anglo-Saxon period, graveyards were 'sites of recycling' and exhumated elements, usually skulls and long-bones, were often stored in charnel houses (Binski 1996, 55). A 12th century example in Worcester was the chapel of the Carnarie, dedicated in honour of St Thomas the Martyr, which was built by William of Blois, Bishop of Worcester (VCH IV, 408-12). In the medieval period, burial location was defined as the place that the head itself was retained and Binski (1996, 55) argues that the perpetual existence of an actual grave was not as important as being buried in consecrated ground in the first place. The origins of this attitude and how prevalent this attitude might have been during the mid-late Anglo-Saxon period is not known but the frequent intercutting of graves observed may well be one of the many manifestations of the conversion of the populous to the communal, inclusive burial rites of a Christian community from the exclusive, individualised burial of the dead undertaken in traditional 'pagan' practices.

Current land-use

The main site was part of a wider arable field of rough grass at the time of investigation.

to previous view

Structural analysis

The Site narrative

The trenches and features recorded are shown in Figures 2-7.

Phase 1: Natural deposits

The natural geology comprised a combination of sands and gravels. It lay at an average depth of between 0.90m and 1m below the present ground level to the north of the Hatfield Brook, although it lay only 0.50m deep at the southern end of the excavation area and in Trench 2. To the south of the Brook, where Trench 5 lay within the floodplain, the natural was noted at an average depth of 0.60m below the present ground surface.

Topographically the undisturbed geology was identified at 16.06m AOD (Above Ordnance Datum) at the north end of the excavation area, and sloped gradually to 14.09m AOD at the northern end of Trench 4.

Although no *in situ* evidence for prehistoric, Iron Age or Romano-British activity was revealed during the course of the investigations, the recovery of a number of residual Romano-British artefacts within later deposits does indicate activity of this date within or close to the area of the site.

Phase 2: Late Saxon and medieval deposits

In total 69 distinct grave cuts were identified, although due to the highly mixed nature of burial soil 8019, it is considered likely that more are present below the limit of excavation. Of the 69 graves recorded, 14 extended below the construction horizon so were not fully excavated. Four of these did contain human bone, which was left in-situ. From the remaining 55 that were fully excavated, a total of 46 individuals were recovered. In addition 587 disarticulated bones were recovered from a combination of grave fills and the general burial soil 8019. There was no evidence for the use of coffins and only one shroud pin was recovered (from Grave 1007/8030; Fig 11).

In the northern half of the main excavation area the density of burials was greatest. 54 graves were noted within the burial soil here, which frequently intercut (Fig 13), from which 46 individuals were recovered. The burial soil was deepest in this area, and the majority of the disarticulated bone was recovered here. The greater depth of burial soil to the north is considered to have resulted in a better state of preservation of the inhumations than those to the south, where the soil was shallower, and the graves were frequently cut directly into the natural sand and gravel. Here the graves were found much closer to the modern ground surface and frequently the bone was little more than a small powder trace, such that no articulated remains were recovered. The density of graves identified was much less in the southern area (15), and there was almost no intercutting, indicating that this may have been the periphery of the main burial area.

The intense reuse of the graveyard can be seen with a sequence of at least five phases of burial, and more than this is thought to have been likely below the limit of excavation. The earliest of the burials recorded were 8015, 8034 and 8051, all of which had been truncated by several later burials. For example, grave cut [8015] contained the heavily truncated remains of skeleton 8014, of which there was only the upper left torso and left arm, the remainder having been removed during the inhumation of two later burials; grave [8009] to the west removed the skull and shoulders and the contents of which were themselves truncated by later burials. To the south of [8015], burial [8012] truncated the right side of the torso and the spinal column whilst the lower torso and legs of individual 8014 had been truncated by a later ditch [8103].

All of the burials follow the traditional Christian burial practice with the head laid to the west and the feet to the east, although there is some variation, with those to the north generally aligned west-north-west to east-south-east (the same orientation as the current church), whilst those to the south are aligned more closely east to west. The individuals were laid out in a supine position with the arms and hands either to the side or across the pelvis and the legs out straight. Despite the highly fragmented nature of the remains, 18 of the individuals had their arms close to the body or crossed across the pelvis, their hands and feet together, which is indicative of burial within a closely wrapped shroud, while two others (8005 and 8116) displayed a more ‘splayed’ posture, indicating that they may have been interred unshrouded or within coffins.

No grave goods were recovered, nor were there any of traces of coffin wood. Where the full dimensions of graves could be distinguished they averaged 1.60m in length by 0.60m in width, with vertical sides and flat bases. Two shorter sub-rectangular cuts were noted within the southern half of the excavation area, which are conjectured to have been for juveniles, although no bone was recovered. The first, [8101], measured 0.50m in length and at least 0.30m in width, however its full extent could not be established as it had been truncated to the north by a later ‘adult’ grave [8099]. The second, [8108], measured 0.65m in length by 0.45m in width. Both had vertical sides and flat bases.

A cobbled surface (1031) was revealed at the north end of evaluation Trench 1 at a depth of 0.84m (15.79m AOD) below the current ground level. It was at least 3.20m in length, north to south, by at least 0.40m east to west, and comprised compacted small to medium rounded cobbles. It lay below grave soil 1002/8019 and had been truncated by north to south aligned ditch [8103] (Fig 14). A single sherd of 14th century pottery was recovered from the surface, although this may have derived from the soil above, which had a 14th-15th century *terminus post quem*. As it underlay the general burial soil it is considered to pre-date the (majority of the) burial activity, so is of Saxon rather than medieval date. Its function is unclear.

Three large ditches were revealed during the current investigations, along with one in the 1954 trench. The first of these was a large roughly north to south aligned linear [8103], at least 30m in length which turned eastwards towards the southern half of the main excavation area. The full width and length was indeterminate as the feature extended beyond the limit of excavation, but it was at least 2.40m in width by at least 0.48m deep and contained sandy silt deposit (8102) which appeared to be a deliberate backfill. This feature was truncated by a smaller east to west aligned cut [8110] at the north end of the main excavation area. It had an irregular U-shaped profile with a flat base, 0.36m in depth by at least 0.40m in width (Fig 6)

In evaluation Trench 2 to the south, a vertical cut [2003], 1m in depth, truncated the natural to create a distinct step in the plateau. This feature, orientated roughly north-west to south-east, is still visible at ground level across the existing churchyard to the east (Figs 3 and 4; Fig 23), and appears to be the southern boundary of the churchyard indicated on the tithe plan of 1840 and the 1st edition Ordnance Survey map of 1884-6 (Section 4.1.6 above). It was sealed by soils containing stone rubble that included fragments of medieval roof tile and ceramic building material (CBM). The feature appears to be very similar to that seen in the 1954 trench to the north-west, so they may be contemporary, forming the south and west boundary, in the form of a ha-ha, for the medieval churchyard (Webster 1955).

At the north end of evaluation Trench 3 was a large feature [3014]. The feature was at least 2.20m in length east to west, by at least 1.60m in width and at least 1.55m in depth and extended into the trench baulks. It contained at least five fills that were primarily the result of slumping and natural silting. The south side had a convex break of slope, steeply curving to a shallow concave base (Fig 7). A *terminus post quem* (tpq) of the 15th and early 17th centuries was recovered from the third fill (3005) which differed from the others, being a deliberate dump of material. The northern side of the feature was not revealed, so it is unclear if this is a large pit, or the southern edge of a ditch. It may relate to the boundary features in Trench 2 and the 1954 trench to the north, although it portrayed a differing profile.

All of the above were sealed by a layer of mixed sandy silt (1002/2001/3002/8003). This contained fragments of pottery, ceramic building material and disarticulated human bone, the latter probably derived from the former burial soil.

Phase 3: Post-medieval/modern deposits

The aforementioned burial soil and features were sealed by a soil deposit containing frequent rubble, up to 0.60m thick that lay across the main plateau through the main excavation area and Trenches 1-3. This deposit became gradually thinner to the south, reaching 0.15m at the southern extent of Trench 3. The rubble material was primarily comprised of a sandy silt with frequent stone fragments, ceramic building material and industrial residues such as clinker and ash throughout. It is clear that this material had been used to help create a flat plateau and the material was conjectured to be the remnants of a large building, although only a single fragment of roof tile was noted. This large dump was then sealed by up to 0.40m of subsoil and topsoil.

A similar, albeit thinner (0.15m), deposit (1003) of dumped material was observed during the watching brief in Trench 8 where it appeared to have been lain to augment the edge of the terrace that overlooked the Hatfield Brook. Further down the slope to the south-east a thin topsoil directly overlay the natural gravels.

A linear feature [8105] was recorded in the southern part of the excavation area, orientated west-north-west by east-south-east, apparently cut from directly below the underlying topsoil. The feature measured 0.90m wide, by at least 1.20m deep, with vertical sides to an undetermined base. It was filled with a loose backfill of redeposited natural sands and gravels. This feature is located and orientated in the right position to be the WAS trench of 1954, and although the width of that trench was not discussed in the original transactions results, it fits the description in the account by King's School (Webster 1955; Jones 1958).

Topographic survey

The topographic survey (Figs 3 and 4) defined the westward continuation of the north-west to south-east aligned bank which formed the southern boundary of the churchyard on the 1840 tithe plan and 1st edition Ordnance Survey map of 1884-6. Two distinct slopes were also identified to the west of the churchyard. A broad slope starts *c* 30m west of the churchyard at the northern end of the field, and *c* 10m west at the southern end of the churchyard. A

to previous view

steeper slope lay to the west, down to the flood plain alongside the river, *c* 40m out from the churchyard at the northern end, and *c* 25m at the southern end. On the floodplain a shallow raised bank was recorded, parallel to the river, apparently broken by gaps to north and south of a *c* 11.5m wide shallow platform. The southern bank curved to the south-east toward the upward slope while similarly aligned bank led off from the north-east corner of the platform.

Artefact analysis

The artefactual assemblage recovered is summarised in Tables 1 and 3 (see Appendix 1 for the latter).

The assemblage consisted of 406 artefacts (weighing 21.05kg) which were associated with thirteen contexts, and material could be dated from the prehistoric period onwards (Table 1). Using pottery as an index of artefact condition, this was generally fair with sherds displaying moderate levels of abrasion, although actual sherd size was lower than the average.

Period	material class	object specific type	count	weight (g)
prehistoric	stone	flint flake	3	12
prehistoric	stone	retouched blade	1	4
prehistoric	stone	waste flake	6	6
Roman	ceramic	tegula	1	252
Roman	ceramic	fired clay	7	144
Roman	ceramic	pot	27	387
Roman	stone	quern	1	1034
late Saxon	ceramic	pot	1	4
?Late Saxon	metal	needle	2	1
medieval		mortar	6	242
medieval	ceramic	floor tile	8	796
medieval	ceramic	ridge tile	10	937
medieval	ceramic	roof tile	89	4587
medieval	stone	architectural stone	1	526
medieval	stone	tile	5	1746
medieval	ceramic	pot	104	1166
medieval	stone	sharpening stone	1	38
?medieval	slag	slag (Fe)	7	654
late med/early post-med	ceramic	roof tile	59	5715
late med/early post-med	ceramic	pot	2	54
post-medieval	ceramic	brick	10	348
post-medieval	ceramic	roof tile	2	70
post-medieval	ceramic	clay pipe bowl	1	12
post-medieval	ceramic	clay pipe stem	3	10
post-medieval	metal	grave/ plot marker	1	456
post-medieval	ceramic	pot	6	148
post-medieval	glass	vessel	1	8
modern	ceramic	pipe	1	60
modern	ceramic	roof tile	3	180

go to contents

to previous view

Period	material class	object specific type	count	weight (g)
modern	stone	roof tile	1	32
modern	metal	cartridge casings	2	14
modern	ceramic	pot	17	460
modern	glass	vessel	2	42
undated	metal		1	4
undated	metal	nail	4	54
undated	stone	tile	4	778
undated	ceramic	fired clay	3	46
undated	metal	unident	2	15
undated	metal	waste	1	10

Table 1: Quantification of the assemblage

Summary of artefactual evidence by period
by Laura Griffin

All material has been spot-dated and quantified. Pottery has been grouped and quantified according to fabric type (Table 2). Diagnostic sherds were dated by form type, whilst remaining sherds were datable by fabric type to their general period or production span.

fabric code	Fabric name	count	weight(g)
3	Malvernian ware	8	102
12	Severn Valley ware	17	252
12.1	Reduced Severn Valley ware	1	11
22	Black-burnished ware, type 1 (BB1)	1	22
48	Stafford-type ware	1	4
53	Early Malvernian glazed ware	4	46
55	Worcester-type sandy unglazed ware	46	406
56	Malvernian unglazed ware	45	548
57	Cotswolds unglazed ware	1	12
64.1	Worcester-type sandy glazed ware	6	94
69	Oxidized glazed Malvernian ware	3	66
78	Post-medieval red wares	4	136
81.3	Nottingham stoneware	1	8
81.4	Miscellaneous late stoneware	9	372
85	Modern china	8	88
91	Post-medieval buff wares	1	4
143.2	Ham Green type B	1	48

Table 2: Quantification of the pottery by fabric type

Prehistoric
by Robin Jackson and Angus Crawford

While no prehistoric pottery was recovered from site, six largely gravel derived flint artefacts and one chert artefact were recorded. While the majority of the assemblage was of flaked

to previous view

waste (débitage) material; there was also a snapped blade with notch, and a flake with retouch on both the left and right dorsal surface. This assemblage was consistent with material flaked during the Mesolithic or early Neolithic periods.

Late Iron Age/Roman

All material of Late Iron Age/Roman date was residual. Finds consisted of 27 sherds of pottery, a fragment of tegula (context 2000) and a piece of rotary quern (grave soil 8019). With the exception of a single sherd of Black-burnished ware I (fabric 22; ditch fill 3005), the pottery consisted of locally produced Severn Valley (fabrics 12 and 12.1) and Malvernian wares (fabric 3). The majority of sherds were undiagnostic and, therefore, only datable to the period as a whole. However, the Malvernian ware jar forms were of tubby cooking pot types which can be dated from the Late Iron Age period through to the 2nd century AD (contexts 3005, 8000, 8019 and 8111). Diagnostic sherds amongst the Severn Valley wares and the Black-burnished ware jar were of 2nd-3rd century date. These forms were typical of domestic use in a rural settlement context.

Late Saxon

A single, small body sherd of Stafford-type ware was the only pottery of late Saxon date identified from the site (fabric 48, grave fill 8010). Although this type of pottery has now been shown to have been produced from the mid-9th century, it doesn't appear to have reached Worcestershire until the late 9th century (Bryant 2004, 315). Stafford-type ware has been rarely identified in Worcestershire assemblages outside of the main settlements of Worcester and Droitwich, making this sherd from a rural site, an extremely significant find.

The only other find from the site of possible Saxon date was a small copper alloy pin or needle fragment which was recovered from the grave fill of a burial where the skeleton was dated cal AD 980 to 1040 (context 1029). However, the object could have been incorporated in the backfilling of the grave.

Medieval

The majority of the artefactual material retrieved from the site was medieval, dating from the mid-11th to the late 15th century. Pottery and ceramic building material formed the greater part of this group.

Pottery

A total of 104 sherds weighing 1166g were identified as being of medieval date, accounting for 69% of the pottery assemblage (Table 3). The assemblage was of a standard domestic nature with a relatively narrow range of forms and fabrics identified. All of these fabric types have been described, dated and discussed by Hurst and Rees (1992; i.e. Upwich, Droitwich), and by Bryant (2004; i.e. Deansway, Worcester).

All but two sherds were of locally produced Worcester-type (fabrics 55 and 64.1) and Malvernian wares (fabrics 53, 56 and 69). The remaining two sherds were of Ham Green ware type B (fabric 143.2) and Cotswold unglazed ware (fabric 57.1). This latter sherd was also the earliest medieval pottery identified within the group, being of an everted rimmed cooking pot form of early-mid 11th century date (context 1030; Fig 8, no.1).

Sherds of Worcester sandy unglazed ware (fabric 55) and Malvernian unglazed ware (fabric 56) formed the largest proportion of the group with an even split of 46 and 45 sherds respectively. Both fabrics are most commonly associated with cooking pot forms, with a large proportion of the sherds having blackened or sooted exterior surfaces characteristic of vessels used for this purpose. Diagnostic sherds of the Worcester cooking pots were all of the most developed folded rim form (cf Deansway form 55.3) which could be dated between the 13th and 14th centuries. Those of Malvernian production were of similar date, with the exception of one example with an everted and upright rim (cf Deansway form 56.1; context 8000; Fig 8, no.2), which was dated late 12th-early 13th century.

There were also two more unusual sherds amongst the unglazed Malvernian wares. The first was a rim with thumb or fingertip impressions around the top, forming a 'frilled' effect (grave soil 8019; Fig 8, no.3). This is very similar in form and decoration to that of a shallow bowl previously identified by Webster and dated to the 12th century (1955, 14, fig 1, no.2). The second was a complex rim form of large diameter (320mm), similar to that seen on large pitchers of 12th- early 13th century date (context 8000; Fig 8, no.4). However, these pitchers are usually glazed and more commonly of Worcester production, making this sherd particularly unusual.

Glazed local wares were far fewer in number with just 13 sherds in total. The earliest of the group were highly abraded fragments of early Malvernian glazed ware (fabric 53), all were undiagnostic but likely to have come from pitcher forms of 12th-mid 13th century date. The six sherds of Worcester sandy glazed ware also included a pitcher sherd of similar date. Remaining sherds of this fabric were generally small and undiagnostic. However, there were two sherds, including a rod handle which appeared to have white slip in addition to the usual dark green glaze (ditch fills 8102 and 8003). The handle was also notable for having a diamond-shaped roller-stamped pattern. Use of a slip and complex geometric roller-stamped decoration, are both characteristic of bridge-spouted jug forms (Deansway form 64.2), which would date these sherds as 13th-14th century.

There were just three sherds of oxidised glazed Malvernian ware (fabric 69). Only one was diagnostic and was identified as coming from a dripping dish due to being of an oval form and a heavily sooted external surface. However, such forms are generally of early 15th century date at the earliest, which would make this sherd substantially later than the rest of the medieval pottery assemblage, which doesn't appear to go beyond the 14th century, although there are other finds of later medieval date.

Ceramic building material

Roof tile

Roof tile dating to the medieval period consisted of 158 fragments, weighing 11.24kg. Four fabric types were identified, all of which were produced locally and have been previously identified on a number of medieval sites in Worcestershire:

- 2a Worcester common sandy type
- 2b Worcester coarse sandy type
- 2c Worcester grog/pellet sandy type

to previous view

- 3 Malvernian type

Fabric 2a

A total of 64 fragments of this fabric were identified, including one ridge tile (context 4005). These tiles were oxidised throughout and most were sanded. Thickness generally ranged from 12-18mm, although there was one particularly thick example which measured 22mm (grave soil 8019). Three examples, including the single ridge tile, had a dark green glaze (contexts 3013, 4005 and 8019), one had a circular pierced peg hole (context 2002) and one an unpierced square example (context 2001). Tiles of this fabric are of 13^{th}-15^{th} century date.

Fabric 2b

Just 20 tiles were identified as being of fabric 2b, including one ridge tile (context 2000). Tiles of this type are characterised by a distinctive, highly sandy fabric, usually buff or brown in colour at the surfaces with a dark grey, reduced core. There were no glazed examples in this group and nearly all were noted as having a sanded base. Thickness ranged from 15-19mm and one fragment had a pierced square nail hole (context 2002). As with fabric 2a, tiles of this fabric are of 13^{th}-15^{th} century date.

Fabric 2c

58 fragments of flat roof tile were identified as being of fabric 2c. The fabric is highly distinctive, being oxidised throughout and containing clay pellets or grog and being significantly less sandy than either fabric 2a or 2b. It is thought tiles of this fabric are representative of a new clay source being used for production from the late medieval period onwards (Fagan 2004, 254). Examples in this assemblage all had a sanded base and thickness ranging from 15-19mm. One tile was nibbed (context 3013) and one had a pierced, round peg hole (context 4005). In addition, one tile was stamped with a maker's mark in the form of a 'C' (context 3005; Fig 8, no.5). This is the most commonly identified maker's mark on tiles of this fabric type with examples found within a number of assemblages from excavated sites in Worcester.

Tiles of fabric 2c are now known to have been produced at a kiln on The Tything in Worcester in the later part of the 15^{th} century (Griffin 2004). Occurrence on other sites in the city, along with the discovery of a further kiln during excavations on the St Martin's Quarter development also thought to have produced tiles of this fabric, indicates production to have continued well into the post-medieval period, at least as late as the mid-17^{th} century

Fabric 3

Small amounts of tile of Malvernian fabric were also noted within the medieval assemblage, six identified as ridge tile and three as undiagnostic flat tile. Tiles of this fabric can be dated between the 13^{th} and 16^{th} centuries and commonly form a notable component of roofing tile assemblages from Worcester and the surrounding area. The tiles are distinctive in appearance being thin and highly fired with a thin, often patchy speckled green glaze on the upper surface. None of the examples were sanded, a characteristic of this fabric type (Fagan 2004, 356).

Floor tile

Eight fragments of floor tile were identified in the assemblage (contexts 1000, 1001, 8000 and 8001). All but one was decorated, but unfortunately, all were so highly abraded that no specific designs could be identified. The single undecorated example was a triangular edging tile with dark green glaze (context 1001). Despite the lack of identifiable designs, the tiles could be dated later 14th-15th century.

Stone

Whetstone

A small, unstratified whetstone was identified as being potentially of Norwegian Rag (context 1000) (D Hurst, pers comm). The whetstone has been perforated at one end and was heavily worn with the very tip broken off (Fig 8, no.6). Whetstones of Norwegian Rag appear to have been widely used in medieval England and have been previously recorded at Deansway (Roe 2004), Friar Street (Roe 2002) and City Arcade (Griffin 2002) in Worcester.

Building stone

Remaining finds of this period were largely pieces of building stone, including roof tile (contexts 2000, 2001 and 2002), Blue Lias paving material (context 4005) and a shaped fragment of red sandstone (context 1001). The majority of this material came from the upper layers of the site and are, therefore, residual. However, all are likely to have originally come from buildings within the monastic complex.

Slag

Seven pieces of slag were retrieved from the site (contexts 2002, 8019 and 8111). All were undiagnostic, although one had a slightly dished shape which may indicate that it came from a hearth bottom. None can be dated but come from context with a medieval tpq date. However, all of these contexts also contain residual material of Roman date and, therefore, it cannot be ruled out that this slag is of earlier origin.

Post-medieval

The post-medieval assemblage included just six sherds of pottery, of types typically encountered on sites in Worcestershire. They included four sherds of post-medieval red wares (fabric 78; contexts 5000, 8000 and 8001) and one sherd of post-medieval buff ware (fabric 91; context 8000), which could be dated late 17th-18th century. The remaining sherd was from a Nottingham stoneware jar of mid-late 18th century date (fabric 81.3; context 5000).

Other material of post-medieval date consisted of fragments of clay pipe and ceramic building material, mainly coming from the top- and sub-soil layers of the site.

to previous view

Modern

Seventeen sherds of modern pottery were identified. The sherds were of two fabric types, with eight sherds of modern china (fabric 85; contexts 1000, 8000 and 8001) and three of miscellaneous late stoneware (fabric 81.4; context 8000). All were of a range of domestic forms typical of this period and could be dated from the late 19th century onwards.

Further material of this date included bottle glass (context 8000) and a Victorian era cast iron plot marker associated with the graveyard (context 8000).

Catalogue of the illustrated finds (Fig 8)

1. Cooking pot in Cotswolds unglazed ware (fabric 57.1) with everted rim; context 1030; 10th-mid 11th century
2. Cooking pot in unglazed Malvernian ware (fabric 56) with upright everted rim; context 8000; late 12th- early 13th century
3. Cooking pot or bowl in unglazed Malvernian ware (fabric 56) with thumb-impressed 'frilled' rim (cf Webster 1955, 14, fig 1, no 2); grave soil 8019; mid-13th-14th century
4. Complex rim from possible pitcher in unglazed Malvernian ware (fabric 56); context 8000; 12th- early 13th century
5. Roof tile with 'c' shaped maker's mark (fabric 2c); context 3005; late 15th century onwards
6. Norwegian rag whetstone with perforation; context 1000; medieval

to previous view

Osteological Analysis
by Gaynor Western

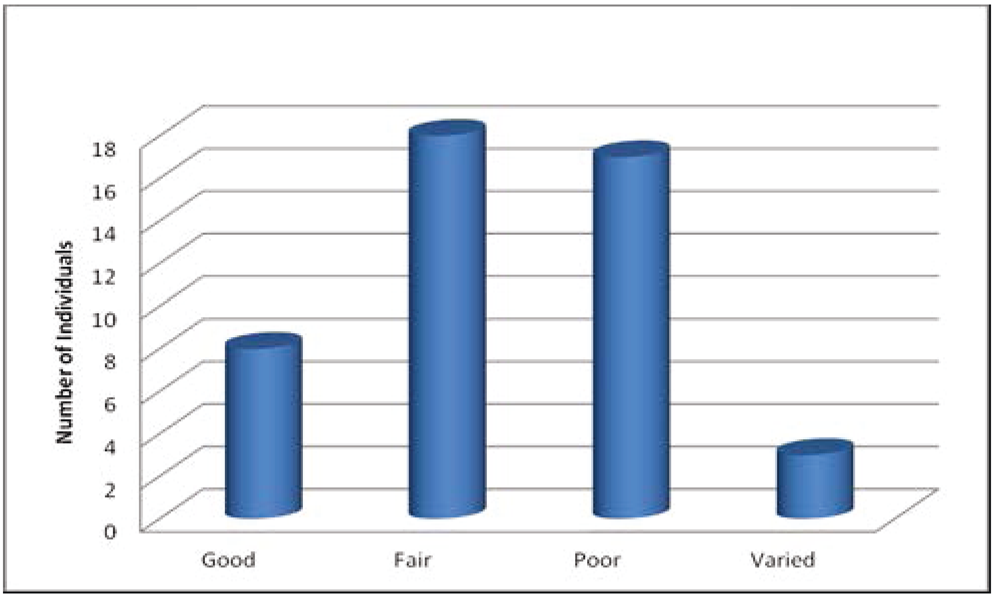
The Articulated Assemblage

The Physical Evidence in Summary

A total number of 46 inhumated articulated individuals were exhumated from the site.

Condition of the skeletal material

The condition of the skeletal material was analysed, macroscopically assessed and graded according to those guidelines set out by Brickley and McKinley (2004). Since most of the skeletons exhibited more than one grade of state of preservation, these categories were simplified into 4 main groups of preservation: Good (grades 0-2), Fair (grades 2-4), Poor (grades 4-5+) and Varied (more than 4 grades of condition).



Graph 1: Completeness of skeletons from St Mary's Church

Overall, 17.4% (n = 8) of the skeletons analysed were classified as being of 'good' condition, 39.1% (n = 18) were considered to be in a 'fair' state of preservation and 37.0% (n = 17) were classified as being in a 'poor' state of preservation (See Graph 1). In addition, 6.5% (n = 3) of the remains exhibited a range of preservation and were classified as 'varied'. Most of the skeletal elements exhibited some level of cortical degradation to outer surfaces of the bone and epiphyses were largely eroded if present. However, endocranial surfaces (inner cranium) were often well preserved. Most of the skeletal remains were represented by diaphyses of long bones and skulls; any elements consisting of high proportion of cancellous (spongy) bone, such as ribs and vertebrae, were often under represented. Variation in preservation across site was observed to relate to the nature of the geological matrix containing the remains. Overall the assemblage was 'Fair-Poor' in condition. This meant that conditions affecting purely the

go to contents

outer surface of the bone, such as periostitis, may be under-represented in this population and in addition, given the relative absence of epiphyses (ends of long bones), observation of joint diseases and metric analyses would be severely restricted.

