LONDON'S MIDDLE SAXON WATERFRONT: EXCAVATIONS AT THE ADELPHI BUILDING, WESTMINSTER

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INTRODUCTION

This supplement has been published online in support of an article in LAMAS Transactions Volume 70 (2019), 129–66, with a separate bibliography. The figure and table numbers are a direct continuation of the main published sequence. The contents comprise:

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THE POTTERY

Chris Jarrett

Introduction

A small sized assemblage of pottery was recovered from the archaeological work: 123 sherds/96 minimum number of vessels (MNV), weighing 2.293kg, of which only three sherds were unstratified. The majority of the pottery consists of Middle Saxon wares (120 sherds/93 MNV/1.877kg), except for two sherds of residual Roman amphora (2 MNV/403g) and a single intrusive sherd (13g) of early medieval pottery. The pottery was in a fragmentary state; although only 4.3% of the material was abraded and indicated that much of the ceramics were deposited soon after discard; sherds from a very small number of vessels were however noted as dispersed throughout the stratigraphy and found in different phases. As implied above, the pottery was quantified by sherd counts (SC), MNV and weight. The classification of the Middle Saxon pottery types, as found in Lundenwic, is referenced to that used by the Museum of London Archaeology (Blackmore 1988a; 1989; 2003a; 2012) and the range of pottery types recorded in the assemblage and their quantification are shown in Table 1. The shell-tempered wares have been only given an umbrella code as the latest research indicates that this class of pottery is best differentiated by chemical analysis rather than by macroscopic and microscopic techniques: the clays used to make these wares were mostly derived from the Woolwich Beds (Blackmore 2012, 247–9). The small quantity of miscellaneous wares (MISC) was all either too small or too abraded to assign to a type. As the fabric types occur in a sequence that fits that for Lundenwic the pottery has been discussed by its distribution. Most of the forms recorded are closed and throughout the text have been termed as cooking pots when they have an external sooting and especially if the vessel had an internal food deposit; however, equally the vessel could have been placed on or next to a fire in order to heat water or other liquids and was not necessarily used to cook food.

Distribution of the Pottery

The pottery was recovered from Phases 2–3 and 5–10 and the quantification of the different types by phase is shown in Table 2.

Phase 2 (Early 7th Century)

Only two sherds/1 ENV/43g of pottery were recorded in this phase, both the fine sand-tempered ware with sparse organic inclusions (SSAND), dated *c.*AD 600–850, and solely derived from the foreshore layer [154]. The pottery type occurred as a jar in a reduced firing condition with wiped external surfaces that are additionally sooted through use.

Phase 3 (Probably the Early or Mid-7th Century)

A single sherd of a reduced SSAND ware jar (9g) with external sooting was found in the embankment layer [153]. Pottery was absent from the Phase 4 deposits.

Phase 5 (Probably the Third Quarter of the 7th Century)

This phase produced a total of three sherds of pottery representing 3 MNV and weighing 76g. The pottery was recovered from two deposits and

Table 1. Quantification of the Middle Saxon pottery types by sherd count (SC), minimum number of vessels (MNV) and weight from Adelphi Building

Fabric code	Expansion and description	Date range	SC	% SC	MNV	% MNV	Weight (g)	% Weight
Chaff-tempered wares								
CHAF	Abundant organic temper in London Clay or brickearth	450–750	4	3.3	4	4.3	79	4.2
CHFS	As CHAF, but moderate quartz sand with sparse flint and/or chert	450–750	3	2.5	3	3.2	36	1.9
CHSF	As CHAF, brickearth with very fine sand, sparse organic matter	450–750	9	7.5	5	5.4	201	10.7
Ipswich wares								
IPSC	Ipswich coarse ware	730–850	7	5.8	7	7.5	98	5.2
IPSF	Ipswich fine ware	730–850	33	27.5	29	31.2	659	35.1
IPSM	Ipswich intermediate ware	730–850	4	3.3	4	4.3	114	6.1
Sand-tempered wares								
SSANA	Sand-tempered, coarse pink-brown core, black surfaces	670–850	3	2.5	2	2.2	53	2.8
SSANB	Sand-tempered (medium), grey-black throughout (?Hampshire)	670–850	4	3.3	4	4.3	34	1.8
SSANC	Sand-tempered (fine), white-firing clay (?Surrey)	670–850	2	1.7	2	2.2	30	1.6
SSAND	Sand-tempered (fine), pale grey	670–850	15	12.5	9	9.7	213	11.3
SSANE	Sand-tempered (fine), pale grey	670–850	1	0.8	1	1.1	1	0.1
Shell-tempered ware								
MSS	Shell-tempered ware	770–850	7	5.8	7	7.5	66	3.5
Imported wares								
BADOA	Badorf ware, soft cream fabric with sparse coarse sand	670–850	1	0.8	1	1.1	12	0.6
BADOB	Badorf ware, hard fine sandy cream/buff ware	670–850	8	6.7	2	2.2	93	5.0
BADOC	Badorf ware, fine ware	670–850	3	2.5	2	2.2	70	3.7
BADOD	Badorf ware, fine	670–850	1	0.8	1	1.1	9	0.5
BEAV	Beauvais-type white ware	700–850	1	0.8	1	1.1	3	0.2
NFGW	North French greyware (umbrella code)	600–850	1	0.8	1	1.1	4	0.2
NFGWA	North French greyware, moderate sand temper	600–850	3	2.5	2	2.2	21	1.1
NFGWC	North French greyware, very hard, thin walled	600–850	6	5.0	3	3.2	55	2.9
NFGWF	North French greyware, much iron	600–850	1	0.8	1	1.1	11	0.6
NFSVB	North French/Seine Valley buffware, medium sandy	700–850	1	0.8	1	1.1	9	0.5
Miscellaneous wares								
MISC	Miscellaneous Middle Saxon pottery	600–850	2	1.7	1	1.1	6	0.3
Total			**120**	**100**	**93**	**100**	**1877**	**100**

Table 2. Phased distribution of the Middle Saxon pottery types by sherd count (SC), minimum number of vessels (MNV) and weight from Adelphi Building

Fabric code	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Chaff-tempered wares								
CHAF			1/1/45				2/2/22	1/1/12
CHFS			1/1/7		2/2/29			
CHSF				4/1/87		1/1/1	3/2/104	1/1/9
Sub-total			**2/2/52**	**4/1/87**	**2/2/29**	**1/1/1**	**5/4/126**	**3/3/24**
Ipswich wares								
IPSC							2/2/30	3/3/36
IPSF							25/23/478	7/5/167
IPSM							4/4/114	
Sub-total							**31/29/622**	**10/8/203**
Sand-tempered wares								
SSANA					2/1/41		1/1/12	
SSANB					3/3/31		1/1/3	
SSANC							1/1/15	1/1/15
SSAND	2/2/43	1/1/9	1/1/24	3/1/53	2/2/38		6/2/46	
SSANE							1/1/1	
Sub-total	**2/2/43**	**1/1/9**	**1/1/24**	**3/1/53**	**7/6/10**		**10/6/77**	**1/1/15**
MSS							5/5/39	2/2/27
Imported wares								
BEAV								1/1/3
BADOA							1/1/12	
BADOB					1/1/6		7/1/87	
BADOC				1/1/50	1/1/12		1/0/8	
BADOD							1/1/9	
Sub-total				**1/1/50**	**2/2/18**		**10/3/116**	
NFGW							1/1/4	
NFGWA					3/2/21			
NFGWC				1/1/21	2/2/18		3/0/16	
NFGWF							1/1/11	
Sub-total				**1/1/21**	**5/4/39**		**5/2/31**	
NFSVB								1/1/9
Imported pottery sub-total				**2/2/71**	**7/6/57**		**15/5/147**	**2/2/12**
MISC							2/1/6	
Residual and intrusive pottery								
AMPH				1/1/342			1/1/61	
ESUR							1/1/13	
Total	**2/2/43**	**1/1/9**	**3/3/76**	**10/5/553**	**16/14/196**	**1/1/1**	**70/52/1091**	**17/15/278**

the earliest, mudflat layer [102], only produced sherds of reduced chaff-tempered wares CHAF and CHFS, the latter as a neck and shoulder from a jar with an externally burnished surface. A later layer of foreshore material [100] produced a thin-walled sherd of a SSAND rounded jar with wiped surfaces. The presence of middle Saxon chaff- and sand-tempered wares in this period of activity equates to the first ceramic phase of Lundenwic (Blackmore 2001, 40) and indicates late 7th-century activity.

Phase 6 (Probably the Early 8th Century)

Compared to the previous phase, there is a small increase in the number of sherds found in Phase 6 (10 sherds/5 ENV/553g) although contemporaneous pottery was only recovered from one context, a mixed dumping horizon (layer [97]). The pottery consists of diagnostic parts and two rounded jars are noted, one each in chaff-tempered ware (CHSF) and sand-tempered ware (SSANB). Both vessels have a reduced firing and slightly everted rims, short neck and burnished surfaces and were used as cooking pots from the evidence of external sooting and internal food deposits.

The other two vessels present in layer [97] are the first occurrence of imported wares in the sequence and occurred in the form of pitchers. The first example was a North French greyware (NFGWC) probable pitcher with an everted rim and a burnished external surface (see below Phase 7; Fig 22.1). Family sherds of this vessel found in later deposits ([95], Phase 7 and [61], Phase 9) have rounded cordons on the shoulder above a band of rouletted decoration. The second pitcher was represented by an oxidised strap handle made in Badorf-type ware (BADOC), dated *c.*AD 670–850. This type of Badorf ware was an early fabric noted at the Royal Opera House and may date to the late 7th century (Blackmore 2003a, 240). Indeed, its occurrence here with chaff- and sand-tempered wares and North French greyware, together with an absence of Ipswich ware, indicates a pre-*c.*AD 730 date. A residual sherd of a Roman amphora was noted in dump layer [75].

Phase 7 (Early 8th Century)

The quantity of pottery increased during this phase (16 sherds/14 MNV/196g). Dump layer [96] produced three sherds of pottery in fabrics CHFS, SSANB and SSAND, present as jar sherds with burnished or wiped surfaces, the SSAND example additionally had an internal food deposit. Sealing [96], the dump layer [95] contained five sherds of pottery with local or regional wares represented by fragments of sand-tempered (SSANB) and chaff-tempered ware (CHFS) and the other sherds are imports. These include two sherds of North French greyware pitchers decorated with cordons and rouletting: firstly as a fragment of the NFGWC vessel (Fig 22.1; discussed in Phase 6), and secondly present as a body sherd in NFGWA (Fig 22.2) with a band of rouletted decoration.

Additionally, there was an oxidised sherd of Badorf-type ware (BADOC) with pronounced internal throwing rings. Sealing [95], the organic dump layer [39] produced two sherds of pottery from a thin walled SSANA rounded jar and a fragment of imported BADOB. A later oyster shell midden [35] produced only three sherds of pottery, which consisted of a sherd of a sooted SSANB

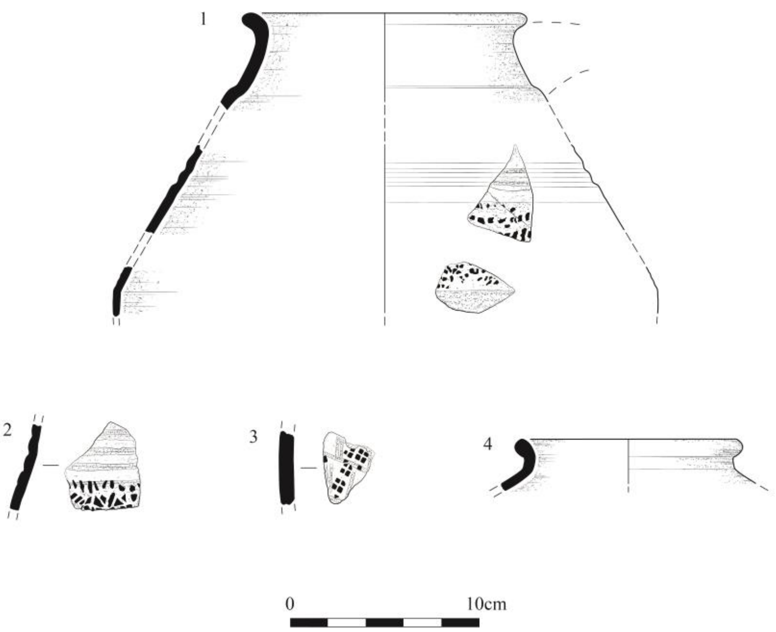

Fig 22. Middle Saxon Pottery. Key: 1. Pitcher in North French greyware (NFGWC) from contexts [35] and [95] Phase 7; 2. Sherd of North French greyware (NFGWA) with rouletted band decoration from [95] Phase 7; 3. Sherd of Ipswich ware (IPSF) with incised line and stamped decoration from [14] Phase 9; 4. Jar rim in North French/Seine Valley buffware (NFSVB) from [7] Phase 10 (scale 1:4)

rounded jar with a wiped external surface and sooting, while two sherds came from a NFGWA pitcher, which survived only as a curved strap handle. Only small burnished sherds of North French greyware (NFGWC) were recovered from layer [67], while a later layer [64] contained a small sherd of a nicely burnished fragment of a SSAND vessel.

Phase 8 (Early to Mid-8th Century)

Only a single sherd (1 g) of a chaff-tempered ware (CHSF) was recovered from this phase, it was found in layer [33].

Phase 9 (Late 8th Century)

The largest quantity of pottery from the site was recovered from this phase, comprising 70 sherds/52 ENV/1.091kg. One of the earliest features in this sequence was pit [21], which contained in its fill [20] only two sherds of sand-tempered ware (SSAND) from thin and thick walled vessels. Sealing the fill, layer [19] produced a total of 11 sherds of pottery, four sherds of which were in the SSAND fabric, besides a single sherd of SSANE. The six other sherds are large and from a single cream-coloured thin walled imported Badorf ware (BADOB) vessel. The oyster shell midden [61] contained six sherds of pottery which consist of a single sherd of CHAF, an abraded sherd (MISC) and four sherds of North French grey ware, one of which is small (NFGW) and has an internal purple deposit, possibly a dye, while the other three sherds are found as family sherds of the previously recorded rouletted NFGWC pitcher (Fig 22.1). The possible pit [94] contained in its fill [93] a single sherd of a BADOC vessel.

A later ditch [15/92] contained in its fill ([91]) four sherds of pottery. Two fragments were derived from a jar made in CHSF, one sherd is represented by a probable pitcher in BADOB and the final sherd is the first occurrence of a new type of pottery, wheel-finished Ipswich ware (IPSF), albeit in an abraded state. The latter ware is dated *c.*AD 730–850, although its occurrence in this deposit with a chaff-tempered ware indicates a possible *c.*AD 730–50 deposition date, unless this abraded sherd is residual. A later fill of the ditch, [36] produced seven sherds of pottery, five of which were Ipswich ware (IPSF) and included a jar rim of a bevelled simple type. One other sherd (MISC) was too abraded to identify to type. The latest pottery type recorded in this deposit is the earliest occurrence in the sequence of a sherd of shell-tempered ware (MSS), dated AD 770–850. A subsequent fill of the ditch, [14] produced 13 sherds of pottery, nine of which consisted of Ipswich ware, mostly as the fineware (IPSF), which include the rim of a pitcher and a sherd decorated with a segmented square stamp and incised lines in a grid pattern (Fig 22.3). The latter is difficult to parallel in the Ipswich ware stamp corpus (Blinkhorn 2012, 57, fig 29). Stamping on Ipswich ware is believed to be more of an 8th-century trait, although a later date is possible (Blackmore 2012, 239). Amongst the two sherds of IPSM, one has possible burnished lattice decoration, suggested to have an early 9th-century date (Blackmore 2001, 35). The latest pottery type present in fill [14] is represented by two *c.*AD 770–850 dated sherds of shell-tempered ware (MSS): one is oxidised and has a dense matrix and the other may possibly be the MSS10 fabric (Blackmore 2012, 248, table 10). A sherd of a chaff-tempered ware (CHSF) is noted, which should be residual at this date (Blackmore 2001, 40), while a jar rim made in early Surrey ware, dated 1050–1150 (Vince & Jenner 1991, 73–5) has to be intrusive. The latest fill [11] of the ditch produced nine sherds of pottery, seven of which consisted of Ipswich ware, and particularly found as IPSF and in the form of some three jars: the rims are either everted or slightly so, flat-topped, although one has a rounded thickening, while the only IPSM example has an external beaded finish and may be from a bowl rather than a jar. Single sherds of a CHAF jar and a sand-tempered (SSANC) sherd also occurred in fill [11].

Truncating ditch fill [11], pit [13/90] produced in one of its fills ([89]) five sherds of pottery, which included a residual sherd of Roman amphora, as well as a sherd of Middle Saxon SSANA, besides an IPSC everted, simple jar rim with a bevel and external bead. The latest pottery type is represented by two sherds of shell-tempered ware (MSS), one sherd of which was a jar shoulder. The latest fill of the pit, context [12] produced twelve sherds of pottery, of which ten sherds are recorded as Ipswich ware, the majority being the fine fabric (IPSF), while one sherd was coarse (IPSC). At least three rounded jars were recorded in the IPSF/C fabrics, represented by rilled shoulders and a slightly everted rim with a rounded top. A single, small sherd of SSANB is noted, while three sherds are imports and include two sherds of Badorf ware (BADOAD) and a sherd of North French greyware in a white-firing fabric (NFGWF).

The earliest stratified deposits in Phase 9, such as fill [20] of pit [21] and layer [19], have fairly broad dating Middle Saxon period pottery types. The earliest fill [91] of ditch [15/92] contained Ipswich ware as the latest pottery type present in

Lundenwic *c.*AD 730–850 and this deposit may date to a third ceramic phase dated *c.*730–70 by the absence of shell-tempered wares (Blackmore 2001, 40). The occurrence of the latter define a Lundenwic ceramic phase dated *c.*AD 770–850 (Blackmore 2001, 40) and these wares first appear in the stratified sequence of fills [36] and [14] of ditch [15/92].

Phase 10 (Probably the Final Quarter of the 8th Century or Possibly Early 9th Century)

Two contexts in this phase produced pottery, totalling 17 sherds/154 ENV/278g. External surface [10] produced six sherds/4 MNV/114g of pottery, one of which was a chaff-tempered ware (CHAF) sherd, the rest of the material consisting of Ipswich fineware that included three jars represented by shoulder fragments and a convex base. Truncating the latter, pit [9] contained in its upper fill [7] 11 sherds of pottery, recorded as four sherds of Ipswich ware (IPSF/C), which includes two different simple jar rims (one with a bevelled top and thickened exterior: IPSC, the other with a flat top: IPSF), two sherds of shell-tempered ware (MSS), single sherds of CHSF and SSANB, besides two sherds of imported pottery. The first is a sherd of Beauvais-type whiteware (BEAV), although it has possible red paint decoration, which would date it to the 9th century (Blackmore 2001, 32). The second imported sherd is a jar rim in North French/Seine Valley buffware (NFSVB) (Fig 22.4), with external sooting and a possible internal food deposit. The presence of shell-tempered wares in Phase 10 indicate a *c.*AD 770–850 date for this phase, although the occurrence of the possible red painted BEAV sherd indicates an early 9th-century date and fits Blackmore's (2001, 40) Lundenwic ceramic phase dated *c.*AD 810–70.

Discussion

The pottery assemblage from the Adelphi Building is important as it is one of the largest recovered from the Lundenwic foreshore. The ceramic profile and phasing of this pottery follows that of other Lundenwic sites (Cowie & Blackmore 2012, 11–12). However, it is interesting that sand-tempered wares, and specifically only SSAND, was the only pottery type recovered from Phases 2–3, albeit in very small quantities. Chaff/organic-tempered wares, which had a long period of production from *c.*AD 400, but was rare until the later 6th century when it became a dominant fabric (Hamerow 1993; Blackmore & Vince 2008, 179), was the main pottery type found in the earliest phases of Lundenwic (Cowie *et al* 2012, 11, figs 7–10). This might imply that the pottery recovered from Phases 2 and 3 pre-date the later 6th century and the establishment of Lundenwic at the very start of the 7th century. However, where Early Saxon activity has been found within Lundenwic, the pottery assemblages were characterised by the occurrence of sandstone-tempered wares, *eg* at Long Acre and Upper St Martin's Lane (Blackmore 2012, 241). As the sandstone-tempered wares and other Early Saxon pottery traits were absent from the Adelphi Building Phase 2–3 assemblage, it appears to be more likely that only ceramics pertaining to the Lundenwic occupation are present here. Chaff-tempered wares first appeared on site during Phase 3, then numerally dwindled during Phases 5 and 6 before peaking during Phase 9 (Table 2), which post-dates *c.*AD 770. In *c.*AD 750 the production or usage of organic-tempered wares ceased in Lundenwic (Blackmore 2001). This suggests that the sherds of chaff-tempered wares, and indeed sand-tempered wares in Phases 9 and 10, were residual, while the presence of sherds of the North French greyware pitcher (Fig 22.1), first found in Phase 7 and with subsequent family sherds present in Phase 9, implies that this material was reworked from earlier deposits.

Ipswich ware, which first arrived in Lundenwic during the period *c.*AD 720–30, first appeared on the site during Phase 9 and its earliest stratified occurrence was two abraded sherds [36], indicating that it was residual and had not been used for several decades. When the contemporaneous Ipswich ware was present it was found in association with shell-tempered wares dated to after *c.*AD 770. This might imply that there was no mid-8th-century activity on the site or at least that Ipswich ware was not deposited on the site during this date.

Imported pottery was present first in Phase 7 deposits and it was limited to the early Badorf ware fabric BADOC and a North French greyware pitcher; the presence of the former indicates a date after *c.*AD 670. The relatively limited range of imported wares, mostly either Rhenish Badorf wares or greywares from Northern France, including residual items, peaked in Phase 9 (Table 2). The imported wares in Phase 10 were restricted to two new types of North French pottery: Beauvais-type white ware (BEAU) and North French/Seine Valley buffware (NFSV). The possibly red-painted BEAU example indicates this phase is possibly dated to the mid-9th century. The presence of the imported pottery in waterfront deposits is significant, as like the Ipswich ware and to a certain extent other non-local wares, this material almost certainly arrived in Lundenwic via the Thames.

DECORATED VESSEL GLASS

Ian Freestone and Rose Broadley with John Shepherd

A very unusual fragment of decorated vessel glass was found at the Adelphi Building. The sherd was discovered in a securely-stratified context consisting of a layer of oyster shell midden [35] (Phase 7), part of a sequence of Middle Saxon waterfront reclamation dumps dating to the early 8th century AD. Other finds from this context included a Roman blue-green glass ribbon vessel handle, Roman ceramic building materials and Middle Saxon pottery. However, no Roman pottery was present. This fragment (Fig 23) was analysed because its decoration did not appear to be consistent with its context. It bears a complex cut decoration which is carefully executed, and in this way differs from most examples of cross-hatched decoration in Roman and Islamic glass vessels from Europe and the Middle East. Visual inspection suggested that the sherd was from the 1st millennium AD, but the unusual quality and rarity of the decoration meant it was necessary to prove the dating in order to rule out the possibility that the sherd was post-medieval in date and intrusive in its context. A further aim was to identify whether the sherd was Roman or from the second half of the first millennium and the Islamic tradition.

A small sample was removed from the edge of the piece and analysed with an electron microprobe. Details of the methodology used are given in Freestone *et al* (2015) and the results listed in the first column of Table 3 is a mean analysis of five individual analyses. From the analysis several features are apparent. This is a soda-lime-silica glass with low magnesium and potassium oxides which indicates the use of natron as a flux. Glass of this type was no longer made after about AD 800, although it continued to be used through recycling for the next two centuries in north-western Europe. The sample has been decoloured by the use of about 1% manganese dioxide (MnO) while no antimony (Sb) was detected. This suggests a relatively pristine glass composition, unaffected by recycling, and the absence of detectable lead, copper, cobalt, zinc and tin, which were also analysed, supports this view. Work on Saxon glass from Lyminge suggests that glass of the 6th–9th centuries in north-western Europe frequently has elevated concentrations of these elements, including antimony, due to the incorporation of coloured glass during the recycling process (see also Schibille & Freestone 2013; Freestone 2015).

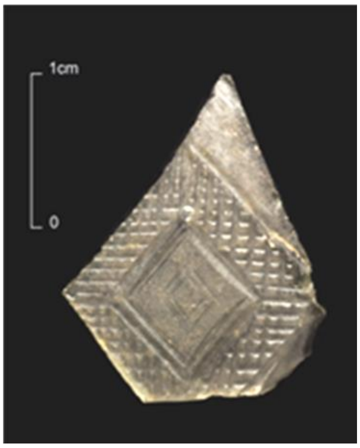

Fig 23. The glass fragment [35] Phase 7

In fact, the Adelphi Building glass fits well into the spectrum of glasses produced on the Levantine coast, through most of the 1st millennium AD. In Table 3 it is compared with average compositions of typical Roman manganese decoloured glass of 2nd–3rd centuries AD from Basinghall Street, London (Wardle *et al* 2015), 4th-century manganese-decolourised glass from the production site at Jalame, Israel (Brill 1988) and 4th–5th-century Levantine glass finds from France and the Mediterranean region (Foy *et al* 2003, group 3.1). There is a general correspondence to this group, but it is well-known that there was a general increase in aluminium oxide (Al_2O_3) levels in glasses over time. The Adelphi Building fragment would appear to correspond to glass of the 4th or 5th centuries rather than earlier material. While the base composition of the glass could be later, Foy *et al* (2003) noted that MnO is generally absent from Levantine glass later than the 5th century, and extensive work in Israel and Jordan appears to confirm this observation. Therefore, the Adelphi Building fragment appears to pre-date the 6th century.

It is concluded that the Adelphi Building glass fragment dates to the 4th or 5th centuries. In fact, this can be confirmed by the cut lozenge and crosshatched decoration. Numerous vessels dating primarily from the 4th century are decorated with such elements, either diamonds or squares filled with cross-hatching or other geometric motifs, circles, bars or open squares/lozenges such as this, with cross-hatching.

The Adelphi Building fragment, as noted above, is of a very high quality glass, visually, and is from a relatively thin-walled vessel. This may set it apart from known beakers coming from the frontier zones, which are comparatively thicker, such as the elaborately beaker from Pécs, Hungary (Barkóczi 1988, 104, no. 165. Not only does this thick-walled beaker have geometric decoration with cross-hatching but it also has a high relief inscription. Another beaker, again comparatively thicker-walled, comes from Mainz (Harter 1999, 205, no. 368, taf. 17). This style of decoration, on such vessels, appears to begin as early as the 4th century (Clairmont 1963, 73, no. 187). Similarly, tall cylindrical bottles, of the late 3rd and 4th centuries, decorated with both incised and, like here, wheel-cut decoration are also known although the quality of decoration in such cases is cruder: the wheel-cut elongated facets tending to overlap the borders of the geometric pattern they decorate.

Although the range of geometric, and figured with geometric infill, cut vessels of the 4th century has yet to be studied in detail (although see de Tomasso 1989 for an art historical discussion of the cut fragments in the Museo Nazionale di Roma) and the relationship of obviously differing forms and styles of decoration have yet to be understood, in terms of workshop origin, relative intrinsic worth and chronology, it is evident that there is a higher quality range of vessels in existence and in circulation. These do appear to be exclusively 4th century at the earliest, with many coming from late 4th- or even early 5th-century contexts. The Adelphi Building fragment would appear to belong to this group. For example, this better quality group is represented by, among others, a straight-sided beaker from Mainz (Harter 1999, 209, no. 392, taf. 17), five thin-walled bowl fragments from Gorsium, Hungary (Barcközi 1988, 68, no. 53, taf IV; 69, nos 54–7, taf VI). Nos 55–7 are dated specifically to the end of the 4th century.

Finds of late 4th- and early 5th-century glass vessels from southern France include examples from Arles (Foy 2010, 418, nos 795–8). A particularly fine bowl fragment, that typifies the highest quality of glass and cutting, came from a late 4th- or early 5th-century context at Les Saintes-Maries-de-le-Mer, south of Arles on the coast (Foy 2010, 420, 800 bis). Another very high quality bowl, with crosshatched and open lozenges, comes from Hières-sur-Amby, just to the east of Lyon (Foy & Nenna 2001, 224, nos 402–3).

All of these high quality examples are coming from the late Roman provinces in western Europe. Examples from the eastern provinces are not so forthcoming, although in fairness less material has been published in such detail. The style of vessel is known there, however, but among the thicker and comparatively cruder types, for example a fragment from a beaker from Aqaba, Jordan (Duncan Jones 2005, 137, fig 2 no. 8): this vessel came from a late 3rd- or early 4th-century context.

The presence of this quality fragment of Roman glassware in a later context is interesting, but not surprising. It is unlikely to have been in use as a vessel by the Middle Saxon period. The same would also be true of the few and much earlier greenish blue glass fragments that came from this site. Late Roman assemblages from the City of London, though unpublished, do contain very late Roman glass, the Billingsgate Bathhouse for example, which also includes a fragment of good quality cut glass. Though they are not residual in the bathhouse, but appear in the latest levels of occupation and abandonment, they do indicate the presence of similar quality glass in late 4th-century London. In the absence of late Roman occupation on the Adelphi Building site, the question is: how did it arrive there? There was late Roman activity nearby at St Martin-in-the-Fields, which provides a possible source (Telfer 2010, 52–3). Perhaps fragments of Roman glass were being collected locally during the Middle Saxon period for any manner of use, possibly for recycling as enamel, for making beads or as keepsakes. Although it could be accidental, it is interesting to note that the fragment of glass itself has been broken, perhaps intentionally, around three of the four sides of the lozenge, although a corner has snapped off. Perhaps it was being fashioned for further use, as an impromptu setting of some sort.

Table 3. Electron microprobe analysis of the Adelphi glass fragment, compared with similar finds

Date	**Adelphi**	**London** 2–3C	**Jalame** 4C	**Foy 3.1** 4–5C
SiO_2	70.28	69.83	n.a.	68.12
Na_2O	15.76	16.05	15.50	16.81
CaO	8.43	7.72	8.30	8.46
K_2O	0.66	0.62	0.70	0.61
MgO	0.52	0.54	0.62	0.63
Al_2O_3	3.12	2.24	2.80	2.90
Fe_2O_3	0.37	0.42	0.41	0.48
TiO_2	0.06	0.07	0.08	0.06
MnO	1.03	1.14	1.18	0.99
Sb_2O_5	n.d.	<0.30	n.d.	(7ppm)
P_2O_5	n.d.	n.d.	0.15	0.12
SO_3	0.18	0.35	n.a.	n.a.
Cl	0.92	0.94	n.a.	n.a.

Key: n.d. = not detected; n.a. = not analysed; < = less than; ppm = parts per million. Key to sites: Adelphi Building; London, Basinghall Street (Wardle *et al* 2015) and Jalame, Israel (Brill 1988)

Fig 24. Loom weights: Left; Intermediate near annular form (SF 2) [8] Phase 10. Right; intermediate tall D form [unstratified] (SF 1)

THE LOOM WEIGHTS

Chris Jarrett and Berni Sudds

A total of nine loom weights were recovered from site, one was unstratified and the remaining eight were recovered from deposits attributed to Phases 7, 9 and 10 (Table 4). All the weights are in Fabric 1a, with a fine micaceous body containing some sand and flint with added organics (Blackmore 1988b, 111, table 13; Goffin 2003a, 216; Riddler 2004a, 20; Keily 2012b, 218–22). This is the most common loom weight fabric type identified in Lundenwic, it was probably produced locally from the brickearth underlying Covent Garden (Leary *et al* 2004, 3). Indeed, a readily available source of brickearth for manufacturing commodities like weights, in addition to producing daub, is likely to have been one of the significant factors in determining the siting of Lundenwic (*ibid)*.

The existing classification of loom weight forms was developed by Hurst who identified three types reflecting differences in date and to some extent manufacture (1959, 23–4). Annular types, made from a coil of clay are Early Saxon. Intermediate types and bun-shaped/biconical examples, each made from a ball or disc of clay with the hole pushed out, are of Middle and Late Saxon date respectively (Hurst 1959, 23–4; Riddler 2004a, 19; Walton Rogers 2007, 30; Blackmore 2008, 195–6). All the weights recovered from this site can be classified as being of the intermediate type, traditionally associated with the Middle Saxon period. In the years since this typology was created, however, their dating has been the subject of revision. Although still largely chronologically successive, the three forms occur together in Middle Saxon deposits from Lundenwic and appear to have been in use at the same time (Blackmore 2008, 196; 2013, 63; Goffin 2003a, 220; Keily 2012b, 226; Riddler 2004a, 19, 22; Sudds 2016). This may indicate a long process of transition between the distinctly annular and biconical/bun-shaped forms, or perhaps that the difference in shape and size is more functional, related to the manufacture of different types of cloth (Blackmore 1988b, 112; 2013, 63).

Intermediate types demonstrate some variation in shape, depending on height, profile and the size of the aperture and have thus been further subdivided into three groups: rounded; C- or D-sectioned; and near annular or tall C- or D-sectioned (see Goffin 2003a, 218). All three are represented in the current assemblage (see Fig 24, right (SF 1), for a tall D-sectioned example). The weights fall within the most commonly observed size range of between 110–45mm, although a single small example from layer [10] (SF 36) is just 100mm in diameter. The near annular intermediate weight from pit fill [12] (SF 3) has two opposing circular impressions or dimples (Fig 25). Similar marks are evident on other weights from Lundenwic and although their function remains unclear it has been suggested they may represent some form of maker's or owner's marks or were perhaps used to denote a 'set' of weights (Keily 2012b, 224; Blackmore 2013, 63). The near complete weight recovered from pit fill [8] (SF 2) has an unusual central aperture (Fig 24, left). These are typically round although the example from [8] is polygonal, probably made with the use of a tool or object with a straight edge, or perhaps even a five-sided tool.

The earliest weight occurred in Phase 7, layer [39], but it is very abraded and was probably redeposited, arriving on site as part of the dumped

Table 4. Distribution and quantification of the loom weights

Phase	Context no.	SF no.	Form	Fabric	Diam (mm)	Ht (mm)	Wall diam (mm)	Hole diam (mm)	% present	Wt (g)	Features	Illus no.
-	0	1	intermediate: tall D	1a	115	55	43	40	45	343	diagonal cord mark to outer edge, oxidised	1
7	39	5	intermediate ?	1a	-	57	-	-	16	132	abraded, partially oxidised	
9	12	3	intermediate: ann	1a	130	37	42–5	35–50	52	302	oval central hole. Oxidised. Two opposed circular impressions	2
9	19	4	intermediate: C	1a	140	49	55	40	16	163	uneven finish, oxidised surfaces	
9	42	6	intermediate: tall D	1a	130	59	34	40	17	166	horizontal groove running around outer edge. Oxidised surfaces	
9	89	9	intermediate: tall D	1a	115	50	41	30	41	237	flattened to one edge with diagonal cord mark. Buff surfaces	
10	8	2	intermediate: ann	1a	130	45	45	42	80	439	near complete. Edges and underside partially abraded or missing. Polygonal hole, made with a five sided tool? Oxidised surfaces	1
10	10	23	intermediate: D	1a	110	46	45	40	25	142	Reduced	
10	10	36	intermediate: ann	1a	100	31	28	30	25	51	small weight. Oxidised	

Key: SF = Small Find; Wt = Weight

material used to reclaim the area behind the waterfront. The weights recovered from Phases 9 and 10, dating to the late 8th or possibly the early 9th century, are more complete and in better condition. Loom weights are ubiquitous on sites across Lundenwic indicating that weaving was a widespread, household craft activity, as it also was at Hamwic (Leary *et al* 2004, 11; Keily & Blackmore 2012a, 156; Andrews 1997a).

Loom weights were present in the Covent Garden area of Lundenwic from the 7th century onwards, but the increasing number of early 8th-century finds at the Royal Opera House suggests that textile manufacture developed from a craft into an industry during this period (Malcolm *et al* 2003, 169–70; Cowie & Blackmore 2008, 149–50; Keily 2012b, 226). This change appears to coincide with the arrival of Ipswich ware in Lundenwic: possibly both developments were stimulated by Frisian traders.

The scale and form of this textile industry is difficult to determine, but the picture emerging is of a ‘cottage’ industry with textile manufacture being undertaken both in designated weaving huts and also domestic houses across the settlement (Keily & Blackmore 2012a, 156).

The examples recovered from the site would appear to coincide with this expansion. Over 100 loom weights were found in 1930 immediately to the west of the site at York Buildings, with smaller

Fig 25. Loom weight: Intermediate near annular form (SF 3) [12] Phase 9

numbers known from several sites between the waterfront and the Strand (17–19 John Adam Street; 18–20 York Buildings; Savoy Steps; Somerset House; Arundel House; Globe House and Hare Court: Cowie 1988, 41–4; Cowie *et al* 2012, 315, 321–2; Sudds 2016). Unfortunately, most of these loom weights are broadly dated, residual or redeposited.

THE COINS

Murray Andrews

A total of three stratified coins were recovered from the Adelphi Building (Table 5). While the small size of this assemblage precludes quantitative analysis, the individual coins are of considerable independent interest, and are discussed below.

The earliest coin from the site is a Roman copper-alloy *nummus* of the House of Constantine (SF 21). This specimen belongs to the 'Constantinopolis' issue of the early AD 330s, struck in enormous quantities to commemorate the dedication of Constantinople under Constantine the Great; examples are ubiquitous among Romano-British single-find assemblages (*eg* Bowsher 2013, 90), and the coin clearly represents a residual occurrence in a Phase 2 Middle Saxon foreshore deposit.

Foreshore horizon [101] (Phase 5) yielded an Anglo-Saxon pale gold shilling of the Two Emperors type (SF 18), dating to *c*.AD 645–65/70 (Naismith 2017, 55) (Fig 14). This type belongs to the post-Crondall phase of Anglo-Saxon gold coinage, and is distinguished by the use of obverse and reverse motifs that imitate 4th-century gold *solidi* of Magnus Maximus (AD 383–8) and Valentinian I (AD 364–78); one side of the coin depicts a diademed bust facing right with a blundered legend, while the other shows two busts holding an orb surmounted by a winged head. With fewer than 40 examples known, coins of the Two Emperors type are comparatively uncommon, and the specimen from the Adelphi Building is certainly the first example from a stratified archaeological deposit; in conjunction with a second specimen found on the south bank of the Thames Foreshore near Southwark Bridge (EMC 1993.9080; Cowie *et al* 2012, 206, table 34), it represents one of the earliest post-Roman coin finds known from the London area.

Despite their scarcity as modern finds, the large number of dies represented in the surviving corpus of Two Emperors type shillings suggests that originally quite a large number of these coins were produced (Grierson & Blackburn 1986, 163). The Adelphi Building specimen further supports this thesis, augmenting the known die corpus with wholly new obverse and reverse specimens; distinctive features on the obverse include a barbell-shaped pseudo-character immediately to the right of the bust, while those on the reverse include single pellets flanking the 'Victory' and F-shaped drapery folds on the right 'Emperor'. The location of the mint where this particular coin was produced are uncertain; though it was certainly produced in south-east England, recent metal detector finds - including a large number from Rendlesham, in Suffolk - dispute the traditional attribution of the Two Emperors type to a Kentish mint (Grierson & Blackburn 1986, 163). It is also possible that coins like the Adelphi Building specimen were in fact produced at several different mints within the region during the mid- to late 7th century (Williams 2013, 134).

Table 5. Coin catalogue

Phase	Context no.	Small finds no.	Description
9	89	8	English silver penny/'sceatta' (Secondary Phase, Series K, Group E-F/'Hwiccian'). *C*.AD 720–35/40. BMC 32a; North 89; Abramson 39.10
5	101	18	English gold shilling ('Two Emperors' type), *c*.AD 645–65/70. BMC 2; Sutherland Class II:V; *cf* MEC 8, nos. 9–11. Diameter 12.7mm, die axis 280°, weight 1.2g
2	154	21	Roman copper-alloy nummus of the House of Constantine. AD 330–5. Trier mint. As LRBC I 51. Obverse: [CONST]AN [TINOPOLIS], Helmeted bust to left. Reverse: No legend, Victory on prow. Mintmark TRS. Diameter 18.5mm, die axis 180°, weight 1.6g

The function of gold coinage in 7th-century England has been the subject of considered debate since the mid-19th century, and until the late 20th century gold coins of this period were generally understood as a form of 'special-purpose' money used for defined social exchanges, like the rendering of tribute or wergild payments or symbolic ritual transactions (Grierson 1959, 131–2; 1970, 16–7). This interpretation was heavily influenced by the nature of the evidence then available, which nearly exclusively consisted of the hoards from Crondall and Sutton Hoo and a body of contemporary English law codes. As Williams (2006, 181–6) and Naismith (2014, 301–2) note, the dramatic growth in the numismatic corpus pursuant on recent metal detector finds means that this reading is no longer sustainable, and it seems more likely that gold coins at this date fulfilled a range of functions, for example, as a means of paying rents or fines, rendering gifts, and of fulfilling commercial transactions. The contextual circumstances of the Adelphi Building shilling offer tentative support to this revised understanding of 7th-century coin use, while we can never know the precise circumstances in which it was lost, its presence in a secure waterfront context suggests an association with maritime commerce.

The latest coin (SF 8) from the site ([89], Phase 9) is a silver penny belonging to the mid to late Secondary Phase of the English *sceatta* coinage, approximately dated to *c.*AD 720–35/40 (Grierson & Blackburn 1986, 188; Naismith 2017, 58). This coin belongs to a subclass of Series K distinguished by the presence of a right-facing whorled serpentine monster on the reverse; although traditionally identified as a wolf (Metcalf & Walker 1967, 21), recent work by Gannon (2003, 131–3) has demonstrated its close stylistic affinities with illustrations of lions in classical and contemporary manuscript art. Die evidence suggests that the Adelphi Building penny belongs to the 'Hwiccian' subgroup E–F, which was produced in the London and Thames Valley region (Metcalf & Walker 1967, 26; Metcalf 1988, 125); its spatial occurrence is therefore unremarkable, and indeed contemporary examples of Series K pennies are known from excavations in Lundenwic at the National Portrait Gallery (Gaimster 2004, 102) and Royal Opera House (Metcalf 2003, 287). As with the earlier shilling, the presence of this coin in a foreshore deposit almost certainly reflects the significance of the River Thames as a commercial artery in the Middle Saxon period.

Fig 26. Double-ended bone pin beater (SF 12) [96] Phase 7 and pig-fibula needle (SF 17) [101] Phase 5

THE METAL AND OTHER SMALL FINDS

Märit Gaimster

In total, some 90 small finds were recovered from the Adelphi Building excavation (Gaimster 2015). While a number of the smaller metal fragments are undiagnostic, the majority of finds could be identified and are included here. The ceramic loom weights, the coins and an unusual sherd of Roman decorated glass are all described in separate reports (see above Jarrett & Sudds, Andrews and Freestone *et al*).