Completeness of the Individuals

This is a guide to the overall completeness of the individual's skeletal remains and is calculated according to the percentage of the bones present in relation the total number of bones in a complete human skeleton. Completeness of remains is gauged through an assessment of the amount of material representing different areas of the body. A complete skeleton comprises of:

Skull = 20%

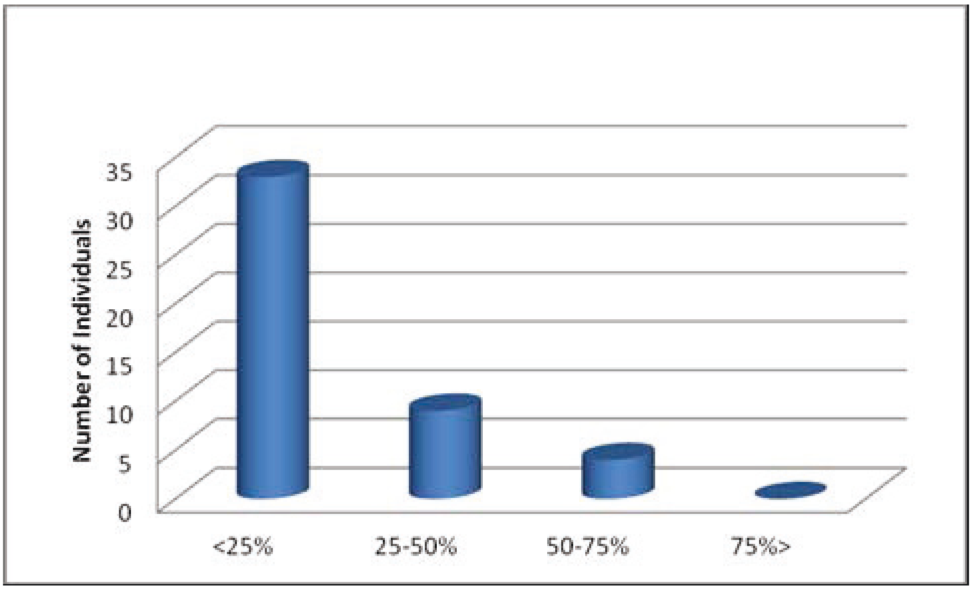
Torso = 40%

Arms = 20%

Legs = 20%

Each area of the skeleton was assessed and then placed into the following four categories of completeness: 75%>, 50-75%, 25-50%, <25% (Buikstra and Ubelaker 1994).

Recording the completeness of the individual can allow an insight to be gained into how much post-depositional activity has occurred as well as to assess how much information can potentially be gained from the remains. Graph 2 below illustrates that 71.7% (n = 33) of the skeletons excavated from St Mary's were less than 25% complete and none were more than 75% complete.



Graph 2: Completeness of skeletons from St Mary's Church

Intercutting of graves at St Mary's church burial ground was frequently observed at excavation and it is clear that this in combination with the overall fair-poor preservation of the skeletal elements has resulted in many remains being significantly depleted of skeletal content. Nonetheless, the elements present allowed some observations regarding the demographic profile of the sample population to be made.

Age and Sex Assessment

Establishing the age and sex of individuals from an archaeological assemblage not only provides an insight into the demographic profile of the population but can also be used to inform us of patterns in pathological distributions in the group. Sex was assessed using the criteria laid out by Buikstra and Ubelaker (1984) in the analysis of morphological features of the skull and pelvis. In addition, metric data was also used where possible, taking measurements of sexually dimorphic elements such as the femoral and humeral head (Bass 1995). Categories ascribed to individuals on the basis of this data were 'Male', Possible Male', 'Indeterminate', 'Possible Female', 'Female' and 'Unobservable'. Sex was ascribed on the basis of metrics alone where no sexually dimorphic traits were observable. Where sex was not observable through either metric or morphological observations, it was recorded as 'Unobservable'. No sexing of sub-adult material was attempted due to the lack of reliable criteria available. Age of sub-adults was assessed, however, using both dental development (Smith 1991) and eruption (Ubelaker 1989) as well as long bone lengths (Schaefer *et al* 2009) and epiphyseal fusion (Scheuer and Black 2004). These methods can usually provide a reasonably accurate age estimation due to a relatively narrow range of variation in normal subadult development. Thus, sub-adults can be placed into the following age categories: Foetal (<36 weeks), Neonate (0-1 month), Young Infant (1-6 months), Older Infant (6-12 months), Child (1-5 years), Juvenile (6-12 years) and Adolescent (13-19 years).

Assessment of adult age at death, unfortunately, results in much less specific age estimates due to a much greater individual variation in the features exhibited by the examined elements at particular ages. Age estimation of adults was assessed from analysis of the auricular surface (Lovejoy et al 1985) and the pubic symphysis (Brookes and Suchey 1990). Each of these methods examines the deterioration of these surfaces and categorises them accordingly. This deterioration is due in part to the health status of the individual but can also be influenced by life-style and so the variation produced by these factors results in much wider age categories: Young Adult (20-34), Middle Adult (35-49) and Old Adult (50+) (Buikstra and Ubelaker, 1984). Grading of dental attrition was also used as a supplementary age assessment technique using the Miles method (1963) where dentition sets were complete enough to allow fair observation.

It should be noted that age categories are, in fact, an artificially constructed means of classifying the ages of individuals according to customary conventions. Specific ages mean different things to different peoples at different times. This may affect the lifestyle and the role that individuals of certain ages played in society. Byrhtferth, in his Manual dating to 1011 AD, divides the course of life into 4 stages: 'Childhood', up to 14 years, 'Youth' up to 28 years, 'Manhood' up to 48 years and 'Old Age' up to 70 or 80 years (Wells and Cayton 1980, 305). Bede also suggests that the end of infancy is 8 years of age, at which time boyhood begins (Wells and Cayton 1980, 313). Though these are unlikely to be precise age categories affecting all people uniformly during the late Saxon period, they testify to the fact that modern day age categories may not necessarily reflect the important life stages for populations in the past and this should be borne in mind when considering the bioarchaeological data.

to previous view

Demographic Profile

Of all the 46 individuals examined, 60.9% (*n* = 28) were found to be adult and 4.3% (*n* = 2) to be sub-adult. The remaining 34.8% (*n* = 16) of individuals could not be ascribed an age category due to the lack of observations regarding epiphyseal fusion; however, the majority of these individuals are in fact likely to be adolescents or adults and were unlikely to younger individuals. Of the observable sub-adults, one individual (SK 1004) was thought to have been adolescent (i.e. aged 13-19 years old at death) whilst a second skeleton (SK 8057) was aged at 3-4 years old at death and was a child. The under-representation of sub-adults in the assemblage is likely to be due at least in part to the fact that the sub-adult skeletal elements are high in cancellous bone content and are generally less well preserved on archaeological sites, especially where high levels of intercutting of graves has occurred. However, the spatial analysis of churchyard burials often indicates that some areas within the churchyard were favoured for particular burials, including sub-adult individuals (See 4.2.2 Burial Practices). Due to the limited extent of excavation of the site, it is difficult to assess the impact of the selective practice of burial location according to cultural customs and to what to extent this may have had a bearing on the under-representation of sub-adults within the sample.

Due to poor preservation of skeletal elements used for assessing age at death in adults, only 6 adult individuals could be assigned a specific age category (Table 4). One was a 'young adult', four were classified as 'middle adults' and one individual was considered to be an 'old adult'. Most of the age categories were assigned using dental attrition scores, which can be of limited value to due inter-population differences in diet and food preparation. Whilst no conclusions can be drawn from such a small sample, it is important to note the osteological evidence for all adult ages being represented, albeit in restricted numbers.

	Male	**Possible Male**	**Female**	**Possible Female**	**Indeterminate**	**Unobservable**	**Total**
Young Adult	0	0	0	0	1	0	1
Middle Adult	0	3	0	0	1	0	4
Old Adult	0	0	0	0	1	0	1
Adult	0	3	0	5	0	14	22
Unobservable	0	0	0	0	0	16	16
Total	0	6	0	5	3	30	44

Table 4: Mortality profile of the skeletal assemblage according to age and sex

The age profile of the population from St Mary's does generally conform, however, with the data from other ecclesiastical and monastic assemblages, where, at all the sites compared here, both adults and sub-adults were present. In addition, the majority of those adults present were middle or old aged. At Jarrow and Monkwearmouth, 42.9% (n = 116) and 35.5% (n = 73) respectively of the population were sub-adults, with 69.8% (n = 30) and 54.9% (n = 45) respectively of adults being middle or old aged (Anderson *et al*. 2006, p.485). At the Chapter House, Worcester Cathedral, of the skeletons for which age could be assessed, there was actually a higher number of sub-adults (n = 81, 58.7%) than adults, although 75.4% (n = 43) of aged adults were 45+ years (Waldron, 2011). At North Elmham, in contrast, 81.1% of individuals were adults, with 52.9% of those being middle or old aged (Wells and Cayton 1980). Some of these differences may be attributed to differing preservation conditions between sites, with sub-adults thought to be under-represented at some Saxon sites (Buckberry, 2000). Preservation of burials at Jarrow and Monkwearmouth, however, was stated to be ‘badly disturbed and in poor condition’ (Anderson *et al* 2006, 481) and both the assemblages still yielded high numbers of sub-adults. It is unclear, then, if these monastic and ecclesiastic sites are more representative of the living population, attracted higher numbers of sub-adult burials or if there is a relative paucity of sub-adult burials at other sites. Unfortunately, the sample at St Mary’s is too small to draw any inferences from regarding age and burial, though it is clear that all age groups were represented in the population.

Sex distribution amongst a population may vary with age and migration but generally populations are found to have a ratio of 1.05 Male: 1 Female, males having a slightly higher mortality rate in all age categories in modern populations (Chamberlain, 2006). At St Mary’s Church, 6 individuals were identified as possible males and 5 individuals as possible females, approximating the ratio expected (54.5% male) (Table 4). The sex of three individuals could not be determined, despite having some morphological traits available for observation, due to the traits present being characteristic of both male and female individuals. This issue was exacerbated by the limited number of observable features available per individual arising from poor preservation and lack of complete epiphyses allowing metric assessment of sex. Nonetheless, the osteological observations indicate the presence of both males and females within the assemblage at St Mary’s, which is in accordance with the other monastic and Christian cemeteries at Jarrow (56.2% male/possible male, n = 41), Monkwearmouth (58% male/possible male, n = 97), The Chapter House, Worcester Cathedral (63.9% male, n = 46) and North Elmham Park (56.0% male, n = 89). The number of males is consistently higher across all groups considered here and all in excess of the ratio expected in an unbiased living population. It may be the case that higher numbers of males reflect the male demographic of monastic populations and ecclesiastical society, though at sites of poorer preservation, the more robust bones of males may be better preserved and thereby more readily identifiable.

Non-metric traits

Non-metric traits are morphological features that occur both in bone and dentition. These features have no specific functional purpose and occur in some individuals and not in others. The origins of non-metric traits have now been shown to be highly complex, each having its own aetiology and each being influenced to differing extents by genetics, the environment and by physical activity. A review of the current literature suggests that the undetermined specific origins of these traits and the fact that there is more genetic variation within populations than between them can prevent useful conclusions regarding their presence or absence in skeletal remains from being drawn (Tyrell 2000).

The observability and presence of any non-metric traits observed in the assemblage have been recorded in the database retained in the project archive. The small sample size limited the analysis of these results. Non-metric traits have been recorded for these skeletons in order to allow future comparisons with findings from other Saxon burial grounds.

Stature and Metric Analysis

Stature of adult individuals can be reconstructed from measurements of long bones of the skeleton. Since the long bones of sub-adults have not yet fully developed it is not possible to provide an estimate of stature for immature remains. Stature is the result of many factors including genetics and environmental influences (Floud *et al* 1990), such as malnutrition and poor health. Height can be used as an indicator of health status and there is a wide range of literature on the relationships between height, health and social status. Estimated stature was calculated by taking the measurements of the individual long bones and using the formula provided by Trotter (1970). Variation in estimated stature can be up to 3cm.

The analysis of stature here was severely restricted due to the limited number of complete long bones present. Only two individuals presented complete long bones. The estimated stature of SK 8122 of unobservable sex was 1.73m whilst estimated stature was 1.71m for SK 8064, a possible male. No female remains could be assessed for stature.

Roberts and Cox (2003, 220) report that the average height for males from this period in Britain is 1.72m for males and 1.61m for females. The estimates from St Mary's appear to reflect the national average height for males and fit in well with the current data. The mean stature for males from The Chapter House, Worcester Cathedral is also 1.72m with a total range of 1.65m-1.80m. The average female height was 1.58m with a range between 1.47m – 1.68m (Waldron, 2011). Very similar ranges for both sexes were also recorded at Jarrow, Monkwearmouth and North Elmham (Anderson *et al* 2006, 486).

Craniometric data was also recorded for a limited number of individuals where preservation allowed and is retained in the project archive.

Skeletal Pathology

Palaeopathology is the study of diseases of past peoples and can be used to infer the health status of groups of individuals within a population as well as indicate the overall success of the adaptation of a population to its surrounding environment. Pathologies are categorised according to their aetiologies; e.g. congenital, metabolic, inflammatory, traumatic, neoplastic etc. Any pathological modifications to the bone are described. The size and location of any lesion is also noted. Distribution of lesions about the skeleton should be noted to allow diagnosis. A differential diagnosis for any pathological lesions should also be provided. This report presents a summary and discussion of the pathological changes observed; detailed observations recorded for each pathology can be found in the project archive.

An insight into the nature of skeletal disease present in a population can be gained through examination of the prevalence rates of each type of disease. Prevalence rates can be calculated as a percentage of the count of each case of pathology recorded in relation to the total number of individuals present, known as the Crude Prevalence Rate (CPR) or in relation to the total number of the same, observable skeletal elements present that could have potentially been affected by the condition, known as the True Prevalence Rate (TPR). The TPR of a disease is much more accurate and representative of the rate of pathology since this method implicitly controls for the condition and completeness of the skeletal material under analysis. Well preserved skeletal elements are by default more likely to exhibit pathological changes and therefore, comparing prevalence rates derived from poorly preserved assemblages to those from well preserved assemblages can be problematic. The CPR only gives a crude estimate of the disease prevalence rate and where skeletal assemblages have undergone a high level of post-depositional disturbance or are poorly preserved, the CPR can be misleading. However, CPRs are perhaps more representative in the calculation of prevalence rates of diseases which result in pathological changes that are disseminated or generalised throughout the skeleton where lesions are interrelated. Additionally, CPR's are commonly the only comparative data available from many skeletal reports. Where possible

to previous view

and appropriate, both types of rates will be presented here, though it should be remembered that the TPR rates for small assemblages are still only approximate indications of the true rate of each disease.

Not only must be the condition of skeletal remains be taken into account when considering evidence for pathology in archaeological populations but also the fact that more skeletal pathologies are likely to be present in older individuals, who have lived long enough to sustain chronic disease processes. This relates to the phenomenon known as the 'osteological paradox' whereby those exhibiting skeletal lesions are thought, in actual fact, to represent comparatively 'healthier' individuals in life than those individuals exhibiting no lesions who may well have succumbed to either more virulent diseases that leave no trace in the skeleton or to have died before a potentially observable disease affected the skeleton (Wood *et al* 1992).

Congenital and Developmental Conditions

A disease classified as 'Congenital' is defined as a disease that was present at birth. Several diseases that were considered 'Congenital' are now, however, considered 'Developmental'; For example, Congenital Hip Dysplasia is now better understood and is thought to be a result of trauma at birth (through the practice of holding newborns upside by the legs and subsequently dislocating the hip) rather than being an inherent condition; to reflect this aetiology this condition is now clinically referred to as Developmental Dysplasia of the Hip. Most of the diseases now considered to be 'congenital' have an underlying genetic component in their aetiology although some are due to environmental factors present prior to birth i.e. diseases transmitted from mother to foetus of a non-genetic origin.

Table 5 records a summary of the congenital and developmental pathologies observed amongst this population.

Pathology	No. of cases	No. of observable elements	TPR	CPR
Cleft Neural Arches S1-S5	2	5	40.0%	4.3%
Cleft Neural Arch L5	1	5	20.0%	2.2%

Table 5: Summary of Congenital and Developmental Conditions

Cleft neural arches were observed in two individuals in the lower vertebrae. SK 8064, a possible male middle aged adult, exhibited an unusual case of clefting of the entire dorsal plate of the sacrum (see Fig 25) in addition to the fifth lumbar vertebrae. The neural arch of the vertebra, located on the posterior side of the spinal column, is initially composed of two separate elements, one on the left and one on the right side of the spine, that fuse in the midline to form the complete arch, which then surrounds the spinal cord in conjunction with the vertebral body on the anterior side. When the neural arches fail to form at the correct time, a cleft remains between the two halves. In the case of SK 8064, the entire dorsal plate of the sacrum, composed of a series of 5 contiguous neural arches, had failed to fuse. However, the defect did not exhibit the widened opening associated with true spina bifida occulta. Clinical observations indicate that there is no myelodysplasia associated with this defect and that this type of cleft vertebrae is most likely a neural arch developmental defect within the paraxial mesoderm developmental field i.e. there is clefting of the vertebrae without any neural tube defect (Barnes 1994, 49). The bony opening is covered with a tough, fibrous tissue protecting the spinal cord (Barnes 1994, 120).

go to contents

Therefore, the individual is unaffected by this condition. Clefting of the neural arch was also observed in the associated fifth lumbar vertebra, where the left arch was hypoplastic, so that the clefting defect occurred to the left of centre (Fig 18). Barnes (1994) describes this as a 'Type C' defect and the result of a minor delay in the development of arches. SK 8111 also exhibited clefting of the 1st and 2nd sacral vertebrae, which is more commonly observed in archaeological populations and is similarly asymptomatic during life.

Generalised and Disseminated Conditions

There are a number of diseases that are classified as generalised and disseminated condition and many of these are associated with metabolic or endocrine disorders.

Pathology	No. of Cases	No. of Observable Elements	TPR	CPR
Cribra Orbitalia	3	11	27.3%	6.5%
Osteoporosis	1	6	16.6%	2.1%

Table 6: Summary of Generalised and Disseminated Conditions

Metabolic disorders are generally associated with a lack of a particular vitamin in the diet or an imbalance of a hormone that is essential to maintaining normal functions of organs in the body and an adequate health status. A lack of intake of vitamins can occur for several reasons. It may be that the individual simply has insufficient access to a particular vitamin in their diet, such as a lack of Vitamin C arising from a lack of fresh fruit. It may also be the case that an individual has acquired or inherited a condition preventing the body from absorbing a particular vitamin, even if it is in plentiful supply in the diet. For example, anaemia can be caused by a high intake of lead into the body or by a number of genetic disorders, such as thalassaemia or sickle-cell anaemia. Other metabolic and endocrine conditions, such as osteoporosis, are very often caused by a change in the level of the production of hormones vital for producing or maintaining bone. The majority of diseases seen in the skeleton that have an underlying metabolic aetiology are generalised conditions, in that the mechanism for producing and maintaining bone is abnormal and, therefore, all bones are affected. Disseminated conditions such as Paget's disease, on the other hand, display pathological changes in discrete localised areas and unaffected bones are normal. Examples of these diseases are recorded in the archaeological record but are much rarer than the majority of the metabolic conditions.

Cribra orbitalia was recorded here according to categories set out by Stuart-Macadam (1991). It is commonly associated in the literature with anaemia and is denoted by the presence of porosity in the eye orbits (Fig 20). This results from the expansion of the trabeculae in the bone produced by the body's expansion of the marrow to increase production of red blood cells (Roberts and Manchester, 1997). This response to anaemia occurs during childhood; with onset in adulthood, the body responds by increasing the expansion of marrow in the long bones but is accompanied by extramedullary hematopoiesis (formation of blood cells) in soft-tissue organs (Aufderheide and Rodriguez-Martin 1998). A recent review of the clinical literature highlights that only megaloblastic or haemolytic anaemias directly result in erythropoietic hyperplasia, associated with a dietary lack of vitamin B or specific parasitic infections arising from polluted water such as giardiasis, diphyllobothriasis (Walker *et al* 2009, 115) or possibly malaria (Gowland and Western 2012). It is generally accepted that lesions located in the skull vault or orbits observed in both adult and juvenile skeletal material are actually lesions incurred during childhood. Lesions are typically, although not always, bilateral. The extent to which lesions are active or healed in adult material is difficult to ascertain and no attempt at distinguishing between the two was made here. Any lesions observed that could not categorically be associated with a specific aetiology, i.e. where there may have been other causes of the lesion, were not recorded as cribra orbitalia.

Two cases of cribra orbitalia were noted in the St Mary's population in two individuals, SK 8136 and SK 8030, the latter exhibiting large foramina and trabecular lesions in both orbits (Fig 19). These individuals are likely to have suffered from megaloblastic or haemolytic anaemia during childhood. The average CPR of cribra oribitalia from early medieval populations in Britain is 7.6%, with a TPR of 24.6% (Roberts and Cox 2003, 187). The population from St Mary's approximates these figures, though it should be borne in mind that this sample is small. The CPR is higher than that of Jarrow (2.3%), Monkwearmouth (4.3%) and North Elmham (2.4%). No data is currently available for the Chapter House, Worcester Cathedral.

Concavity of the upper/mid-thoracic vertebrae was observed in the spine of SK 8050, a possible female adult of at least middle age. Degenerative joint disease was also observed in these vertebrae. The concavity of the vertebrae may be related to osteoporosis, causing a loss of bone density in the vertebral bodies leading to their compression from the collapsing of bone unable to sustain their normal weight-bearing function. The end plate surfaces have a distinct roughened appearance indicating 'osteopenia' or too little bone (Fig 20). The vertebrae do not exhibit the classic biconcave changes present in 'cod-fish' vertebrae associated with osteoporosis; however, given the sex and the age of the individual, osteoporosis is a likely contributing factor to the lesions and single sided lesion are noted in the literature where moderate deformities occur (Brickley and Ives 2008, 166). Although complex in aetiology, osteoporosis is clinically observed to be more common in post-menopausal women and related to a decrease in oestrogen causing a deficiency in bone production (Brickley and Ives 2008, 152-3). Essentially, more bone is resorbed than is formed in the aging adult, resulting in skeletal elements becoming increasingly vulnerable to macro- and micro-fracture. Concavity of vertebral bodies can also occur in osteomalacia, due to a lack of vitamin D, concentrations of which also decrease with age and is noted specifically in elderly individuals with osteoporosis and post-menopausal females (Brickley and Ives 2008, 87, 154). Therefore, it is probable that such defects in the skeleton are multi-factorial in aetiology. Osteoporosis has only been recorded in seven individuals from early medieval sites (Roberts and Cox 2003, 189).

Inflammatory Disease

Inflammation occurring to the bones can be observed at three levels; one involving the outer surface of the bone, known as periostitis, a second called osteitis where the inner cortex is involved and thirdly, when the whole transverse section of the bone is involved to the extent of the development of a draining sinus (*cloaca*), known as osteomyelitis. Inflammation can occur as a result of many causes; for the most part, inflammation is associated with infection. It should be remembered, however, that whilst infection will always create an inflammatory reaction, conversely inflammation does not necessarily indicate the presence of an infection; many pathological processes can potentially result in inflammation. Some infections produce a particular distribution of lesions around the skeleton allowing a specific diagnosis to be given to certain infectious conditions, such as syphilis and tuberculosis. Most infections resulting in an inflammatory reaction are, however, non-specific. The presence of woven bone deposits indicate that a lesion was active at the time of death whereas remodelling lamellar bone suggests the lesion was active prior to death.

Periostitis, a non-specific inflammation affecting the outer surface of the bone, is highly likely to be under-represented amongst the St Mary's population due to the degraded nature of the outer cortex of many skeletal elements. Only four elements were observed to exhibit periostitis in total, both tibiae and fibulae from SK 8024 (Table 7). In this individual, the lamellar bone periostitis was located on the left and right tibial diaphyses on the lateral sides, adjacent to the interosseous border. The diffuse remodelling lesions covered the proximal third of the right tibia (approx 15cm S-I x 3cm A-P) and the proximal and middle third of the left tibia (25cm S-I x 2cm A-P). The ipsilateral fibulae were similarly affected. Periostitis is most frequently recorded in the lower limb bones in archaeological populations (Ortner 2003, 207, 209) and although it can be associated with specific disease processes, often occurs without any other indications of infection in the body. In these cases, it is thought that inflammation to the tibiae and fibulae as a result or repeated minor trauma to the lower limbs, possibly in combination with infection (Ortner 2003, 208; Roberts and Cox 2003, 235) and may be associated with a physically active lifestyle leading to increased exposure to such trauma. Periostitis of the tibia and fibula was noted in several individuals at Jarrow and in three individuals at Monkwearmouth (Anderson *et al* 2006, 495). No information on the prevalence of periostitis is currently available for the Chapter House, Worcester.

Pathology	No. of Cases	No. of Observable Elements	TPR	CPR
Maxillary Sinusitis	1	8	12.5%	2.2%
Endocranial Lesions	1	15	6.6%	2.2%
Periostitis Tibia	2	24	8.3%	2.2%
Periostitis Fibula	2	12	16.7%	2.2%

Table 7: Summary of Inflammatory Pathology

Also reflecting lifestyle in some cases, maxillary sinusitis, is linked to smoke, environmental pollution, upper respiratory tract infections and house dust (Roberts and Manchester 1997, 131). However, it can also be associated with dental abscesses, as is the case recorded at St Mary's. In one individual, SK 8033, prolific deposits of lamellar bone in spiculated and nodular appearance were observed in the left maxillary sinus (Fig 21). The bone was smooth and porotic, indicating a chronic condition. The bottom of the sinus was perforated forming a canal into the alveolar bone beneath, communicating with the socket for M3. This tooth has been lost ante-mortem and it is likely that the abscess associated with the missing tooth has perforated the sinus. The right side maxillary sinus was normal, indicating a localised causative agent to the changes in the left sinus. Three additional abscesses were present in the right maxilla (Pm1, Pm2 and M1, all lost ante-mortem). Periodontal disease and possible associated abscesses were also present in association with M1, M2 and M3 in the left mandible. In the case of SK 8033, it is clear that the individual suffered from poor dental health with a number of chronic abscesses present, one of which led to subsequent infection of the left sinus.

The disease is likely to be underestimated in St Mary's population as maxillae were damaged or absent though post-mortem processes in several cases and conversely, if maxillae are complete the sinuses cannot be observed except through endoscopic analysis. The crude prevalence rate of 2.2% is lower than average for the early medieval period of 4.7% (Roberts and Cox 2003, 174). Sinusitis, however, was only observed in one individual at North Elmham Park (CPR = 0.5%), possibly reflecting the rural location of the site.

One individual, SK 8136, exhibited lesions consisting of bone changes to the endocranial (inner) surface of the cranium. A deposit of fine, smooth bone periostitis with some

to previous view

microporosity was observed along the groove for the superior sagittal sinus on the parietals and superior occipital (Fig 22). The sinus receives the superior cerebral veins and is penetrated by the arachnoid granulations, through which the cerebrospinal fluid drains (McMinn *et al* 1993, 69). The bone change is accompanied by a lighter colouration, which is only present along the groove within the calvarium. The bony changes are likely to represent inflammation to the sinus and/or veins, possibly through infection. Endocranial lesions such as these are non-specific and are usually associated with inflammation of the meninges or a reaction to adjacent soft tissue lesions in the literature (Ortner 2003, 250). Thus, lesions can arise from a number of causes, such as epidural haematoma, meningitis, meningoencephalitis and tuberculous meningitis (Ortner 2003, 93). The CPR for endocranial lesions at St Mary's was 2.2%, higher than the overall average CPR for early medieval populations in Britain (0.07%).

Specific Infection

Skeletal evidence of specific infection is rarely observed in the archaeological record (Roberts and Manchester 1997). However, one potential rare case of acquired syphilis was observed at St Mary's, and examined by digital radiograph to allow diagnosis (Table 8).

Pathology	No. of Cases	No. of Observable Elements	TPR	CPR
?Acquired Syphilis	1	24	4.2%	2.2%

Table 8: Summary of Specific Infection cases

The right tibia of SK 8024, a possible male, was observed to have a swollen and bowed appearance. The surface of the tibia was smooth, though there was some striation present along the medial diaphyseal border. The mid-diaphysis of the tibia appeared bowed anteriorly, the affected region measuring approximately 150mm S-I and 30mm A-P, affecting the whole of the mid-shaft. Right fibula also had a bowed appearance but was fragmented; it was though the fragment possible represented the distal third. A small area (15mm x 10mm) of the fragment appeared a little swollen and here the bone also appeared bowed. The surface of the fibula was normal.

Radiographic analysis was undertaken to investigate the lesion further, since it was not possible to assign a diagnosis macroscopically (Fig 18). The medio-lateral view revealed a substantial deposit of periosteal (bone surface) new bone formation on the anterior side. The medulla is substantially reduced and appears to be partially obliterated by bony bridging in the central area. There is also a possible limited expansion of the cortex into the medulla on the corresponding posterior side but no periostitis. The substantial deposit of periostitis on the anterior aspect of the diaphysis overall has a cotton-wool appearance, the radiographic appearance consisting of ill-defined areas of patchy density and lucency. Small subcircular lucent defects are present but barely visible. Additionally, some periosteal striation is apparent, particularly along the original surface of the outer cortex, which appears irregular and much reduced in density.