The Middle Saxon site assemblage included textile tools, bone and antler working waste, lead net sinkers and iron clench bolts. These finds are described and discussed by category and their broader context within Lundenwic, rather than by phase. With the exception of a Roman copper-alloy *nummus* coin (SF 21; see Andrews above) in Phase 3, the earliest diagnostic finds came from dumping associated with the construction of waterfront structures. The finds from Phase 7 represent waste material dumped from elsewhere. Only finds from Phase 9, originating from the backfill of cut features and associated with the waterfront occupation, can be securely related to activities located on site. This phase produced the majority of metal and small finds, with the second largest individual assemblage from Phase 10, representing the latest recorded Saxon activity on site.

Textile production

In addition to ceramic loom weights (see above Jarrett & Sudds), a further three textile tools were among the finds. They comprise a bone needle, a double-ended bone pin beater and an unusual spindle whorl carved from cattle metapodial.

The Phase 5 foreshore deposit produced a so-called pig-fibula pin (Fig 26; SF 17). Utilising the naturally-flattened distal end of this particular bone, and normally with perforated heads, these characteristic implements are known in their thousands from settlement contexts dating from the Early to Late Saxon periods (Keily 2012c, 293, fig 172). In spite of their name, however, pig-fibula pins have recently been reclassified as needles on the basis of a detailed study of over 300 examples from Ipswich (Riddler *et al* forthcoming; Andersson 2003, 83–7, 127–30). The needle from the Adelphi Building is complete and can be classified as Ipswich Group 8, characterised by its head being trimmed laterally to form a flat apex. It has a neat circular knife-cut perforation, and the surface is highly polished all over from use. Needles like this are likely to have been multifunctional implements; they may have been used to manufacture and repair fishing nets and sailcloth (Margeson 1993, 13; Andersson 2003, 86–7), or utilised as weaving tools, in basketry, or in looped needle knitting,

(Scandinavian) *nålebinding* (Tweddle 1986, 342–3). The needle came from the same context as an Anglo-Saxon pale gold shilling of the 'Two Emperors' type dating from *c*.AD 645–65/70 (see Andrews above).

A complete double-ended bone pin beater was retrieved from Phase 7 (Fig 26; SF 12). Pin beaters, or thread pickers, were important weaving aids used to separate warp threads or push the weft into position before beating in place with the aid of a weaving batten (Walton Rogers 2009, 297). The double-ended pin beater is associated with the vertical warp-weighted loom used in the Early and Middle Saxon periods, and it seems the form went out of use with the introduction of a different type of vertical loom, the two-beam loom, during the late 9th and 10th centuries (Leahy 2003, 72–4). This loom did not require weights to keep the warp tight, and it also seems to have brought with it a change in the form of associated tools that saw the double-ended pin beater replaced with a single-ended type (Walton Rogers 2014, 292). The pin beater from the Adelphi Building is long and slender, measuring 175mm, with an oval cross section. Much of the surface is somewhat degraded, but one end retains the characteristic high polish of these textile tools. Double-ended pin beaters occur in a variety of sizes, with the majority measuring

Fig 27. Spindle whorl of cattle metapodial, (top) lower and (bottom) upper faces, (SF 39) [36] Phase 9

between 80–160mm (Walton Rogers 2009, 288; Riddler *et al* forthcoming). Longer examples are known from several sites, including from within Lundenwic. A pin beater from the Royal Opera House site measured 180mm; this example was decorated with an incised band of lattice around the centre, possibly to give a better grip (Blackmore 2003b, 306, fig 74). The reason why double-ended pin beaters vary in length is not clear. At Flixborough, a high-status Middle and Late Saxon period settlement in Lincolnshire, the long and slender examples of pin beaters are thought to be possibly associated with linen production (Walton Rogers 2009, 287–8).

A small lathe-turned bone spindle whorl came from Phase 9 (Fig 27; SF 39). The spindle whorl is unusual in several ways. While at first sight it resembles an ivory object with laminate-like features, zooms testing revealed the material to be cattle. Bone spindle whorls utilising the natural shape of cattle femur heads appear to have come into use during the Middle Saxon period, becoming predominant in the Late Saxon period (Riddler & Trzaska-Nartowski 2013, 91). The Adelphi Building whorl, however, differs from this well-known type, not only in its small size. Kevin Rielly comments: the density of the object and the presence of a vascular canal would suggest it is made from solid, compact bone, most likely from a metapodial. This choice of material makes this spindle whorl a very unusual, if not unique object of its type (Ian Riddler, pers comm). Apart from this, its hemispherical shape is typical for the period and the polished surfaces a characteristic of textile tools manufactured from skeletal material. The very small size, measuring only 20mm in diameter, may suggest this was a child's practicing tool (Walton Rogers 1999, 1964). However, both size and weight of a spindle whorl were decisive factors for the quality of yarn that was spun. Mounted on the end of a wooden or iron spindle, the whorl served to keep the momentum of the rotating spindle when spinning, with lighter whorls producing finer yarns. While most of the lightest recorded whorls weigh around 5g, the weight of the Adelphi Building spindle whorl is just over 3g (3.39g). There are nevertheless other instances of spindle whorls weighing 3g, for example at Löddeköpinge in south-west Sweden, a coastal trading centre during the Viking period (Andersson 2000). It seems plausible therefore that the Adelphi Building spindle whorl was an actual spinning tool, not a practice tool for a child or juvenile, and that its size and weight was determined by its function to produce very fine yarn.

Fig 28. Antler comb-making waste from Phase 7, including sawn tine (SF 79) [95] and crown (SF 70) [35]; quartered section of tine (SF 76) [64]; comb tooth segment blank (SF 74) [39]; and possible trial piece (SF 73) [39]

Spindle whorls and other textile tools are important for understanding how textile production was organised in Lundenwic, where it appears there was a thriving 'cottage' industry that included both home production and work in designated weaving huts (see above Jarrett & Sudds). Spinning, involving portable tools, would perhaps have been more likely to take place at home, although it is worth pointing out that manufacture of sailcloth, something that must have been an important element at a trading settlement, would require a highly organised production (Andersson 2003, 49–50, 151). It has been calculated that it would take one person two years to produce the material for a 25m^2 sail (Andersson Strand 2015, 16–17). In that context, it is notable that the ratio of spindle whorls from Lundenwic sites, in relation to that of recorded loom weights, remains low in comparison to other sites (Malcolm *et al* 2003, 168).

Bone, Horn and Antler Working

Antler working waste is frequently found on Lundenwic sites, though normally in small amounts (Riddler 2004b, 145). Antler provided the main type of skeletal material used during the Saxon period, with combs representing the most frequent product. Red deer appears to have been the source for all antler waste on site; this remained the most common skeletal raw material utilised during the early medieval period (MacGregor 1985, 32). Recently, however, an increased use of animal

Fig 29. Bone comb-making waste including sawn-off proximal end of cattle metacarpus (SF 66) [12] Phase 9; cattle metatarsal split longitudinally with proximal end still present (SF 65) [12] Phase 9; proximal end of cattle metacarpus, sawn halfway through (SF 51) [7] Phase 10; split midshaft cut into segments (SF 64) [12] Phase 9 and the discards from removing the curved anterior face of the bone segments (SF 55) [10] Phase 10 and (SF 58) [11] Phase 9

bones as raw material in comb making has been demonstrated on urban sites during the period *c.*AD 720–850, clearly seen in a Lundenwic assemblage of nearly 400 pieces of waste recovered from a single pit in Bedford Street (Riddler & Trzaska-Nartowski 2012). This phenomenon is reflected also in the finds from the Adelphi Building, Phase 7 dump layers, which produced only antler waste in contrast to the mixture of bone and antler waste present in Phases 9 and 10 (Figs 24–7). It is now widely understood that bone and antler were worked by the same craftspeople during the Saxon period, so it is likely that these individuals also worked with horn.

This practice of working with a variety of materials is indicated by the presence of a single goat horncore (see Rielly below) recovered from a Phase 9 deposit [10] along with a piece of antler waste in the form of a tine end (SF 75). Unsurprisingly, as this material rarely survives, no other waste or finished horn products were recovered, but the presence of horn working is important. As horn requires more elaborate preparation, involving boiling and soaking to be able to extract and separate the keratinous horn sheets from the bone core, it is a good indication of sedentary workshops (MacGregor 1985, 66–7; Riddler & Trzaska-Nartowski 2013, 89–90). While bone and antler provided the material for comb manufacture, horn was above all used for implement handles during the Early and Middle Saxon periods (MacGregor 1991, 364; Riddler & Trzaska-Nartowski 2011, 122, 124).

The eight pieces of antler waste from Phase 7 consisted mostly of primary waste in the form of sawn-off tine ends and irregular splinters and shows some of the processes of working the material. One tine was sawn from two sides and then snapped off (Fig 28; SF 79), while part of a crown has two sawn surfaces and several cut marks from a knife; one surface has also been shaved down with the use of a drawknife (Fig 28; SF 70).

A roughly quartered section of tine represents the next stage, where the removal of cortile tissue and outer guttering with the aid of a drawknife would eventually produce a rectangular plate (Fig 28; SF 76). The plates would form the comb tooth segments which were held together by way of connecting plates, one at each side of the comb. For this purpose, the individual tooth segments were provided with rivet holes on or near the edge, often just on one side. One such tooth segment is also among the Phase 7 waste pieces (Fig 28; SF 74). Not until the comb was fully assembled, and any decoration applied, would the teeth be cut with a saw (MacGregor 1985, 74–5). On the segment from the Adelphi Building the hole appears to have been cut nearer to one end, which would suggest it was for a single-sided comb, with teeth on one side only. Both ends retain traces of saw or cut marks so, rather than having snapped or broken, the position of the hole appears to be deliberate.

Another, longer plate has one smooth and straight side, while the other has been given a rounded, slightly facetted shape (Fig 28; SF 73). The front of this plate carries drawknife marks. This tool was used to shave the plate down at a slight angle from the facetted edge, creating a profile that is almost triangular at one end. While the surface at the other end of the plate was not affected by this operation and retains the outer guttering, the thinned down end has a neatly finished surface carved with two rather rough ring-and-dot designs; one consists of a double ring and the other of two almost superimposed double ring designs. This plate appears to have snapped at both ends, but the way it has been worked obliquely does not fit well with a comb connecting plate. The ring-and-dot design is not at all common on Middle Saxon combs in London and is rare on Middle Saxon combs in general, but it can be found on other objects such as spindle whorls and knife or tool handles (Keily 2012c, 292, fig 170). The Adelphi Building piece, however, is flat and not tubular so it could not have functioned as a tool handle. It is likely this is just a trial piece for the craftsperson or somebody learning and practising their skills. Similar trial pieces (which can be distinguished from motif pieces) have been found on several sites in Dublin (Ian Riddler, pers comm).

Among the finds from Phase 9 both antler and bone waste are present, with 21 pieces in total recorded from backfills of various features. The material is dominated by primary waste, for antler in the form of sawn-off tip ends (SFs 61, 63, 75) and roughly quartered tine sections (SFs 60, 77) and ten pieces of bone waste, all from cattle metapodia, mostly from metatarsals. Similarly, Phase 10 produced three pieces of antler waste, in the form of a tine end, a short sawn tine section and a wedge-shaped section sawn from near the coronet (SF 52–4), and four pieces of waste from cattle metapodia.

The bone waste represents various stages of primary waste from comb manufacture. With the aim of obtaining as much flat bone as possible, two different methods appear to have been used to work the material. One involved sawing the ends off and then splitting the midshaft (Fig 29, SFs 56, 66). With the other method, the metapodia was split in half before the ends were sawn away (Riddler & Trzaska-Nartowski 2013, 84, figs 11–12). The second method is evidenced in several pieces from the Adelphi Building, including a metatarsal that has been split close to the posterior side which still remains together with the proximal end (Fig 29; SF 65). The remaining part was then sawn into pieces (Fig 29, SF 51). The next step involved cutting the split midshaft into segments (Fig 29; SF 64), before removing the curved anterior face of the bone while retaining as much as possible of the sides (lateral and medial) (Fig 29; SFs 55, 58). The aim was to obtain as much of the flat bone surface as possible, this method of working would have been the most efficient one, utilising the flatter posterior surface of the bone along with the sides of the anterior part. Further work involved shaving down the flat surfaces to produce rectangular plates that served as blanks for comb teeth segments or connecting plates.

While Middle Saxon combs continued to be made of antler, as either single- or double-sided composite combs, bone was principally utilised to produce a different type of comb. One was a single-sided composite comb with tooth segments of bone or antler and connecting plates formed from animal rib. The other type, also single-sided, was a handled comb that was produced in different combinations of bone and antler components. The latter was the more frequently produced, with several examples known from Lundenwic and the London area (Riddler 1990). Interestingly, single-sided combs appear to be outnumbered by double-sided combs in Lundenwic (Riddler 2005a, 59). At the Adelphi Building only a handful of secondary waste or unfinished components were retrieved, most of which can or may be associated with handled combs.

Fig 30. Ovicaprid (sheep/goat) metacarpus with a small drilled or punched hole through the proximal end (SF 57) [11] Phase 9

One is an ovicaprid metacarpus, a bone known to have been utilised for this particular purpose at both Hamwic and Ipswich, as well as Lundenwic (Riddler & Trzaska-Nartowski 2013, fig 5; Cowie & Blackmore 2008, fig 102, S125). The Adelphi Building example has a small drilled or punched hole through the proximal end and most of the midshaft has split away (Fig 30; SF 57). Axial holes through the proximal end are a common feature on waste from cattle metapodia. The purpose of this was probably to facilitate sawing off the ends by inserting a wooden rod to work as a grip (Riddler 2005b, 80; Riddler & Trzaska-

Fig 31. Secondary waste or unfinished components of combs including a fine connecting plate of bone (SF 62) [11] Phase 11; blanks for antler comb tooth segments (SF 38 and 69) [14] Phase 9; unfinished connecting plate of antler (SF 7, [89] Phase 7; and end segment of a double-sided composite comb (SF 35) [7] Phase 10

Nartowski 2013, 84–5). It is possible that the small hole in the ovicaprid bone here, perhaps for a metal pin or similar, served a similar purpose. Another interpretation for perforated ovicaprid metapodia is that they could have functioned as bobbins or shuttles in textile production, or as floats for fishing nets (Blackmore 2003b, 306–7, fig 98; Keily 2012c, 292–3, fig 171). The holes drilled in the suggested examples, however, are far larger. The process of working bone for handled combs would have been the same as for the antler examples described above, involving drilling and sawing to create a slot for the tooth segments and it is possible that the split of the midshaft on the Adelphi Building bone was a result of these operations, causing the bone to be discarded.

A second piece of comb making waste is represented by a fine tapering connecting plate of bone (Fig 31; SF 62). The plate has snapped by the rivet holes still visible at either end, which may be the reason it was discarded. The unusually fine dimensions of this connecting plate have parallels in double-sided combs with narrow connecting plates from other Middle Saxon sites, including Lundenwic (Blackmore 2003b, fig 175: B211; Riddler 2005a, fig 68.2). However, a similar slender section of bone connecting plate, from Bedford Street, was thought to come from a handled comb (Riddler & Trzaska-Nartowski 2012, fig 13b).

Phase 9 also produced two blanks for antler comb tooth segments (Fig 31; SFs 38, 69).

Fig 32. Iron clench bolts, complete example (SF 29) [11] Phase 9 and incomplete one (SF 33), [97] Phase 6, plus small iron staple (SF 82) [10] Phase 9

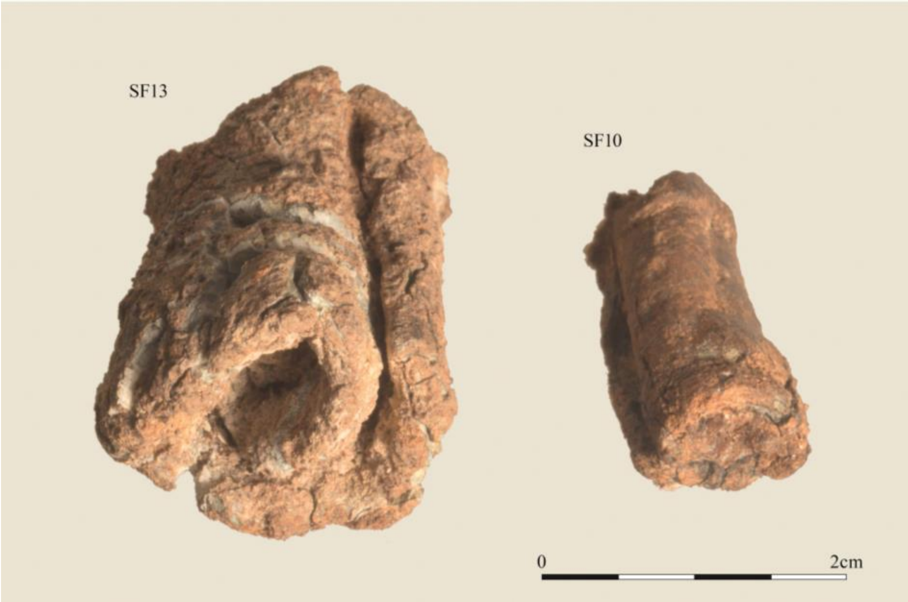

Fig 33. Net sinkers of rolled lead sheet (SF 13) [97] Phase 6; and (SF 10) [91] Phase 9

Considering the relative lack of single-sided composite combs in Lundenwic (Riddler 2005a, 59), the dimensions of these blanks, far too short for double-teeth segments, suggest they were intended for handled combs.

Finally, there is an antler plate with facetted sides, an unusual feature for comb connecting plates (Fig 31; SF 7); it was associated with both antler and bone waste (SF 77–8) (Phase 9, [89]) and a Middle Saxon coin dating from *c.*AD 720–35/40 (SF 8; see Andrews above). One end of the plate appears to have been snapped and broken at an early stage, with some polish from handling showing clearly along the broken surface, while the other one has been sawn from two sides and then deliberately snapped off. At the broken end is a mark from a draw knife, while the rest of the surface looks neatly finished and polished. The facetted sides have a parallel in a handled antler comb with a provenance thought to be the River Thames in London (Riddler 1990, fig 1a; MacGregor 1985, 91). However, unfinished antler comb tooth segments may have trapezoidal sections before they are finished, the intended end product was more likely a double-sided composite comb rather than a handled one (Ian Riddler, pers comm).

Besides the primary waste discussed above, no other comb making waste was retrieved from Phase 10. There is however an incomplete end segment of a double-sided composite comb (Fig 31; SF 35). Sawing the teeth represented the final stage of comb manufacture, so this could represent part of a finished product. As no teeth remain on this particular piece it is not possible to identify wear from use, although this might be suggested from the visible polish on the edge of this fragment.

Iron Clench Bolts

With Damian Goodburn

At least two clench bolts or rove nails which served as rivets were recovered; there was a complete example from Phase 9 and the shank and rove from another one from Phase 6 (Fig 32; SFs 29, 33). Clench bolts consist of an iron nail with a perforated iron plate, or rove, set over the tip with the function to join two pieces of timber together. Clench bolts served a number of functions during the Saxon period, including door fittings, but they were widely used in clinker-built vessels, including the Sutton Hoo 1 ship (*c.*AD 625) and have been recovered from reused hull sections of later date found within the waterfront of the City of London (Goodburn 1994). As these examples were recovered from the waterfront, they were probably derived from the dismantling of ships on the foreshore, so that the metal fitting could be recycled and the timbers used as fuel, so should not be interpreted as evidence of either boatbuilding or vessel repair within the locality.

Rove nail (SF 33) from a Phase 6 deposit [97] (Fig 32), was unusually large for this period with a diamond shaped rove 60mm wide and nail shank over 10mm across, so it must have been derived from a very large vessel, such as the Sutton Hoo 1 ship, where large rove nails were used to secure the side frame ('futtock') heads.

Rove nail (SF 29) from a Phase 9 deposit [11] was rather concreted but clearly had a diamond shaped rove *c.*45mm across and a gap between head and rivet of *c.*18–20mm; this suggests it was probably a nail from an end to end planking joint, or 'scarf', in a ship or large boat (Fig 32). Complete clench bolts are rare finds from Lundenwic sites, with only two examples previously reported (Fowler & Taylor 2013, 77–8).

Lead Net Sinkers

Among the finds were also two cylindrical net sinkers, or net weights, of rolled lead sheet (Fig 33; SFs 13, 10). Phase 9 produced a complete example of a small and neat shape, while another from Phase 6 is cruder. Net sinkers of this form are known from as early as the Late Iron Age and Roman period (Steane & Foreman 1991, 97, fig 12.8 nos 1–20), but they are particularly frequent in the later medieval period when they have been associated with the spread of the herring gill net (Riddler 2009, 102–3).

Lead net sinkers have previously been found in Lundenwic at the Royal Opera House (Blackmore 2003c, 271). At Flixborough, a Middle and Late Saxon period site in Lincolnshire, 11 cylindrical weights of this form were recorded; here, an alternative use of these weights for bird netting was noted (Wastling 2009).

Other Metal Objects

The only other diagnostic metal object from the site is a small U-shaped staple (Fig 32; SF 82). Small staples like this example are known from other sites in Lundenwic (Malcolm *et al* 2003, fig 69 M93; Fowler & Taylor 2013, fig 53 S29), they would have been used to attach fittings, such as chains, rings or hasps, to wood (Goodall 2011, 162).