One large radiolucent area exists in the medulla and is surrounded by opaque bone bridge around it from anterior to posterior sides of the cortex; however, interpretation here must be cautionary due to difficulty in distinguishing the effects of silt that have washed into the open medulla post-mortem. It is unclear if this is a genuine lesion or a post-mortem artefact. The general appearance of the medulla suggests that there may be some bony expansion into it

go to contents

on the anterior side, significantly reducing the medullary cavity in the area of the extra-cortical bone deposit but unfortunately this cannot be established absolutely. The posterior cortex also appears to be slightly expanded into the medulla in the area of the corresponding area to the changes seen on the anterior aspect but overall little affected with no extra-cortical changes.

A review of the current medical literature suggests that similar bone changes to those observed here could be caused by fibrous dysplasia or osteofibrous dyplasia. In active cases these conditions, however, can have a more soap-bubble or ground-glass appearance and in monostotic cases, the medulla is enlarged while at the same time is accompanied by little periosteal remodelling (http://www.orthopaedicsone.com/display/Main/Fibrous+dysplasia). Differentiating between fibrous dysplasia and osteofibrous dysplasia is difficult even in the clinical context as the signs and symptoms of the two diseases overlap. Osteofibrous dysplasia occurs almost exclusively in the tibia and fibula with the age of onset in first decade (Vigoritta 2008, 326). The condition is frequently associated with a marked bowing or pro-curved tibia and affects the anterior mid diaphysis (Most *et al* 2010, 359). The ipsilateral fibula is also reportedly affected in between 11-17% of cases (Medscape Reference 2012). It is a rare condition occurring slightly more commonly in boys and may involve ipsilateral fibula. Radiographic changes are confined to the cortical zone showing intracortical osteolysis, often in a bubbling fashion. Although regression may occur, it is rare and usually there is progression during childhood; however, there is no progression after puberty. The condition is usually seen clinically because of progressive deformity, particularly moderate anterior or anterolateral bowing of the fibula. It may stabilize with healing or regression in early adulthood and patients do well without treatment (Vigoritta 2008, 326).

The age of onset of fibrous dysplasia, in contrast to osteofibrous dysplasia, is 20-30 years and is generally found in equal numbers in males and females (Levine *et al* 2003, 159). The condition is most commonly monostotic though it can be polyostotic (affecting one or many bones). Long bones are affected in the intramedullary and diaphyseal area and lesions have a ‘ground-glass’ radiographic appearance, being of variable radio-opacity (Levine *et al* 2003, 159-160). Lesions may be of a cystic or pagetoid type, the latter consisting of a trabecular pattern which is denser than normal bone (Wheeless 2011). Though fibrous dysplasia is not associated with bowing of the skeletal element according to some authors (Vigorita 2008, 327), others suggests that in chronic cases, the affected bone is weakened due to the irregular and poor trabecular bone formation within the lesion, leading to secondary stress fractures and bowing of weight bearing elements. Osteofibrous dysplasia may be linked to fibrous dysplasia or adamantinoma, which should be considered differential diagnoses here, as well as osteoid osteoma and nonossifying fibroma. Whilst adamantinoma shares characteristics with osteofibrous dysplasia (Most *et al* 2010), the more aggressive nature of the condition results in more prominent and numerous radiolucent lesions, though the outer surface of the cortex is smooth and compact (Ortner 2003, 524).

Another differential diagnosis that should be considered is osteoid osteoma, a true neoplastic condition, which consists of a radiolucent lesion surrounded by a reactive deposit of dense lamellar bone (Ortner 2003, 506) and is commonly found in the femur and tibia. However, in this disease a well-defined ‘nidus’ represented by a radiolucent lesion is present within the cortex (Vigorita 2008, 341), which is not observed in the example here. Non-ossifying fibroma is also a fibrous lesion of childhood but has a predilection for the metaphyseal areas of long bones rather than the midshaft, where it is rare. Since this specimen is found in an adult individual, regression and remodelling of the lesion since childhood may have obscured some of the diagnostic characteristics of the lesion if it originated during development, making it difficult to form a conclusive diagnosis.

Review of the palaeopathological literature also suggests that similar substantial deposits of periosteal bone on the anterior aspect of the tibia can be a result of infection by syphilis. Syphilis is a bacterial infection by treponemal spirochetes (Walker *et al* 2015). In more temperate, Western climates, syphilis is either endemic (non-venereal, transmitted by direct skin contact) or acquired (venereal) (Walker *et al* 2015); congenital cases passed from an infected mother to foetus also occur; these are associated with high mortality in the younger age groups and are most commonly, though not exclusively, a sequela of venereal syphilis (Ortner 2003). All of these types of syphilis can result in changes in the bone but unfortunately, there are no specific changes associated with either type (Ortner 2003; Walker *et al* 2015). Generally if the remains of younger sub-adults display lesions it is thought that congenital syphilis is a likely diagnosis but in adults there is no clear-cut method of distinguishing between endemic and venereal cases.

Bone infection occurs in chronic cases of the disease in its second and tertiary stages; secondary stage infections (usually involving extensive ulceration) are often multiple and occur in several skeletal elements (Palmer and Reeder 2001). Lesions may heal and result in periosteal thickening and fibrosis (Palmer and Reeder 2001). Gummatous lesions (appearing as holes or lytic lesions on the outer surface of the bone, usually in tandem with an area of bone deposit) and caries sicca in the cranial vault (evident by a lytic lesions on the surface of the cranium that often run into each other creating a nodular, irregular surface) are more easily recognisable and thereby diagnostic of the disease, usually occurring in tertiary stage syphilis. However, the infection can result in a suite of bone changes that are often non-specific and that are difficult to differentiate from other diseases. These cases are known as 'non-gummatous' (Ortner 2003, 294).One of the more recognised changes of non-gummatous periostitis includes 'sabre shin', which results in anterior 'bowing' of the tibia. The tibia may be affected to the extent where it is physically bowed due to the subsequent syphilitic overstimulation of bone growth during childhood (Ortener 2003). In comparison, some cases exhibit a large deposit of periosteal bone on the anterior surface that gives the appearance of bowing but radiographic examination reveals the posterior cortex to be relatively unaffected. Ortner (2003, 294-6) suggests that this is a means of differentiating the former as congenital syphilis compared to the latter as acquired syphilis. These latter changes are very similar to those seen here in SK [8024]. Indeed, radiographs with similar changes to SK [8024] have also been observed in cases of sabre shin by Palmer and Reeder (2001; see http://www.isradiology.org/tropical_deseases/tmcr/chapter35/clinical3.htm).

Traditionally, syphilis was thought to have first occurred in England after contact with the New World in 1493 with evidence for 'pre-Columbian' syphilis being virtually absent (Mays *et al* 2010; Aufderheide and Rodriguez-Martin 1998). However, more recent analyses have revealed some earlier evidence of the disease in England, albeit still rare. To date, 11 sites dating from the late Saxon/early medieval periods (1050-1539 AD) have produced skeletons with possible pre-Columbian syphilis with one additional case putatively dating to the mid 6th century (Roberts *et al* 2013, Walker *et al* 2015). Lesions have been found to vary little in their expression in pre- and post-Columbian cases though an increase in numbers of cases is noted over time (Walker *et al* 2015).

to previous view

Although the differential diagnoses discussed earlier must be considered, as a potential case of acquired syphilis, this could represent one of the earliest examples of syphilis currently known in the palaeopathological literature. This individual is from a grave which contained 14th century material and extended beyond the edge of excavation, so the upper portion remains preserved in situ. It was below the general burial soil which contained material of 14th – 15th century date while the radiocarbon dates from four individuals in the assemblage are of the late Saxon/early medieval period (Section 5.6).

Trauma

Only one case of skeletal trauma was observed at St Mary's, which in this case consisted of two well healed rib fractures of SK 8033, a possible male adult (Table 9). Smooth, lamellar bone callus was present that was remodelled and the fractured ribs were well aligned (Fig 23). Though the ribs were fragmented from post-mortem damage and could not be sided, it could be seen that the ribs had been fractured in the mid-diaphyseal area. Whilst fractures represent incidences of trauma to the torso by either striking or being struck by a hard object, in some cases an underlying condition that weakens the structure of the bone can predispose some individuals to fractures of the ribs and so clinically, it is common to see fractures in the elderly who have osteoporosis or osteomalacia (Salter 1999, 200). It is, however, also common to see trauma in younger males than females and in fact, for the early medieval period a total of 28 males compared to only 8 females have been found with rib fractures (Roberts and Cox 2003, 206). This may reflect the increased exposure of males to trauma in lifestyle compared to females during this period. The CPR of 2.2% from St Mary's is slightly higher but corresponds well to the national average of 1.4% (Roberts and Cox 2003, 206) though the observable sample presented here is very small due to the depletion of skeletal elements of a composition high in cancellous bone. At Monkwearmouth, rib fractures were observed in two males and one female amongst the population, with a CPR of 0.9% (Roberts and Cox 2003, 206), whilst four males and one female were recorded with rib fractures from The Chapter House, Worcester Cathedral (CPR = 2.7%; Waldron 2011). At the Chapter House, eleven examples of trauma throughout the skeleton were found amongst males in total compared to two cases affecting females.

Pathology	No. of Cases	No. of Observable Elements	TPR	CPR
Fracture of Ribs	2	49	4.1%	2.2%

Table 9: Summary of Trauma Prevalence

Joint Disease

Primary osteoarthritis and degenerative joint disease (DJD) are an inevitable consequence of old age when the body's tissues begin to break down and are unable to repair themselves adequately (Salter 1999). Clinically, this condition is most common in adult women, though it occurs in 80% of both women and men over the age of 75 years (Salter 1999). This is diagnosed through the appearance or osteophytes round the periphery of the vertebral body, increased porosity of articulating surfaces and additionally subchondral cysts due to the breakdown of the subchondral bone surface. In the most severe cases, eburnation of the articulating surfaces created as the bones' surfaces abrade each other is present and this is feature is pathgnomic of osteoarthritis.

go to contents

to previous view

Primary joint disease occurs without associated trauma or pathological conditions and is associated mainly with abnormal stress on the joint or age. When associated with trauma or other pathological conditions, the joint disease is said to be ‘secondary’. Degenerative joint disease is characterised by the presence of macro- or microporosity to the joint and osteophyte formation around the joint surface. Osteoarthritis is only diagnosed if eburnation is present. This is the result of the complete destruction of the cartilage lining the joint, allowing the bone surfaces to abrade against each other (See Fig 24). It is difficult to assess which conditions would have had the greatest impact on the individual, as in some clinical cases patients present with joint pains where little bony change has occurred, yet others exhibit quite advanced skeletal changes and experience little discomfort (Rogers and Waldron 1995). Joint diseases such as osteoarthritis, however, can be a debilitating disorder. Observations of pathological changes in the spine are recorded separately for the anterior body as well as for the posterior arch at the zygapophyseal joints.

No extra-spinal joint diseases were observed among the articulated skeletal remains from St Mary’s and this paucity is a direct result of the lack of survival of the epiphyses making up the appendicular joints in the body. However, some cases of primary spinal joint disease were observed, including osteoarthritis of several cervical vertebrae in SK 8033, a possible adult male with rib fractures, which exhibited degeneration of the zygapophyseal and body joints including eburnation (CPR = 2.2%). This individual did not exhibit corresponding changes in the lumbar area of the spine and it may well be the case that the osteoarthritis evident in the cervical area was associated with some trauma or specific type of repetitive stress to the neck joints.

Observations of spinal joint disease, including osteoarthritis, for the population as a whole are recorded in Table 10.

	Zyg. Joints Affected	Body Affected	Zyg. Joints Present	Body Present	TPR Zyg. Joints %	TPR Bodies %	CPR Zyg. Joints %	CPR Bodies %
C1-C2	0	0	5	5	0.0	0.0	0	0
C2-C3	1	0	4	5	25.0	0.0	2.2	0
C3-C4	1	1	4	4	25.0	25.0	2.2	2.2
C4-C5	1	1	4	5	25.0	20.0	2.2	2.2
C5-C6	1	0	5	4	20.0	25.0	2.2	0
C6-C7	1	3	6	5	16.7	60.0	2.2	6.5
C7-T1	0	1	5	5	0.0	20.0	0	2.2
T1-T2	0	0	5	4	0.0	0.0	0	0
T2-T3	0	0	5	2	0.0	0.0	0	0
T3-T4	0	0	5	3	0.0	0.0	0	0
T4-T5	0	1	5	4	0.0	25.0	0	2.2
T5-T6	0	1	5	4	0.0	25.0	0	2.2
T6-T7	0	1	5	3	0.0	33.3	0	2.2
T7-T8	0	0	4	1	0.0	0.0	0	0
T8-T9	0	0	4	1	0.0	0.0	0	0
T9-T10	0	0	4	1	0.0	0.0	0	0
T10-T11	0	0	3	2	0.0	0.0	0	0
T11-T12	0	0	3	1	0.0	0.0	0	0

go to contents

to previous view

	Zyg. Joints Affected	Body Affected	Zyg. Joints Present	Body Present	TPR Zyg. Joints %	TPR Bodies %	CPR Zyg. Joints %	CPR Bodies %
T12-L1	0	0	3	2	0.0	0.0	0	0
L1-L2	0	0	6	2	0.0	0.0	0	0
L2-L3	2	0	6	3	33.3	0.0	4.3	0
L3-L4	4	0	7	4	57.1	0.0	8.7	0
L4-L5	2	2	7	6	28.6	33.3	4.3	4.3
L5-S1	2	0	5	4	40.0	0.0	4.3	0

Table 10: Summary of Spinal Joint Disease

Overall, the TPR rates are high due to the small number of observable elements and cannot be reliably used for inter-site comparison. Nonetheless, it is noteworthy that the most commonly involved areas of the spine are the cervical and lumbar vertebrae and that the individuals affected by changes in the lower back are generally middle and old adults, three male and one female (Total CPR = 13%). Two adults of unobservable or indeterminate sex also exhibited degenerative changes in the lumbar region. At the Chapter House, Worcester Cathedral, ten males and 5 females are reported to have exhibited osteoarthritis in the zygapophyseal joints of the spine (Total CPR = 8.1%; Waldron 2011).

	SN	OBS	TPR %
C2-C3	0	5	0.0
C3-C4	0	4	0.0
C4-C5	0	5	0.0
C5-C6	0	5	0.0
C6-C7	0	5	0.0
C7-T1	0	5	0.0
T1-T2	0	2	0.0
T2-T3	0	1	0.0
T3-T4	0	1	0.0
T4-T5	0	3	0.0
T5-T6	0	4	0.0
T6-T7	2	4	50.0
T7-T8	1	2	50.0
T8-T9	0	1	0.0
T9-T10	1	1	100.0
T10-T11	2	2	100.0
T11-T12	1	2	50.0
T12-L1	1	2	50.0
L1-L2	1	2	50.0
L2-L3	1	3	33.3
L3-L4	1	4	25.0
L4-L5	0	5	0.0
L5-S1	0	3	0.0

Table 11: Presence of Schmorl's nodes

to previous view

Also manifest as vertebral joint disease amongst the population at St Mary's were Schmorl's nodes. These are rounded lesions occurring in the surfaces of vertebral bodies and occur as a result degenerative changes to the intervertebral disc and soft tissues. With age, the annulus fibrosis of the intervertebral disc loses its elasticity and the thin cartilage lining the end plate (body surface) deteriorates. This allows the nucleus pulposis of the intervertebral disc to protrude through the cartilage forming a depression in the surface of the body (Salter 1999, 274). Schmorl's nodes are frequently seen radiographically but they are of little clinical significance. They are, however, a clear indication of degeneration of the spine in archaeological populations.

Dental Disease

Dental diseases include conditions that not only directly affect the teeth but also the soft tissue surrounding them, sometimes observable in changes to the underlying alveolar bone. Each condition can give an indication of different aspects of lifestyle and health of the individual. For example, caries is associated with diets high in sucrose content. The presence of calculus can inform us about dental hygiene whilst enamel hypoplastic defects testify to developmental stresses that an individual has undergone in childhood. The analysis of dental disease, therefore, not only informs us of specific oral conditions but provides complimentary data regarding overall health status and cultural practices.

Prevalence rates of dental diseases are presented here as a percentage of the number of observable teeth present or number of observable sockets. In total, 213 teeth were recorded as observable, all of which were permanent dentition. No deciduous dentition was present and there was no dentition present amongst the sub-adults. The prevalence rate of ante-mortem loss and the prevalence rate of abscesses were calculated according to total number of observable tooth sockets for each condition. No tooth sockets were observed amongst the sub-adult sample. Crude prevalence rates for St Mary's are likely to be unrepresentative for comparison to other sites due to many individuals being represented by the lower skeleton only. Only 13 individuals were recorded with dentition present.

True and crude prevalence rates for dental diseases present are shown below in Table 12 below:

Dental Disease	Adult (n)	Adult Obs. Elements (N)	Adult TPR %	Subadult TPR	Whole Pop. TPR %	No. of Affected Individuals	Whole Pop. CPR %
Caries	29	213	13.6	-	13.6	6	13.1
Calculus	174	213	81.7	-	81.7	13	28.3
Ante-Mortem Loss	24	281	8.5	-	8.5	6	13.0
Abscess	12	201	6.0	-	6.0	5	10.9
Enamel Hypoplasia	25	76	32.9	-	32.9	5	10.9
Periodontal Disease	106	131	80.9	-	80.9	8	17.4

Table 12: Prevalence rates of Dental Disease

go to contents

to previous view

The 13.6% TPR of caries, linked to diets high in sucrose and poor oral hygiene, is much higher than the national average TPR of 4.2% for early medieval sites (Roberts and Cox 2003, 189-191). The rate from St Mary's is likely to be elevated due to the small sample size. Nonetheless, the TPR of caries from sites with comparable sizes of dentition samples ranges from 1.9-3.3%, also much lower than St Mary's. At Jarrow and Monkwearmouth, the TPR at both sites was 1% (Anderson *et al* 2006, 488). The TPR for caries at North Elmham, an ecclesiastical centre, is 6.5% also higher than the national average. It may well be the case that those individuals with dentition present were middle aged or older adults, who may have been more likely to exhibit higher rates of caries or it may be that the individuals at St Mary's had a higher level of sucrose in their diet. During the early medieval period, honey is thought to be the only source of sweetening foodstuffs, with cane sugar becoming available to the general populous from the 16th century onwards (Roberts and Manchester 1997, 48). The high TPR rate could also reflect poor dental hygiene routines in general; interproximal caries were frequently observed at St Mary's and may have developed from food particles lodged between neighbouring teeth.

Evidence of whether dental care was employed regularly can be inferred from the relative presence of calculus or mineralised plaque in an archaeological population. Although, as Roberts and Cox (2003, 131) point out, calculus can also relate to a diet high in protein it is generally assumed that high levels of calculus relate to poor oral hygiene. The analysis of calculus presence at St Mary's indicates that 81.7% of observable teeth present exhibited calculus deposits. As with caries, the prevalence rate of calculus is much higher than the national average of 39.2% (Roberts and Cox 2003, 194). A higher amount of plaque and mineralised calculus, like caries, is found in those individuals with greater sucrose in their diets (Roberts and Manchester 1997, 55) but similarly, the accumulation of calculus may also well be more the result of a lack of dental hygiene. Some deposits were noted to be extensive, as illustrated in Fig 26.

Calculus builds up as a deposit on the teeth along the lines of the gums and when sufficient is present, irritation to the neighbouring gums is caused. This irritation is known as gingivitis, or gum disease, which can lead to changes observed in the underlying alveolar bone, known as periodontal disease (Fig 26). Eventually, the gum and the underlying bone may recede, causing teeth to become loose. Of all the observable teeth with tooth sockets, 80.9% exhibited some of the changes associated with alveolar inflammation and resorption. CPR rates for periodontal disease during this period average at 27% (Roberts and Cox 2003, 137). Unfortunately, it is difficult to make comparisons due to the nature of skeletal assemblage at St Mary's. Overall, 61.5% of those individuals in this sample recorded as having dentition present exhibited periodontal disease and the similarity of this rate with that of calculus probably reflects their inter-related aetiology.

As periodontal disease progresses, teeth become loose and can be lost as a result. Ante-mortem tooth loss affected 8.5% of observable tooth sockets, just above the national average of 8% (Roberts and Cox 2003, 193). At Jarrow, ante-mortem tooth loss is reported at 4.0% for the population and at Wearmouth, 7.3%. The comparative TPR for North Elmham Park is 11.1%. Ante-mortem tooth loss can also be associated with abscesses, where the infective process leads to a similar loss of alveolar bone around the tooth root. Severe caries and attrition are both linked to abscess formation, where bacteria from the tooth infection spread through the pulp to the jaw. Evidence of chronic abscess and its sequella were noted in SK 8033, where an abscess had perforated the maxillary sinus, leading to inflammation (Fig 21); this individual exhibited 5 abscesses in total (Fig 27). The TPR of dental abscess at St Mary's

go to contents

of 6% is well above the national average of 2.8%, reported by Roberts and Cox (2003, 192) and also the rates of 2% and 1.1% reported for Monkwearmouth and Saxon Jarrow respectively (Anderson *et al* 2006, 489) as well as the 2% TPR at North Elmham Park. In part, the high TPRs at St Mary's are due to the inter-dependent aetiology of dental abscess and caries. It should, of course, be remembered that increased ante-mortem tooth loss is associated with age and that a sample consisting of middle and older aged individuals might produce a biased prevalence rate.

Caries and abscesses would have caused individuals great discomfort. As Cameron (1993, 12) points out, there was no anaesthesia at the time of the Anglo-Saxon period, and ailments including tooth-ache had to be endured, though they may have been muted by using herbs such as mandrake, henbane and poppy. No reference to dental fillings as a therapeutic procedure exists in Saxon literature but there is other medical advice on how to treat painful teeth and gums with herbal poultices and rinses. In Leechbook III, it is recommended that for toothache, the patient chew pepper with the affected tooth or to cook henbane roots in strong vinegar or wine which is then to be applied to the sore tooth to be chewed on from time to time (Cameron 1993, 12). A treatment for mouth ulcers is referenced in the Leechdoms: 'For an ulcerated mouth, take plum-tree leaves, boil in wine and wash out the mouth with it' (Cameron 1993, 75). Based on the preceding Roman medical theories, caries were believed to be caused by 'worms' and their removal required fumigation using the smoke from burning candle wax. No archaeological evidence for tooth filling or prosthetics has been found from the Anglo-Saxon period.

The prevalence rate of enamel hypoplasia was also recorded and is interpreted in many archaeological analyses to indicate physiological stress during development. Hypoplastic defects in the teeth, usually more common in the anterior dentition, are caused by bouts of childhood illness or severe malnutrition and are often used as an indicator of stress to health in childhood (Goodman and Armelagos 1985). These defects appear to occur most often around the age of three years (Dobney and Goodman, 1991) and it is believed that only one person in 14,000 is affected by a hereditary hypoplastic condition (Hillson 1986). Many ethnographic studies have found correlations between low socio-economic status and a higher rate of hypoplastic defects (e.g. Dobney and Goodman 1991) and diachronic increases in observations of such defects have also been observed in archaeological populations, thought to be related to lifestyle changes and increased stress following colonisation (Hutchinson and Larsen 1988). It should be borne in mind, however, that many of the people who are subjects in ethnographic studies live in conditions of the extreme poverty where there is little scope for social mobility and that we should expect to see more variance and less of a clear-cut picture in populations where the nutritional standard is over the critical nutritional threshold and where social mobility is more likely.

At St Mary's, enamel hypoplastic defects were found in 32.9% of the anterior dentition, in 5 individuals, compared to the 7.4% average rate found across contemporary sites in Britain. The defects were typically manifest as linear grooves in the anterior teeth (Fig 28). It should be noted that most of these defects occurred in one individual, with the CPR for the whole population being 10.9%. This rate is more reliable given the inter-dependence of observations of hypoplastic defects on teeth within the same individual. The national average CPR is 18.8% and, therefore, the rate from St Mary's is comparative low and indicates that physiological stress during childhood was experienced less frequently than at many other contemporary sites, although the rate was very similar to Jarrow (CPR = 11.1 %). Wells and Cayton (1980, 282) state that observations of enamel hypoplasia were commonplace amongst the population at North Elmham, although generally lesions were slight, with about half the observable adult jaws affected (N = 182). The rate at St Mary's was more frequent, however, than Monkwearmouth, where the CPR was 3.4% (Anderson *et al* 2006, 490).

The Articulated Assemblage: Conclusions

The remains of a total of 46 individuals were exhumated from 69 graves. The intercutting of graves in combination with a limited area of investigation resulted in the excavation of incomplete graves and the subsequent recovery of partial skeletons only. Most of remains were, therefore, only 25% or less complete. The majority of the skeletal remains were of poor or fair preservation, with many of the individual elements having suffered cortical degradation from post-mortem taphonomic processes. This poor level of preservation restricted the metric analysis of the skeletal elements and stature could only be assessed for two individuals. Nonetheless, the age and sex of several individuals could be assessed and the osteological evidence indicates that the assemblage included adults, male and female, and sub-adults. Several cases of pathology were also observed, including inflammation, developmental and metabolic conditions, trauma and a possible rare early case of acquired syphilis. The presence of cribra orbitalia suggested some cases of megaloblastic or haemolytic anaemia during childhood whereas dental enamel hypoplasia was comparatively low, perhaps indicating fewer cases of childhood febrile diseases. Adults were exposed to inflammation, infection and trauma, possible relating to lifestyles and occupations, and old age resulted in degeneration, causing joint disease in the spine, osteoporosis and tooth loss. Dental diseases were particularly prevalent in the population, with high rates of calculus, abscesses, caries and periodontal disease, reflecting a lack of dental care and possibly a diet rich in sucrose. Overall, the osteological data provides the first direct evidence about the population and the environment in Kempsey during the mid-late Saxon period and although limited by the small sample number and poor preservation conditions, it gives us an intriguing insight into the lifestyle during both adulthood and childhood at the time.

The Disarticulated Assemblage

The disarticulated assemblage was analysed macroscopically and recorded using a Microsoft Access database, which is retained in the project archive. Each element recorded was given a unique identification number and recorded by context. In each instance, the identification, side and portion of the bone was noted, along with completeness, taphonomy and observable joint surfaces. Any metrics that would provide an estimation of sex or of stature were taken where possible. The pelvic or skull bones were also analysed for sexually dimorphic traits where preservation allowed, using the criteria set out by Buikstra and Ubelaker (1994). Age determination was carried out using epiphyseal fusion, analysis of the pubic symphysis and of the auricular surface, where appropriate, and classified according to Brookes and Suchey (1990) and Lovejoy *et al* (1985). Grading of dental attrition was also used as a supplementary age assessment technique using the Miles method (1963) where dentition sets were complete enough to allow fair observation. Age of sub-adults was assessed using both dental development (Smith 1991) and eruption (Ubelaker 1989) as well as long bone lengths (Schaefer *et al* 2009) and epiphyseal fusion (Scheuer and Black 2004). The same methods of assessment were applied to the disarticulated as to the articulated assemblage so that fair comparisons could be made between the two samples.

to previous view

The minimum number of individuals (MNI) represented by the assemblage was calculated according to the number of repeated elements or parts of elements in tandem with observations of age at death according to development.

Observations

A total number of 587 bone fragments in addition to 44 permanent and 7 deciduous teeth were recovered as disarticulated elements from 16 stratified contexts. Some contexts appear to have contained discrete anatomical regions, in particular complete crania, as well as sub-adult remains. Fragments excavated and recovered as discrete deposits within contexts that could be re-associated or reconstructed were recorded as whole elements. It was not possible to re-associate any skeletal elements that were recovered from separate contexts. Some fragments were not recorded due to being unidentifiable. As a result, 184 elements were recorded and analysed for condition, age, sex and pathology. The majority of the bone present was observed to be of 'fair' condition (n = 96, 52.2%), or 'good' condition (n = 71, 38.5%), allowing elements presenting the epiphyeal areas of bone to be assessed for age, fused epiphyses being classified as 'adult' and unfused as 'subadult'. Those elements containing dentition were also assessed for age according to dental development, eruption and attrition.

Results

A total of 43 disarticulated elements could be classified as 'adult', with an additional 8 elements being ascribed a specific adult age category; 2 were categorised as 'young adult', 5 being 'middle adult' and one recorded as 'old adult'. Six elements belonged to the sub-adult classification in total, one being identified as 'older child' from grave soil 8019. All age groups were, therefore, represented in the disarticulated assemblage. A total of 127 fragments were unobservable for age. Of the 16 elements that could be assessed for sex, 3 were 'male', 2 were 'possible male', 3 were 'indeterminate' and 8 were 'possible female', suggesting there was no sex-related bias in the sample.