Wooden Vessel

The basal fragment of a lathe-turned alder vessel came from Phase 6 (SF 83) [97]. The fragment measures 45mm by 25mm by 6–7mm thick and retains some of the vessel wall to one side; on the inside base are three parallel incised lines transverse against the grain (Fig 34).[1] Wooden objects are rare from Lundenwic, with only one example, a vessel bung or stopper, previously published (Fowler & Taylor 2013, 79, fig 56). The Adelphi Building fragment is too small and undiagnostic to suggest the form or size of the vessel although the curve of the wall indicates a diameter of at least 130mm indicating a bowl rather than a cup. Both forms are known from Early Anglo-Saxon burials (Morris 1982, 256) and in

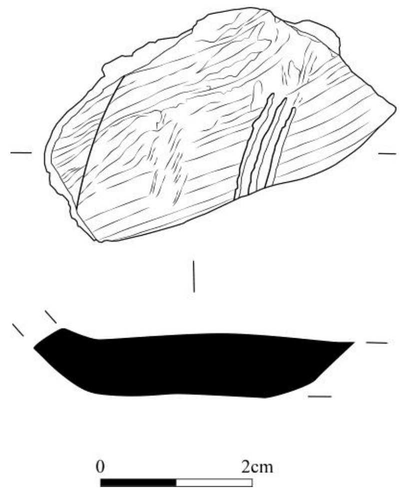

Fig 34. Basal portion of lathe-turned alder vessel (SF 83) [97] Phase 6

Late Saxon wooden vessels retrieved from Coppergate in York (Morris 2000, 2165–86). The most common chosen species for lathe-turned vessels appears to have been alder, followed by field maple (*ibid*, 2159).

Stone Objects

With petrological identifications by Kevin Hayward

Three sandstone hones were retrieved from Adelphi Building. All are portable objects that would have been used to sharpen iron knives and other hand tools.

The earliest fragment was originally probably part of a rectangular or bar shaped hone, it has both sides worn down to a concave shape from repeated sharpening of iron blades; the remaining face is also worn (Fig 34; SF 30; *cf* Goffin 2003b, fig 15 <S1>). The hone is made of a fine-grained Greensand, comparable somewhat to Reigate stone and potentially sourced from the Upper Greensand of the Reigate-Merstham area.

The two remaining hones were both from Phase 6. A fine rectangular hone of Wealden sandstone, also from Kent, is slightly tapering from wear on the sides, with the remaining surface marked by a single longitudinal groove for sharpening the point of knives and other implements (Fig 35; SF 14). One side and part of the surface are blackened from soot or burning. Traces of burning can be seen also on the third hone, present as the terminal of a more substantial rectangular hone of Sarsen sandstone, sourced from Hertfordshire (Fig 35; SF 47).

The use of predominantly local stone – sandstone, limestone and mudstone – is characteristic of the Middle Saxon period, and can be seen also at Hamwic (Andrews 1997b). A change to this pattern occurred in the Late Saxon period, with long-distance imports of hones of Norwegian ragstone and blue phyllite becoming dominant (Goffin 2003b, 202).

Besides hones, nine fragments of Mayen lava quern stones from the Rhineland were also present. With the exception of one piece from a Phase 6 context all these fragments came from Phase 9. Some of the pieces have surfaces with evidence of tooling, mostly in the form of short pecked grooves or furrows; one fragment, an edge piece from Phase 6 (SF 32, not illustrated), retains parallel diagonal grooves on the circumferential edge (*cf* Goffin 2003b, 208). However, the size and fragmentation of the quern pieces make any further identification difficult. A rotary hand quern would have consisted of a lower stone or bedstone, sometimes with a small central hole for fixing it to the ground or base, and a rotating upper part with a larger hole for feeding through the grain to be ground. The tooling, often a crude form of harp-dressing with short parallel furrows in groups at an angle to each other, was normally used on the grinding surface but could also be present on the upper non-grinding surface. Only two of the quern fragments from the Adelphi Building retained both upper and lower surfaces, giving thicknesses of 30mm and 50–5mm respectively. This is likely a reflection of use and wear, as the original thickness of unused quern stones may have been 80–100mm (Feveile 2010, 134; *cf* Goffin 2003b, 207). Two edge fragments were large enough to provide an estimated diameter of *c*.440mm and 450mm respectively (SFs 26, 27). This, too, compares well with the estimated size of domestic querns in Lundenwic (Riddler 2004c, 24, fig 23) and other contemporary urban sites like Dorestad (Parkhouse 1997, 98) and Ribe in West Denmark (Feveile 2010, 133–4). The lava querns appear to have been transported as blanks or roughouts from quarries in the Eifel in Germany, to be finished at *wics* and *emporia* before being traded or transported further. This is supported by boat finds with unfinished querns, such as the 10th-century Graveney boat from Kent (Fenwick 1978; *cf* Parkhouse 1997, 102–3), and evidence of waste and partially finished querns from Middle and Late Saxon London (Goffin 2003c, 205; Parkhouse 1997, 99–102).

In addition to the Rhineland lava quern fragments, there was also a piece of quern stone produced in Millstone grit, from a source either in South Wales or South Yorkshire (SF 45) [12] Phase 9 (see Hayward below). This piece retains both the grinding and non-grinding surfaces and has a thickness that varies from 28–35mm. The slightly concave grinding surface indicates it is from the

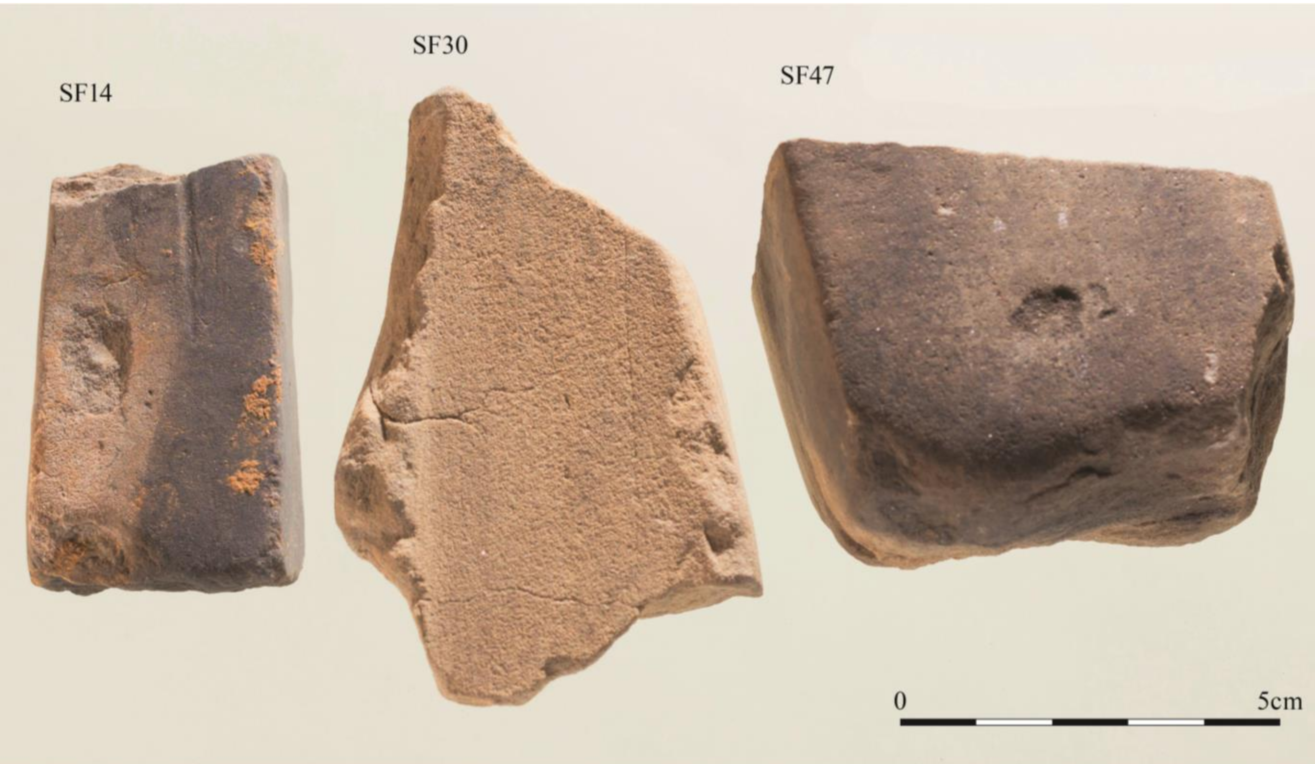

Fig 35. Stone hones of Greensand (SF 30), [102] Phase 5, Wealden sandstone (SF 14) [97] Phase 6 and Sarsen sandstone (SF 47) [76] Phase 6

upper stone of a quern. While quern stones were dominated by material from the Rhineland, more local stone would also have been used at the time, also in places with access to long-distance imports. Finds of non-lava quern stones from Lundenwic, however, remain rare and only a few examples have been published (Blackmore & Williams 1988, 134; Goffin 2003b, 209; Keily 2012a, 213–14; Williams 1989, 130–1).

ROMAN BUILDING MATERIALS

Kevin Hayward

Introduction and Methodology

A sizeable group (318 fragments – 312kg) of dumped Roman building materials (tiles, bricks and stonework) recovered from the Middle Saxon waterfront dumps were examined in order to determine their origins and material type.

The ceramic building materials were examined using the London system of classification and a fabric code allocated to each object.[2] The application of a 1kg mason's hammer and sharp chisel to each example ensured that a small fresh fabric surface was exposed. The fabric of the ceramic building materials and the geology of the stonework were examined at x20 magnification using a long arm stereomicroscope or hand lens (Gowland x10). Comparison was then made with the Pre-Construct Archaeology building material reference collection to determine the fabric type, source and period of use. Most of the rock-types were identified in this way and their geology recorded using the Museum of London reference collection. Where this was not possible comparison was then made with a reference collection of outcrop samples of freestone together with samples of worked freestone from the corpus of Roman architecture and funerary monuments in London and south-east England compiled as part of the author's research into the character and origin of high status materials from this region (Hayward 2009; 2015).[3]

The Worked Stone

Petrology and Form

Hand specimen comparative analysis of the worked and rubble stone assemblage identified 10 lithotypes, the majority of which can be sourced to definite outcrops within the British Isles and the Continent (Table 6). In keeping with sites throughout Roman London, Kentish ragstone and associated Hassock stone quarried from greensand outcrops along the Medway were by far the most common material-type, forming over 78.3% of the assemblage by weight. Other stone types from East Kent included a red ferruginous sandstone from the Sevenoaks area (Potter & Hayward 2006). Tufa, a nodular calcareous deposit which forms at the intersection of Holocene spring water deposits and rivers, may have come from the Medway. Examples of higher quality dimension stone were represented by fragmentary blocks of Middle Jurassic (Bathonian) limestone from the South Cotswolds. The open porous texture of these banded shelly oolitic limestones or freestone (Sutherland 2003) permits accurate and intricate carving. These limestones were widely used in the late 1st- to 2nd-century buildings and funerary monuments of the provincial capital (Hayward 2015).

Portable utilitarian objects such as whetstones, which require a hard fine-grained even surface for effective sharpening of tools and weapons, were represented by fine grained sandstones such as the Wealden type sandstone used extensively in the southern half of Britannia (Allen 2014; Hayward & Roberts 2019) and sarsen (Hayward & Roberts 2019; see Gaimster above). Fragments of quern stone travelled even further with an example of millstone grit from South Wales or South Yorkshire. It is possible that the examples of Neidermendig lavastone quern from the Andernach region of Germany may be Saxon and not Roman in date as this hard vesicular volcanic rock was the material of choice for Lundenwic (*eg* Goffin 2003b; Riddler 2004c; Keily 2012a; see Gaimster above).

Ceramic Building Materials

Forms

Only brief comment will be made on the fabric and form of the small quantity (187 examples, 56 kg) of broken up Roman bricks, tiles and box flue tiles recovered from the Middle Saxon waterfront reclamation dumps. Roman brick (44kg) dominated the assemblage, especially in the Phase 7 [64] and Phase 5 dumps [100], which contained very large quantities of broken or near complete *bessalis, Lydion* and *pedalis* bricks, often with large chunks of hard gravel mortar still adhering. These bricks were made from the common London sandy fabric group 2815. By contrast those from the Phase 7 group (contexts [97], [96], [95]) were dominated by the Hampshire Grog fabric 3054 (AD 70–140).

Table 6. Stone types present

MoL fabric code	Description	Geological type and source	Adelphi Buildings
3105	fine hard dark grey sandy limestone	Kent ragstone, Lower Cretaceous, Lower Greensand Maidstone District – Kent	dumped rubblestone and ashlar blocks, 101 examples 205kg part-worked stone and rubble. Phase 5 layers [98], [100]
3106	yellow-green glauconitic sandstone	Hassock stone Lower Cretaceous, Lower Greensand Maidstone District – Kent	
3107R	pale cream-grey low-density glauconitic limestone	Reigate stone type – Upper Greensand, Lower Cretaceous Farnham, Leatherhead Surrey	part worked block 1 example 0.5kg, Phase 9 ditch fill [11]
3109	pale-cream banded shelly oolitic limestone (Hayward 2015)	Middle Jurassic (Bathonian) South Cotswolds source	part worked fragments 7 examples 7.8kg, possible origin roadside funerary monuments outside the city walls as at Newgate where this rock type was identified (Pitt 2006, 14). Phase 10 pit fill [7], external surface [10]
3111	ferruginous sandstone	Carrstone: Folkestone Beds Lower Greensand, Sevenoaks area of the Weald (Potter & Hayward 2006)	1 example 0.3kg. Partly worked curved chamfered plinth stone element delineating base of Roman defensive wall
3118	white nodular low-density calcareous stone	Calcareous Tufa. Holocene nearest outcrops chalk outcrops Thames Estuary or Medway	ashlar blocks each 3kg, Phase 5 layers [100], [101], possibly bath-house material
3120a	pale grey/green fine calcareous sandstone	Wealden sandstone, Lower Cretaceous (Weald) (*cf* Allen 2014)	whetstone, Phase 9 pit fill [93]
3120b	fine white-grey cryptocrystalline sugary sandstone	Sarsen – Palaeogene Tertiary Home Counties (*eg* Kent)	sharpening stone, Phase 6 (SF 47) layer [76]
3120c	gypsiferous selenite rich mudstone	probably Upper Jurassic (Kimmeridgian) Dorset Mudstone	burnt nodules, Phase 7 layer [95], Phase 5 layer [99]
3123	hard, coarse, dark-grey vesicular basalt lava – with white (leucite) and black inclusions.	Neidermendig lavastone Tertiary-Andernach Region, NW Germany	quern fragments, Phase 9 fills [11], [12], [14], [16], 11 examples 1.9kg
3130	medium-grained angular quartz sandstone	Millstone Grit (Namurian) Upper Carboniferous Derbyshire or South Wales	quern fragment, Phase 10 pit fill [9]

Table 7. Types of Roman roller stamped and combed tiles and bricks present

Type of Die	Context	Description	Fabric	Date
Roller stamped tile	Phase 10 external surface [7]	Die 1 of Betts and Black (1997)	2452	AD 55–160
Roller stamped brick	Phase 6 dump layer [97]	poor die imprint	3054	AD 70–400
Combed	Phase 9 ditch fill [11]	narrow comb, slight curve	2452	AD 55–160
	Phase 9 ditch fill [91]	straight comb, two faces wall jacketing	2452	AD 55–160
	Phase 9 ditch fill [14]	narrow curved	2459a	AD 50–160
	Phase 3 embankment [153]	wide comb, poorly defined	2452	AD 55–160

Box-Flue Tiles and Bricks

A small but nevertheless varied assemblage of cavity walling material (8 examples, 1.7kg) was recorded from the Middle Saxon deposits (Table 7).

Of note is one clear roller stamped die in fabric 3054 with a poorly defined roller stamped impression. Roller stamped bricks do not turn up very often in London, but have been found at Drapers' Garden (Pringle in prep).

Discussion: The Origins of the Material

Roman City Wall

Huge quantities (131 examples, 262kg) of Roman stone rubble and squared blocks were recovered from the Middle Saxon waterfront (Phase 5) consolidation layers [98] and [100]. The average size (210 x 160 x 120mm – 12kg) and composition (Kentish ragstone) of the squared blocks and the fact that many were still attached to areas of the same hard flint pebble *opus caementatum* bonding mortar seen in surviving sections of the landward portion of the city wall of nearby Londinium (Fig 3 – main report) – for example at Jewry Street (Hayward 2017) and the Wardrobe Tower (TOL164) (Hayward & Roberts 2019) – suggests that the Adelphi Building masonry may have been derived from the demolition of part of this structure. Furthermore, part of a curved chamfered plinth element in red Ferruginous sandstone is of a petrology and form typical of the base of the Roman defensive wall, for example at Wardrobe Tower (*ibid*), Cripplegate (Potter & Hayward 2006) and Duke Street (*ibid*; site code: DUK77).

The evidence from the ceramic building material assemblage supports the city wall hypothesis. Flat elements (brick, undiagnostic tile, box flue fragments) dominated the assemblage (51.4kg – 92.7%), while flanged and curved roofing elements were very poorly represented (4.1kg – 7.3%). Although, this may indicate either the selective collection of flat elements (which are also easier to transport) from stockpiles of salvaged Roman building material obtained from Londinium, it seems more likely that this group represents the systematic dismantling of a section of a large structure such as the superstructure of the Roman city wall, which was constructed of levelling courses of Roman brick and was faced with squared blocks of Kentish ragstone, while the core of the wall was infilled with random shaped lumps of ragstone rubble set in lime mortar.

There were numerous examples of half or near complete *bessalis*, *Lydion* and *pedalis* bricks, many with large chunks of mortar still attached, especially from [100], together with a fragment of sandwiched brick course walling and an enormous assemblage (198kg – probably the largest for a Middle Saxon London site) of large Kentish ragstone blocks.

Funerary Monuments

A feature of the stone assemblage was the presence of a sizeable quantity (8kg) of worked limestone, reused in a Middle Saxon external surface (Phase 10; [7], [10]). Based on their thickness (50mm) and lithology (banded shelly oolitic limestone from the South Cotswolds), these fragments are likely to have originated from Roman tombstones and sarcophagi. This Bath type-stone, was used in enormous quantity not only for Roman funerary monuments but religious sculpture and monumental architecture in London from the late 1st century AD until the late 2nd century (Hayward 2015).

A late Roman limestone sarcophagus is known from nearby at St Martin-in-the-Fields (Telfer 2010, 52). At Newgate Street in the City of London, this stone type was identified in the foundations of a monumental structure (Pitt 2006, 14).

THE LEATHER

Quita Mould

Methodology

The wet leather was initially scanned in 2014, working drawings made and diagnostic measurements taken to provide a permanent record of the material prior to conservation. A small number of pieces were then submitted to the Scottish Universities Environmental Research Centre for radiocarbon dating in July and August 2016 (Table 8). The remainder were conserved and then re-examined in May 2017 following their treatment. Various degrees of shrinkage were noticeable after conservation and some fragments had deteriorated or disintegrated during treatment so that the descriptions and measurements taken of

Table 8. Summary of calibrated radiocarbon dates obtained from leather samples

Phase	Context no.	Lab code	Date 95% probability	Uncalibrated dates	Description
6	[97]	GU40830	failed		scrap, all edges broken
6	[97] bag 2	SUERC-67626 GU40831	607–764 cal AD	AD 586 +/–34	secondary waste, calfskin
2	[154]	GU40832	failed		secondary waste, calfskin
6	[97]	SUERC-68540 GU41455	606–76 cal AD	AD 566 +/–29	scrap, all edges broken
2	[154]	SUERC-68541 GU41456	606–70 cal AD	AD 560 +/–27	secondary waste, calfskin

Table 9. The waste leather recovered from Adelphi Building

Phase	Context no.	Cat no.	Type	Dimensions	Species	Features
2	154	43	tertiary	62+ x 12 x 0.41	calf(d)	trimming
2	154	44	tertiary/primary	62+ x 5 x 1.56	calf	trimming with hide edge
2	154	45	secondary	48 x 13 x 0.72	calf	triangular
6	75	8	primary	102+ x 85 x 1.69	calf	small area of hide edge
6	76	9	secondary	64+ x 29 x 1.85	cattle	tapering
6	76	10	primary	109 x 72 x 1.75	cattle	hide edges (leg area)
6	97	36	secondary	109+ x 33 x 2.09	bovine(d)	rectangular
6	97	37	tertiary	103+ x 10 x 1.97	bovine	trimming
6	97	38	secondary	63+ x 24 x 0.63	calf	rectangular
6	97	39	secondary	74+ x 16 x 0.73	bovine(d)	curved edge
7	39	1	secondary	40 x 26 x 0.81	bovine(d)	triangular
7	67	3	primary	45+ x 32 x 1.86	bovine(d)	area of hide edge
7	67	4	secondary	51+ x 25 x 1.05	calf	scored cut on grain side
7	96	14	secondary	52+ x 31 x 1.07	calf	tapering
7	96	15	secondary	81+ x 21+0.79	bovine(d)	wide trimming
7	96	16	secondary	36+ x 19+1.25	bovine	rectangular, torn
7	96	18	secondary/primary	118 x 63 x 1.90	calf	rectangular, hide edges
7	96	19	tertiary	83 x 4 x 1.23	calf	trimming
7	96	20	tertiary	85 x 4 x 0.82	no grain	trimming
7	96	21	tertiary	137 x 10 x 0.81	calf	trimming
7	96	22	tertiary	64 x 11 x <1	bovine(d)	tapering, grip mark
7	96	23	secondary		bovine(d)	cut and torn x5
7	96	24	primary	<1.5	bovine	unusable hide area x13

Key: (d) = delaminated, no grain = no grain pattern visible, grip mark = impression made by a small clamp

the wet (unconserved) material have been used in the basic record, augmented by any observations made later on re-examination. The basic record will be deposited at the London Archaeological Archive and can be consulted by prior appointment. All measurements are given in millimetres (mm). '+' indicates that the measurement is of an incomplete or broken item.

Leather species were identified by hair follicle pattern using a low-powered magnification. Ten pieces were subsequently examined under a Wild MB microscope at x50 magnification to confirm the identifications: I am most grateful to Dr Esther Cameron for this. Where the grain surface of the leather was heavily worn identification was not always possible. The term 'bovine' has been used when uncertainly arose between mature cattle hide and immature calfskin.

Summary

Fifty-four small pieces of leather were recovered from the lift pit excavation generating 45 individual entries in the basic record. All were of vegetable tanned leather, black/very dark brown in colour, robust and in good condition, some delamination was present but this is usual for much archaeological leatherwork. Those with a grain pattern visible were of bovine leathers. The recovery of Middle Saxon period leather in England is rare (Cameron & Mould 2011, 104; Mould & Richardson 2013), so that, although small and fragmentary, this assemblage is significant.

The assemblage comprised small pieces of waste and scrap along with fragments with some stitching, but all lacked features by which they could be independently dated. As such, it was indistinguishable from leather of Roman date and, as much of it came from layers of mixed dumping/levelling, the possibility that some of it might be residual Roman material should not be discounted. For this reason, leather samples from foreshore [154] (Phase 2) and dump layer [97] (Phase 6) were subject to radiocarbon dating. While two of the five samples (GU40830, GU40832) contained insufficient carbon, the Middle Saxon date of the other three (GU40831, GU41455, GU41456) was confirmed (Table 8). This leather assemblage is the second of Middle Saxon date to be found in London in recent years; the first was recovered from the lower fills of a defensive ditch identified at St Martin's Courtyard in Lundenwic. It varies from the assemblage from St Martin's Courtyard, however, in being significantly more fragmentary, having been recovered chiefly from sampling of mixed dumping likely to have been subject to movement and fragmentation prior to deposition (Mould & Richardson 2013).

The majority of the leather from the Adelphi Building was recovered from waterfront dump layers [96] (Phase 7) and [97] (Phase 6). Layer [97] contained three pieces of leather with areas of stitching remaining (Cat Nos 27, 33, 34), and another with a possible small thong or fastening hole present (Cat No. 35; see below for detailed descriptions). They were accompanied by other small fragments of similar leather, likely to have been broken from them. These fragments may come from a shoe but, regrettably, insufficient remains now to be certain. Individual features hint at possible shoe styles but any suggestions must remain tentative (see below). The only other stitching present was a single stitch hole with the impression of thread visible on the grain side surviving on a piece of leather (Cat No. 2) trimmed and torn from a larger item found in levelling deposit [39] (Phase 7).

Thirty-nine pieces of waste leather were recovered from Adelphi Building (Table 9). The majority were of secondary waste with knife cut edges, several were broken so that some edges are now torn. Amongst the secondary waste were narrow trimmings produced when trimming down pattern pieces to their final size; they are sometimes termed tertiary waste and this term has been used in Table 9. A small amount of primary waste was also present comprising small unusable areas of hide and waste leather with areas of hide edge (Mould 2011, 33). The remainder of the leather found was scrap; that is small fragments of leather with torn edges and no diagnostic features present, broken from larger items. The waste leather shows that leatherworking, in the form of the manufacture and/or repair of leather goods, was being undertaken in the vicinity. This was also the case at St Martin's Courtyard where, amongst the shoes and fragments of other items, was a small amount of secondary waste and hide edge trimmings (Mould & Richardson 2013, 96). From this we may assume that leatherworking was being undertaken in Lundenwic, though at present the scale of the evidence for this remains small. Though the evidence is limited, it now appears unlikely that only readymade luxury leather goods were being imported into the capital, which may have been the supposition previously. Similarly, leatherworking waste suggests this is also the case elsewhere in the British Isles. Waste leather was recovered from the monastery at Iona in a context dating to AD 585–618 (Groenman-van Waateringe 1981, 319–20), though the quantity and the nature of the waste found is uncertain. At Deer Park Farms, County Antrim, Northern Ireland, waste leather offcuts and a shoe last of common yew (*Taxus baccata*) provide evidence of the working of vegetable-tanned leather and shoemaking in the late 7th–mid-/late 8th centuries (Neill 2011, 375).

Phase 2: Foreshore (Early 7th Century)

Three pieces of waste leather were found in a sample <46> from foreshore deposit [154]. The first fragment, a small triangular piece (Cat No. 45), and the second, a curving trimming (Cat No. 43), were both secondary waste, the latter was radiocarbon dated to cal AD 606–70 (Table 8). The third fragment (Cat No. 44) was a narrow trimming along a hide edge and may be considered primary waste.

Phase 3: Waterfront 1 Landward Dumps (Probably the Early or Mid-7th Century)

A piece of scrap leather (Cat No. 42) with all its edges broken and no distinguishing features came from sample <45> of layer [153].

Phase 6: Waterfront 4 Landward Dumps (Probably the Early 8th Century)

An unusable piece of hide (Cat No 8) with a small area of hide edge, primary waste, was found in a dump layer [75].

A piece of secondary waste (Cat No 9) and what may be the leg area cut from a bovine hide (Cat No 10) came from an organic layer [76]. A larger group (Cat No. 25–41) came from a dumped deposit [97]. Two pieces of leather (Cat No. 29, 38) from layer [97] produced radiocarbon dates of cal AD 607–764 and cal AD 606–76 (Table 8). The group comprised a small amount of waste leather

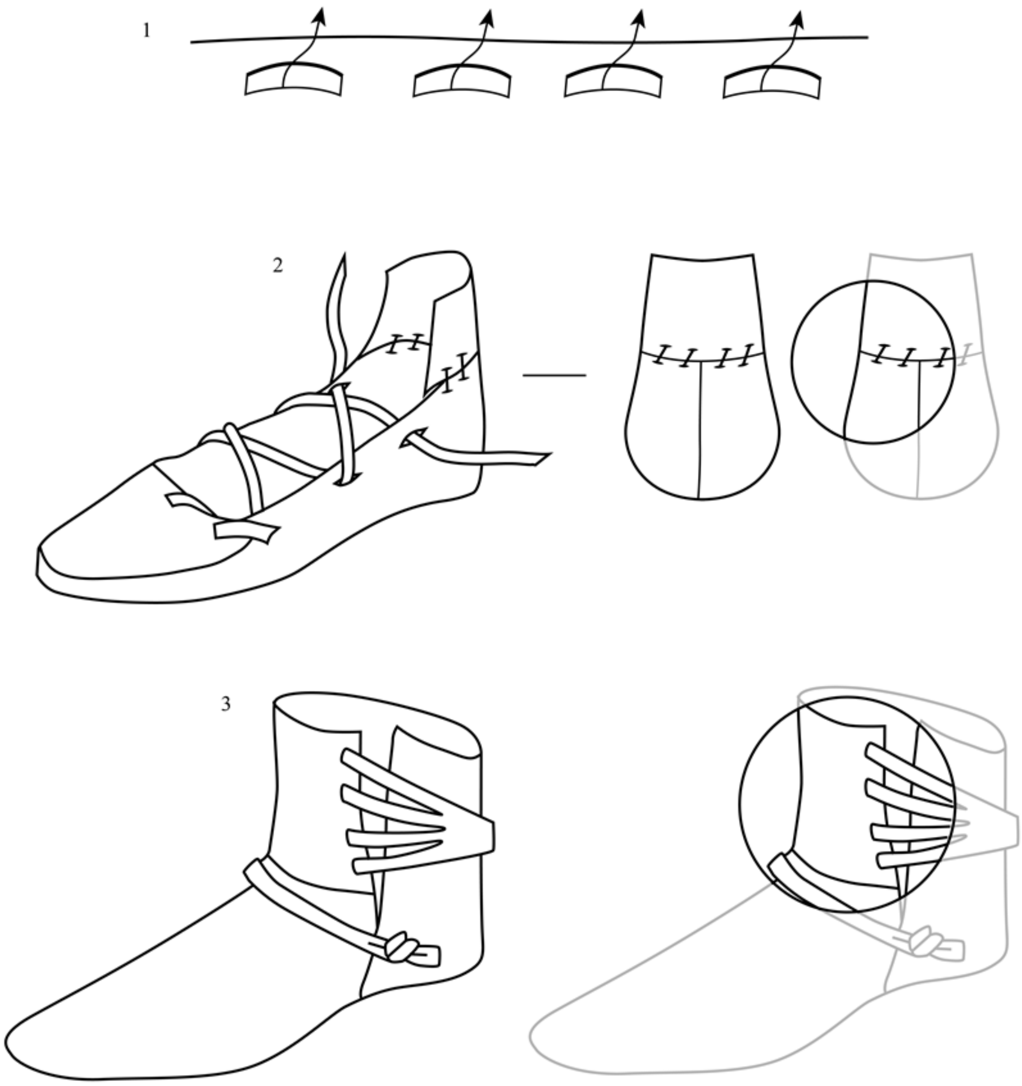

Fig 36. Saxon leather shoes. Key: 1). Slots with curved and polished side closest to the edge, arrows indicating direction of thong; 2). Shoe with separate heel extension (after Volken 2014, 271, 7.09), area for comparison circled; 3). Shoe fastening with a split pull strap (after Volken 2014, 351, 21.11), area for comparison circle

(Cat Nos 36–8) and the fragmentary remains of a manufactured item or items (Cat Nos 25–35). The leather is worn and the grain pattern indistinct but it edge (Cat No. 34), and a piece with a whip stitched seam and a slotted edge at right angles to it (Cat No. 33). These features suggest the fragments come from a shoe or shoes, the short length of lasting margin (Cat No. 27) coming from a shoe made with a separate sole and upper.

The slotted piece (Cat No. 33) is unusual. The slots run very close to the edge and, unusually, are aligned parallel to it. Under magnification, the upper side of each slot, closest to the edge, can be seen to be curved and polished indicating that a thong had passed through it in the manner of a whip stitched edge or seam (Fig 36.1). A thonged edge of this type suggests two possibilities. The first possibility is that the piece has been cut from the back part of a shoe with a separate 'heel-appears to be of bovine leather probably calfskin. These fragments include a small length of lasting margin (Cat No. 27), a piece with a whip stitched tongue' extension originally sewn together with thong using a whipped stitch (Fig 36.2). Tongue-like extensions on the back part of a shoe running up the back of the heel were a feature of early medieval footwear, occurring on at least three shoe styles of late 6th- or 7th-century date (Volken 2014, 120, fig 157) and often depicted in the iconography of late antiquity (*ibid*, 115, fig 145 top right, 116, fig 50) and the early medieval period, such as the man depicted in a sculpture, attributed to the 9th century, now displayed at the church of St Peter, Codford in Wiltshire (Owen-Crocker 2004, 170, fig 129). Shoes with this distinct 'heel-tongue' were found at St Martin's Courtyard, just to the north of the site, in a ditch dated to AD 730–850 (Mould & Richardson 2013). Currently, only one shoe style with this extended heel feature made of a separate piece has been recognised. The shoe, with a radiocarbon date of cal AD 640–760, was found inside a hollow tree trunk well lining at Town Farm Quarry, Burlescombe in Devon (Friendship-Taylor 2007a, 42; 2007b, 68–70). Though the separate heel piece, also termed a 'back bridged piece', was missing on the Burlescombe shoe, stitching revealed where it had once been attached (Volken 2014, 271, cat no. 7.09).

The second possibility is that the thonged edge comes from a shoe style fastening with a split pull strap (Goubitz *et al* 2001, 157–60 Type 30; Volken 2014, 211–2), the slotted edge being the slotted side-opening through which the individual thongs/narrow straps of the fastening passed (Fig 36.3). This, rather complicated, fastening was used on shoes dating to both the Roman and the medieval periods, appearing on styles dating to the 2nd century (Southfleet style, Volken 2014, 370 style 26.01), late 3rd to early 4th century (Southfleet/Magor style, *ibid*, 376 style 28.04), and the 14th century (The Hague style, *ibid*, 334, 351 styles 18.13, 21.11, 21.12). These split pull strap fastening shoes varied in cutting patterns and methods of fastening the strap to the shoe, the Roman examples tying across the instep, the medieval fastening with a rolled leather toggle (button) or a small metal buckle (only the toggle fastening method is shown in Fig 36.3). This second suggestion may be the better explanation for the fragment (Cat No. 33), accounting for both the position of the slots, the whip stitched seam and the cut edge; however, the first suggestion provides a better fit for the dating. In truth, too little survives of these small stitched fragments to say what style of shoe they represent, all that can be said with any confidence is that they are likely to come from a shoe or shoes.

Phase 7: Land Reclamation Dumps (Early 8th Century)

A sample <32> taken from organic layer [67] contained a number of small fragments of waste leather. One example consisted of primary waste with a small area of hide edge (Cat No. 3) and the other was a piece of secondary waste calfskin with a scored cut mark visible (Cat No. 4), plus some small fragments of scrap bovine leather (Cat Nos 5–7).

A larger group of leather was recovered from dump layers [39], [95] and [96]. Sample <20> from [39] included a piece of secondary waste (Cat No. 1), and a strip torn from a larger item with a cut edge and a single stitch hole present (Cat No. 2). Sample <37> from [95] contained three pieces of scrap calfskin (Cat Nos 11–13), and one fragment of calfskin with a single small tack or nail hole present (Cat No. 11). Layer [96] contained waste leather and a single fragment of scrap (Cat No. 17).

The primary waste from [96] comprised a rectangular piece of calfskin with an area of hide edge present (Cat No. 18) and 13 pieces torn from unusable areas of hide (Cat No. 24) of various bovine leathers, none more than 1.5mm thick. The secondary waste from [96] included trimmings (Cat Nos 15, 19–22) produced when trimming pattern pieces to size. One of the trimmings (Cat No. 22) had the impression made by the jaws of pincers used to tension the hide whilst it was being worked by the currier (Mould 2011, 36), a feature also seen on waste leather at St Martin's Courtyard (Mould & Richardson 2013, 96). It is also of interest that at least three of the waste leather pieces (Cat Nos 14, 16, 21) appeared to be of unworn and, therefore, of unused leather suggesting that new hides were being used, rather than leather salvaged from other leather items.

Catalogue of Illustrated Leather (Fig 37) from JAD14

Cat No. 27 (SF 15.3) [97] (Phase 6)
Length of lasting margin with a U-shaped profile and 14 figure-of-eight shaped grain/flesh stitches running along the edge, each stitch 3mm long, spaced 3–4mm apart producing a stitch length of *c.*5–6mm. The lasting margin has a gently curving profile and has been broken away above the row of stitching. The leather is 1.68mm thick, no grain pattern is visible. Length 88mm+, max width 8mm, leather 1.68mm thick.

Cat No. 33 (SF 15.9) [97] (Phase 6)
Roughly square fragment with a cut edge and a row of four rectangular, slightly oblique, slits or small slots running parallel to it just 2mm below. Each slot is 4–5mm long and 1mm wide. Under x50 magnification the sides of each slot closet to the edge can be seen to be curved, and smoothed/polished from wear suggesting the passage of a thong, while there are no thread impressions present running between the slots from a stitched seam. Running at a right angle to the slotted edge is a vertical grain/flesh whip stitched seam on the left and a plain cut edge on the right, the lower edge is torn. The grain pattern is worn but the leather appears to be of calfskin *c.*1.89mm thick. Height 60mm+, width 64mm.

Cat No. 34 [97] (Phase 6)
Fragment with 25mm of a grain/flesh whip stitched straight edge remaining, the stitching is faint but at least five stitches are visible. All other edges are broken. Leather delaminating with much of the grain surface now missing. Appears to be worn bovine leather *c*.1.40mm thick. Length 66mm+, width 77mm+.

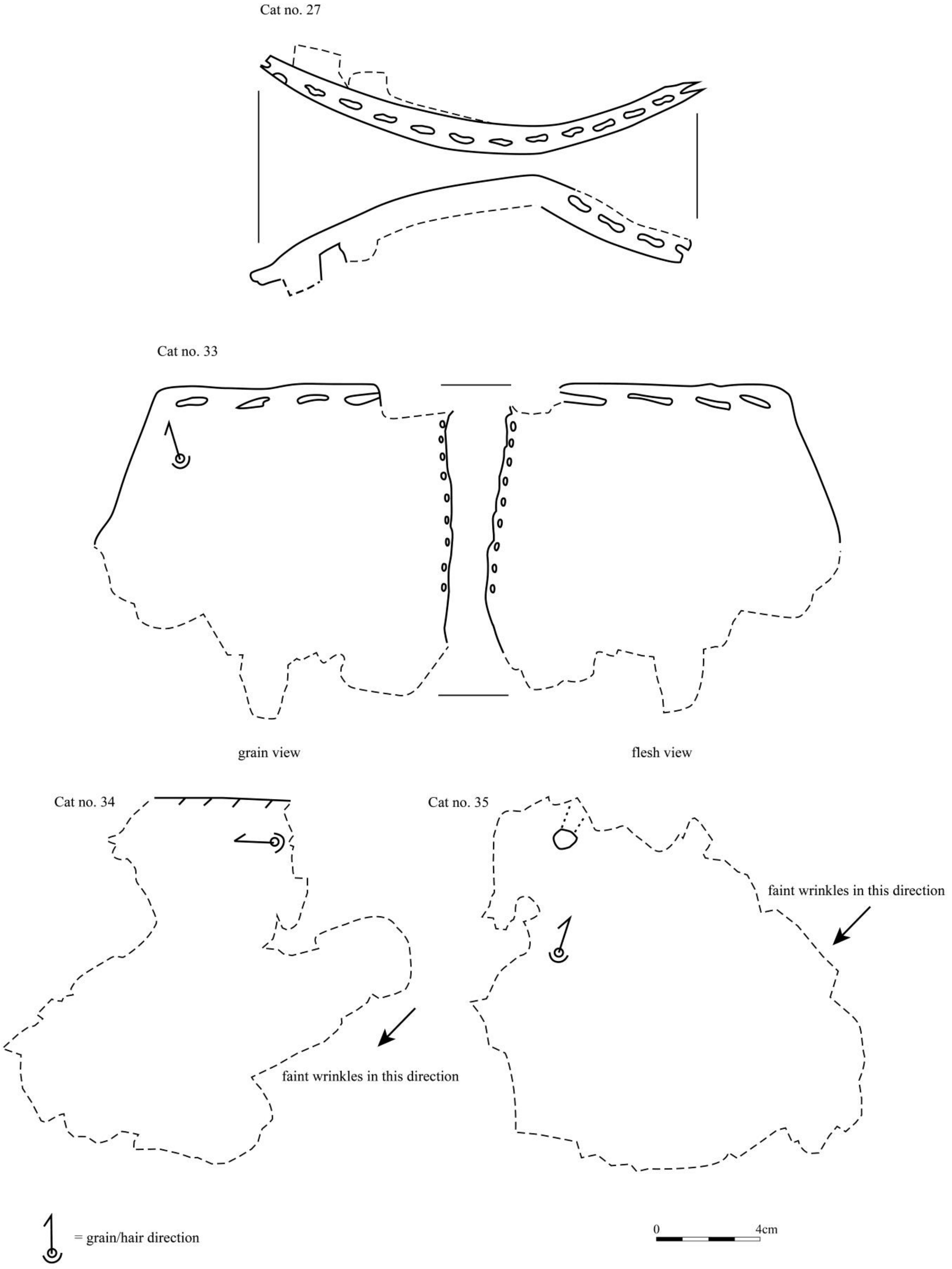

Fig 37. Leather catalogue Nos. 27, 33, 34 and 35, see report for further details

Cat No. 35 [97] (Phase 6)
Fragment of scrap with broken edges and a hole, 3mm in diameter, with irregular sides, not cleanly cut or punched out. The hole may be a fastening hole as there is a faint thong or lace impression visible on the grain surface. Wear present on grain surface, leather bovine 2.14mm thick. Length 87mm+, width 68mm+.

THE ANIMAL BONES

Kevin Rielly

Quantity

Middle Saxon deposits produced a total of 4,336 hand collected bones as well as 5,273 fragments recovered from the bulk samples taken across the sequence. The majority of these bones were recovered from the dumped deposits of Phases 5–7, the Phase 9 features and the Phase 10 deposits (Tables 10, 11).

Methodology

The bones were recorded to species/taxonomic category where possible and to size class in the case of unidentifiable bones such as ribs, fragments of longbone shaft and the majority of vertebra fragments. Recording follows the established techniques whereby details of the element, species, bone portion, state of fusion, wear of the dentition, anatomical measurements and taphonomic including natural and anthropogenic modifications to the bone were registered. Age determination is based on the dental eruption and epiphyses fusion sequences described in Schmid (1972, 75, 77) with expansion of the tooth age sequence to include wear in Grant (1982). Measurements essentially used the dimensions described in von den Driesch (1976) while calculation of shoulder heights was based on multiplication factors given in von den Driesch and Boessneck (1974).

Quantification of species and skeletal parts is based on total fragment counts, but mindful of the biases inherent within this method concerning the differential survival and recovery of the larger compared to the smaller parts, quantification was augmented by the use of a weighted method – epiphyses only (after Grant 1984). This is based on a count of all limb bone articular and, with the other parts, on a count of non-repeatable aspects, as for example specific teeth within the maxilla and mandibles. In addition, when comparing the relative proportions of certain species, the expected frequency of certain parts is taken into account (noting for example that pigs have more metapodials than cattle and sheep/goat).