Given the intercutting nature of burials on site, it is a distinct possibility that the skeletal remains of one individual may be spread over several contexts. Given this scenario, it is necessary to calculate the minimum number of individuals for the collated assemblage as well as by context. Considering all the recorded disarticulated elements, a minimum number of 8 individuals is represented by the sample, 7 adults and 1 sub-adult. If contexts are considered separately and as representing unassociated deposits of individuals, a minimum number of 21 individuals may be present, represented by 19 adults and 2 sub-adults. It is not possible to assess the extent to which these latter figures are an artefact of the context system of recording.

Pathological changes were recorded for 12 fragments. Inflammatory lesions were observed on the endocranial surfaces of two crania, one of which, context 8035-1, was extensively affected (TPR = 9.1%, N = 22, parietal bones). In this cranium, periostitic inflammatory bone remodelling was present on the endocranial surface of the right parietal, right side of frontal bone, right sphenoid (orbital plate of frontal bone, jugum area and cerebral surface of greater wing of sphenoid) and the endocranial surface of occipital bone (Fig 29). In addition, the ecto-cranial infra-temporal surface of greater wing and temporal surface of sphenoid were similarly affected. These changes represent inflammation of the meningeal vessels and dura mater, which could be the result of epidural haematoma, meningitis, meningoencephalitis, tuberculous meningitis though it is important to note the restriction of the lesions to the right hand side of the head only. This may indicate a more localised condition. The areas affected on the endocranial surface of the right parietal bone are the furrows for the parietal branch of the middle meningeal vessels. These vessels pass through the foramina of the sphenoid; the accessory meningeal artery passes through foramen ovale and the middle meningeal artery passes through foramen spinosum. Extensive inflammation to the right side meningeal vessels could therefore lead to the endo- and ectocranial lesions observed here. The porotic and trabecular appearance of the lesions may indicate that the lesions were remodelling at the time of death, although the bone itself has a distinct dense appearance and are not typical of woven bone.

Context	Total Element Count	Adult	Sub-adult	Unobs.	Young Adult	Middle Adult	Old Adult	MNI
8000	56	10	0	45	0	1	0	2
8002	10	2	0	7	1	0	0	1
8003	1	0	0	1	0	0	0	1
8004	2	0	0	2	0	0	0	1
8010	26	10	0	15	0	1	0	1
8019	43	11	5	23	1	2	1	5
8029	2	2	0	0	0	0	0	1
8054	5	2	0	2	0	1	0	1
8059	1	0	1	0	0	0	0	1
8062	6	1	0	5	0	0	0	1
8087	22	1	0	21	0	0	0	1
8127	1	1	0	0	0	0	0	1
8131	4	1	0	3	0	0	0	1
8132	2	0	0	2	0	0	0	1
8035-1	2	1	0	1	0	0	0	1
8035-2	1	1	0	0	0	0	0	1
Total	184	43	6	127	2	5	1	21

Table 13: Summary of the MNI by context

A total of 8 elements were affected by degenerative joint disease, 4 of which were spinal cases (TPR = 23.5%, N = 17, observable body surfaces) and 4 extra-spinal. Three cases of joint disease were observed at the hip (TPR = 25%, N=4), denoted by the presence of microporosity and minor osteophyte formation around the acetabular joints. One additional case was recorded at a knee joint on the proximal joint surface of a tibia (TPR = 50%, N=2). Two metabolic conditions were also observed. One possible case of healed rickets was found in a tibia exhibiting medio-lateral curvature (TPR = 6.3%, N = 16). Unfortunately, the incompleteness of the element prevented a definite diagnosis being made. Minor cribra orbitalia was also recorded in one eye orbit (TPR = 16.6%, N = 6; 3 individuals).

Post-Mortem Modifications

Post-mortem modifications were observed affecting the skull vault from context 8035-1 that were unusual. Many linear v-shaped defects ran across the top of the skull vault, mainly on the right hand side around the bregma and the adjacent right parietal (Fig 30). The marks were generally parallel and ran from the posterior right hand side to anterior left hand side, diagonally across the vault. The marks were a broad v-shape in cross section, well-defined with reasonably sharp edges and generally 3-5 cm in length. The colouration of the bone forming the marks is the same as the rest of the cranium. Approximately 15 distinct marks were recorded. Some edges were smooth, others were coarser. The marks were not typical of sharp force trauma and did not resemble the dendritic patterning usually associating with roots. Though it is a possibility that large roots may have caused the marks, they are more likely to represent ancient blows to the skull with a blunt edged implement such as a spade or mattock. Interestingly, the characteristics of the marks noted above suggest that the bone was still relatively fresh or 'wet' when the blows were received. More recent post-mortem damage would have resulted in dry bone fracturing and also discolouration of the exposed cortex, depending upon the timing of the damage. The marks, therefore, not only indicate post-depositional disturbance to the grave, presumably during the cutting of a new grave into an old one, but also that this occurred within a relatively short time after deposition. Unfortunately, it is not possible to speculate more specifically about the length of time involved due to the posthumous condition of bone varying widely according the burial environment. Additionally the recovery of discrete disarticulated crania, rather than scattered individual cranial bones, from possible pits or in the backfill of graves suggests that whole elements were reinterred once exhumed, albeit in a somewhat haphazard manner (Fig 31). These subsequently remained undisturbed once the focus of burial changed to the later enclosed churchyard i.e. the location of re-deposition was out of the area used for later burial.

Discussion

Analysis of the disarticulated skeletal material revealed the remains of at least 8 individuals based upon assessment of the whole assemblage. By context, the remains of least 21 individuals were recovered. Given the amount of intercutting of burials on site, it is not clear if all or any of these elements originate from some of the partial burials excavated or represent additional individuals. The majority of the remains were adult though sub-adult remains were also present. The data from the disarticulated confirms the demographic profile obtained for the articulated assemblage, with both males and females present, as well as adults of all age groups. The disarticulated assemblage reflects the articulated assemblage in terms of the range of pathological conditions observed and, furthermore, those elements that were better preserved augment the data collected from the articulated assemblage. For example, the analysis of the disarticulated assemblage has confirmed the presence of extra-spinal joint disease, absent in the articulated assemblage due to its poorer preservation of joints. It is interesting to note that inflammatory conditions affecting the endocranial surfaces were prevalent amongst both the disarticulated and the articulated assemblages; in part, its relatively frequent appearance is due in part to the better preservation of these surfaces but even taking this into account, three cases within the collated assemblage is noteworthy and suggests that inflammation was a particular common condition amongst the population.

to previous view

Isotope analysis
by Andrew Millard

Carbon and nitrogen isotopes

Collagen was poorly preserved at Kempsey, with only 14 of 21 bones yielding sufficient collagen for measurement and six of those 14 having C:N ratios outside the acceptable range of 2.9 to 3.6 given by DeNiro (1985). Table 14 and Graph 3 show that the samples with high C:N generally have lower $\delta^{13}C$ values, which would be consistent with contamination by humic acids from the soil.

Sample No.	Context	Species	Element	C wt%	$\delta^{13}C$ ‰ VPDB	N wt%	$\delta^{15}N$ ‰ AIR	Atomic C:N	Notes
1	10003	Cow	tibia	42.9	-22.57	13.5	6.28	3.69	a
2	3005	Cow	right metacarpal	43.6	-22.05	14.4	7.00	3.54	
3	8003	Pig	right distal humerus	43.1	-20.25	13.4	8.49	3.75	a
4	8000	Pig	unfused distal tibia	43.0	-22.00	14.1	7.95	3.54	
5	8000	Sheep/ Goat	metacarpal	43.3	-21.08	15.4	4.91	3.28	
6	10003	Sheep/ Goat	right radius	42.4	-20.82	14.8	5.45	3.34	
7	SK1004	Human	right femur	42.9	-20.73	13.6	10.33	3.68	a
8	SK8005	Human	right femur	insufficient collagen					
9	SK8125	Human	left humerus	43.3	-20.55	14.0	11.62	3.60	
10	SK8127	Human	parietal	insufficient collagen					
11	SK8030	Human	right rib	43.1	-20.79	13.7	11.80	3.66	a
12	SK8033	Human	right rib	43.2	-19.61	15.2	10.43	3.32	
13	SK8136	Human	parietal	42.7	-20.91	12.6	11.48	3.96	a
14	SK8041	Human	right femur	insufficient collagen					
15	SK8044	Human	parietal	43.4	-19.85	15.1	10.04	3.34	
16	SK8050	Human	tibia	insufficient collagen					
17	SK8064	Human	right rib	insufficient collagen					
18	SK8102	Human	temporal	44.0	-20.99	14.1	11.92	3.64	a
19	SK8119	Human	occipital	41.8	-20.54	14.3	10.50	3.41	b
20	SK8122	Human	right humerus	insufficient collagen					
21	SK8035	Human	parietal/occipital	insufficient collagen					

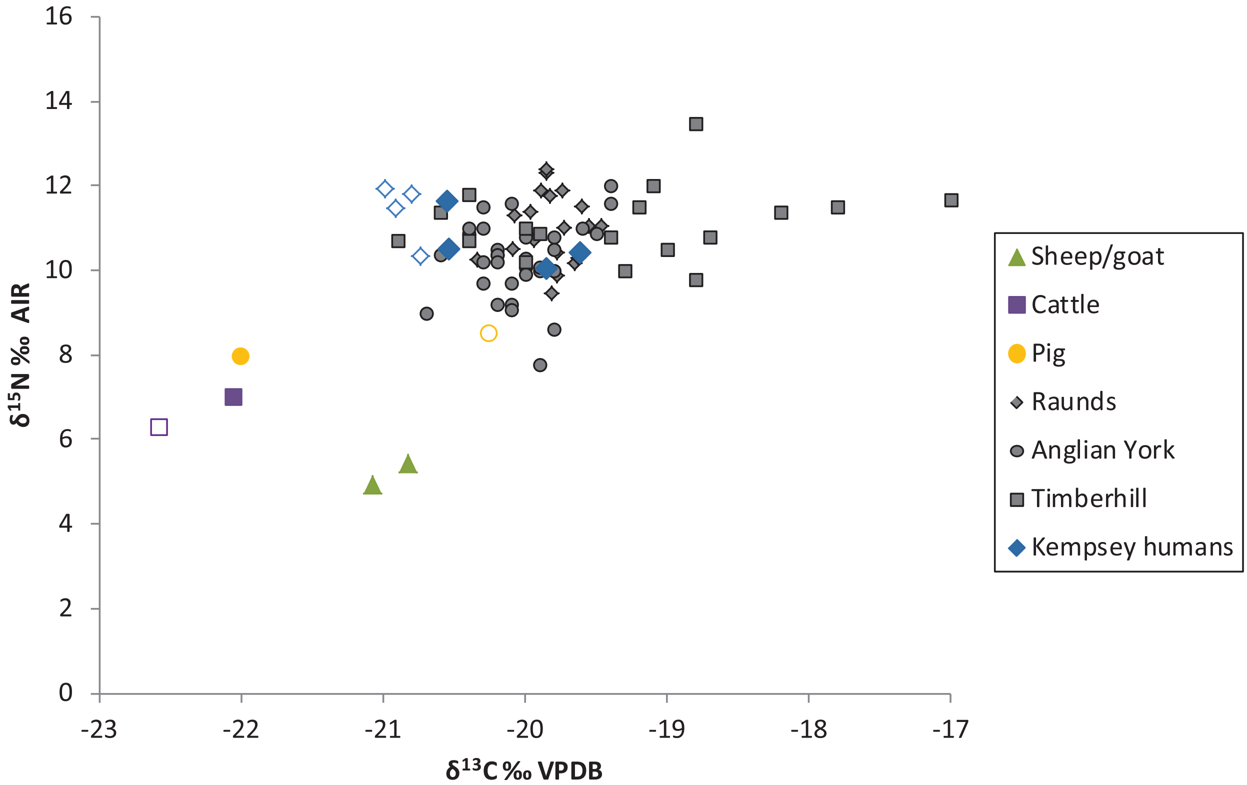
Table 14: Dietary isotope measurements
(Notes: a: C:N ratio falls outside acceptable range of 2.9-3.6; b: single measurement not in duplicate)

The $\delta^{13}C$ values of both animals and humans are typical of C3 ecosystems and show no evidence for input of marine foods in the diet. The isotopic shifts from the mean faunal values to the mean human values, -21.5 ‰ to -20.1 ‰ in $\delta^{13}C$ and 6.3 ‰ to 10.7 ‰ in $\delta^{15}N$, are consistent with trophic level shifts of 0-2 ‰ for $\delta^{13}C$ and 3-5 ‰ for $\delta^{15}N$ (Bocherens and Drucker 2003). Jay *et al* (2013) have suggested that a range in $\delta^{13}C$ of -21.4 to -19.9 ‰ is typical of a terrestrial diet in

to previous view

Britain, with people of continental origin expected to have slightly higher values. Only SK8033 falls marginally above this range. The results are therefore consistent with the primary protein sources being terrestrial animals and there is no evidence for consumption of any significant amount of either freshwater or marine fish. An account of food rent due from the Bishop's estate at Kempsey in AD 847 included ale, mead, bread, cows, wethers, hams and cheeses (Dyer 1980, 28-29), but no fish despite the proximity of the Severn. The food rent is likely to reflect the normal, locally available produce and is consistent with the isotopic findings.

The late Saxon and Norman period in England has seen relatively few dietary isotope studies. Graph 3 compares the data from Kempsey to a few broadly contemporary sites, Anglian York (Müldner and Richards 2007), the 11th to 12th century cemetery at St John Timberhill, Norwich (Bayliss *et al* 2004) and 10th to 11th century cemetery at Raunds (Haydock *et al* 2013). The individuals from Kempsey are very similar in their isotope values to those from York and Raunds, but do not show the marine fish consumption that is evident at Norwich.



Graph 3: δ^{13}C and δ^{15}N results. Solid symbols denote samples with acceptable C:N ratios and open symbols those with C:N>3.60. Data from comparator sites is in grey: Raunds (Haydock et al 2013), Anglian York (Müldner and Richards 2007) and St John Timberhill, Norwich (Bayliss et al 2004).

Oxygen isotopes

There are no widely accepted quality control criteria for oxygen isotope measurements on enamel. Previously we have compared the yield of silver phosphate to the expected amount and only used samples falling in a range of 90-110% yield. Recent measurements on

NBS120C have shown that this is unnecessarily restrictive. However we continue to report the yield as the only available quality control measure. One sample (SK8050 PM2) had a very low yield and this result should be treated with caution.

Sample No.	Context	Species	Element	Yield %	$\delta^{18}O_P$ ‰ VSMOW	Calibration Equation	$\delta^{18}O_{DW}$
22	8003	Cow	Tooth	79.8	18.02	A	-6.81
23	8046	Pig	tooth	89.4	17.18	B	-6.43
24	8002	Pig	tooth	89.8	15.71	B	-8.14
25	8000	Cow	tooth	89.4	16.22	A	-8.60
26	10003	Cow	tooth	90.0	16.52	A	-8.29
27	8019	Sheep/ goat	tooth	88.2	21.92	C	-2.72
28	SK8010	Human	PM2	74.7	18.23	D	-5.65
29	SK1010	Human	M3	76.2	17.13	D	-7.35
30	SK8030	Human	PM2	79.1	17.80	D	-6.31
31	SK8030	Human	M3	90.2	19.59	D	-3.55
32	SK8033	Human	L Mand PM2	87.4	18.89	D	-4.63
34	SK8033	Human	L Mand M3	94.2	18.17	D	-5.74
35	SK8041	Human	L Mand PM2	68.0	18.85	D	-4.70
36	SK8041	Human	R Max M3	91.7	18.15	D	-5.76
37	SK8044	Human	R Max PM2	88.2	21.56	D	-0.51
38	SK8044	Human	L Max M3	96.0	19.10	D	-4.30
39	SK8050	Human	L Mand PM2	45.7	17.67	D	-6.52
40	SK8050	Human	L Mand M3	87.3	18.65	D	-4.99
41	SK8102	Human	R Mand PM2	82.1	19.53	D	-3.65
43	SK8102	Human	R Mand M3	82.8	19.79	D	-3.24
44	SK8122	Human	L Max PM2	69.2	19.89	D	-3.09
45	SK8122	Human	R Max M3	84.6	21.05	D	-1.30
46	SK8125	Human	R Max M3	88.0	19.56	D	-3.60
47	SK8125	Human	R Mand PM2	86.1	20.09	D	-2.78
48	SK8127	Human	R Max M3	78.6	19.80	D	-3.22
49	SK8127	Human	R Max PM2	82.1	18.54	D	-5.17
50	SK8136	Human	L Mand PM2	88.1	20.60	D	-1.99
51	SK8136	Human	R Mand M3	93.3	18.48	D	-5.26
52	SK80351	Human	L Max M2	80.5	19.91	D	-3.06

Table 15: Oxygen isotope measurements

Calibration equations:

A - D'Angela and Longinelli (1990) Equation 3

B - Longinelli (1984) Equation 5

C - Delgado Huertas et al. (1995) Equation 1

D - Daux et al. (2008) Equation 6

The expected local range of oxygen isotopes is estimated from a combination of data. The results from the cows and pigs are fairly consistent and suggest a local drinking water value of -8.6 to -6.4 ‰ but the sheep-goat suggests a higher value of -2.7 ‰, though all these values have a margin of error that exceeds 0.5 ‰ at one standard deviation, and the equations are based on relatively few data points. The prediction of the Online Isotopes in Precipitation Calculator (Bowen 2013; Bowen and Revenaugh 2003) for Kempsey is 8.1±0.5 ‰. From modern data on the composition of precipitation and ground waters in the British Isles (Darling *et al* 2003; Darling and Talbot 2003) the local drinking water is predicted to have an average $\delta^{18}O$ of about -8.0 to -7.0 ‰. On this basis, local drinking water most likely has a $\delta^{18}O_{DW}$ in the range -9.1 to -5.4 ‰, corresponding to a range of 16.0 to 18.4 ‰ in enamel phosphate.

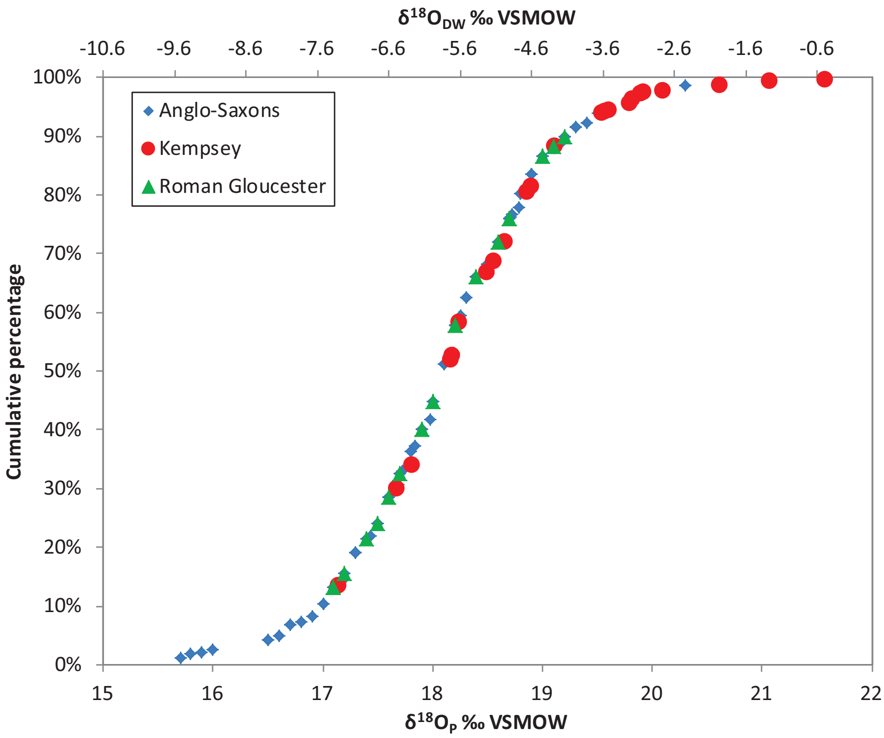
In general the $\delta^{18}O_P$ values are higher than would be predicted from the local drinking water values. Higher values could arise from migration (primarily from the west or south), but the $\delta^{18}O$ of ingested fluids might be increased by up to 2.3 ‰ by consumption of boiled and brewed liquids (Brettell *et al* 2012b). Even allowing for such a shift, which *might* extend the upper bound for local $\delta^{18}O_P$ values to 19.9 ‰, several individuals must be migrants. Graphs 4 and 5 show that these individuals are also outside the range of values from other Anglo-Saxon sites and the range for the more local population from Roman Gloucester. Natural water values above -4.9 ‰ are not found in the British Isles (Darling *et al* 2003; Darling and Talbot 2003), so even allowing for boiling and brewing, ingested water values will not be above about -2.6 ‰, and these individuals (SK8044, SK8122, SK8136 and possibly SK8125) certainly spent at least part of their childhood in an area of higher $\delta^{18}O_{DW}$, the nearest such places being the Iberian coasts, south-west France and the Mediterranean (Bowen and Revenaugh 2003). Evans *et al* (2012) have suggested that $\delta^{18}O_P$ values above 19.2 ‰ fall outside the empirically observed range for western Great Britain, including Gloucestershire, and that limit would include any increase due to boiling and brewing.

Some individuals show significant within lifetime changes in $\delta^{18}O_P$, both decreases (SK8010, SK8044, SK8136) and increases (SK8030, SK8122, SK8127), though a larger number (SK8033, SK8041, SK8050, SK8102, SK8125) show changes of <1 ‰ which are probably within the limits of natural variability on a single water source. Two of the decreases (SK8044, SK8136) are from outside the maximum possible range for Kempsey to within it, indicating a significant migration during childhood. However the later tooth for both these individuals is only within the extended local range and not within the local water range, which might indicate a further migration in late childhood. The migration of SK8010 was more local, as the values lie entirely within the local water range, but this does not rule out large areas of England as the source. The increases for SK8030 and SK8127 are within the extended local range but must indicate a significant move which could be more local, but in a different direction than for SK8010. The increase for SK8122 is from the upper limit of the extended local range to a value well outside the local range, implying a move from one place to another and then to Kempsey. Though we cannot be certain that the first place was not Kempsey it seems unlikely. The other individuals with small changes may have spent all their childhood in one place or may have moved between areas of similar $\delta^{18}O_{DW}$. The values for SK8125 are close together but cross the extended upper limit for Kempsey and therefore this individual most likely moved from elsewhere.

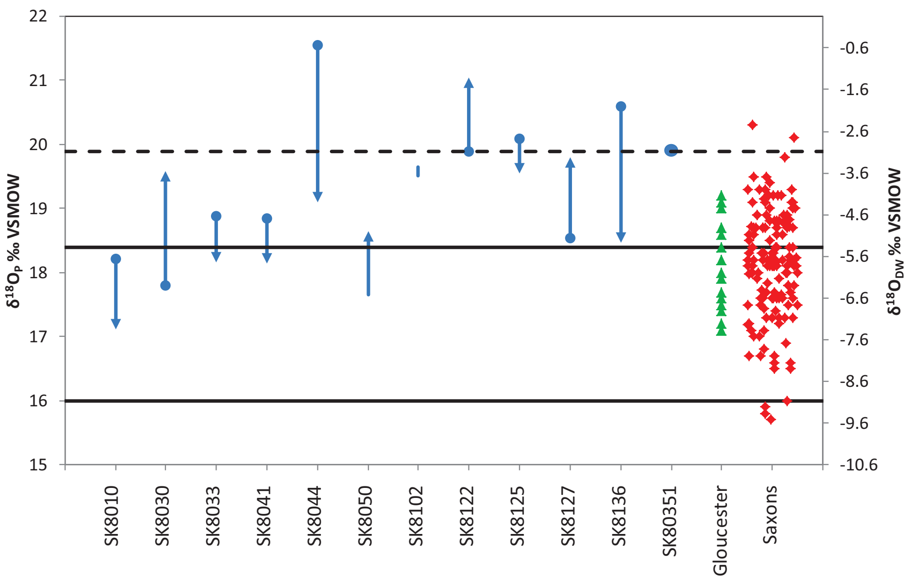
The closest site with a significant number of $\delta^{18}O_P$ analyses is Roman Gloucester (Chenery *et al* 2010), which is less than 35km away, and comparison with this data is made in Graphs 4 and 5. Chenery *et al* have suggested that the individuals with the five highest values are immigrants, and if the same cut-off were adopted here it would apply that all but two of

to previous view

the individuals at Kempsey had spent some part of their childhood outside the British Isles. This seems very unlikely, and the more conservative approach to identifying migrants outlined above produces more plausible results.



Graph 4: δ^{18}O results from Kempsey compared with Roman Gloucester (Chenery et al. 2010) and other Anglo-Saxon sites: Bamburgh (Groves et al 2013), Ringlemere (Brettell et al 2012a), Wasperton (Montgomery et al 2009), Berinsfield (Hughes et al 2014) and Eastbourne (Millard et al 2005). The δ^{18}O$_{DW}$ values are computed using Equation 6 of Daux et al (2008).



Graph 5: δ^{18}O values from Kempsey showing direction of change from earlier to later tooth for each individual and the ranges of values for Roman Gloucester and for other Anglo-Saxon sites (sources as in Figure 2). Solid lines indicate the possible range of local drinking waters and the dotted line the upper limit allowing for the consumption of boiled and brewed liquids.

go to contents

to previous view

Environmental analysis
by Alan Clapham

Results

The environmental evidence recovered is summarised in Tables 16 and 17.

Animal bone

The animal bone remains in the overall assemblage were poorly represented and were mainly fragmented but some of the long bones did exhibit signs of marrow extraction. Pig (*Sus*), sheep/goat (*Ovicaprid*) and cow (*Bos*) were identified (Vaughan and Webster 2012, 30-2, Table 13).

Context 8109, fill of linear 8110

This context is the main fill of an east to west aligned ditch (8110), of medieval date.

Charred plant remains were found in reasonably large numbers (Table 16) and the preservation was good enough to allow identification to species in the majority of cases. Some of the cereal grains were very fragmented and it was not possible to assign these fragments to any of the cereal crops.

The commonest remains were those of cereals, with free-threshing wheat (*Triticum* sp) being the dominant one. The presence of a number of bread wheat (*Triticum aestivum*) rachis fragments suggests that the grains of hexaploid bread wheat and not the tetraploid free-threshing durum wheat (*Triticum durum*). Other cereals were identified but were not present in such quantities include hulled barley (*Hordeum vulgare*), rye (*Secale cereale*) and oats (*Avena* sp). Chaff remains in the form of rachis fragments of barley and rye were also recorded. No oat chaff was recorded and the lack of pedicels makes it impossible to determine if the oats is wild or cultivated.

Apart from the cereals other food crops were present and included peas (*Pisum sativum*) and broad bean (*Vicia faba*).

Weed taxa included fat hen (*Chenopodium album*), docks (*Rumex* sp), wild radish (*Raphanus raphanistrum*), vetch/pea (*Vicia/Lathyrus* sp), stinking chamomile (*Anthemis cotula*), corn marigold (*Glebionis segetum*) and spike-rush (*Eleocharis* sp). hazel (*Corylus avellana*) nutshell fragments were also recorded.

Context	Sample	large mammal	small mammal	fish	mollusc	charcoal	charred plant	Comment
8109	124	abundant	common	some	rare	abundant	abundant	Some of the large mammal bone was burnt, oyster shell fragments present

Table 16: Other biological material present in context 8109, fill of linear 8110

to previous view

Latin name	Common name	Habitat	8109
Charred			
Triticum aestivum rachis fragment	bread wheat	F	15
Triticum sp (free-threshing) grain	free-threshing wheat	F	80
Triticum sp (free-threshing) grain fragment	free-threshing wheat	F	14
Triticum sp (free-threshing) tail grain	free-threshing wheat	F	1
Hordeum vulgare grain (hulled)	barley	F	8
Hordeum vulgare grain fragments (hulled)	barley	F	4
Hordeum vulgare rachis	barley	F	1
Secale cereale grain	rye	F	21
Secale cereale grain fragment	rye	F	6
Secale cereale rachis (fragment)	rye	F	4
Cereal sp indet grain (fragment)	cereal	F	283
Avena sp grain	oat	AF	16
Avena sp grain fragments	oat	AF	16
Poaceae sp indet culm node	grasses	AF	1
Corylus avellana shell fragment	hazelnut	C	4
Chenopodium album	fat hen	AB	2
Rumex sp	dock	ABCD	3
Raphanus raphanistrum pod fragments	wild radish	AB	1
Vicia faba	broad bean	AF	1
Vicia/Lathyrus sp	vetch/pea	ABCD	8
Vicia/Lathyrus sp (fragment)	vetch/pea	ABCD	5
Pisum sativum	garden pea	AF	2
Pisum sativum cotyledon	garden pea	AF	5
Anthemis cotula	stinking chamomile	AB	2
Glebionis segetum	corn marigold	AB	1
Eleocharis sp	spike-rush	E	3
unidentified bud			1
unidentified parencyhma fragments			4

Table 17: Charred plant remains from context 8109, fill of linear 8110

Habitat
A= cultivated ground
B= disturbed ground
C= woodlands, hedgerows, scrub etc
D = grasslands, meadows and heathland
E = aquatic/wet habitats
F = cultivar

Key to Table 17

go to contents

to previous view

Discussion

The free-threshing cereals such as bread wheat and rye are typical cereal crops for the medieval period, along with the hulled barley and oats. The presence of chaff suggests that the crops were processed on site, most likely at the edge of the field. As the cereals are preserved by charring it may suggest that there was a field edge corn drier being used. It is not possible to say whether the cereals were grown as a mixed crop as was often the case at this time is difficult to determine but the possibility cannot be ruled out. The presence of the legume food crops, pea and broad bean may well have been grown in an adjacent plot but as these crops do not require heat in order to release the grain, they have arisen from another source such as domestic waste.

The weeds are most likely to be associated with the cereal crops, stinking chamomile is usually associated with heavy calcareous soils while spike-rush which is not often considered to be a crop weed in normal circumstances may well be considered as one here, especially as the site is on a flood plain and there may have been isolated area which had a higher water table permitting spike-rush to survive in this unusual situation. It may also have survived at the edge of cultivation and may have become incorporated into the assemblage at harvesting.

The presence of hazel nutshell fragments suggests that the local wild environment was exploited in order to supplement the daily diet.

The presence of fragments of large mammal bone (some of which may have been residual within the backfill of graves), with a small amount showing the effects of burning may suggest the dumping of food waste perhaps from the Bishop’s Palace. This is supported the presence of fish remains in the form of scales and vertebrae and the occasional oyster (*Ostrea edulis*) shell fragment.

The assemblage recorded here adds to the sparse records of early medieval agriculture and economy in Worcestershire. The assemblage is very similar to that found in medieval contexts throughout Britain. The presence of chaff remains suggests that the crops were grown locally and possibly dumped in the ditch after being rendered unusable by fire. The presence of possible meat waste indicates that there may have been some dumping of food waste post consumption.

to previous view

Radiocarbon dating

by Nicholas Daffern, Suzi Richer and Peter Marshall

Results

The results are conventional radiocarbon ages (Stuiver and Polach 1977) and are listed in Table 18. The calibrated date ranges for the samples have been calculated using the maximum intercept method (Stuiver and Reimer 1986), and are quoted with end points rounded outwards to ten years. The probability distributions of the calibrated dates, calculated using the probability method (Stuiver and Reimer 1993) are shown in Graphs 6 and 7. They have been calculated using OxCal v4.2 (Bronk Ramsey 2009) and the current internationally-agreed atmospheric calibration dataset for the northern hemisphere, IntCal13 (Reimer *et al* 2013).

Laboratory code	Context number	Material	$\delta^{13}C$ (‰)	Conventional Age	OxCal calibrated age (95.4% probability or 2 sigma)
Beta-303445	1004	Human bone	-20.1 ‰	1130 +/- 30 BP	cal AD 770–990
Beta-303446	1005	Human bone	-19.5 ‰	1020 +/- 30 BP	cal AD 970–1040
Beta-303447	1007	Human bone	-20.0 ‰	1020 +/- 30 BP	cal AD 970–1040
Beta-303448	1008	Human bone	-20.0 ‰	870 +/- 40 BP	cal AD 1030–1260
SUERC-42606 (GU28518)	8102	Charred grain: *Triticum* sp	-23.4 ‰	1085 ± 26 BP	cal AD 890–1020

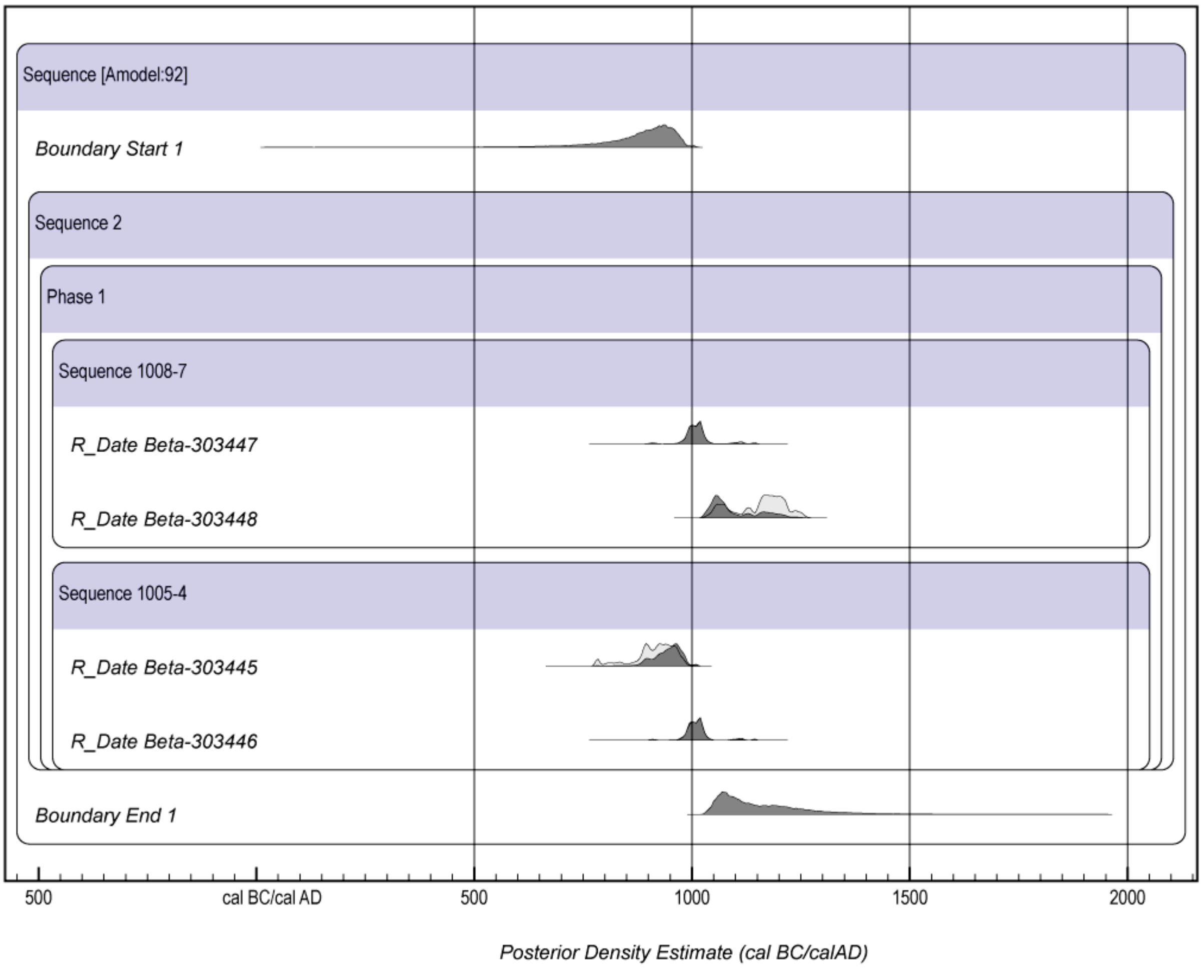
Table 18: Radiocarbon dating results

to previous view

Chronological modelling
by Suzi Richer and Peter Marshall

The radiocarbon dates from the burials clearly fall into a coherent group concentrated in the early medieval period. The measurements are not, however, statistically consistent (T'= 27.148; T'(5%)= 7.8; n= 3; Ward and Wilson 1978), and so they certainly represent more than one episode of activity.

Simple visual inspection of the calibrated radiocarbon dates does not allow us to assess the date of burial activity at Kempsey accurately, since the calibration process does not allow for the fact that this group of radiocarbon dates are related – they all come from the same site. Bayesian statistical modelling is required to account for this dependence (Buck *et al* 1992; Bayliss *et al* 2007), which has been undertaken using OxCal v.4.2 (Bronk Ramsey 1995; 1998; 2001; 2009). The date ranges from these models are given *in italics* to distinguish them from simple, calibrated radiocarbon dates.

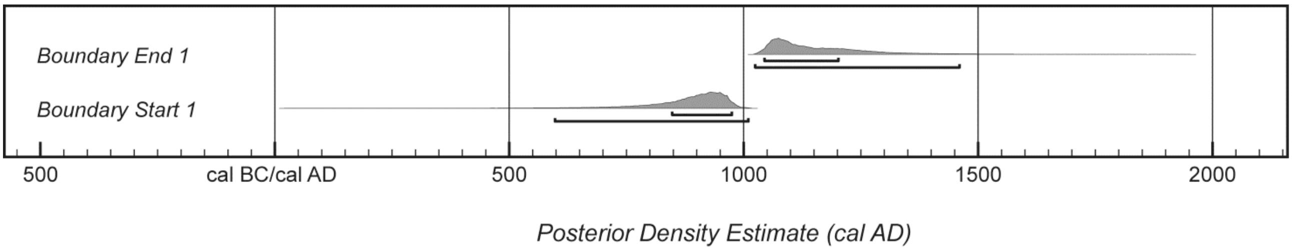


Graph 6: Chronological model of Anglo-Saxon activity at Kempsey

Figures in outline are the probability distributions of the simple calibrated dates, following Stuiver and Reimer (1993), while those in solid black are the posterior density estimates derived from the Bayesian modelling. The brackets down the left side and the OxCal keywords define the model exactly.

to previous view

The model (Graph 6) interprets the burials as representing a continuous period of activity (Buck *et al* 1992). This model has good overall agreement (Amodel: 92; Bronk Ramsey 1995, 429). Excavation did not reach the base of the cemetery; therefore it is not possible to model a start date for the cemetery, however the earliest date of burial for this group of skeletons can be estimated to be broadly *cal AD 580–1010* (*95% probability*), and probably *cal AD 840–980* (*68% probability*). Burial activity can be estimated to have ended by broadly *cal AD 1025–1460 (95% probability; Boundary end* Graph 7), and probably in *cal AD 1045–1210 (68% probability).*



Graph 7: Estimate for the earliest burial in the group excavated, and the end of burial activity, with the upper horizontal bracket representing 68% probability and the lower brackets representing 95% probability

It should be noted that while the sample of charred grain (SUERC-42606; Table 18) was from a context that was stratigraphically later than the burials (8102, probable primary fill of north to south aligned ditch [8103] which cut through the burial soil), it cannot be considered to be from a secure context as the possibility remains that it was redeposited, and therefore it was excluded from the model.

Discussion and Conclusions

The investigations have identified a previously unknown western extension of the existing churchyard, with associated boundary features, to the west of the present boundary.

Artefacts
by Laura Griffin

The artefactual material from the site is largely made up of a standard range of finds consistent with rural settlement in this part of the county. The presence of small amounts of prehistoric and Late Iron Age/Roman material is not unexpected and in many ways, typical of rural excavations in Worcestershire. This does not necessarily indicate settlement on this site, although the good condition and size of the Late Iron Age/Roman sherds would suggest a strong likelihood of a settlement in the general vicinity.

Perhaps the most important find of the assemblage is the small sherd of 9th century Stafford ware from a grave fill (context 8010). Sherds of Stafford-type ware are rarely found in Worcestershire, with all previous examples coming from urban assemblages from Worcester and Droitwich and even there, sherds are few and far between. The identification of this sherd may suggest that supply to the Minster and Bishop's manor house was more akin to that of an urban settlement during the Late Saxon period, reflecting the higher status of the site.

In contrast, the medieval pottery assemblage was very much that of a rural settlement, with locally produced fabrics dominating and the vast majority of sherds being from cooking pots. Dating of this material indicated a peak in the 13th century with very few sherds dating later than the 14th century. It is possible that this decline in the use of pottery indicates a greater use of metal cooking vessels such as cauldrons which became more common from the mid-14th century onwards, coinciding with an increase in wealth in the general population. This pattern can be see through documentary evidence which points to even the poorest households in Worcestershire being equipped with a brass cooking pot by the later 14th century (Bryant 2004, 335; Dyer 1982, 39).

Continuation of settlement well into the later medieval period can be seen through the ceramic building material, which included a significant amount of roofing tile which could be dated from the late 15th century onwards. It is likely that much of this roofing tile resulted from the demolition of the Bishop's manor house by the end of 17th century. Although all of the decorated floor tiles were too abraded to identify specific patterns and therefore date more closely, it is clear that the medieval complex included at least one tile pavement, most likely of mid-14th-15th century date. The presence of these floor tiles, as well as a number of glazed ridge and flat tiles within the assemblage, is again consistent with a higher status building.

All post-medieval and modern material on the site dates from the late 17th century onwards and is, therefore, not associated with the Bishop's manor house or the Minster complex, with the majority coming from the disturbed topsoil and subsoil layers of the site.

to previous view

Osteology
by Gaynor Western

Osteological analysis of the inhumated remains has given a unique insight into the health and lifestyle of the late Saxon/early medieval population inhabiting Kempsey as well as providing an informed understanding into contemporary funerary rites. The area of the burials excavated now lies outside the present day churchyard. The contraction of the churchyard, in or soon after the 14th century, to the enclosed area around the church, incidentally ensured the survival of the relict burials, AMS dated from *cal AD 840–980 to cal AD 1045–1210 (68% probability*). This has provided a snapshot of life during the late Saxon and early medieval period in Kempsey, where otherwise little tangible evidence exists to corroborate the historical evidence of this once important ecclesiastical site.

Overall, 69 graves aligned on an approximately east to west axis were identified. Of these 55 were excavated and 46 contained human skeletal remains. In addition, 587 disarticulated fragments greater than 1cm in length were recovered, of which 184 identifiable, discrete elements were analysed from up to 21 individuals. The skeletal remains were in a fair-poor condition and several of the burials were intercutting, resulting in the majority of the remains being less than 25% complete. This restricted the potential of the osteological analysis, particularly in terms of metric analysis. Nonetheless, the available elements have provided important evidence enabling the function of the churchyard to be established. It is clear that both females and males were present amongst the skeletal assemblage as well as sub-adults and adults. Of these, all ages categories were represented. It would appear then, that this area of the burial ground during the late Saxon period served the whole community, rather than any particular group of individuals. This observation compares well with similar ecclesiastical sites and indicates that by this period, churchyard burial may have been the accepted norm for the people of Kempsey. The high number of intercutting burials, representing at least five phases of burial, in addition to the presence of many disarticulated skeletal elements suggests that the area was intensively used for some period of time and from this it can be inferred that the church was a successful and adaptive institution within the community. Though perhaps not surprising, given the early episcopal prominence of the Minster church in the settlement within the diocese, the acceptance of churchyard burial is an important observation to make as the burials pre-date any law codes stipulating such rites as obligatory and it is clear from archaeological evidence in other mid-late Saxon settlements that the establishment of a church did not ensure its long-term success.

The exact extent of the late Saxon/early medieval burial ground is currently unknown (see Section 6.6 below) and, unfortunately, the small assemblage and the limited size of the excavation does not allow any inferences to be made regarding burial within the churchyard according to status, age or sex of the individuals interred there. However, it is important to note the mode of burial at St Mary's, with a higher frequency of intercutting graves and re-deposition of disarticulated elements toward the northern end of the excavation area. Some crania were re-interred within cut features. This may reflect a belief in a lack of importance in intactness of the body for the 'Final Things' and that the head was considered the focus of burial during the late Saxon period, as it was in the medieval period. Several marks observed on one re-deposited skull suggest that exhumation took place relatively soon after deposition. Other elements were also retrieved from the backfill of graves and it is clear that the posthumous disturbance and scattering of individual remains was not an issue of consequence within the Christian doctrine at this time. The nature of the intercutting at Kempsey, however, suggests that there was no systematic grave clearance since partial articulated skeletons are present. Skulls and major elements were not exhumed and collected for depositing in a charnel house. Rather, skeletal elements were probably exhumed on a piecemeal basis as a consequence of digging new graves and their exposure appears rather inconsequential. The use of the graveyard appears to reflect more of an emphasis on the importance of the soul after death rather than the intactness of the physical remains left behind, similar to the medieval period, and there was certainly no notion of being buried in perpetuity.

Excavations at the Chapter House, Worcester Cathedral also revealed a high level of intercutting burials with 9 phases of interments and disarticulated skeletal elements present (Guy 2010, 75). Here, the skeletal assemblage also contained males, females and sub-adults. Burials were also aligned east-west but were more elaborate than the interments at St Mary's. For example, 36.5% (n = 106) of the burials were furnished with a coffin and 29.4% were found to contain deliberately placed stones, the majority of which were found in coffined burials. One burial of a female also contained an iron barrel padlock, two examples of which were also found at Hereford Cathedral with females (Guy 2010, 78-80). Though there is no evidence of burial within coffins at St Mary's, the possibility of coffin burial isn't completely excluded since it may be simply be that the preservation conditions did not permit the survival of evidence for coffins. No examples, however, of 'coffin tumble', where skeletal elements become disarticulated and displaced within the space created by the coffin in some burial environments. This observation suggests that bodies were placed in shrouds, although it doesn't rule out the possibility the shrouded bodies were then placed in coffins for burial. No small finds representing grave goods were found at St Mary's and there appears to have been no practice of expressing social status, kin, age or sex in the form of burial within this group by material means. A recent survey of late Saxon burial grounds suggest that more elaborate burials were found in high status sites (Hadley and Buckberry 2005) and it may well be case that the difference in the form of the burials of St Mary's and The Chapter House, Worcester Cathedral, reflect their relative ecclesiastical importance at the time. It should be taken into consideration, however, that the burials at The Chapter House are so far undated by independent methods, so the exact date of the burials at the two sites cannot be compared at the present time.

Several cases of pathology were noted within the St Mary's assemblage, though due to preservation and intercutting, observations were limited. The recorded prevalence rates of diseases should, therefore, be considered as tentative when being used for inter-site comparison. However, despite the preservation conditions and limited completeness, a possible rare case of acquired syphilis was discovered that may represent one of the earliest examples in the country. Overall, examples of congenital, metabolic, inflammatory and fibrous disease were present in addition to lesions from trauma and degenerative joint disease. In comparison to other ecclesiastical sites, similarities in the distribution of the diseases could be seen, such as degenerative diseases of the spine, osteoporosis and ante-mortem tooth loss in the older individuals, both female and male, in addition to an example of trauma in a male individual. Cribra orbitalia prevalence rates suggest that there was exposure of individuals to pathogens in childhood, who suffered haemolytic or megaloblastic anaemias as a result, perhaps more so than other contemporary ecclesiastical sites. Examples of enamel hypoplasia, in contrast, appear to be lower in prevalence, indicating that febrile diseases or malnutrition was not so much of an issue during childhood in comparison to many other early medieval sites recorded. Stature could only be assessed for two individuals. The estimates were average for males of the period.

Dental health was very poor in comparison to all sites, with very high rates of caries, calculus, periodontal disease and dental abscess. This reflects the inter-related aetiology of these diseases and suggests that dental hygiene was poor amongst the population. The high rates of caries may also be indicative of a diet containing more sucrose than other contemporary populations. Inflammatory diseases were also more frequently observed in the population, in particular lesions indicating inflammation to the meninges within the crania, possibly reflecting the ineffectiveness of treatment for infections at the time. One rare case of possible fibrous dysplasia was recorded, providing important evidence of the condition in the late Anglo-Saxon period.

Though limited by preservation conditions, the bioarchaeological analysis of the human remains from the site has provided an invaluable insight into the use and practices of burial grounds associated with the early Christian church, for which there are is no documentary evidence. This area of the churchyard served the lay community and within the assemblage analysed, burials were relatively uniform, with no difference in form between adults or sub-adults nor between the sexes. The burials were not as elaborate as at The Chapter House, Worcester Cathedral, and may indicate the relative status of the Minster church within the Episcopal hierarchy in the region. The area was used intensively with new graves being dug into older ones, rather than the burial ground being expanded at this time. Intactness of the dead was not an important consideration and precedence appears to have been given to be buried within the specific area in use, possibly in proximity to the Minster church. Skeletal material was clearly exhumed on a piecemeal basis during this process. Nonetheless, some effort to rebury skeletal elements exhumed appears to have taken place, although careful collection and curation within a crypt or charnel house seems not to have been undertaken. The palaeopathological data collected from the analysis compares well with other contemporary ecclesiastical sites in terms of health status, though overall dental health was considerably poorer in the sample analysed. Despite the condition of the skeletal remains, one rare example of possible fibrous dysplasia, previously unrecorded in the period, and a possible case of acquired syphilis that may represent one of the earliest examples in the country, illustrates the importance that the analysis of such assemblages and the contribution they can make to our overall understanding of the period, in terms of both the physical adaptation of people to their environment as well as funerary and religious beliefs at the time. This is particularly true in consideration of the fact that the excavation of the skeletal assemblage has provided the first tangible archaeological evidence for the late Saxon period in Kempsey. It is hoped that the integration of this data with contemporary documentary information will significantly enhance the current knowledge of the local history for Kempsey as well as contribute to the understanding of late Saxon England at a regional and national level.

Isotope

by Andrew Millard

Dietary isotopes indicate that the population from Kempsey had a mostly terrestrially-based diet, concordant with studies of many other communities in Britain and the contemporary populations of Raunds and York. However, the oxygen isotopes show a significant divergence from contemporary and local populations with a number of individuals exhibiting high values of $\delta^{18}O_P$ and at least three, possibly five, of the 12 individuals analysed had spent their childhood in a warmer or more westerly location.

to previous view

Environmental
by Alan Clapham

A single context (8109) from an east to west aligned ditch [8110] was fully analysed for charred plant remains. The feature is 14th century in date. Remains of cereals (wheat, barley, rye and oats) in the form of grain and chaff were recorded from the context along with weed seeds that are most likely to have grown with the crops.

Apart from the charred plant remains, other biological debris was present and included very fragmented large mammal bone (some of which was burnt), charcoal, these were present in abundance in the sample. Less common biological remains included fish remains and oyster shells. The animal remains may well be the remains of domestic debris from the Bishop's manor house or the Minster.

Radiocarbon dates
by Suzi Richer, Nicholas Daffern and Tom Vaughan

The chronological modelling of the dates from the burials suggests that while they clearly fall into a coherent group from the early medieval period, they also represent more than one episode of activity. The dates of the burials have been modelled to show that the episodes of burial were continuous (Graph 6).

The earliest date of burial for this group of skeletons can be estimated to be *cal AD 840–980 (68% probability*). However, the start date for burials here remains unknown as the full depth of the burial soil (8019) was not revealed across the northern half of the excavation area, so it is considered very likely that earlier burials remain unexcavated and *in situ*. Burial activity is estimated to have ceased at the site by *cal AD 1045–1210 (68% probability*).

The sample from ditch [8103] which cut through the burial soil and the burials is *cal AD 890–1020 (95% probability).* However the material may have been residual, so this date cannot be considered to be definite for the actual excavation of the ditch. The finds assemblage from the fill, 8102, dates to the 14th century.

to previous view

The Site
by Tom Vaughan

The earliest defined feature on site was the cobbled surface exposed at the northern end of evaluation Trench 1. It underlay the burial soil, so predates the late Saxon burials, although is otherwise undated and its function remains unclear.

It was not possible to phase or date the construction of the two slopes down to the floodplain, on the western side of the site, or the banks and platform on the floodplain, simply on the basis of the topographic survey. The banks and platform form part of a wider alignment of similar features along the edge of the floodplain, which are visible on the LiDAR plot. It is unclear if they are related to flood defence or some other form of water management or are activity platforms.

The slope aligned west-north-west to east-south-east across the terrace appears to be a continuation of the southern churchyard boundary as it stood into the 19th century, and accords well with the vertical bank identified in Trench 2. Given that no burials were identified south of this bank, it is considered to form the southern boundary of the churchyard from the late Saxon/early medieval period.

There was no trace in the topographic survey of a continuation of the vertical bank 9.75m west of the present churchyard boundary which was revealed in the 1954 WAS trench. There is however a faint linear anomaly on the LiDAR sheet on this alignment. It is therefore conjectured to represent a western boundary of the churchyard and given their apparently identical form, is potentially contemporary with the bank in Trench 2. The footpath across the field as indicated on the 1st edition OS map of 1884-6 lies roughly along the edge of the western bank, so may represent a fossilisation in the landscape of this feature even after it disappeared topographically (although the LiDAR anomaly appears to curve off the north-west at the north end of the field). Two undated burials were however identified in 1954 to the west of this boundary, so the churchyard must have extended further westward at some point.

Neither the topographic nor the LiDAR surveys give any indication of a linear change in the landscape along the course of the large feature [3014], the southern edge of which was identified in Trench 3 outside the south-west corner of the existing churchyard. It is therefore considered to be a large pit, rather than a linear feature, so is unlikely to form part of a boundary defining a more southerly extent of the earlier churchyard.

On the basis of the above, it is conjectured that the southern churchyard boundary which existed into the 19th century also formed the southern extent of the late Saxon/early medieval churchyard which also extended further westwards. The sequence on the western side is less clear however, with three distinct boundaries. At some stage the churchyard appears to have extended over the entire plateau, to the upper of the two western slopes. At another time it occupied a smaller area, as defined by the bank identified in the 1954 trench. Unfortunately the burials exposed in 1954 to the west are undated. The burials excavated to the east of this bank in the present investigations date from *cal AD 840–980* to *cal AD 1045–1210 (68% probability*), although this does not necessarily indicate the date of the start of burials in this area, as the earliest burials may not have been revealed.

The lowest defined fill of boundary ditch [8103], which truncated the burials in the present investigations along the present churchyard boundary, has a 14th century tpq, indicating that the ditch fell out of use from this time, but that the excavation for this boundary of the churchyard occurred earlier, probably in the 13th or 14th centuries. The church itself appears to have undergone repeated alterations during the medieval period (Brooks and Pevsner 2007, 390-1), so it is not possible to relate this particular phase of contraction of the churchyard to a specific period of reconstruction of the church. Ditch [8103] curved to the east at its southern exposed end, although the topographic and LiDAR surveys give no indication as to its subsequent alignment further south.

The soils overlying the burial soil contained material of 14th and 15th century (and later) date, including late 15th century and later (glazed ridge and flat) roofing tile and mid-14th to 15th century decorated floor tile. This is appears to have come from a high status building, most probably the Bishop's manor house, and may indicate dates for periods of renovation and repair of the buildings (i.e. construction of a tile pavement in the mid-14th-15th centuries and replacement of the roof in the late 15th century), which appears to have been demolished between *c* 1540 and 1695.

The slight variation in alignment of the burials to the north (generally west-north-west to east-south-east) compared with those to the south (generally more closely east to west), may relate to the relative sequence of burials over these areas. The date of burials may be inferred by comparison with the alignment of the church (west-north-west to east-south-east; the earliest surviving fabric of which is Norman; 11th to 12th centuries). The burials to the north are generally aligned with the church, so may be contemporary with it, whereas those to the south are generally not, so may pre-date the present church. Three of the four radiocarbon dates (all taken from burials in the northern portion) are *cal AD 1045–1210 (68% probability*), which correlates with the date of the earliest surviving church fabric, so this hypothesis bears up to initial scrutiny.

The density of burials to the north is greater, with more intercutting of burials, indicating that space was limited within the northern portion of the churchyard, even though there were fewer in the southern portion, indicating that the preferred location of burial was closer to the church itself, and away from the periphery.