Age categories were employed to facilitate the interpretation of this data, specifically in connection with the major domesticates – cattle, sheep/goat and pig. These include the data involving the two main ageing methods, *ie* mandibular tooth eruption and wear, and epiphyses fusion. The age categories employed are as follows: infant, based on bone size and porosity (see Amorosi 1989); juvenile, as infant plus unfused early epiphyses and unworn first adult molar; sub-adult, unfused Intermediate epiphyses and unworn third adult molar; and adult, fused Intermediate and late epiphyses, plus worn third adult molar, further divided into young and old adult based on tooth wear (after Grant 1982), the latter marked by full wear of the third adult molar (wear stage ‘g’). The limb bone articular ends used to provide the three epiphyseal age groups include: early – proximal (P) scapula, distal (D) humerus, P radius, pelvis acetabulum and P phalanges; Intermediate – D metapodials and tibia; late – P ulna, D radius, P and D femur, P tibia and P calcaneus. These groups approximately coincide with the first, second and third (and later) years respectively. It should be noted that there will be an overlap between the juvenile and sub-adult age groups.

Finally, it should be noted that the fish bones are the subject of a separate report (see Armitage below).

Preservation and Fragmentation

It can be seen that while the great majority of the bones show a slight level of surface damage, there are relatively few showing a greater level of erosion/abrasion. In general, this level of damage is no more than 5–10% within individual phase collections. In addition, the bones have not suffered a high level of fragmentation, either within individual or grouped collections. Taking the proportion of loose teeth amongst the cattle, sheep/goat and pig assemblages as a guide, the phased collections tended to provide proportions of no more than 3%, with the exception of the latest phase (9 and 10), these with 12 and 9.7% loose teeth. Other post-depositional modifications include a minor level of dog gnawing, no more than 2 to 4% in most phases though rising to 6.7% in Phase 3. Overall it can be assumed that the bone waste was probably buried soon after deposition, certainly beyond the attentions of scavengers while the lack of any greater level of fragmentation would suggest that the bone deposits had not suffered much movement (redeposition) following their initial deposition and burial.

Table 10. Hand collected species abundance by phase (see narrative text for dating)

	Phase								
Species	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cattle	23	25	13	191	402	311	2	216	96
Equid				1	1				4
Cattle-size	22	14	11	138	457	630	1	417	150
Sheep/Goat	2			15	48	79	6	118	34
Sheep				1	1	1		1	1
Pig	2	5		25	73	113	3	96	44
Sheep-size	7	1	1	27	104	121	1	116	34
Red deer						4		4	1
Roe deer									1
Dog								3	1
Cat								1	
Chicken				3	8	13		8	2
Goose					20	20		4	2
Goose-size								1	
Mallard					2				
Snipe								1	
Total	**56**	**45**	**25**	**401**	**1116**	**1292**	**13**	**986**	**370**

Table 11. Sieved species abundance by phase, where N is the number of samples with animal bones

	Phase							
Species	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Cattle	6	1	42	23	113	15	132	41
Cattle-size	35	7	34	41	705	90	670	134
Sheep/Goat		3	3	2	54	15	88	30
Goat							1	
Pig	4	1	1	6	111	30	122	39
Sheep-size	25		35	17	739	160	1180	385
Red deer				1	2		4	2
Dog							1	1
Small cetacean							1	
House mouse					2			1
Chicken			2	1	12	2	8	3
Chicken-size					5	2	2	1
Goose				1	10		5	3
Goose-size				1	4		3	
Mallard					1			
Amphibian							3	
Fish					13		39	8
Crustacean					1			
Total	**70**	**12**	**117**	**93**	**1760**	**314**	**2259**	**648**
N samples	**1**	**1**	**2**	**2**	**6**	**5**	**8**	**3**

Animal Bone Distribution by Phase/Period

Phases 2–6: Early 7th Century to Probably the Early 8th Century

Up to Phase 4, the faunal assemblages recovered were quite small, this is in complete contrast with the wealth of material recovered from the later deposits, in particular from dump layers [100/102] (272 fragments) and [97] (972 fragments) dated to Phases 5 and 6 respectively. There was generally a good representation of cattle in each of these phases often followed by pig and then sheep/goat (Table 10; Fig 38), the results for each phase combined in Table 13; Fig 39. Each of these collections features a wide array of skeletal parts (all three species) suggesting that an explanation for this perceived disparity is not related to undue biases towards butchery or any other type of specialist waste. The domesticate abundance within the larger collections (Phases 5 and 6) was also calculated using a weighted quantitative method (Table 12; Fig 40 and above Methodology). This had the effect of increasing the proportion of sheep/goat and pig at the expense of cattle. However, the difference is rather minor.

Both methods are indicative of the predominance of cattle (about 80%) and, amongst the other two species, a somewhat greater abundance of pig compared to sheep/goat. It is notable that the sieved faunal assemblage collection provided a very similar result.

Other food species make an appearance in Phases 5 and 6; this is possibly related to sample size rather than any changes in diet. These include chickens in Phase 5 and the addition of deer, geese and ducks in Phase 6 (Tables 10, 11). Deer was only represented by a single antler piece and therefore must represent working rather than food waste. In fact, all but one of the deer remains found at this site consisted of antler pieces, the exception being a roe deer tibia from Phase 10 (see below). Of interest is the notably greater abundance of goose compared to chicken in Phase 6. Finally, these later phases also produced a small number of equid bones – a metapodial from Phase 5 and a loose mandibular tooth (an incisor) from Phase 6. The wear on this tooth is indicative of an animal in excess of 10 years while the obvious disarticulation of this or possibly both equids could suggest some use of post-mortem products.

Phases 7 and 8: Early to Mid-8th Century

The greatest concentration of animal bones from this site were recovered from dump layers [95] and [96] with 360 and 287 bones respectively, while a notable quantity was also recovered from the midden deposit [35], which was largely composed of oyster shells, with 354 bones (Fig 4). In contrast there were just 13 bones associated with the usage of the timber building (Fig 18). Examining the assemblage from Phase 7, it can be seen that there has been a change in the domesticate abundance pattern compared to the previous phases (Tables 10, 12; Fig 38). While cattle were still dominant there has been an appreciable increase in both sheep/goat and pig, the latter still better represented; the weighted method results confirming this pattern (Fig 40) although showing an even greater abundance of the smaller domesticates, now equally proportioned. The scale of this temporal change can clearly be seen by a comparison of the combined group collections (see Table 13; Figs 39, 41).

Of interest is the far better representation of pig compared to cattle from the sieved collections (Table 12). It can be supposed that pig is likely to be underrepresented; however, the identifiable bones from the sieved assemblage tended to be mainly composed of loose teeth, metapodials and phalanges. In combination these assemblages probably overestimate the relative proportion of pig. Following the earlier phases, each of these domesticates is represented (amongst the hand collected assemblages) by a wide range of skeletal parts, indicative of a general mix of processing and food waste.

In addition to the major meat providers there was a reasonable collection of poultry (hand collected and sieved), almost entirely composed of chicken and goose with the latter yet again more abundant than the former.

Phase 9 and 10: Late 8th Century to Possibly the Early 9th Century

The Phase 9 bones were recovered from a series of cut features. Notable collections were derived from ditches [14] (215 bones) and [92] (246 bones), and pits [13] (144 bones) and [90] (143 bones) (Fig 20). There was also a notable assemblage recovered from a number of possible surface deposits and in particular from [11] with 134 bones. Overlying these are the three deposits dated to Phase 10, including external surfaces [7] and [10] (206 and 119 bones) and the pit [9] truncating these surfaces (45 bones). These phase assemblages show a continuing predominance of cattle amongst the major domesticates although their importance declined through Phases 9 and 10 (Table 12). During these two phases there was a corresponding increase in the smaller domesticates, particularly sheep/goat, in Phase 9, this species outnumbering

Table 12. Percentage abundance of cattle, sheep/goat (S/G) and pig amongst the better represented phase assemblages based on Total Fragment (TF) and Epiphyses Only (EO) counts, where N is the combined domesticate fragment count

		Species			
Recovery/Method	**Phase**	**Cattle**	**S/G**	**Pig**	**N**
Hand/TF	5	82.3	6.9	10.8	232
	6	76.7	9.4	13.9	524
	7	61.7	15.9	22.4	504
	9	50.1	27.6	22.3	431
	10	54.9	20	25.1	175
Hand/EO	5	76.9	9.2	13.9	151.5
	6	71.4	12.4	16.2	314.5
	7	47.1	26.1	26.8	333.5
	9	39.1	38.4	22.5	251
	10	37.4	31.3	31.3	105.5
Sieved/TF	5+6	84.4	6.5	9.1	77
	7	40.6	19.4	40.0	278
	9	38.5	25.9	35.6	343
	10	37.2	27.3	35.5	110

pig in the total fragment counts and it was approximately similar to cattle in the Epiphyses Only (EO) results. In Phase 10, pig outnumbered sheep/goat using the former method while each rose to a similar proportion, just less than cattle using the weighted method. Comparing the combined Phase 9 and 10 results to the previous results clearly shows the sequential diminishment of cattle alongside the complimentary increase of sheep/goat and pig, and in particular of the former species based on the EO data (Table 13; Figs 40, 41). In contrast, the sieved results while certainly showing a decrease in cattle by Phase 7 and an increase in sheep/goat through time tend towards a similar proportion of cattle and pig from Phase 7 deposits, their proportions decreased somewhat by Phases 9 and 10. As previously explained pig may be over represented in these collections, thus skewing the results. The skeletal representations otherwise again follow a generally mixed pattern. The only evidence from this site for venison consumption was a roe deer tibia found in one of the Phase 9 external surfaces [7]. Other food species present include the aforementioned poultry, now with chicken better represented than goose and one other game species, snipe, was also present, in Phase 9 deposits. It is also worth mentioning that the latest two phases produced the largest number of fish bone (Phase 9 with 39 and Phase 10 with 8 fragments, compared to 13 from the previous

Table 13. Percentage abundance of cattle, sheep/goat (S/G) and pig using Total Fragment and Epiphyses Only, where N is the combined domesticate fragment count. The data is arranged into three chronological periods

		Species			
Method	**Period**	**Cattle**	**S/G**	**Pig**	**N**
TF	1	79.2	8.1	12.7	826
	2	60.8	16.7	22.5	515.0
	3	51.5	25.4	23.1	606.0
EO	1	74.7	10.6	14.7	517.5
	2	46.1	26.6	27.3	342
	3	38.6	36.3	25.1	356.5

Key: Period 1 (Phases 2–6), early 7th to early 8th century AD; Period 2 (Phases 7, 8), early to mid-8th century; Period 3 (Phases 9, 10), late 8th to mid-9th century

phases, all from Phase 7). However, this may relate more to quantity than changes in fish exploitation, as these two phases provided some of the largest hand and sieved assemblages of faunal material, the latter no doubt also related to the number of samples (Table 11). A final and probable food waste item from the Phase 9 fill [89] of pit [90] was the caudal vertebrae of a small cetacean, most probably a porpoise. It was identified due to its similarity to identified porpoise remains from late medieval Oxford (Rielly 2015, 70–1, fig 63).

These later phases also produced a small number of bones from non-food species, including equid, dog and cat. All four Phase 10 equid bones were found in external surface deposit [7], suggesting they may be part of the same adult individual, comprising a sacrum, two splint bones and a third phalange. The dog and cat bones were derived from adult animals, with the exception of a femur from fill [89] of pit [90] (Phase 9) with unfused articular ends and therefore subadult.

The antler pieces recovered from these and previous phases can be described as antler working waste, the frequency of such items being a major feature of Lundenwic animal bone assemblages, signifying the importance of antler working activities (Keily 2012c, 289). Though less frequent, there also tends to be a scattering of large goat horncores at these sites, a single example of which was found in the Phase 9 midden dump [61]. In the general absence or minimal representation of other goat skeletal parts it can be proposed that these were specially imported for horn working purposes. A small concentration of goat horncores, generally male, were found at the Royal Opera House (Malcolm *et al* 2003, 103), and similarly sized examples from 28–31 James Street (Armitage 2004a, 34). A ram horncore recovered from another external surface [10] in Phase 10, may have also derived from one of these workshops. Finally, concerning craft activities, there is a general under representation of cattle horncores throughout the Middle Saxon levels, perhaps indicative of their removal elsewhere. A notable cache of horncores was recovered at the Royal Opera House site within an area which may also have incorporated tanning pits (see Malcolm *et al* 2003, 182–3).

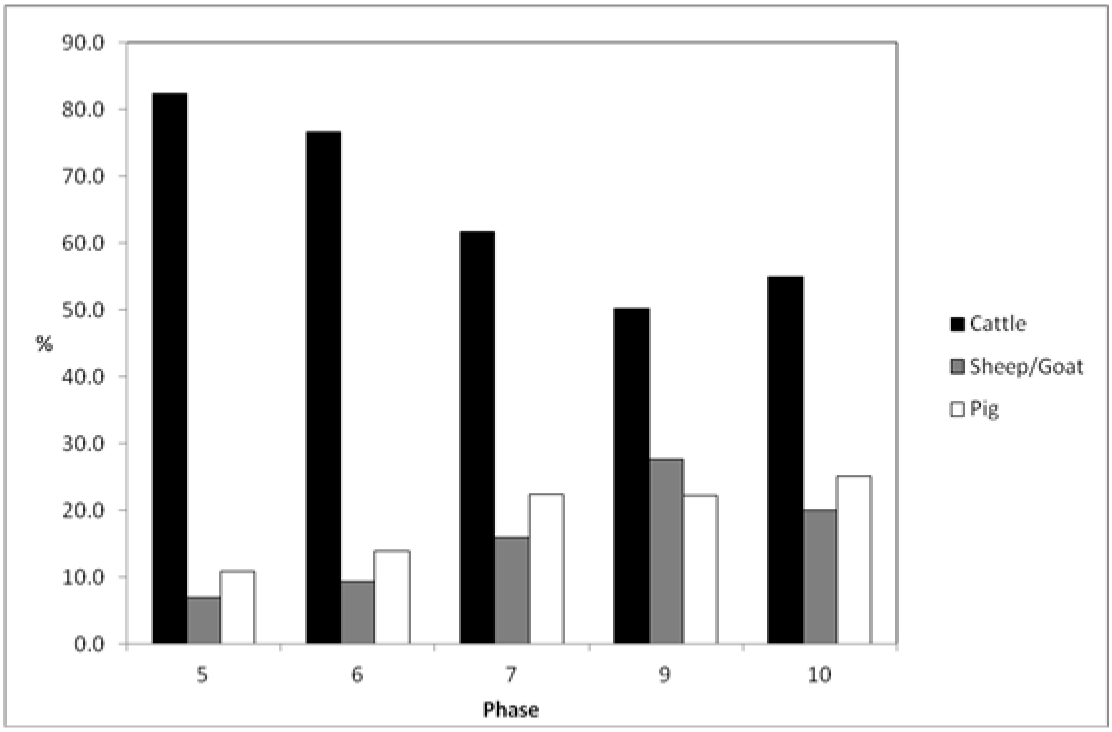

Fig 38. Percentage abundance of major domesticates within the larger phase collections based on Total fragment counts (data taken from Tables 10 and 12)

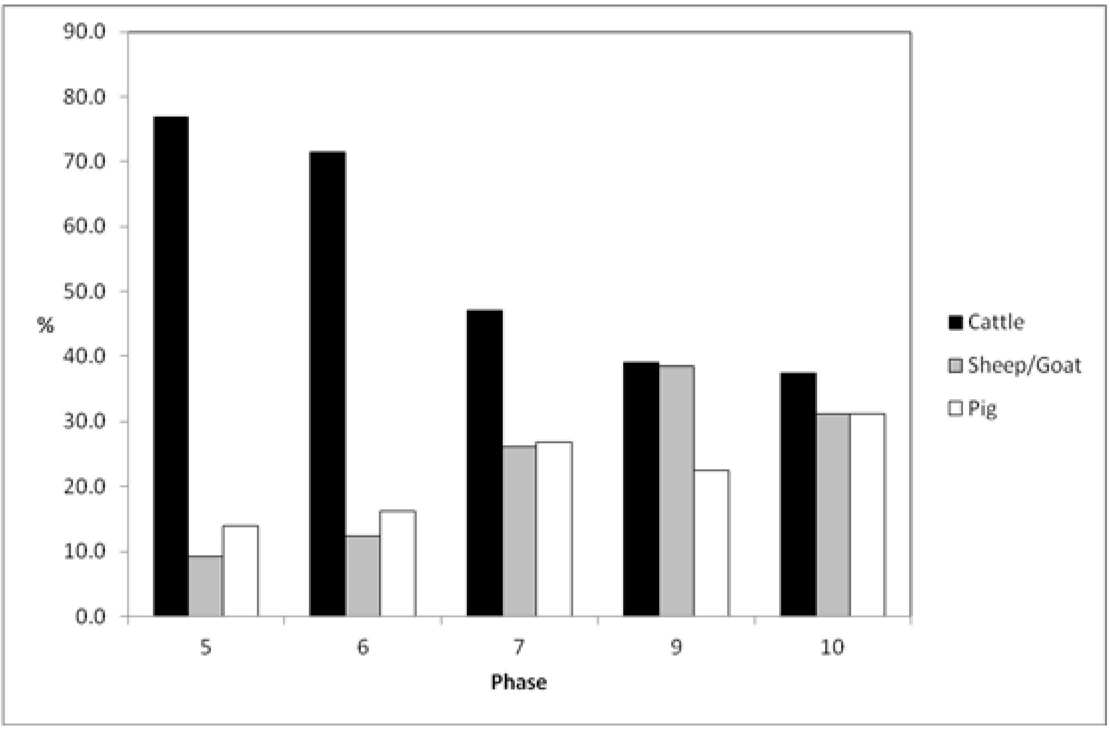

Fig 39. Percentage abundance of major domesticates within the three main Saxon periods, given in centuries AD, where 7th-mid-8th includes Phases 2–6; 8th with Phases 7 and 8; and mid-8th to mid-9th with Phases 9 and 10 (data taken from Table 13)

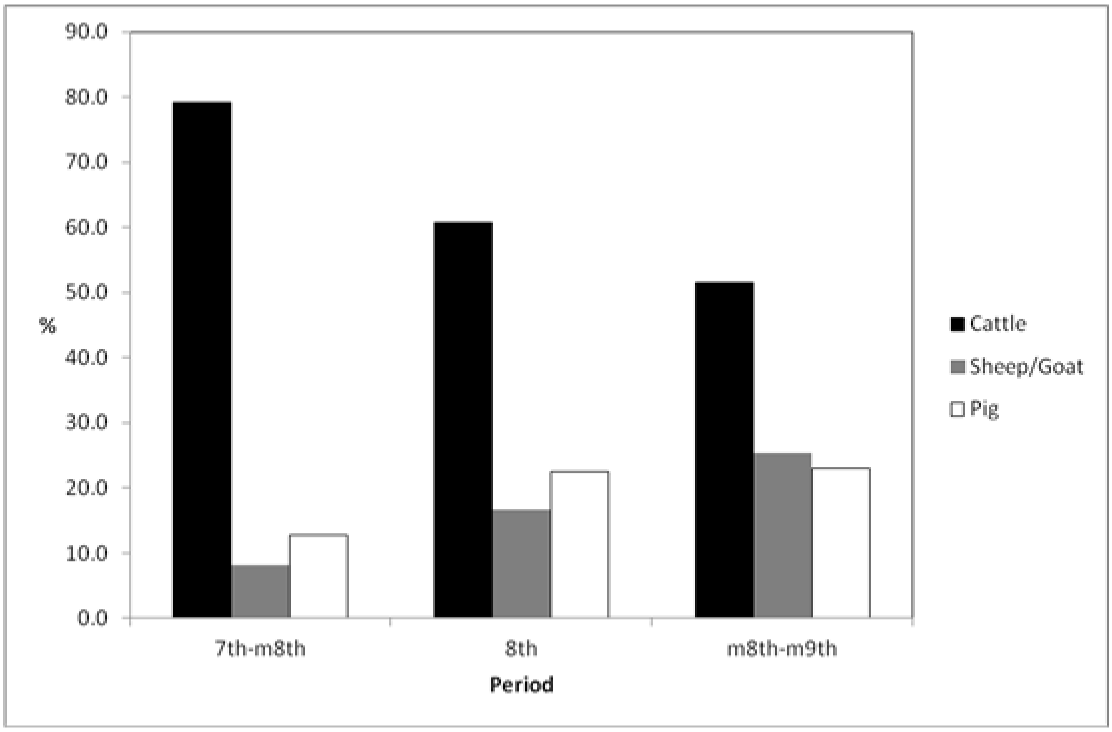

Fig 40. Percentage abundance of major domesticates within the larger phase collections based on Epiphyses Only counts (Data taken from Table 12)

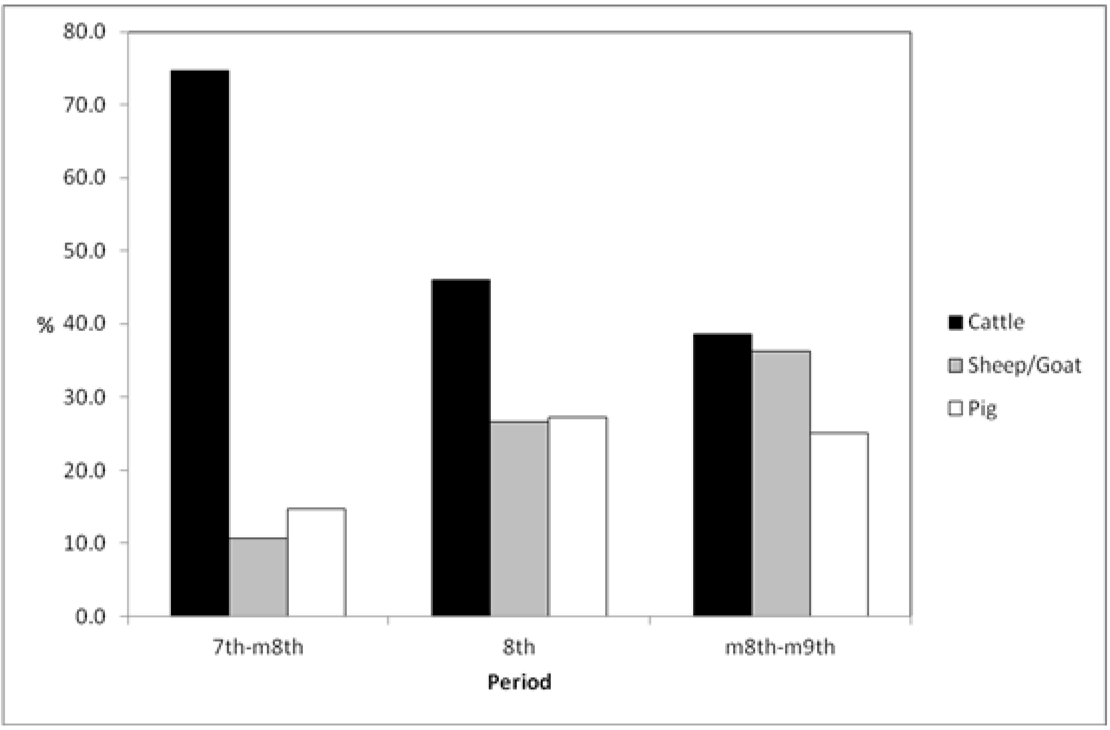

Fig 41. Percentage abundance of major domesticates using Epiphyses Only counts within the three main Saxon periods, given in centuries AD, where 7th–mid-8th includes Phases 2–6; 8th with Phases 7 and 8; and mid-8th to mid-9th with Phases 9 and 10 (data taken from Table 13)

Modifications, Exploitation Practices and Size/Type

Skeletal Representation and Butchery

The faunal material recovered from the site generally consist of mixed collections of food and processing waste with one probable exception. A minimum of three cattle skulls, one nearly complete example, as well the major part of a pig skull, were found within dump layer [153] (Phase 3), amongst a range of other cattle, sheep/goat and pig bones (N=39 with 24 cattle and 4 pig bones). This material could conceivably represent butchers' waste, the concentration of head parts offering a rare insight into the organisation of the local meat redistribution network. The generally mixed nature of the faunal waste present would suggest that the distribution network represented here operated at a rather low level. It can be seen that a more advanced level of organisation operated elsewhere, as shown for example by the large dumps of butchers' waste present throughout the site sequence at the Royal Opera House site (Rielly 2003, 316–7).