Acknowledgements

Worcestershire Archaeology would like to thank the following for their kind assistance in the successful conclusion of this project: Tegan Cornah and Maggi Noke (Historic Environment Record Assistants, Worcestershire County Council), Mike Glyde (former Historic Environment Planning Officer, Worcestershire County Council), Vaughan Felton (Project Manager, Environment Agency), Peter Marshall (Scientific Dating Coordinator, Historic England), Andrew Millard (Senior Lecturer, Department of Archaeology, Durham University), Gaynor Western (Ossafreelance), Robin Whittaker (Worcestershire Archaeological Society), Ed Wilson (Senior Archaeologist, Environment Agency), Beta Analytic Ltd, and the Scottish Universities Environmental Research Centre (SUERC).

to previous view

Bibliography

Adams, M, 1996 Excavation of a Pre-Conquest Cemetery at Addingham, West Yorkshire, *Medieval Archaeology,* **40**, 62-150

Anderson, S, Wells, C, and Birkett, D, 2006 *People and Environment: 36, The human skeletal remains,* in Cramp, R, Bettess, G, and Bettess, F, (eds), *Wearmouth and Jarrow Monastic Sites,* Vol ii, English Heritage

Appleton-Fox, N, 1998 *Kempsey Flood Alleviation Scheme, Worcestershire: A Desk-top Survey*, Marches Archaeology Series **033**, dated July 1998

Atkin, M, 1995 *The Civil War in Worcestershire,* Alan Sutton Publishing, Worcester

Aufderheide, A C, and Rodriguez-Martin, C, 1998 *The Cambridge Encyclopedia of Human Palaeopathology,* Cambridge University Press, Cambridge, England

Barnes, E, 1994 *Development Defects of the Axial Skeleton in Paleopathology,* University Press of Colorado, Colorado, USA

Bass, W M, 1995 *Human Osteology; A Laboratory and Field manual,* Missouri Archaeological Society, Inc. Columbia, USA

Bassett, S R, 1989 Churches in Worcester before and after the conversion of the Anglo-Saxons, *Antiq J,* **69**(2), 225-256

Bayliss, A, Bronk Ramsey, C, van der Plicht, J, and Whittle, A, 2007 Bradshaw and Bayes: towards a timetable for the Neolithic, *Cambridge Journal of Archaeology*, **17.1**, supplement, 1-28

Bayliss, A, Shepherd Popescu, E, Beavan-Athfield, N, Bronk Ramsey, C, Cook, G T, and Locker, A, 2004 The potential significance of dietary offsets for the interpretation of radiocarbon dates: an archaeologically significant example from medieval Norwich, *Journal of Archaeological Science* **31**, 563-575

Beard, G R, Cope, D W, Jones, R J A, Palmer, R C, and Whitfield, W A D, 1986 *Soils of Worcester and the Malvern District,* Soil Survey of England and Wales, Sheet **150**

BGS (British Geological Survey), 1976 Geological Survey of Great Britain (England and Wales) Solid and Drift sheet, **182**, 1:50,000

BGS (British Geological Survey), 1990 1:250,000 Series, Solid Geology sheet 52^0 N-04^0 W

Binski, P, 1996 *Medieval Death,* British Museum Press, London

Blair, J (ed), 1988 *Minsters and Parish Churches: The Local Church in Transition 950-1200*, Oxford University Committee for Archaeology, Monograph **17**

Bocherens, H, and Drucker, D, 2003 Trophic level isotopic enrichment of carbon and nitrogen in bone and collagen: case studies from recent and ancient terrestrial ecosystems, *International Journal of Osteoarchaeology* **13**, 46-53.

Boddington, A, 1996 *Raunds Furnells: The Anglo-Saxon Church and Churchyard,* English Heritage, Archaeological report **7**

Bond, C J, 1988 Church and Parish in Norman Worcestershire, 119-158 in Blair, J (ed), 1988 *Minsters and Parish Churches: The Local Church in Transition 950-1200*, Oxford University Committee for Archaeology, Monograph **17**

Bowen, G J, 2013 *The Online Isotopes in Precipitation Calculator*, version 2.2, http://www.waterisotopes.org/ accessed: 19 December 2013

go to contents

Bowen, G J, and Revenaugh, J, 2003 Interpolating the isotopic composition of modern meteoric precipitation, *Water Resources Research* **39**, 1299, doi:1210.1129/2003WR002086

Brettell, R, Evans, J, Marzinzik, S, Lamb, A, and Montgomery, J, 2012 "Impious easterners": can oxygen and strontium isotopes serve as indicators of provenance in early medieval European cemetery populations? *European Journal of Archaeology* **15**, 117-145

Brettell, R, Montgomery, J, and Evans, J, 2012 Brewing and stewing: the effect of culturally mediated behaviour on the oxygen isotope composition of ingested fluids and the implications for human provenance studies, *Journal of Analytical Atomic Spectrometry* **27**, 778-785.

Brickley, M, and McKinley, J I, (eds) 2004 Guidelines to Recording Human Remains, *IFA Paper,* **7**, Institute of Field Archaeologists, in association with BABAO

Brickley, M, and Ives, R, 2008 *The Bioarchaeology of metabolic Bone Disease,* Elsevier Ltd, Oxford

Brooks, A and Pevsner, N, 2007 *The Buildings of England: Worcestershire*, Yale University Press, 390-393

Brooks, S T, and Suchey, J M, 1990 Skeletal Age Determination on the Os Pubis: A Comparison of the Acsadi-Nemeskeri and Suchey-Brooks Methods, in *Human Evolution,* **5**, 227-238

Bronk Ramsey, C, 1995 Radiocarbon calibration and analysis of stratigraphy: the OxCal program, *Radiocarbon*, **37**, 425–30

Bronk Ramsey, C, 1998 Probability and dating, *Radiocarbon*, **40**, 461-74

Bronk Ramsey, C, 2001 Development of the radiocarbon calibration program OxCal, *Radiocarbon*, **43**, 355-63

Bronk Ramsey, C, 2009 Bayesian analysis of radiocarbon dates, *Radiocarbon*, **51**, 337-60

Brown, P A D, 1954 Roman Excavations at Kempsey, *The Vigornian*, Summer 1954, 91, King's School magazine, Worcester

Bryant, V, 2004 Medieval and early post-medieval pottery, in H Dalwood and R Edwards (eds.), *Deansway, Worcester, Romano-British small town to late medieval city*, CBA Res Rep **139**, 281-339

Buck, C E, Litton, C D, and Smith, A F M, 1992 Calibration of radiocarbon results pertaining to related archaeological events, *J Arch Sci,* **19**, 497-512

Buck, C E, Cavanagh, W G, and Litton, C D, 1996 *Bayesian Approach to Interpreting Archaeological Data*, Chichester

Buckberry, J, 2010 Cemetery Diversity in the Mid-Late Anglo-Saxon Period in Lincolnshire and Yorkshire, in Buckberry, J, and Cherryson, A, (eds), *Burial in Later Anglo-Saxon England c650-1100 AD,* Oxbow Books, 1-27

Budd, P, Millard, A, Chenery, C, Lucy, S, and Roberts, C, 2004 Investigating population movement by stable isotopes: a report from Britain, *Antiquity* **78**, 127-140

Buikstra, J E, and Ubelaker, D H, 1994 *Standards for Data Collection from Human Skeletal Remains,* Arkansas Archaeological Survey Research Series no **44**

Cameron, M L, 1993 *Anglo-Saxon Medicine,* Cambridge Studies in Anglo-Saxon England, **7**, Cambridge University Press, Cambridge

Cappers, R T G, Bekker, R M , Jans, J E A, 2006 *Digital seed atlas of the Netherlands*. Groningen Archaeological Studies, **4**, Barkhuis Publishing and Groningen University Library, Groningen

CAS 1995 (as amended) *Manual of Service practice: fieldwork recording manual*, County Archaeological Service, Hereford and Worcester County Council, report, **399**

Chamberlain, A, 2006 *Demography in Archaeology,* Cambridge Manuals in Archaeology, Cambridge University Press, Cambridge

Chenery, C, Müldner, G, Evans, J, Eckardt, H, and Lewis, M, 2010 Strontium and stable isotope evidence for diet and mobility in Roman Gloucester, UK, *Journal of Archaeological Science* **37**, 150-163

Cherryson, A, 2010 'Such a resting-place as is necessary for us in God's sight and fitting in the eyes of the world': Saxon Southampton and the Development of Churchyard Burial, in Buckberry, J, and Cherryson, A, (eds), *Burial in Later Anglo-Saxon England c.650-1100 AD,* Oxbow Books, 54-72

Cox, M, 2000 Ageing Adults from the skeleton, in *Human Osteology in Archaeology and Forensic Science, Greenwich Medical Media,* 289-305

Craig, E, and Buckberry, J, 2010 Investigating Social Status Using Evidence of Biological Status: A Case Study from Raunds Furnells, in Buckberry, J, and Cherryson, A (eds), *Burial in Later Anglo-Saxon England c650-1100AD,* Oxbow Books, 128-142

Crawford, S, 1999 *Childhood in Anglo-Saxon England,* Sutton Publishing Ltd, Stroud

D'Angela, and Longinelli, A, 1990 Oxygen Isotopes in Living Mammals Bone Phosphate - Further Results, *Chemical Geology* **86**, 75-82

Darling, W G, Bath, A H, Talbot, J C, 2003 The O and H Stable Isotopic Content of Fresh Waters in The British Isles: 2 ground-water and surface waters, *Hydrology and Earth System Sciences* **7**, 183-195

Darling, W G, and Talbot, J C, 2003 The O & H stable isotopic composition of fresh waters in the British Isles. 1 Rainfall, *Hydrology and Earth System Sciences* **7**, 163-181

Daux, V, Lécuyer, C, Héran, M-A, Amiot, R, Simon, L, Fourel, F, Martineau, F, Lynnerup, N, Reychler, H, and Escarguel, G, 2008 Oxygen isotope fractionation between human phosphate and water revisited, *Journal of Human Evolution* **55**, 1138-1147

Delgado Huertas, A, Iacumin, P, Stenni, B, Chillon, B S, and Longinelli, A, 1995 Oxygen-Isotope Variations of Phosphate in Mammalian Bone and Tooth Enamel, *Geochimica Et Cosmochimica Acta* **59**, 4299-4305

DeNiro, M J, 1985 Postmortem preservation and alteration of in vivo bone collagen isotope ratios in relation to palaeodietary reconstruction, Nature **317**, 806-809

Dettman, D L, Kohn, M J, Quade, J, Ryerson, F J, Ojha, T P, and Hamidullah, S, 2001 Seasonal stable isotope evidence for a strong Asian monsoon throughout the past 10.7 m.y., *Geology* **29**, 31-34

Dobney, K, and Goodman, A, 1991 Epidemiological Studies of Dental Enamal Hypoplasis in Mexico and Bradford; Their Relevance to Archaeological Skeletal Studies, in Bush, H, and Zvelebil, M, (eds) *Health in Past Societies. Biocultural interpretations of human remains in archaeological contexts,* Tempus Reparatum, British Archaeological Reports, International Series, **567**, 101-13

Dyer, C, 1980 *Lords and peasants in a changing society: the estates of the Bishopric of Worcester, 680-1540*, Cambridge University Press, Cambridge

Dyer, C, 1982 The social and economic changes of the later middle ages, and the pottery of the period, *Medieval Ceram*, **6**, 22-42

English Heritage 2002 *Human Bones from Archaeological Sites: Guidelines for producing assessment documents and analytical reports,* English Heritage, Centre for Archaeology guidelines

Evans, J A, Chenery, C A, and Montgomery, J, 2012 A summary of strontium and oxygen isotope variation in archaeological human tooth enamel excavated from Britain, *Journal of Analytical Atomic Spectrometry* **27**, 754-764

Fagan, L, 2004 Medieval roof tiles, in Dalwood, H, and Edwards, R, (eds*.), Deansway, Worcester, Romano-British small town to late medieval city*, CBA Res Rep **139**, 342-361

Floud, R, Wachter, K, and Gregory, A, 1990 *Health, Height and History: Nutritional Status in the United Kingdom 1750-1980,* Cambridge University Press, Cambridge

Fourel, F, Martineau, F, Lécuyer, C, Kupka, H-J, Lange, L, Ojeimi, C, and Seed, M, 2011 $^{18}O/^{16}O$ ratio measurements of inorganic and organic materials by elemental analysis–pyrolysis–isotope ratio mass spectrometry continuous-flow techniques, *Rapid Communications in Mass Spectrometry* **25**, 2691-2696

Goodman, A, and Armelagos, G, 1985 Factors Affecting the Distribution of Enamel Hypoplasias Within the Human Permanent Dentition, in *Am .J. Phys. Anth,* **68**, 479-493

Goldstein, L, 1995 Landscapes and Mortuary Practices: A Case for Regional Perspectives, in Beck, L, A, (ed) *Regional Approaches to Mortuary Analysis*, Plenum, New York, 101-21

Gowland, R, and Western, A G, 2012 Morbidity in the Marshes: Using Spatial Epidemiology to Investigate Skeletal Evidence for Malaria in Anglo-Saxon England (AD410-1050), in *Am. J. Phys. Anth.* **147 (2)**, 301-311

Griffin, L, 2002 Stone, in S Griffin *et al.,* Excavation at City Arcade, High Street, Worcester*, Trans Worcs Archaeol Soc 3ser*, **19**, 94

Griffin, L, 2004 Ceramic Building Material, in D Miller, L Griffin and E Pearson , *Programme of Archaeological Work at 9-10 The Tything, Worcester*, Worcestershire Historic Environment and Archaeology Service, internal report, **1150**, 10-15

Groves, S E, Roberts, C A, Lucy, S, Pearson, G, Gröcke, D R, Nowell, G, Macpherson, C G, and Young, G, 2013 Mobility histories of 7th–9th century AD people buried at early medieval Bamburgh, Northumberland, England, *American Journal of Physical Anthropology* **151**, 462-476.

Guy, C, 2010 An Anglo-Saxon Cemetery at Worcester Cathedral, in Buckberry, J, and Cherryson, A, (eds), *Burial in Later Anglo-Saxon England c 650-1100 AD,* Oxbow Books, 73-82

Hadley, D, 2010 Burying the Socially and Physically Distinctive in Later Anglo-Saxon England, in Buckberry, J, and Cherryson, A, (eds), *Burial in Later Anglo-Saxon England c650-1100AD,* Oxbow Books, 103-115

Hadley, D, and Buckberry, J, 2005 Caring for the Dead in Late Anglo-Saxon England, in Tinti, F, (ed), *Pastoral Care in late Anglo-Saxon England,* Boydell Press, Woodbridge, 121-147

Haydock, H, Clarke, L, Craig-Atkins, E, Howcroft, R, and Buckberry, J, 2013 Weaning at Anglo-Saxon Raunds: implications for changing breastfeeding practice in Britain over two millennia, *American Journal of Physical Anthropology* **151**, 604-612

HEAS 2011a *Proposal for an archaeological evaluation at Kempsey Flood Alleviation Scheme, Kempsey, Worcestershire,* Historic Environment and Archaeology Service, Worcestershire County Council, unpublished document, revised 6 July 2011, **P3708**

HEAS 2011b *Proposal for an archaeological excavation at Kempsey Flood Alleviation Scheme, Kempsey, Worcestershire,* Historic Environment and Archaeology Service, Worcestershire County Council, unpublished document, dated 25 July 2011, **P3708**

Henderson, J, 1987 Factors Determining the State of Preservation of Human Remains, in Boddington, A, Garland, A N, and Janaway, R C, (eds), *Death, Decay and Reconstruction: Approaches to Archaeology and Forensic Science,* Manchester University Press, Manchester

Hillson, S, 1986 *Teeth,* Cambridge University Press, Cambridge

Hoggett, R, 2010 The Early Christian Landscape of East Anglia, in Higham, N J, and Ryan, M J, *Landscape Archaeology of Anglo-Saxon England,* The Boydell Press, Woodbridge, 193-210

Holloway, J, 2010 Material Symbolism and Death: Charcoal Burial in Later Anglo-Saxon England, in Buckberry, J, and Cherryson, A, (eds), *Burial in Later Anglo-Saxon England c650-1100 AD,* Oxbow Books, 83-92

Hooke, D, 2007 Uses of waterways in Anglo-Saxon England, in Blair, J (ed), *Waterways and canal-building in medieval England*, 37-54

Hughes, S S, Millard, A R, Lucy, S J, Chenery, C A, Evans, J A, Nowell, G, and Pearson, D G, 2014 Anglo-Saxon Migration Investigated by Isotopic Analysis of Burials from Berinsfield, Oxfordshire, UK, *Journal of Archaeological Science* **42**, 81-92

Hurst, J D, and Rees, H, 1992 Pottery fabrics; a multi-period series for the County of Hereford and Worcester, in S G Woodiwiss (ed*), Iron Age and Roman salt production and the medieval town of Droitwich*, CBA Res Rep **81**, 200-9

Hurst, J D (ed), forthcoming *The Black Death in Hereford: excavation at the New Library site, Hereford Cathedral*, Worcestershire, Archive and Archaeology Service, Worcestershire County Council, anticipated date 2015

Hutchinson, D L, and Larsen, C S, 1988 Determination of Stress Episode Duration from Enamel Hypoplasias: A Case Study from St Catherine's Island, Georgia, in *Human Biology*, **60**, 93-110

IfA 2008a *Standard and guidance for archaeological field evaluation*, Institute for Archaeologists

IfA 2008b *Standard and guidance for archaeological excavation*, Institute for Archaeologists

IfA 2008c *Standard and guidance for an archaeological watching brief*, Institute for Archaeologists

Jay, M, Montgomery, J, Nehlich, O, Towers, J, and Evans, J, 2013 British Iron Age chariot burials of the Arras culture: a multi-isotope approach to investigating mobility levels and subsistence practices, *World Archaeology* **45**, 473-491

Jones, A E E, 1958 *Anglo-Saxon Worcester,* Ebenezer Baylis and Son Ltd, The Trinity Press, London

Lécuyer, C, Grandjean, P, Oneil, J R, Cappetta, H, and Martineau, F, 1993 Thermal excursions in the ocean at the Cretaceous-Tertiary boundary (northern Morocco) - delta-O-18 record of phosphatic fish debris, *Palaeogeography Palaeoclimatology Palaeoecology* **105**, 235-243.

Lee, A, 2007 *Archaeological watching brief of Kempsey Flood Alleviation, Kempsey, Worcestershire*, Historic Environment and Archaeology Service, Worcestershire County Council, report **1574**, P3112, WSM 38365, dated 19 December 2007

Lee, A, 2011 *Archaeological monitoring of Kempsey geotechnical works: Bore hole and test pits,* Historic Environment and Archaeology Service, Worcestershire County Council, summary report, **P3605**, WSM 43244, dated 3 February 2011

Lee-Thorp, J A, 2008 On isotopes and old bones, *Archaeometry* **50**, 925-950

Longin, R, 1971 New method of collagen extraction for radiocarbon dating, *Nature* **230**, 241-242

Longinelli, A, 1984 Oxygen isotopes in mammal bone phosphate: a new tool for paleohydrological and paleoclimatological research? *Geochimica et Cosmochimica Acta* **48**, 385-390

Longley, D, 2002 'Orientation within Early Medieval Cemeteries: Some data from North-West Wales', *Antiquities Journal*, 309-21

Lovejoy, C, Meindl, T, Pryzbeck, T, and Mensforth, R, 1985 Chronological Metamorphosis of the Auricular Surface of the Ilium: A New Method for the Determination of Age at Death, in *Am, J, Phys, Anth,* **68**, 15-28

Mawer, A, and Stenton, F M, 1927 *The place-names of Worcestershire*, Cambridge University Press, London

Mays, S, Vincent, S, and Meadows, J, 2010 A Possible case of Treponemal Disease from England Dating to the 11th and 12th Century AD, in *Int. J. Osteoarchaeol.* **22**, 366-372

Medscape Reference, 2012 *Osteofibrous Dysplasia,* http://emedicine.medscape.com/article/1256595-overview site accessed 05 July 2012

Meaney, A L, 1992 The Anglo-Saxon view of the causes of illness, in Campbell, S., Hall, B. and Klausner, D. (eds) *Health, disease and healing in medieval culture,* 12-33, Palgrave, MacMillan, New York,

McMinn, R, Hutchings, R, Pegington, J, and Abrahams, P, 1993 *A Colour Atlas of Human Anatomy,* 3rd Edition, Mosby-Wolfe Publishing, London

Miles, A E W, 1963 The Dentition in the Assessment of Individual Age in Skeletal material, in Brothwell, D R, (ed), *Dental Anthropology,* Pergamon, Oxford, 191-209

Millard, A R, Roberts, C A, and Hughes, S S, 2005 Isotopic evidence for migration in Medieval England: the potential for tracking the introduction of disease, Society, *Biology and Human Affairs* **70**, 9-13

Millard, A R, 2015 *Isotopic investigation of diet and residential mobility of individuals from St Mary's Church, Kempsey, Worcestershire*, Department of Archaeology, Durham University, unpublished report, dated February 2015

Montgomery, J, Evans, JA, Chenery, CA, and Müldner, G, 2009 Stable isotope analysis of bone, in Carver, M O H, Hills, C, and Scheschkewitz, J (eds), *Wasperton: A Roman, British and Anglo-Saxon Community in Central England*, Boydell and Brewer, 48-49

Most, M, Sim, F, and Inwards, C, 2010 OsteoFibrous Dysplasia and Adamantinoma, in *J, Am, Acad, Orthop, Surg,* **18**, 358-366

Müldner, G, and Richards, M P, 2007 Stable isotope evidence for 1500 years of human diet at the city of York, UK, *American Journal of Physical Anthropology* **133**, 682-697

Ortner, D J, 2003 *Identification of pathological Conditions in Human Skeletal Remains,* Academic Press, Simthsonian Institution, Washington DC

Palmer, P, and Reeder, M, 2001 *The Imaging of Tropical Diseases with Epidemiological, Pathological and Clinical Correlation*, volumes 1 and 2, Berlin, Heidelberg, New York: Springer Verlag

Phenice, T, 1969 A Newly Developed Visual Method of Sexing in the Os pubis, in *Am, J, Phys, Anth,* **30**, 297-301

Pitcher, J D, and Veillette, C, 2010 Interossesous Hemangioma, in *Orthopaedia,* www.orthopaedia.com

Ragg, J M, Beard, G R, George, H, Heaven, F W, Hollis, J M, Jones, R J A, Palmer, R C, Reeve, M J, Robson, J D, and Whitfield, W A D, 1984 *Soils and their use in midland and western England*, Soil Survey of England and Wales, **12**

to previous view

Reimer, P J, Bard, E, Bayliss, A, Beck, J W, Blackwell, P, Bronk Ramsey, C, Buck, C E, Cheng, H, Edwards, R L, Friedrich, M, Grootes, P M, Guilderson, T P, Haflidason, H, Hajdas, I, Hatté, C, Heaton, T J, Hoffmann, D L, Hogg, A G, Hughen, K A, Kaiser, K F, Kromer, B, Manning, S W, Niu, M, Reimer, R W, Richards, D A, Scott, E M, Southon, J R, Staff, R A, Turney, C S M, and van der Plicht, J, 2013 IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP, *Radiocarbon*, **55**, 1869–87

Rippon, S, 2000 'Landscapes in Transition: The Later Roman and Early Medieval Periods' in Hooke, D, (ed) *Landscape: The Richest Historical Record,* Society for Landscape Studies, Amesbury, 47-62

Rippon, S, 2010 Landscape Change during the 'Long Eighth Century' in Southern England, in Higham, N J, and Ryan, M J, (eds), *Landscape Archaeology of Anglo-Saxon England,* The Boydell Press, Woodbridge, 39-64

Roberts, C, and Cox, M, 2003 *Health and Disease in Britain from Prehistory to the present Day,* Sutton Publishing Ltd, Stroud

Roberts, C, and Manchester, K, 1997 *The Archaeology of Disease*, Sutton Publishing Ltd, Stroud

Roberts, C, Millard, A, Nowell, G, Groeke, D, Macpherson, C, Pearson, D and Evans, D, 2013 Isotopic Tracing of the Impact of Mobility on Infectious Disease: The Origin of People with Treponematosis buried in Hull, England, in the late Medieval Period, *American Journal of Physical Anthropology*, **150 (2):** 273-285

Roe, F, 2002 Worked stone, in Jackson, R *et al*., Excavation, Survey and Watching Brief at Warner Village Cinemas, Friar Street, Worcester, *Trans Worcs Archaeol Soc 3ser*, **18**, 87-89

Roe, F, 2004 Worked stone, in H Dalwood, H, and Edwards, R, (eds.), *Deansway, Worcester, Romano-British small town to late medieval city*, CBA Res Rep **139**, 462-473

Rogers, J, and Waldron, T, 1995 *A Field Guide to Joint Disease in Archaeology*, Wiley and Sons, Chichester

Salter, R, 1999 *Textbook of Disorders and Injuries of the Musculoskeletal System,* 3rd Edition, Williams and Wilkins, Maryland

Schaefer, M, Black, S, and Scheuer, L, 2009 *Juvenille Osteology: A Laboratory and Field Manual,* Academic Press, London

Scheuer, L, and Black, S, 2004 *The Juvenile Skeleton,* Elsevier Academic Press, London

Smith, B H, 1991 Standards of human Tooth Formation and Dental Age Assessment, in Kelley, M and Larsen, C S, (eds), *Advances in Dental Anthropology*, Wiley-Liss, New York, 143-216

Soil Survey of England and Wales, 1983 *Midland and Western England*, sheet 3, scale 1:250,000 + Legend for the 1:250,000 Soil Map of England and Wales (A brief explanation of the constituent soil associations)

Stace, C, 2010 *New Flora of the British Isles,* Third Edition, Cambridge University Press, Cambridge

Stuart-Macadam, P, 1991 Anaemia in Roman Britain, in H Bush and M Zvelebil (eds) Health in Past Societies: Biocultural interpretations of human remains in archaeological contexts, Oxford, Tempus Reparatum, *British Archaeological Reports, International Series* **567**, 101-13

Stuiver, M, and Polach, H A, 1977 Reporting of 14C data, *Radiocarbon*, **19**, 355–63

Stuiver, M, and Reimer, P J, 1986 A computer program for radiocarbon age calculation, *Radiocarbon*, **28**, 1022–30

go to contents

Stuiver, M, and Reimer, P J, 1993 Extended 14C data base and revised CALIB 3.0 14C age calibration program, *Radiocarbon*, **35**, 215–30

Thompson, V, 2004 *Dying and Death in Later Anglo-Saxon England*, Boydell Press, Woodbridge

Thorn, F, and Thorn, C, 1982 *Domesday Book* - Worcestershire, Chichester

Trotter, M, 1970 Estimation of Stature from Intact Limb Bones, in Stewart, T D, (ed), *Personal Identification in Mass Disasters,* 71-83, Smithsonian Institution, Washington DC

Tyrell, A, 2000 Skeletal non-metric traits and the assessment of inter- and intra- population diversity: Past problems and future potential, in Cox, M, and Mays, S, (eds), *Human Osteology in Archaeology and Forensic Science,* Greenwich Medical Media, London, 289-305

Ubelaker, D, 1989 *Human Skeletal Remains,* 2nd ed, Taraxacum Press, Washington DC

Vaughan, T M and Webster, J, 2012 *Assessment and Updated Project Design for the Kempsey Flood Alleviation Scheme, Kempsey, Worcestershire*, Archive and Archaeology Service, Worcestershire County Council unpublished report, **P3708**, WSM 45802, dated 2 March 2012

VCH III, Willis-Bund, J W, and Page, W (eds), 1913 *Victoria History of the County of Worcestershire*, **III**, London, 430-437

VCH IV, Page, W, and Willis-Bund, J W (eds), 1924 'The City of Worcester: City Churches and advowsons', *A History of the County of Worcester: Victoria History of the County of Worcestershire*, **IV**, 408-412, http://www.british-history.ac.uk/report.aspx?compid=42916 accessed 13 June 2012

Vigorita, V J, 2008 *Orthopaedic Pathology,* 2nd ed, Wolters Luwer/Lippincott Williams and Wilkins, London

Waldron, T, 2011 The Human Remains from the Chapter House, Worcester Cathedral, in *Report of the 20th Annual Symposium,* Worcester Cathedral Archaeology Department, England

Walker, D, Powers, N, Connell, B and Redfern, R, 2015 Evidence of Skeletal Treponematosis from the Burial Ground of St Mary Spital, London and the Implications for the Origins of the Disease in Europe, in *Am. J. Phys. Anth.* **156**, 90-101

Walker, P, Bathurst, R, Richman, R, Gjerdrum, T, and Andrushko, V, 2009 The Causes of Porotic Hyperostosis and Cribra Orbitalia: A Reappraisal of the Iron Deficiency-Anemia Hypothesis, in *Am. J. Phys. Anth.* **139**, 109-125

Ward, G K and Wilson, S R, 1978 Procedures for comparing and combining radiocarbon age determinations: a critique, *Archaeometry*, **20**, 19–31

Watt, S, (ed) 2011 *The Archaeology of the West Midlands: A Framework for Research,* Oxbow Books, Oxford

WCC 2010 *Standards and guidelines for archaeological projects in Worcestershire*, Planning Advisory Section, Worcestershire Archive and Archaeology Service, Worcestershire County Council unpublished report **604**, amended July 2012

Webster, G, 1955 A Trial Excavation at Kempsey, *Trans Worcestershire Archaeol Soc*, New Series, **XXXII**, 13-14

Weiss, K, 1973 *Demographic Models for Anthropology,* Memoirs **27**, Society for American Archaeology, Washington DC

Wells, C, and Cayton, H, 1980 The Human Bone, in Wade-Martins, P, (ed), *Excavations at North Elmham Park 1967-1972,* East Anglia Archaeology, **9**, 247-374

to previous view

Western, G, 2015 *Osteological Analysis of the Human Remains from St Mary's Church, Kempsey, Worcestershire*, Ossafreelance, project **OA1037**, unpublished report, dated June 2012, updated March 2015

Wheeless, C, 2011 *Fibrous Dysplasia*, http://www.wheelessonline.com/ortho/fibrous_dysplasiaas accessed 06 June 2012

Wichbold, D, 1996 *Watching Brief at St Mary's Church, Kempsey*, County Archaeological Service, Hereford and Worcester County Council, report, **414,** dated January 1996

Wood, J W, Milner, G R, Harpending, H C, and Weiss, K M, 1992 The Osteological Paradox. Problems of inferring health from Skeletal samples, in *Current Archaeology*, **33**, **4**, 343-370

Wright, L E, and Schwarcz, H P, 1998 Stable carbon and oxygen isotopes in human tooth enamel: Identifying breastfeeding and weaning in prehistory, *American Journal of Physical Anthropology* **106**, 1-18

to previous view

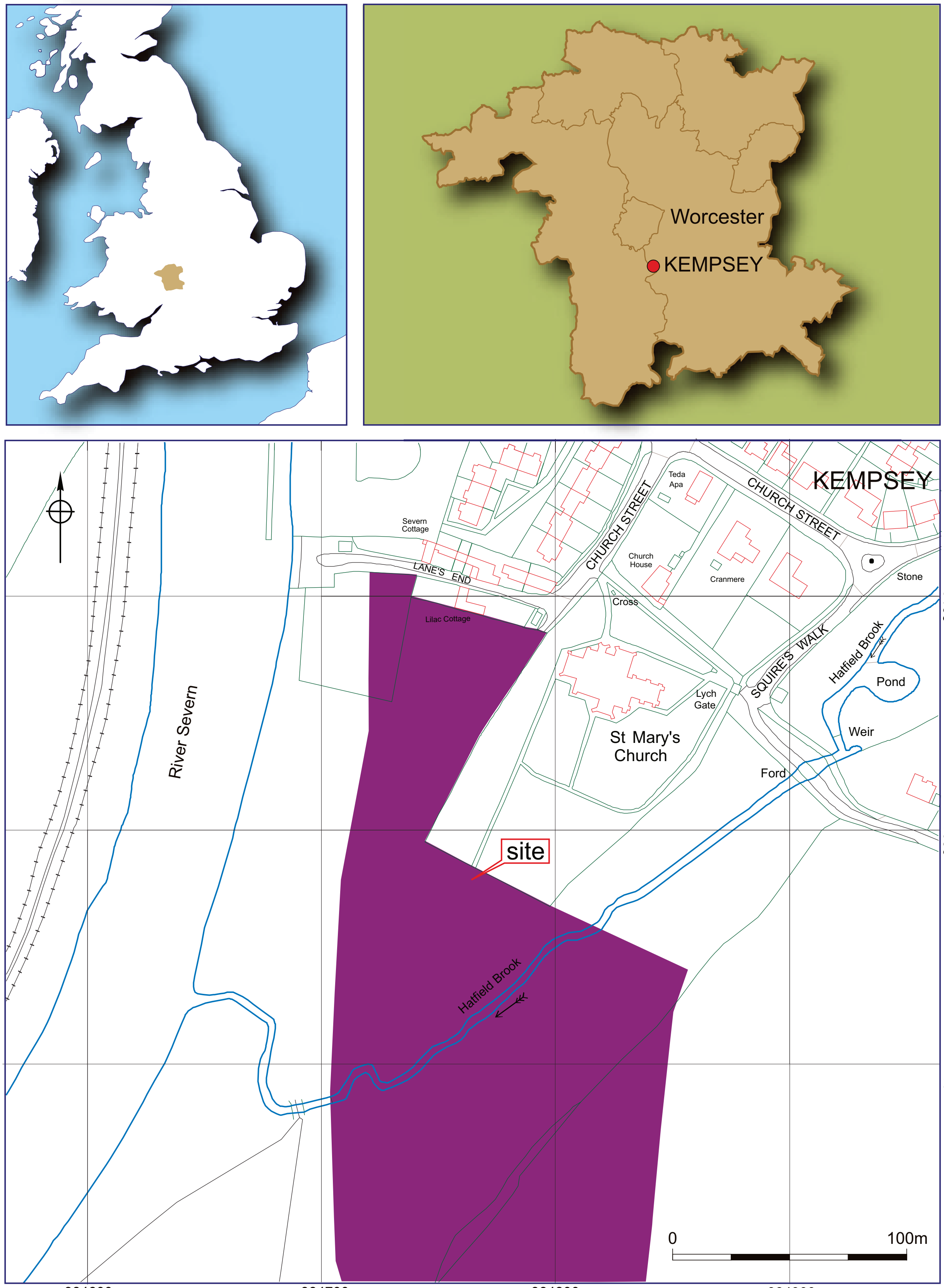


Figure 1: Location of the site

go to contents

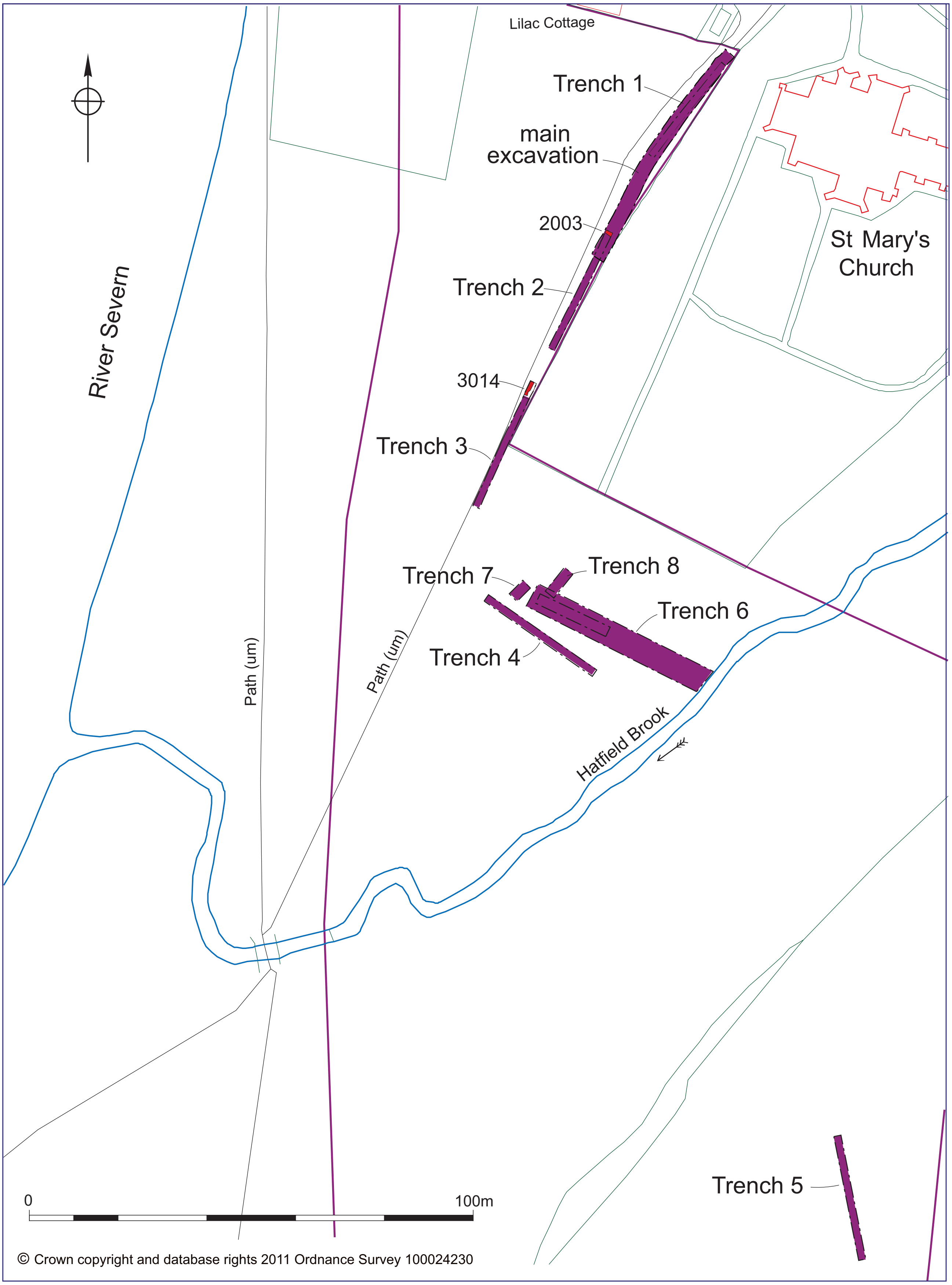


Figure 2: Trench location plan

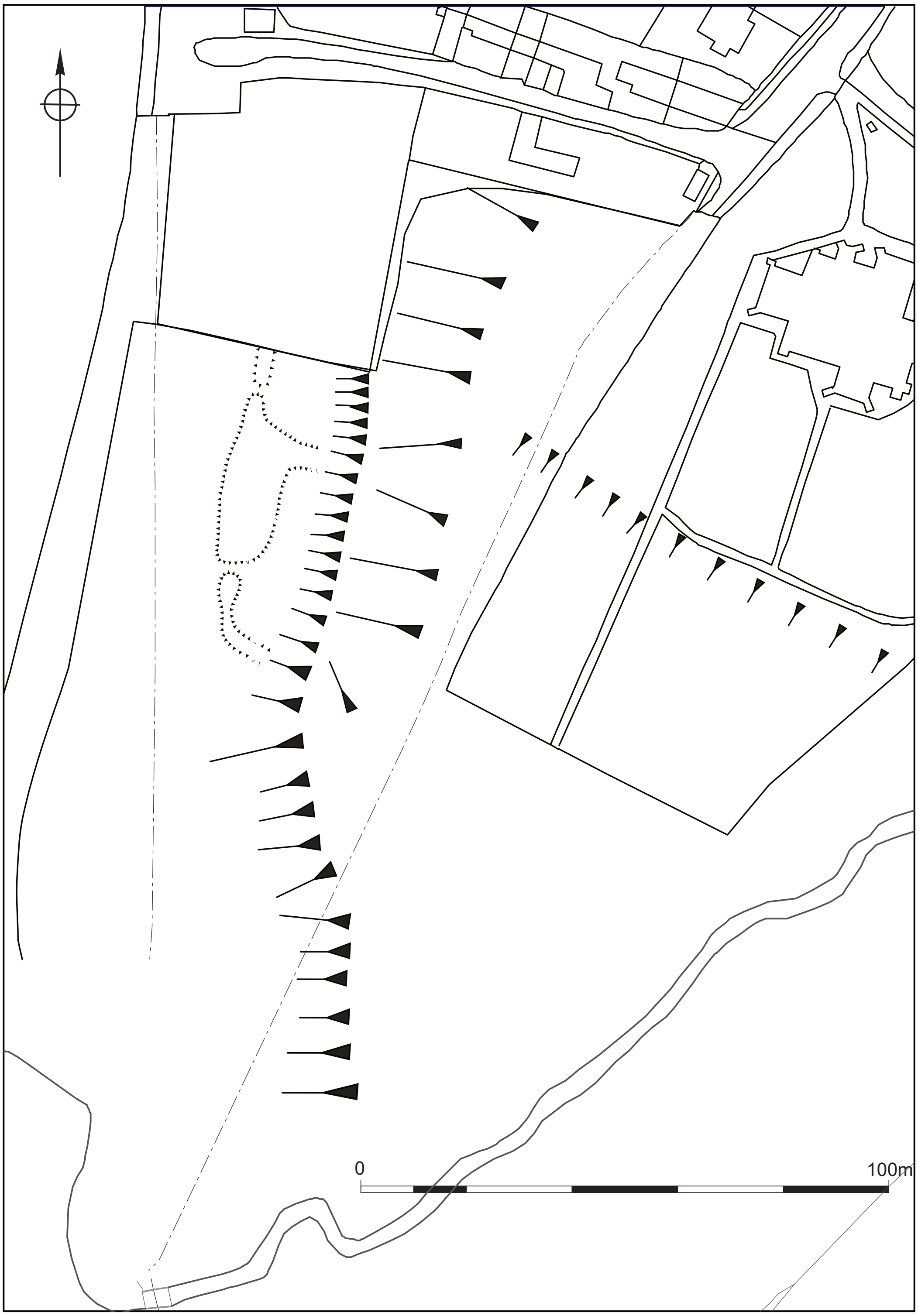


Figure 3 : Topographic Survey

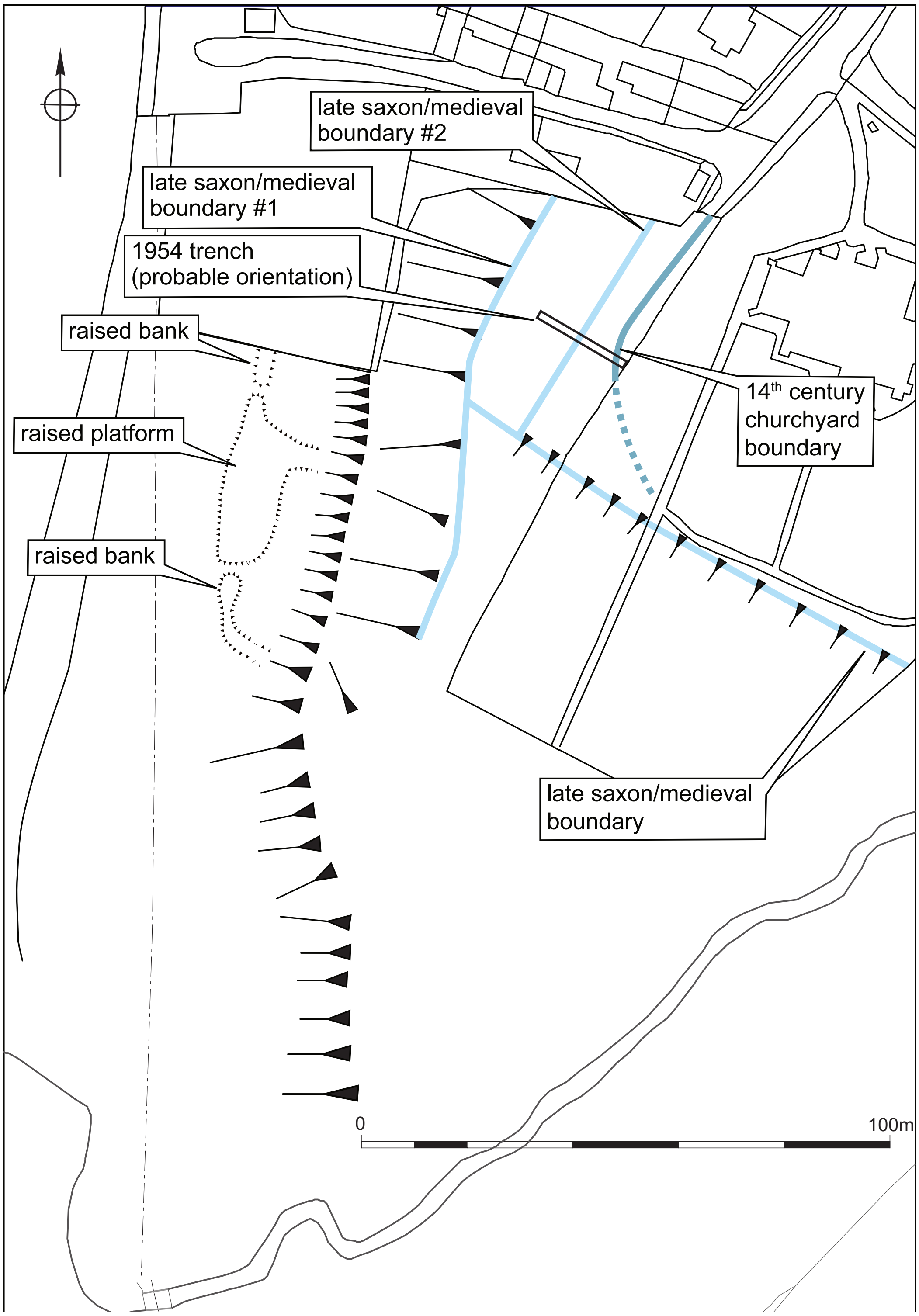


Figure 4: Topographic Survey interpretation

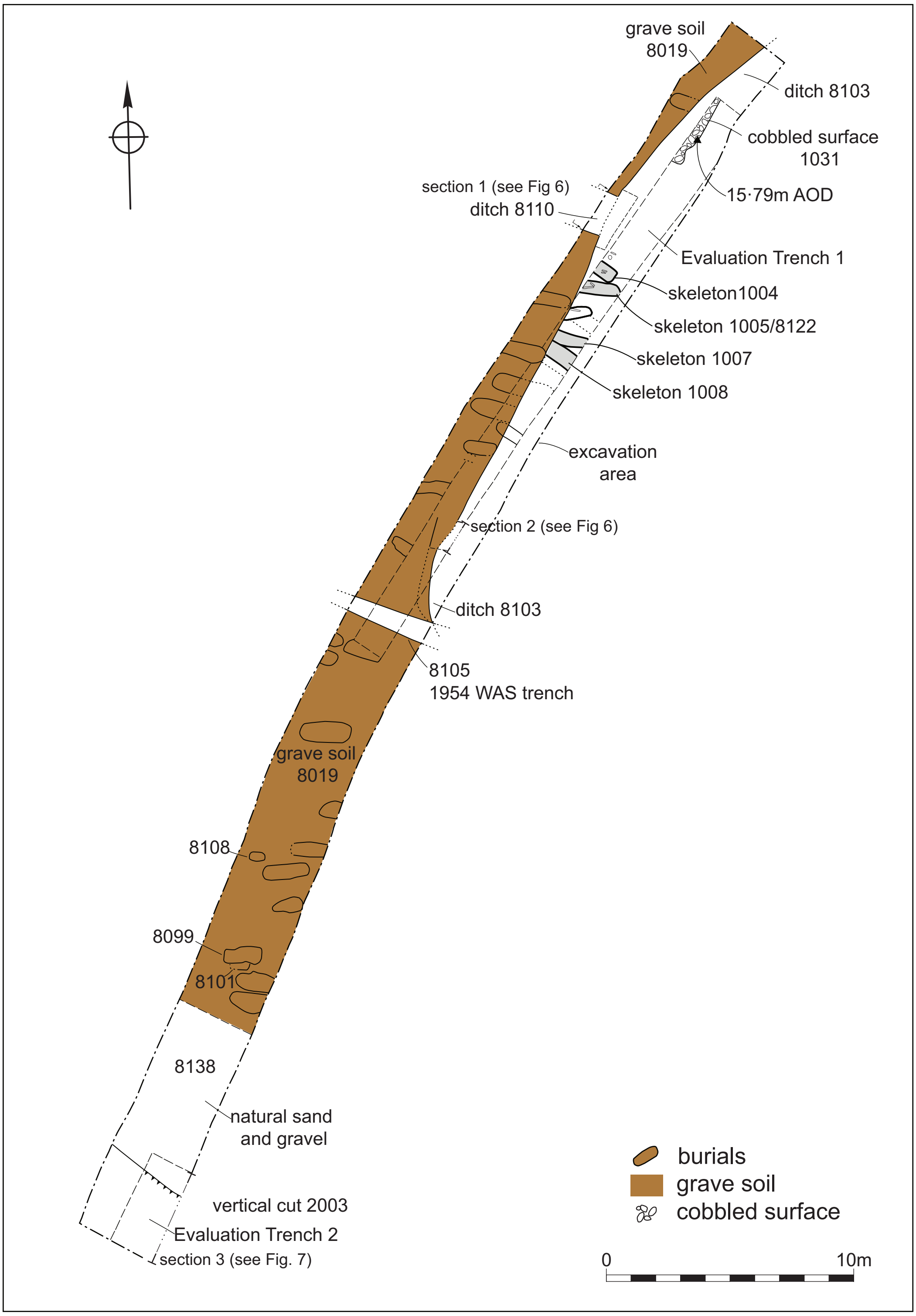


Figure 5: Excavation area - all features

to previous view

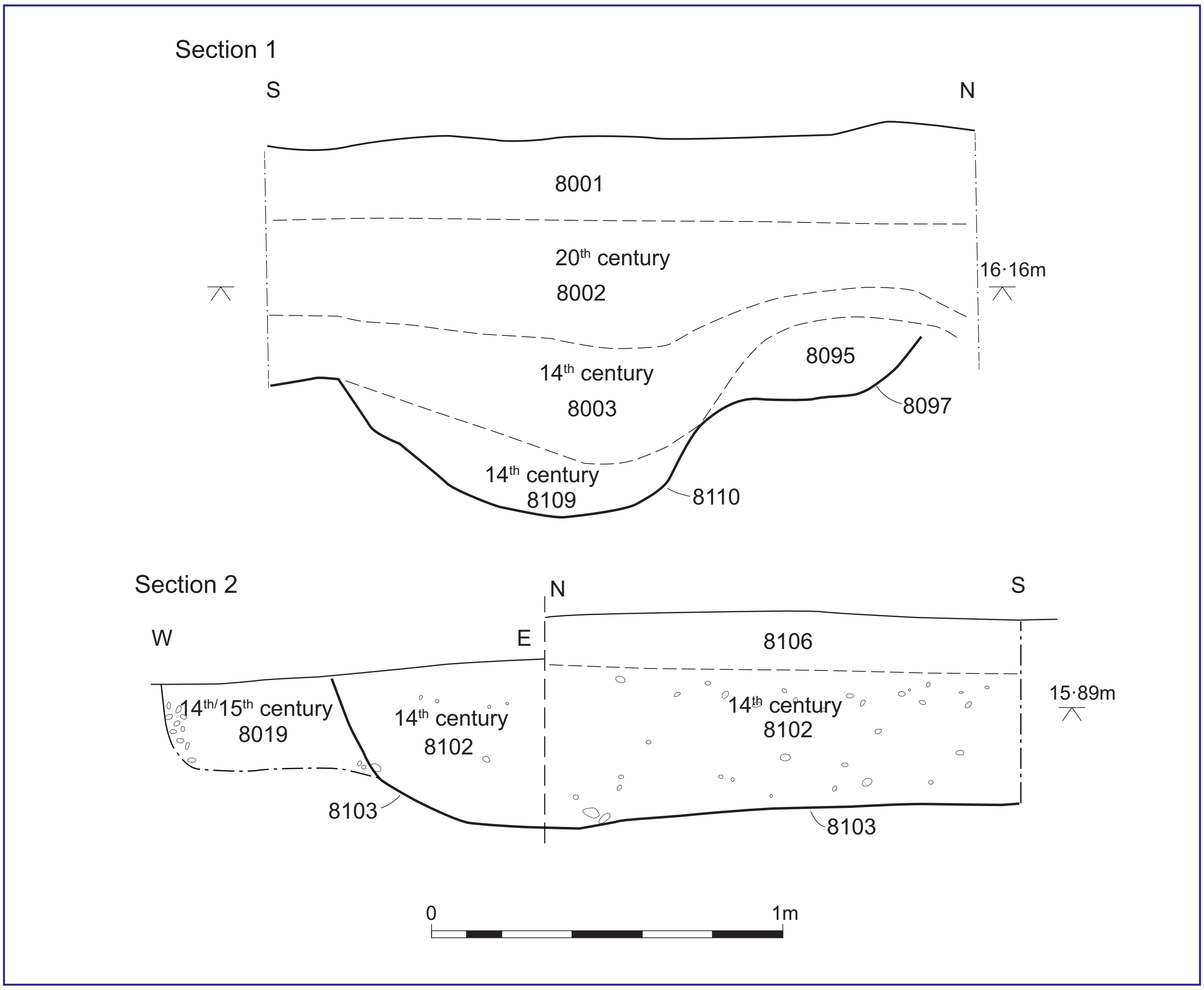


Figure 6: Sections through medieval linear features seen in the main excavation area

go to contents

to previous view

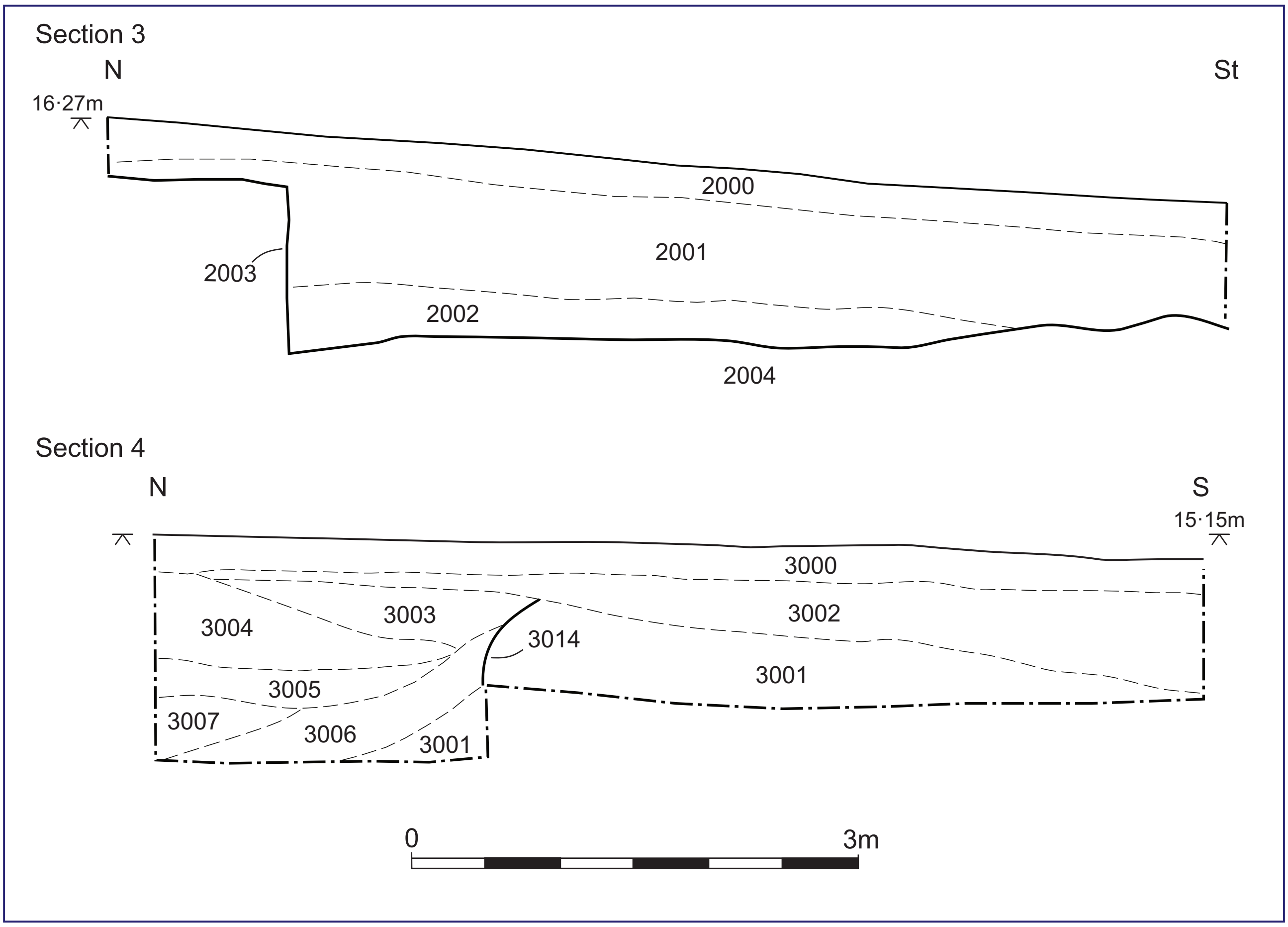


Figure 7: Sections through bank in Trench 2 and pit/linear in Trench 3

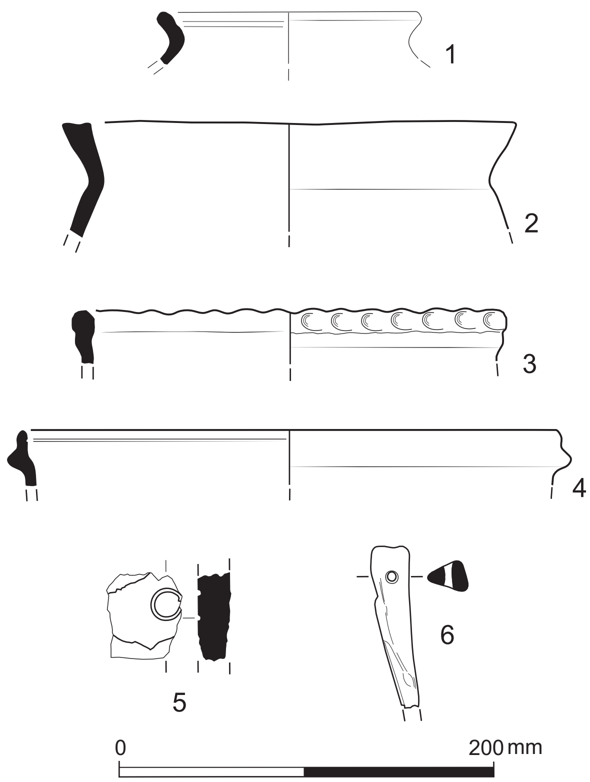


Figure 8: Medieval pottery and small finds

go to contents

to previous view

Figure 9: Illustration of a medieval burial from a French Book of Hours

to previous view

Figure 10: Inhumation (8030) truncating inhumation (8032), Scale 1m, view west

Figure 11: Inhumations (8039 and 8041), Scale 1m, view west

go to contents

to previous view

Figure 12: Inhumation (8064), truncated by ditch [8103], Scale 1m, view west

Figure 13: Intercut inhumations (8116, 8119, 8122 and 8125), truncated by ditch [8103], Scale 1m, view west