Another indication of the redistribution pattern present at the Royal Opera House was the general under representation of cattle horncores, in marked contrast to a large concentration of such skeletal parts recovered from a single pit (Malcolm *et al* 2003, 182–4). The assumption was that horns had been systematically removed from the cattle carcasses for some industrial process, perhaps horn working, and that this concentration represented the waste items from a local workshop. It has been noticed that cattle horncores generally form a very minor component of the cattle collections from many Lundenwic sites, including the present site, the intimation being that they were regularly removed for craft purposes. In addition, and of interest concerning such purposes, this site provided a rather small quantity of red deer antler fragments. This is very unusual for Lundenwic sites (Keily & Blackmore 2012b, 163–5). The small amount of antler present on site suggests that no specialist workshops were operating in those parts of Lundenwic which were producing the waste dumped on site.

Turning to the butchery evidence, it can be seen that there is a plethora of bones with cut marks (Tables 14, 15), the great majority of which were achieved with the use of the cleaver. Indeed, knife marks were rather rare and appear to be most abundant amongst the few cases of bird butchery (Table 14). There are examples of most stages of the butchery process (cattle and to a lesser extent sheep/goat and pig: Table 16) with the exception of slaughter and decapitation. The former would presumably be undertaken either by poleaxing and/or cutting the throat, the identification of the former dependent on the survival of a particular part of the skull and the latter on cut marks observed on the hyoid, although these would not necessarily be associated with slaughter. An example of negative evidence concerning the former process is shown by the relatively complete posterior half of a cattle skull found in the Phase 3, dump [153] (see above). This is sufficiently intact in the frontal area to show that this animal had clearly not been poleaxed.

The next two stages – skinning and dressing (removal of the head and lower limbs, the latter achieved by cutting through or adjacent to the bones of the carpal and tarsal joints) are rather poorly represented. However, it can perhaps be assumed that butchery intended to remove the horncores would also represent part of the skinning process. There are five cases of such butchery (four cattle and one sheep), denoting the use of at least two methods to achieve the removal of this part of the skull. The first involved chopping directly through the base of the horn (the sheep example and one of the Period 1 cattle cases) and the second by chopping obliquely through the bone beneath the horn either from an anterior (cattle Period 1) or lateral (both Period 3 cattle examples) direction thus removing the horncore and part of the nuchal area.

Decapitation cuts appear to be absent although a number of butchery marks interpreted as sectioning, cutting between the atlas and axis (two cattle atlases from Phases 7 and 10 and one cattle axis from Phase 6) or the axis and the third cervical vertebrae (one cattle axis from Phase 5 and two sheep/goat axes in Phase 7) could have achieved this result.

The next stage may well have been to halve the carcass; however it is always possible that sectioning or even dismemberment/jointing could have preceded this major division. Several vertebrae show signs of halving, here using those which were identifiable to species (cattle atlas, axis and sacrum and a pig sacrum) as well as those placed as cattle-size, these more likely representing cattle than horse. There were clearly two methods used to split the carcass, either cutting through the centre of the vertebrae (the axial cuts in Table 16) or, more commonly, slicing along their left or right margins (peripheral cuts). Notably several vertebrae show cuts to both margins, the one perhaps representing halving and the other jointing.

The greater representation of the peripheral method is a typical feature of Middle Saxon butchery in Lundenwic (see Armitage 2004b, 106), in fact extending through to the later medieval period at London sites eventually being overtaken by the axial method during the late medieval/early post-medieval era (PCA and MOLA archives; Rielly in prep a). A number of cattle pelves were also split, the position of the cut suggesting an association with the peripheral rather than the axial method. The aforementioned sectioning (transverse cuts) was clearly visible amongst the cattle-size vertebrae, no doubt related to the creation of broad sections and perhaps individual joints, although no individual vertebrae were found with chops through both the anterior and posterior margins.

Table 14. The frequency of bones with butchery cuts amongst the hand collected phase assemblages, the number of cases being those with cleaver marks and knife cuts (in brackets)

	Phase								
Species	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cattle	3	7	2	35	52(2)	31	1	16	6
Cattle-size	8	2		28(1)	54(2)	44		16	3
Sheep/Goat				2(1)	1	9(1)		4	1(1)
Sheep					1				1
Pig	1	1			1	2		5	1
Sheep-size	1				1	1		3	5
Chicken					(2)				
Goose					(1)	1(1)			(1)

Table 15. The percentage abundance of bones with butchery cuts amongst the hand collected phase assemblages using data from Tables 10 and 14

	Phase								
Species	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cattle	13.0	28.0	15.4	18.3	13.4	10.0	50.0	7.4	6.3
Cattle-size	36.4	14.3		21.0	12.3	7.0		3.8	2.0
Sheep/Goat				20.0	2.1	12.7		3.4	5.9
Sheep					100.0				100.0
Pig	50.0	20.0			1.4	1.8		5.2	2.3
Sheep-size	14.3				1.0	0.8		2.6	14.7
Chicken					25.0				
Goose					5.0	10.0			50.0

Such chops were also observed on two cattle sacrums (both in Phase 7), these cuts most likely related to jointing associated with particular cuts through the pelvis (J and JS, see below and Table 17). This type of cut was also seen on a few cattle and pig skull fragments (Table 16) no doubt associated with a division of this skeletal part to gain access to the brain (although splitting will have achieved the same result) and/or to produce more manageable joints for cooking purposes. A similar aim undoubtedly explains the large number of cattle-size rib butchery (JS), the ribs clearly chopped into at least four sections, as demonstrated by those shaft fragments with cuts at each end (JSx2). Here it can be assumed that these pieces represent joints with meat eaten on the bone.

A further division of the carcass jointing was observed throughout the cattle and much of the sheep and pig dressed skeletons. These included two cases involving the cattle mandibular joint, chopping through the ascending ramus and another through the condyler process, these providing examples of a recurrent theme, whereby jointing was achieved by chopping close to or through the articular surface (J) or through the shaft (JS), as shown in Table 16 and, for cattle, in Table 17. These two methods occurred in approximately equal numbers on the cattle scapula and the pelvis, while J is clearly better represented with each of the other limb bones. A third method is applicable to the scapula (not shown in Table 17) as demonstrated by superficial chop marks on the medial surface (two cases dated to Phase 7), this interpreted as a means to remove the scapula form the ribcage. Transverse chops through the cattle pelvis, as mentioned above, can be equated with sectioning cuts, these occurring through the ilial shaft/blade or, less frequently through the ischial shaft (JS) and then adjacent to or through the acetabulum (J). Examples of such cattle butchery were found throughout the occupation phases. All of these cuts would have facilitated the removal of the hindleg and/or the production of various rump and/or silverside (femoral) joints. There were also a few cases of similar JS butchery (ilial shaft and blade) amongst the sheep (Phases 6, 7 and 8) and

Table 16. A description of the butchery cuts observed on cattle (C), sheep/goat (S/G) and pig (P) bones and see text for explanation of butchery types

Species	**C**			**S/G[P]**		
Period	**1**	**2**	**3**	**1**	**2**	**3**
Butchery						
Skinning						
Skull	1					
Foot bones	1		1			
Rem horncore	2		2			1
Halving						
Vert A	3	3	3			[1]
Vert P	13	7	9			[1]
Vert P2	13	1	1			
Pelvis	6			1		
Dressing	2	1	1		1	1
Sectioning						
Skull	4			[2]		
Vert	11	11	6		2	
Jointing						
Artic J	18	10	6	2	3[1]	1[1]
Shaft JS	12	4	3	1[1]	2	4[3]
Rib JS+JS x2	55+6	26	3			
Splitting						
Skull/Mand	3	1		1[1]		[1]
Longbone	48	10	7		2[1]	
Defleshing						
Skull/Mand	1					
Other	8	2	1			1

Table 17. Distribution of jointing cuts (J and JS) as well as defleshing (DF) and splitting (SP) butchery amongst the cattle limb bone assemblages from each period

Period	**1**				**2**			**3**		
Butchery	**J**	**JS**	**DF**	**SP**	**J**	**JS**	**SP**	**J**	**JS**	**SP**
Part										
Scapula		3		1	3	3			1	
Humerus	4			8	1			2		1
Radius	1			2	2			1		2
Ulna	2									
Pelvis	5	5	1		3	1		2	2	
Femur	3			4	1		1	1		2
Tibia		1					1			
Metacarpus				21			5			2
Metatarsus				9			3			
Metapodial				1						

pig collections (Phases 2 and 9). Examples of J and JS cuts were also observed on a number of other sheep/goat and pig limb bones, generally, unlike cattle, favouring the latter method (Table 16).It was noted that cleaver marks were more prominent than knife marks, perhaps indicative of the level of preservation, with just two cases, referring to the major domesticates, involving major cuts, a sheep calcaneus (dressing) from Phase 7 and a proximal cattle radius (J) from Phase 6. The remainder (see Table 14) can be interpreted as defleshing cuts, these forming a small proportion of a rather minor component of the total number of butchery cuts observed within the domesticate collections. It can perhaps be suggested that defleshing, at least using heavier instruments, was not a major part of the butchery process. So either there was a major use of cooking meat on the bone or defleshing occurred in such a way as to leave few marks on the bone, particularly when the surface condition of the bones was less than perfect.

Finally, there is the rather large quantity of cattle limb bones which have been split, presumably facilitating removal of the marrow. While this butchery was observed on a variety of parts, there is clearly a concentration of split metapodials, largely provided by Phases 5 and 6 (Period 1 and Phase 7 (Period 2), as shown in Table 17. The method used invariably involved an oblique chop through either the proximal or distal end breaking through either on the lateral or medial side anywhere between 25% and 90% of the length of the shaft. Combining the phase collections and limited to those limb bones where the degree of breakage could be observed (here comprising five humerii, four radii, five femurs, 23 metacarpals, 11 metatarsals and one metapodial), 16 were split into halves, 15 were broken to the midshaft, 13 to about the quarter or third shaft and another four were almost completely split leaving an intact proximal or distal end. It is conceivable that those exhibiting the minimum breakage may in fact represent jointing rather than splitting butchery. In this method, as in the others described above, there is no evidence to suggest any clear changes in cattle butchery through time or indeed, though the evidence is much smaller, regarding the sheep/goat or pig butchery.

The few cases of chicken and goose bones with cut marks include knife cuts to the proximal (J – one chicken and two geese) and distal end (DR – one chicken) of a tibia, all dated to Phase 6 apart from one of the geese proximal tibias (Phase 10) and further jointing cuts to two geese proximal tarsometatarsals (one knife and one chop mark and both in Phase 7).

Age and Sex

The analysis of the two main sets of age data, mandibular tooth eruption and wear and the state of fusion of the limb bone articular ends, provided the major domesticate results shown in Table 18 and Figs 42, 43 and 44 respectively. The available data is dominated by the cattle and sheep/goat assemblages and consequently these two species will receive the most attention. Further limitations concern the generally small quantity of data making it necessary to combine the phase assemblages into three chronological periods, which were also used for comparing this faunal assemblage with those recovered from various other Lundenwic excavations (see below). Period 1 corresponds with Phases 2–6 on site (early 7th century AD until the early 8th), Period 2 with Phases 7 and 8 (early to mid-8th century) and Period 3 with Phases 9 and 10 (late 8th century until the mid-9th century), see the narrative text for further details concerning the dating of Phases 2–10, which are slightly different to the above date ranges. Period 1 broadly corresponds with Periods 3 and 4 at the Royal Opera House (ROH), Period 2 with Period 5 at the ROH and Period 3 with Period 6 at the ROH (Cowie *et al* 2012, 14).

Looking first at the cattle age evidence, the mandibles (Table 18) are predominantly from adult individuals in Period 1, a total of 17 (AG5–7 or greater than 2.25yrs) out of 26 (69.2%). There is a notable proportion of young adults (AG5) followed by 5 out of the remaining 7 mandibles in the oldest group (AG7). These last two age groups according to O'Connor (1991, 249) probably represent animals aged up to about four years and then eight to nine years respectively. Amongst the younger age groups, it can be seen that there are similar quantities of late first (AG3) and second year (AG4) individuals. There would appear to be a change by the early to mid-8th century (Period 2) where 45.4% of the mandibles are adults or 53.3% taking account of the sieved data (although note a similarly good representation of young adults), with a possible change to the Period 1 pattern by the late 8th century (Period 3). The Period 1 epiphysis fusion evidence (Fig 42) approximately agrees with the mandible data concerning a good survival of adult individuals (fused intermediate group) and while there is a lesser quantity of adults in Period 2, the reduction does not match that shown by the mandibles. In addition, there is no obvious evidence for the abundance of young adults in Period 1, the data in fact suggesting a major survival of adults into and beyond their fourth year (fused Late group). The lesser proportion of fused Late epiphyses in Period 2 could, however, relate to the notable lack of older mandibles in this period.

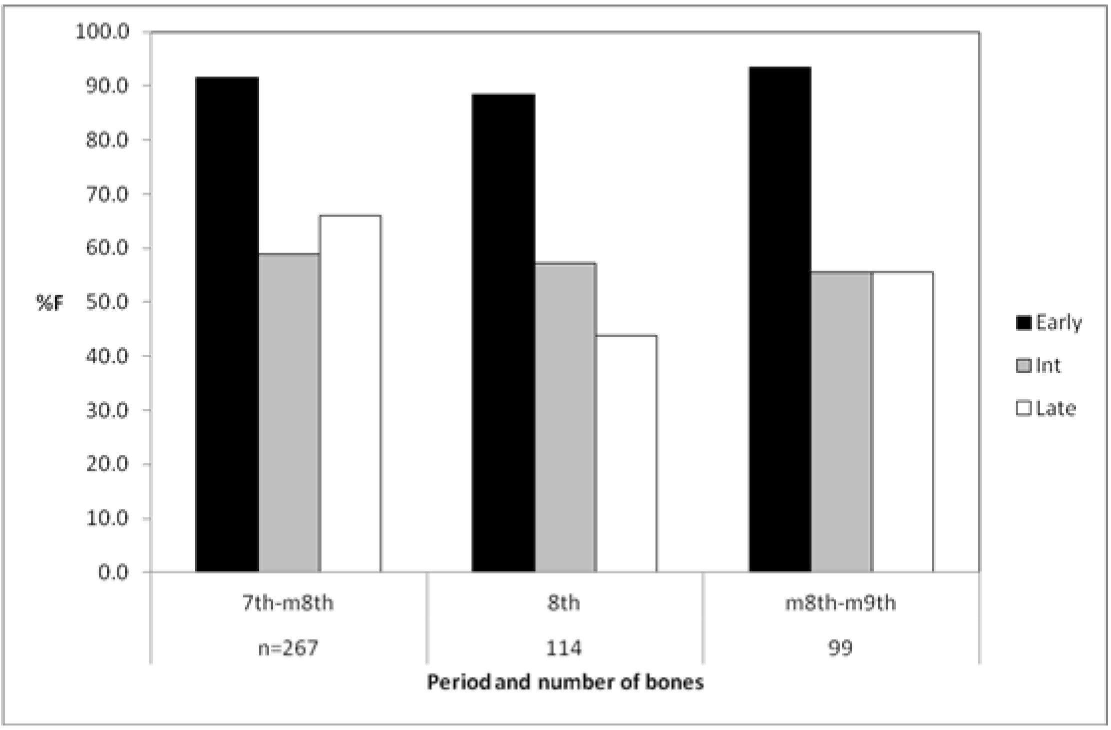

Fig 42. Cattle epiphyses fusion data by period showing the percentage of fused articular ends within the three major age groups (see Methodology) where N is the combined number of bones

Table 18. Age of cattle, sheep/goat and pig mandibles divided into three chronological periods

		AG							
Species	**Period**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All**
Cattle	1			4	4(1)	11	2	5	26(1)
	2				6(1)	4(1)	1(1)	(1)	11(4)
	3			1	1	2	1	1(1)	6(1)
Sheep	1		2		1	1			4
	2				1	1(4)			1(5)
	3		1		(4)	6(3)	3(1)		10(8)
Pig	1				3	3	1		7
	2			1	2				3
	3	(1)		1(4)	(1)	(1)			1(7)

Key: Period 1 (Phases 2–6), early 7th to early 8th century AD; Period 2 (Phases 7 and 8), early to mid-8th century; Period 3 (Phases 9 and 10), late 8th to mid-9th century. AG = age group, defined as follows: 1 – dpm4 unw; 2 – dpm4 w; 3 – M1 w; 4 – M2 w; 5 – M3 w (WS a–f, except pig a–b); 6 – M3 w (WS g–h, except pig = or > c); 7 – M3 w (WS = or > j), where dpm4 = deciduous fourth premolar; M1–M3 = 1st–3rd adult molar; w = worn and unw = unworn; WS = tooth wear state after Grant 1982; numbers in brackets = mandibles from sieved collections.

Table 19. The frequency of infant (I), juvenile (J) and adult (A) bones amongst the cattle, sheep/goat and pig assemblages

		Phase					
Species	**Age**	**5**	**6**	**2–6**	**7**	**9**	**10**
Cattle	I		3	3		1	2
	J	5	11	18	11	5	1
	A	62	136	209	67	59	24
	%A	92.5	90.7	90.9	85.9	90.8	88.9
Sheep/Goat	I		1	1			
	J		6	6	6	6	1
	A	4	6	11	16	32	11
	%A	100.0	46.2	61.1	72.7	84.2	91.7
Pig	I		1	1	1		
	J	1	6	7	7	2	2
	A	6	10	18	18	22	7
	%A	85.7	58.8	69.2	69.2	91.7	77.8

Key: %A is percentage adult based on the total number of I, J and A fragments (see Methodology for a description of the age groups)

Both periods are represented by relatively few first year animals (unfused Early epiphyses – about 10%) and a major proportion of second year animals (the difference between the Early and Intermediate groups – about 30%). This is again different to the mandibular evidence. The same pre-adult pattern continued into the final period, the proportion of adults then following that shown by Period 1, although to a somewhat lesser extent. The combined method is used here to show the representation of the younger age groups with the easily identifiable adult bones acting as a base for comparison. In cattle these are essentially first year animals and the data in Table 19 clearly shows a rather minor abundance compared to the adult component. The few infant bones could be indicative of the import of rather 'choice' meats and/or the keeping/breeding of animals within the settlement. While too old to be 'infant mortalities' they may still represent young calves which had succumbed to disease and would then presumably have been deposited with the other rubbish.