go to contents

to previous view

Figure 14: Cobbled surface (1031) truncated by ditch [8103] to left, as seen in Trench 1, Scale 1m, view south

go to contents

to previous view

Figure 15: Vertical cut [2003] in Trench 2, Scale 1m, view north

Figure 16: General view north of Trench 8 access road strip through terrace edge

go to contents

to previous view

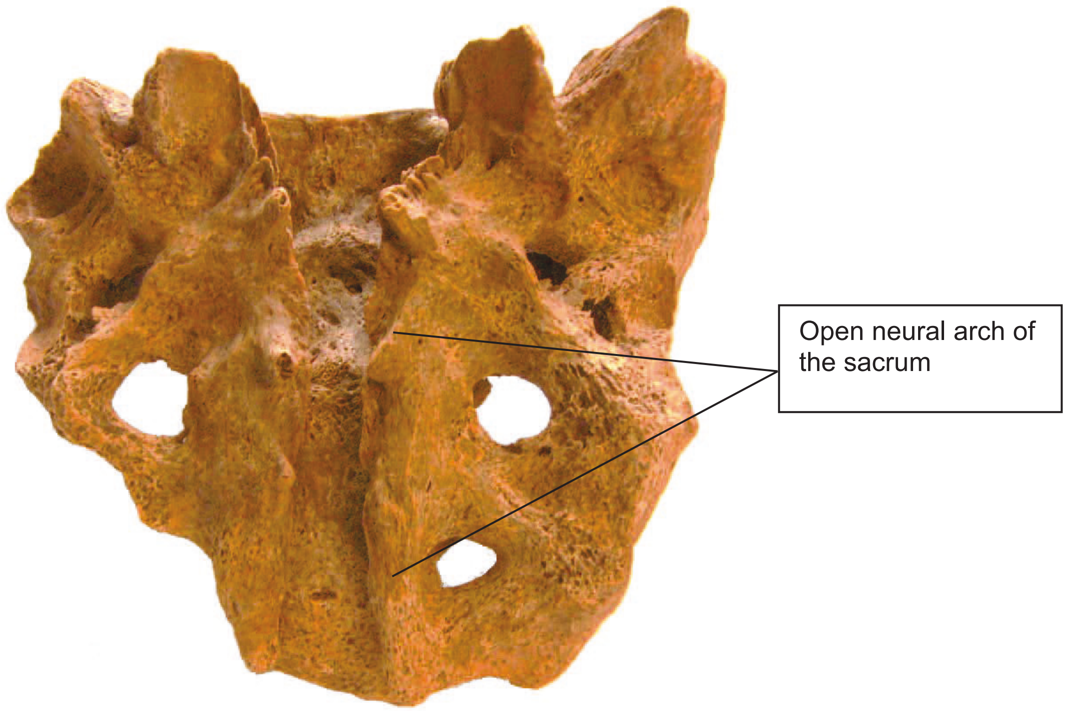


Figure 17: Cleft Neural Arch in the dorsal plate of the sacrum (SK 8064)

Figure 18: Hypoplastic left neural arch with associated cleft defect (SK 8064)

to previous view

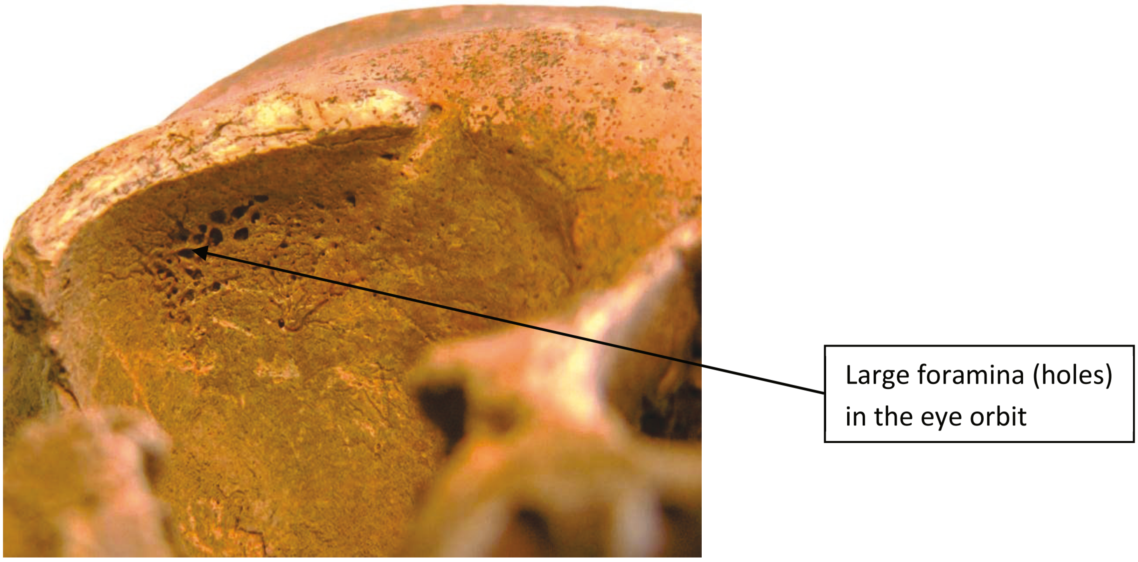


Figure 19: Cribra Orbitalia in the Right Orbit of SK 8030.

Figure 20: Thoracic vertebrae from SK 8050 exhibiting concavity of the end plate surface. The surface also has a roughened appearance indicating osteopenia.

go to contents

to previous view

Figure 21: Maxillary Sinusitis in SK 8033

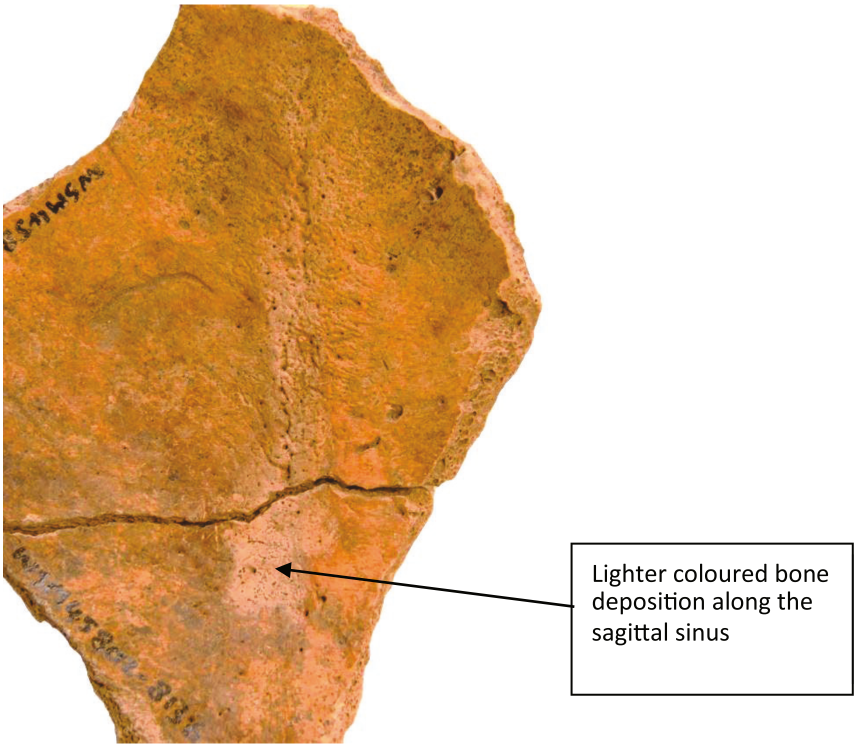


Figure 22: Lesion on the endocranial surface of the parietal bones in SK 8136

go to contents

to previous view

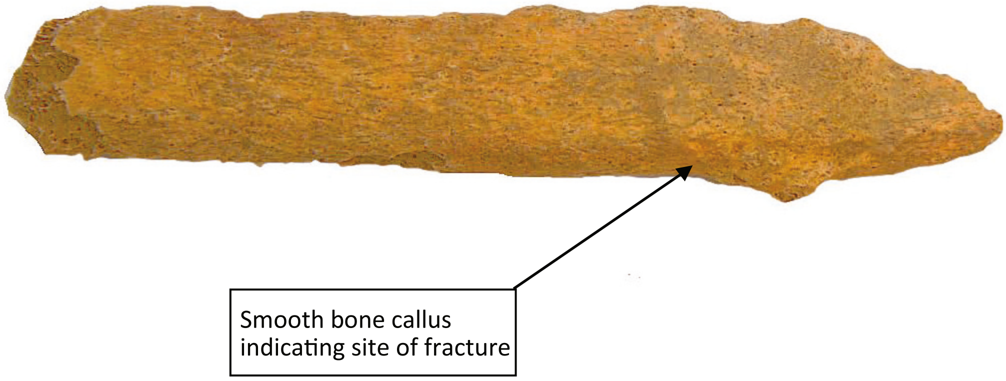


Figure 23: Well healed fracture of SK 8033

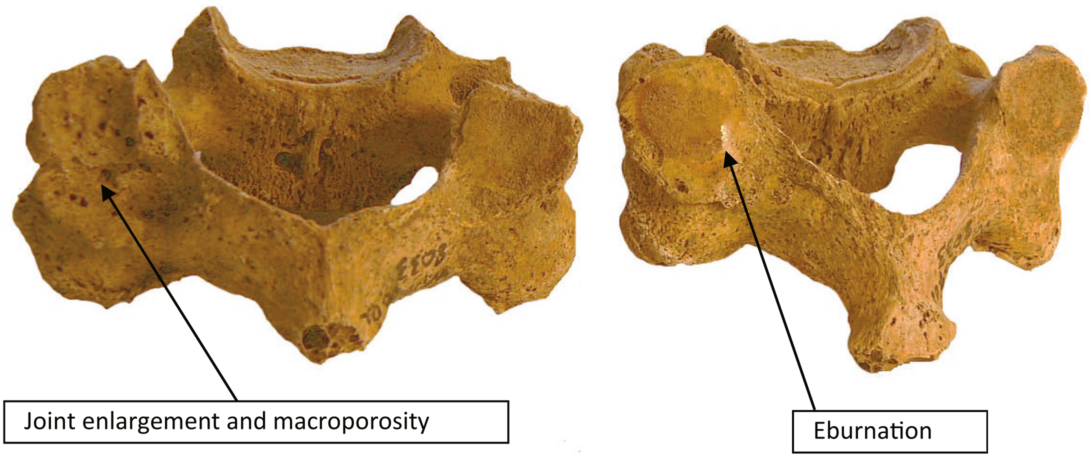


Figure 24: Spinal Joint Disease: Osteoarthritis in the zygapophyseal joints of SK 8033

go to contents

Figure 25 : Radiograph and macroscopic image of the right tibia of SK 8024, displaying anterior bowing and a swollen appearance.

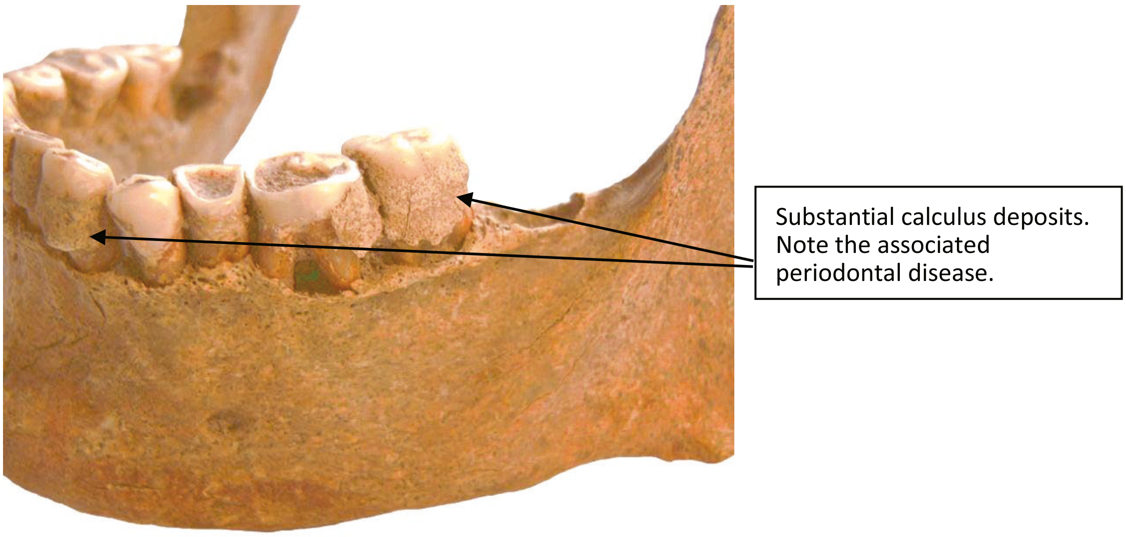


Figure 26: Calculus deposits on the teeth of SK 8033. Periodontal disease resulting in porosity and resorption of the alveolar margin is also present.

to previous view

Figure 27 : Multiple dental abscesses around the tooth roots in SK 8033

Figure 28: Enamel hypoplastic defects manifest as horizontal grooves in the anterior dentition of SK8044.

to previous view

Figure 29: Bone deposits indicating inflammation in the cranium from context 8035-1

Figure 30: Post-Mortem modifications to the skull vault in context 8035-1.

go to contents

to previous view

Figure 31: Disarticulated crania 8035-1 and 8035-2 re-deposited within a cut feature, scale 0.3m, view west

go to contents

to previous view

Appendix 1

Table 3:
Summary of context dating based on artefacts

context	material class	object specific type	fabric code	count	Weight (g)	start date	end date	Finds tpq
1000	ceramic	pot	12	1	10	M1C	4C	
1000	ceramic	pot	55	2	12	L11C	M14C	
1000	ceramic	pot	53	2	6	12C	M13C	
1000	ceramic	pot	12	1	36	2C	3C	
1000	ceramic	pot	56	4	18	L12C	14C	
1000	ceramic	pot	143.2	1	48	L12C	13C	
1000	ceramic	pot	85	2	12	19C	20C	
1000	ceramic	roof tile	3	1	27	13C	16C	
1000	ceramic	floor tile		2	148	L14C	15C	
1000	ceramic	roof tile	2c	2	84	L15C+		
1000	flint	flake		1	4			
1000	stone	sharpening stone		1	38			20C
1001	ceramic	pot	69	1	24	E15C	16C	
1001	ceramic	floor tile		1	128	14C	15C	
1001	stone	architectural stone		1	526			E15-16C
1002	ceramic	pot	56	1	12	L12C	14C	14C
1026	ceramic	pot	56	1	6	L12C	14C	
1026	ceramic	pot	55	2	8	12C	M14C	M14C
1030	ceramic	pot	12	1	10	M1C	4C	
1030	ceramic	pot	57	1	12	10C	M11C	
1030	ceramic	pot	53	1	4	12C	M13C	
1030	ceramic	pot	56	1	12	M13C	14C	M13C
1031	ceramic	pot	56	1	4	L12C	14C	14C
2000	ceramic	roof tile	?2c	1	256	L15C+		
2000	stone	tile		1	280			
2000	ceramic	ridge tile	2b	1	512	13C	15C	
2000	ceramic	roof tile	2b	4	378	13C	15C	
2000	ceramic	tegula		1	252	M1C	4C	
2000	ceramic	roof tile	2a	1	141	13C	15C	L15/16C
2001	ceramic	pot	12	1	8	M1C	4C	
2001	ceramic	roof tile	2a	8	439	13C	15C	
2001	ceramic	ridge tile	3	1	26	13C	16C	
2001	stone	tile		4	1466			
2001	ceramic	roof tile	2c	2	143	L15C+		
2001	ceramic	roof tile	2b	3	350	13C	15C	15C

go to contents

to previous view

context	material class	object specific type	fabric code	count	Weight (g)	start date	end date	Finds tpq
2002	ceramic	roof tile	2b	5	137	13C	15C	
2002	stone	tile		1	162			
2002	ceramic	roof tile	2a	5	485	13C	15C	15C
2002	slag			3	40			
3002	ceramic	roof tile	2c	7	780	L15C+		
3002	ceramic	roof tile	2a	3	144	13C	15C	15C
3005	ceramic	pot	12	1	12	M1C	4C	
3005	ceramic	pot	3	2	34	1C	E2C	
3005	ceramic	pot	69	1	30	15C	E17C	
3005	ceramic	pot	22	1	22	AD120+		
3005	ceramic	roof tile	2b	4	171	13C	15C	15-E17C
3005	ceramic	roof tile	2c	2	85	L15C+		
3005	ceramic	fired clay		7	144			
3010	ceramic	roof tile	2c	1	102	L15C+		
3010	ceramic	ridge tile	3	1	22	13C	16C	L15-16C
3012	ceramic	roof tile	3	1	142	13C	16C	16C
3013	mortar			5	128			
3013	ceramic	roof tile	2c	6	997	L15C+		
3013	ceramic	roof tile	2a	4	174	13C	15C	L15-16C
3013	ceramic	roof tile	?3	1	41	13C	16C	
4000	ceramic	ridge tile	3	2	212	13C	16C	
4000	ceramic	roof tile	2c	10	860	L15C+		
4000	ceramic	ridge tile	3	1	78	13C	16C	L15-16C
4002	ceramic	roof tile	?3	4	282	13C	16C	16C
4005	ceramic	pot	64.1	2	4	12C	14C	
4005	ceramic	roof tile	2a	16	528	13C	15C	
4005	mortar			1	114			
4005	ceramic	roof tile	2c	21	2298	L15C+		
4005	ceramic	ridge tile	2a	3	44	13C	15C	
4005	stone	tile		3	616			L15-16C
4005	ceramic	ridge tile	3	1	43	13C	16C	
5000	ceramic	pot	78	2	8	L17C	18C	
5000	ceramic	pot	81.3	1	8	M18C		
5000	ceramic	roof tile	2c	6	78	L15C+		
5000	ceramic	brick		6	170	17C	18C	18C
5000	ceramic	brick		1	8	17C	18C	
5001	ceramic	brick		1	22	17C	18C	18C

to previous view

context	material class	object specific type	fabric code	count	Weight (g)	start date	end date	Finds tpq
8000	ceramic	pot	85	2	20	L19C	20C	20C
8000	ceramic	pot	91	1	4	L17C	18C	
8000	ceramic	pot	55	1	12	L11C	M14C	
8000	ceramic	pot	3	1	12	1C	E2C	
8000	ceramic	pot	12	3	20	M1C	4C	
8000	ceramic	pot	78	1	10	M17C	E18C	
8000	ceramic	pot	81.4	1	4	19C		
8000	ceramic	pot	12	2	10	M1C	4C	
8000	ceramic	pot	53	1	36	L12C	M13C	
8000	ceramic	pot	56	1	14	L12C	14C	
8000	ceramic	pot	85	2	38	L19C	20C	
8000	ceramic	pot	81.4	3	28	L19C	20C	
8000	ceramic	pot	85	1	14	19C	20C	
8000	ceramic	pot	55	1	10	L11C	M14C	
8000	ceramic	pot	56	2	108	L12C	E13C	
8000	ceramic	pot	56	1	16	L12C	14C	
8000	ceramic	pot	69	1	12	13C	15C	
8000	metal	nail		2	12			
8000	ceramic	roof tile	2b	1	66	13C	15C	
8000	ceramic	floor tile		1	120	13C	14C	
8000	ceramic	floor tile		1	36	13C	14C	
8000	ceramic	roof tile	1	3	180	19C	20C	
8000	ceramic	floor tile		2	244	14C	15C	
8000	ceramic	roof tile	2a	7	398	13C	15C	
8000	ceramic	brick		1	108	17C	18C	
8000	ceramic	pipe		1	60	L19C	20C	
8000	ceramic	roof tile	?3	1	148	13C	16C	
8000	ceramic	roof tile	?2c	2	70			
8000	ceramic	roof tile	2c	1	32	L15C+		
8000	ceramic	roof tile	2a	1	68	13C	15C	
8000	metal	cartridge casings	0	2	14	20C		
8000	ceramic	clay pipe bowl	0	1	12	17C	18C	
8000	flint	flake	0	2	8			
8000	metal	grave/ plot marker	0	1	456	19C	E20C	
8000	glass	vessel	0	1	36	20C		
8000	glass	vessel	0	1	6	20C		

go to contents

to previous view

context	material class	object specific type	fabric code	count	Weight (g)	start date	end date	Finds tpq
8001	ceramic	pot	12	2	86	M1C	4C	20C
8001	ceramic	pot	81.4	4	318	M19C	E20C	
8001	ceramic	pot	78	1	118	L17C	18C	
8001	ceramic	pot	85	1	4	L19C	20C	
8001	stone	roof tile		1	32			
8001	ceramic	floor tile		1	120	14C	15C	
8001	ceramic	roof tile	2a	1	70	13C	15C	
8001	ceramic	clay pipe stem	0	1	4	17C	18C	
8001	ceramic	clay pipe stem	0	1	4	16C	18C	
8001	metal	unident	0	1	14			
8002	ceramic	pot	12	4	44	M1C	2C	20C
8002	ceramic	pot	55	2	14	L11C	M14C	
8002	ceramic	pot	81.4	1	22	L19C	20C	
8002	ceramic	brick		1	40	17C	18C	
8002	ceramic	clay pipe stem	0	1	2	16C	17C	
8003	ceramic	pot	55	1	10	L11C	M14C	14C
8003	ceramic	pot	56	1	24	E13C	M13C	
8003	ceramic	pot	56	1	26	L12C	M13C	
8003	ceramic	pot	56	1	38	L12C	13C	
8003	ceramic	pot	55	9	82	L11C	M14C	
8003	ceramic	pot	55	2	18	12C	M14C	
8003	ceramic	pot	56	2	34	M13C	L13C	
8003	ceramic	pot	64.1	1	72	13C	14C	
8003	ceramic	pot	55	9	9	L11C	M14C	
8003	metal	nail		1	6			
8003	ceramic	fired clay	0	1	14			
8004	ceramic	pot	55	1	6	L11C	M14C	M14C
8010	ceramic	pot	12	1	16	M1C	4C	13-15C
8010	ceramic	pot	48	1	4	L9C	M11C	
8010	ceramic	roof tile	2a	1	14	13C	15C	
8010	flint	waste flake	0	1	1			
8016	metal	unident	0	1	1			undated

to previous view

context	material class	object specific type	fabric code	count	Weight (g)	start date	end date	Finds tpq
8019	ceramic	pot	3	3	48	1C	E2C	14-15C
8019	ceramic	pot	55	4	62	12C	M14C	
8019	ceramic	pot	55	1	32	1125	1350	
8019	ceramic	pot	56	5	38	L12C	14C	
8019	ceramic	pot	55	1	34	12C	M14C	
8019	ceramic	pot	64.1	1	8	13C	15C	
8019	ceramic	pot	55	1	6	L11C	M14C	
8019	ceramic	pot	56	10	89	M13C	14C	
8019	ceramic	pot	55	1	4	L11C	M14C	
8019	ceramic	pot	55	1	8	L11C	M14C	
8019	ceramic	pot	56	3	16	L12C	L14C	
8019	ceramic	pot	55	1	10	12C	M14C	
8019	ceramic	roof tile	2a	1	48	13C	15C	
8019	ceramic	roof tile	2a	2	50	13C	15C	
8019	ceramic	roof tile	2a	3	54	13C	15C	
8019	ceramic	roof tile	2a	2	22	13C	15C	
8019	metal	nail		1	36			
8019	ceramic	roof tile	2a	2	44	13C	15C	
8019	ceramic	fired clay	0	1	16			
8019	stone	quern	0	1	1034	1C	4C	
8019	flint	retouched blade	0	1	4			
8019	slag	slag	0	3	388			
8019	metal	waste	0	1	10			
8019	flint	waste flake	0	1	1			
8023	ceramic	pot	56	1	1	L12C	14C	14C
8026	ceramic	fired clay	0	1	16			Undated
8029	metal	needle	0	2	1			?Late Saxon
8046	ceramic	roof tile	2b	1	14	13C	15C	13-15C
8072	flint	waste flake	0	1	1			Prehistoric
8078	flint	waste flake	0	1	1			Prehistoric
8098	ceramic	pot	56	1	4	L12C	14C	L12-14C
8102	ceramic	pot	64.1	1	4	13C	14C	14C
8102	ceramic	pot	56	1	10	L12C	14C	
8102	ceramic	roof tile	2a	1	30	13C	15C	
8109	ceramic	pot	55	6	69	12C	M14C	14C
8109	ceramic	pot	56	2	42	L12C	14C	
8109	ceramic	pot	12.1	1	11	M1C	4C	

to previous view

context	material class	object specific type	fabric code	count	Weight (g)	start date	end date	Finds tpq
8111	ceramic	pot	56	1	6	L12C	14C	14C
8111	ceramic	pot	3	2	8	1C	2C	
8111	ceramic	pot	64.1	1	6	12C	E13C	
8111	ceramic	roof tile	3	1	73	13C	16C	
8111	ceramic	roof tile	2b	1	15	13C	15C	
8111	slag	slag	0	1	226	43	400	
8111	flint	waste flake	0	1	1			
8111	flint	waste flake	0	1	1			
8111	metal		0	1	4			
8132	ceramic	roof tile	2a	2	18	13C	15C	13-15C
8135	ceramic	pot	56	2	8	L12C	14C	14C
10003	ceramic	pot	56	2	22	L12C	14C	20C
10003	ceramic	roof tile	2a	1	16	13C	15C	
10003	glass	vessel	0	1	8	19C	20C	

to previous view

The project archive

Site code: WSM 45802

The archive consists of:

- 168 Context records AS1
- 18 Field progress reports AS2
- 10 Photographic records AS3
- 621 Digital photographs
- 2 Drawing number catalogues AS4
- 79 Scale drawings
- 4 Context number catalogues AS5
- 46 Skeleton records AS6
- 8 Matrix sheets AS7
- 1 Context finds sheets AS8
- 1 Recorded finds records AS13
- 1 Sample records AS17
- 2 Sample number catalogues AS18
- 10 Flot records AS21
- 11 Levels records AS19
- 5 Trench record sheets AS41
- 5 Boxes of finds/environmental material
- 2 CD-Rom/DVDs
- 1 Copy of this report (bound hard copy)

go to contents

to previous view

Osteological Archive (Ossafreelance)

Type	No	Type	No
Skeleton Recording Form A	48	Skeleton Recording Form K	8
Skeleton Recording Form B	46	Skeleton Recording Form L	3
Skeleton Recording Form D	42	Skeleton Recording Form P	2
Skeleton Recording Form E	18	Skeleton Recording Form Q	3
Skeleton Recording Form F	0	Skeleton Recording Form R	2
Skeleton Recording Form G	0	Skeleton Recording Form S	0
Skeleton Recording Form H	41	Skeleton Recording Form W	10
Skeleton Recording Form I	42	Articulated Anglo-Saxon Inhumated Db	1
Skeleton Recording Form J	18	Disarticulated Bone Db	1

The project archive is intended to be placed at:

Worcestershire County Museum
Museums Worcestershire
Hartlebury Castle
Hartlebury
Near Kidderminster
Worcestershire DY11 7XZ
Tel Hartlebury (01299) 250416

Published by

Worcestershire
Archive & Archaeology Service

www.explorethepast.co.uk/

worcestershire
county council