The livestock sex data, based on the pelves, showed a greater abundance of females compared to males in Period 1 (8:2, as shown in Table 20) with insufficient cases for comparative purposes thereafter. The pelves used in this analysis were all fused and thus will include animals aged from about 1–1.5 years (fusion of the pelvis acetabulum), this age group essentially comprising the great majority of the cattle represented in this and subsequent periods. Combining the data from all three periods the female to male ratio from the pelves was 11:4.

It can be supposed from this combined evidence that a large proportion of the cattle brought to this settlement would have provided good quality meat, here referring to the large proportion of pre-adults as well as (the mandibular data) the abundance of young adults (prime beef). However, the large quantity of older cattle strongly suggests a major import of animals initially employed for secondary purposes. There would appear to be no obvious changes in cattle usage through time apart from a suggestion that there was a lesser import of older cattle in Periods 2 and 3 compared to Period 1. While undoubtedly including pre-adult individuals, the aforementioned sex ratio favouring cows over oxen and bulls could indicate that a large proportion of these older cattle were derived from dairy herds.

The first two periods produced rather small quantities of sheep/goat mandible age data, it can be tentatively suggested that Period 1 animals mainly comprised pre-adults, and by Period 2 adults were the main age group represented (principally young adults including the sieved data). A somewhat larger dataset from Period 3 appears to follow the same pattern, although with the sieved data there is also a good proportion of second year animals (AG4). The epiphysis evidence was also slight in Period 1 (Fig 43), here perhaps suggestive of similar proportions of pre-adults and adults, the latter largely culled as young adults. The collections are larger for Periods 2 and 3, though still based on less than 100 fragments, the evidence showing a relatively similar fusion pattern in Period 2 followed by a notable increase in both young and older adults by Period 3. Looking at the incidence of youngsters in relation to adults (Table 19) it can be seen that juveniles formed a major component of the assemblage, though less so in Phases 9 and 10, when there was a larger proportion of adults. It should be noted that there were relatively few bones from very young individuals (infants), although their presence, as with cattle, may be indicative of some local keeping/breeding. The minimal quantity of sex data (Table 20) is indicative of a greater proportion of males compared to females. With Period 3 showing a preponderance of adults, this evidence could reflect the preferential use of wethers, indicative in turn of the importance of wool production over other secondary products (and see Conclusions).

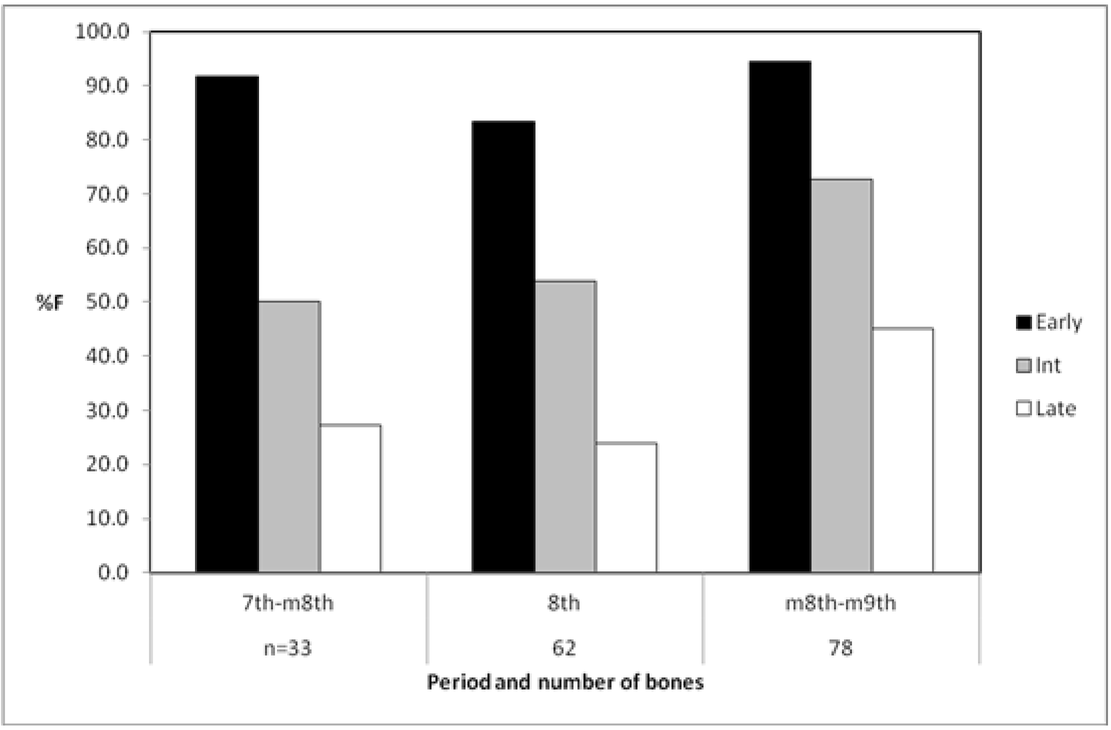

Fig 43. Sheep/Goat epiphyses fusion data by period showing the percentage of fused articular ends within the three major age groups (see Methodology) where N is the combined number of bones

Table 20. The distribution of major domesticate bones which could be sexed (M male and F female)

			Phase					
Species	**Bone**	**Sex**	**3**	**5**	**6**	**7**	**9**	**10**
Cattle	Pelvis	F		5	3	2	1	
		M			2	2		
S/G	Pelvis	F				1	3	
		M		2		5	2	3
Pig	Mandible	F	1		2	1	1	1
		M			2		7	2

Note: cattle and sheep/goat data is based on the shape of that part of the pelvis where the *rectus femoris* is attached and in pigs by the shape and size of the mandibular canine

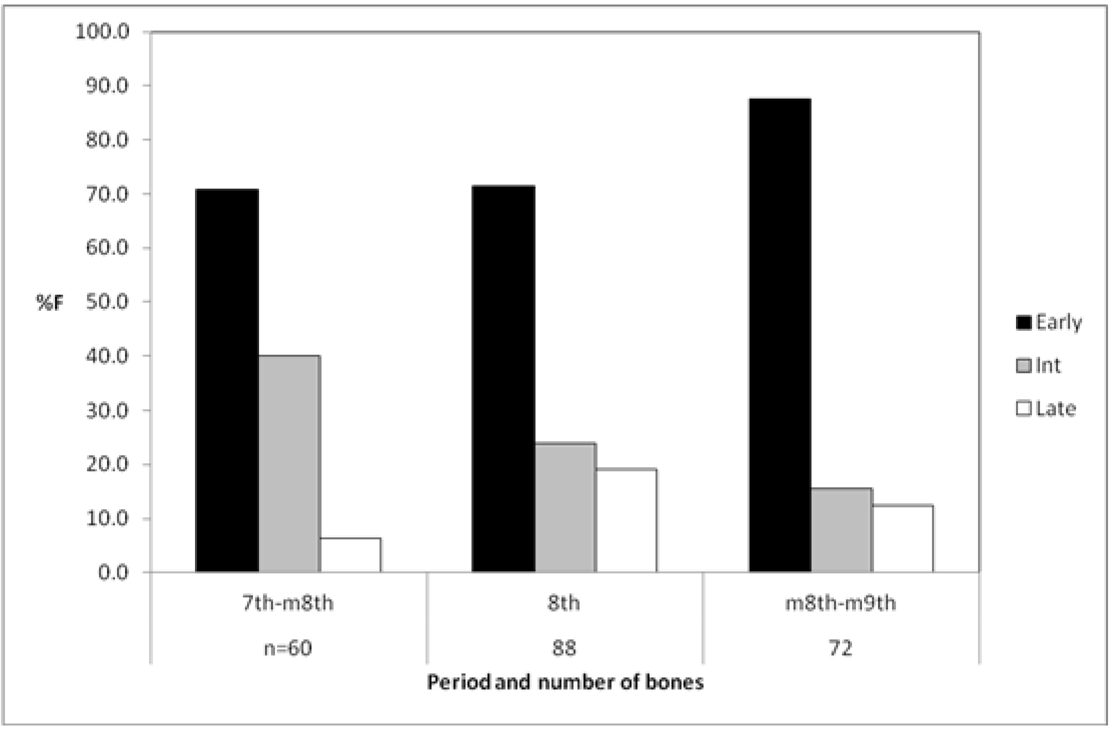

Fig 44. Pig epiphyses fusion data by period showing the percentage of fused articular ends within the three major age groups (see Methodology) where N is the combined number of bones

Quantity is again a problem, when considering the pig age data (both mandibular and epiphyseal) appears to show a declining abundance of adults through time (Table 18; Fig 44). This might be indicative of production, moving away perhaps from the notable proportion of adult baconers shown in Period 1. Of interest is the coincidental increase in second year animals according to the epiphyses evidence, a feature also shown by the apparent rise in adults by Phases 9 and 10 compared to first year animals (I and J) in Table 19). The culling of more males than females in this late period (Table 20) would be expected following the general requirement for rather fewer boars compared to sows in a breeding herd.

The poultry bones almost entirely consisted of the remains of adult birds (fusion of the articular ends of the limb bones), apart from those representing a few juvenile chickens from Periods 1 and 2 (Table 24). Both hens and cockerels were identified amongst the chicken bones, the former from the incidence of medullary bone (with five out of a total of 16 femurs and tibias) and the latter by the presence of the spur on the tarsometatarsus (one example out of one, this from Phase 9). However, with just one tarsometatarsus and also just one carpometacarpus and no head parts present, it could be argued that these bones mainly represent processed birds, perhaps purchased rather than home produced.

Size and Type

There was insufficient evidence to compare the sizes of the domestic livestock across the various phases. However, the various measurements of the three major domesticates do compare favourably with the data available from other Lundenwic sites (Tables 21, 22). Pig represents the sole species amongst these domesticates which could also include wild fauna. Yet the lengths of the two mandibular third adult molars at 30.3 and 31.2mm are clearly well below the generally accepted wild boar equivalent and minimum value of 40mm (Crabtree 1989, 51). Nevertheless, the pigs at this site were relatively large (Table 21), clearly comparable to the Saxon examples found elsewhere, such as at Hamwic (Bourdillon & Coy 1980, 112).

Evidence concerning the 'type' of animals represented is essentially limited to a review of the cattle horncores, using the descriptions given in Armitage and Clutton-Brock (1976), as well as the shape of the nuchal profile (after Grigson 1976). The site produced just four complete horncores and one proximal end, four of which are Short Horned (lengths between 96 and 150mm) or one is just within the Medium Horned category (length 150–200mm, this example at 156mm). This clearly fits the range of sizes noted at other Lundenwic sites (Rielly 2003, 323–4; 2012a, 138–9). While these may represent the principal 'types' of cattle butchered in this settlement, it should be mentioned that there may be a level of under representation of the larger forms. One pit at the Royal Opera House site contained a concentration of cattle horncores, almost of which were examples of the largest cores (24 examples in the Long Horned category with lengths of greater than 200mm compared to just two Short/Medium Horned cases). This material was interpreted as a cache of horn working waste (Malcolm *et al* 2003, 184), the clear size bias is indicative of a selection process. The four complete cores recovered from site included a variety of forms, with one certain bull and perhaps two oxen. One of the latter examples was extensively grooved, a possible castrate indicator (after Luff 1994).

The nuchal profile evidence, consisted of just four skulls (including those with horncores interpreted above as a probable cow as well as two of the oxen) it would appear that all are similar from the dorsal aspect, showing a low double arch. In addition, all displayed a rounded boss (posterior direction), although only slightly rounded in three specimens (including the aforementioned sexed skull fragments) and prominently so in the fourth.

While perhaps not associated with 'type', various congenital anomalies can be used to suggest if the various domesticates were taken from particular herds or flocks. This is obviously assuming that a relatively closed herd structure was in operation without any major transfer/import of animals from further afield. The results for three well documented congenital mandibular anomalies (see for example Johnstone & Albarella 2002, 21) are shown in Table 23, namely the absence of the first and second adult premolars in pigs and cattle respectively, as well as cattle adult third molars missing a third cusp. This table also highlights the presence/absence of the foramen supratrochleare in pig humerii (following Ashdown & Evans 1981, 212). Comparative data from other sites in Lundenwic is not available concerning the cattle anomalies; however, each of these traits is certainly more prevalent here than within contemporary collections from Ipswich (Rielly in prep b). Yet the Ipswich pig mandibles and humerii provided similar results regarding the first adult premolars and the humerus foramen, as indeed did the pig bones from Middle Saxon deposits at the Royal Opera House (data from MOLA archives, site code ROP95).

Table 21. Cattle, sheep/goat (S/G) and pig shoulder heights (calculated using indexes shown in von den Driesch & Boessneck 1974)

Species	Phase	Bones	Range	Mean	N
Cattle	5–9	Mtc+mtt	1056.6–1302.6	1161.5	16
S/G	7–9	Rad+mtc	607.3–639.6	623.1	4
Pig	7–9	Rad, ast+cal	709.8–726.9	718.8	3

Key: mtc = metacarpal; mtt = metatarsal; rad = radius; ast = astragalus; cal = calcaneus; N = the number of bones. All measurements are given in millimetres

Table 22. A selection of cattle, sheep/goat (S/G) and pig measurements following dimensions given in von den Driesch (1976)

Species	Phase	Bone/measurement	Range	Mean	N
Cattle	5–9	Tibia Bd	50.0–63.8	55.9	13
	5–9	Astragalus GLl	59.2–68.3	62.5	13
	5–9	Metacarpus Bd	49.8–66.0	57.1	10
	4–10	Metatarsus Bd	47.3–59.2	50.9	5
S/G	2–10	Tibia Bd	23.3–26.3	25.0	20
Pig	5–7	Tibia Bd	27.2–30.3	29.2	7

Key: GLl = the greatest lateral length; Bd = the maximum breadth at the distal end; N = the number of bones. All measurements are given in millimetres

Table 23. The distribution of congenital anomalies within the cattle and pig collections sorted by period

			Period			
Species	**Skeletal part**	**Anomaly**	**1**	**2**	**3**	**All**
Cattle	Mandible	M3 2 cusps	2	2		4
		N M3	17	6	5	28
		% M3 2 cusps	11.8	33.3	0.0	14.3
		with P2	13	4	2	19
		without P2	2	1		3
		% without P2	13.3	20	0.0	13.6
Pig	Mandible	with P1	3		2	5
		without P1	1	1	1	3
		% without P1	25	100	33.3	37.5
Pig	Humerus	with FS	3	5	4	12
		without FS			3	3
		% without FS	0.0	0.0	42.8	20

Key: the mandibular teeth P1, P2 and M3 are the first and second adult premolar and the third adult molar respectively, while FS is the foramen supratrochleare, this situated just proximal to the distal end of the humerus

Table 24. Age and sex of poultry species showing hand collected and sieved totals (in brackets)

		Period		
Species	**Age/Sex**	**1**	**2**	**3**
Chicken	A	7(3)	12(14)	10(11)
	J	3	1	
	MB	1	2	2
	No MB	3	4	4
Goose	A	18(1)	16(10)	6(8)
Mallard	A	2	(1)	

Key: Period 1 (Phases 2–6) early 7th–early 8th century AD; Period 2 (Phases 7, 8) early–mid-8th century; Period 3 (Phases 9, 10) late 8th–mid-9th century. A = adult (fused) and J = juvenile (unfused limb bones), with the sex data limited to the presence and absence of medullary bone (MB) within the chicken femurs and tibias

Pathology

There were a small number of pathological specimens, mostly associated with mandibles but also present in a variety of other skeletal parts. Two sheep/goat mandibles displayed a marked level of malocclusion between the adult fourth premolar and first molar (Phase 7) and between the deciduous third and fourth premolar (Phase 8), these indicative of crowding. In addition, a cattle mandible from Phase 9 exhibited extensive alveolar depression on both the lateral and medial sides alongside the adult fourth premolar and first molar showing advanced gum disease. Lastly, two adult cattle mandibles exhibited modifications to the surface of the condyler process (at the tempero-mandibular joint), one with a series of localised perforations (Phase 9) and the other with a series of deep lesions (Phase 7), both possibly associated with joint disease. The latter cause would also explain the notable degree of eburnation or polishing to the proximal and medio-posterior parts of a cattle femoral head (caput) dated to Phase 5. Though there are no obvious signs of exotoses (boney growths) or indeed of pitting adjacent to or on the articular surface respectively, it may be assumed that this individual was suffering from osteoarthritis (Baker & Brothwell 1980, 115). Severe bony growths were present at the distal end (both lateral and medial sides) of a sheep/goat first phalange (Phase 9), again suggestive of some form of joint disease or conversely the result of a 'crush' trauma. Further lesions were noticed on the proximal articular surface of a cattle metatarsus (Phase 6). Finally, there were two cases of clear traumatic injury, a partial fracture at the lateral end of the transverse process of a cattle-size lumbar vertebra (Phase 6) and another fracture resulting in the formation of a large callus at the midshaft of a sheep-size rib (Phase 7).

Conclusions

This assemblage is an important addition to the corpus of faunal material so far recovered from Lundenwic (see Rielly 2012a; Cowie *et al* 2012, 313–26). One important aspect of this faunal assemblage is its location. In this respect it is unique, being the only major Middle Saxon collection derived from a site to the south of the Strand and west of Aldwych, *ie* at or near the riverside. In complete contrast a number of substantial Middle Saxon assemblages have been found to the north of the Strand. These sites provide comparative data with which to attempt an interpretation of the faunal evidence from site. Comparative features include the rather limited range of food species, the collections here as elsewhere in Lundenwic were almost entirely composed of bones of cattle, sheep/goats and pigs.

A similar lack of diversity at other Middle Saxon emporia has been explained in terms of a dependency of artisan based communities on the redistribution of food renders made to their regional king or chief (O'Connor 1991, 276–7; 2001; Saunders 2001, 12–3; based on Hodges 1982). Contributory factors to this argument include a possible filtering effect whereby the choice cuts of meat were allocated to the social elite, which may have also reduced the range of species, as well as the relative absence of species such as chickens which could have quite easily have been kept in an urban environment. There were indeed very few chicken bones present at this site while only a small quantity of deer remains were recovered, the vast majority of which were antler pieces, which should be interpreted as manufacturing rather than food waste. However, the small cetacean (most likely porpoise) vertebra may argue against the aforementioned 'filtering' process. While this is just a single skeletal fragment it is nonetheless significant as such species may well have been designated a special status. Late Saxon kings seem to have possessed a legal claim to anything including fish washed up by the sea, since occasionally they appear to have conferred these rights upon others (Hagen 2006, 165). So while this right may have included stranded cetaceans, it is not certain if this practice extended back to the Middle Saxon period, but certainly later on these animals were designated as 'royal fish' (Gardiner 1997, 177–9). An English law code dating to *c.AD* 1000 listed 'salt whale' (*craspois*) as one of the imported commodities on which tolls were payable at London Bridge (Hagen 2006, 157). Small cetaceans, identified as bottlenose dolphins, were a major component of the bone assemblage recovered from the high status Middle to Late Saxon settlement of Flixborough on the Humber estuary (Dobney *et al* 2007, 199–211). To date the Adelphi Building find represents the fourth cetacean bone found in Lundenwic; previous discoveries include a vertebrae from a small-sized whale from the Royal Opera House dated to Period 2 (Malcolm *et al* 2003, 87), and two bones from 55–57 Drury Lane, consisting of a vertebrae and a possible skull fragment, possibly derived from the same individual, dating to Period 3 (Cowie *et al* 2012, 142).

Within Lundenwic it is clear that over time there were significant changes within the meat supply, which are suggestive of a move from a tribute based system to a more complex one. The following discussion of these changes is based on the comparison of the Adelphi Building with 13 other Middle Saxon Lundenwic sites listed in Table 25. It should be mentioned that some significant faunal assemblages including those from Maiden Lane (West 1988) and Bedfordbury (Rackham & West 1989) have been omitted. These omissions are due to the difficulty of assigning this material to the three chronological Periods defined earlier.[4]

The domesticate faunal abundance results from these 14 sites arranged on a chronological basis are shown in Figures 45–7. While there is undoubtedly some variation, this evidence essentially demonstrates that cattle are particularly well represented in Period 1. However, while cattle were still the predominant species in Period 2, their dominance was declining. By Period 3, the amount of cattle present had suffered a major decline, which coincided with a significant rise in the number of sheep/goats present. Pig abundance remained relatively constant, generally second place to cattle in Period 1, but by Period 3 it had largely been relegated to third place. There are no obvious changes to the exploitation pattern of either cattle or pigs during Periods 1 to 3. The cattle data shows a mix of pre-adults and adults, while the pigs show a continuing usage of pre-adults and young adults, different in this respect to the perceived intensification of production noticed at the Adelphi Building by Period 3. Cattle appear to have mainly consisted of cows (Rielly 2003, 322; 2012a, 135), according to the pelvis evidence as here, as well as the use of particular distal metacarpal measurements (after Thomas 1988). As the latter specifically refers to adult individuals it can be assumed that a major proportion of these animals derived from dairy herds.

The sheep assemblage, however, suggest a significant change with a notable increase by Period 3 in the proportion of adults and especially older adults coinciding with a notable predominance of males (*ibid*), this perhaps indicative of the use of surplus animals from wool producing wether flocks. The evidence concerning changes in sheep abundance and usage may well be associated with contemporary activity showing an intensification of textile production at the Royal Opera House (Malcolm *et al* 2003, 168–70). The increased presence of sheep also coincides with the establishment of a number of possible 'farmsteads' or production centres at the periphery of Lundenwic, chiefly in the south-west at The National Portrait Gallery and National Gallery (sites 11, 12 and 13). Each of these sites provided relatively large quantities of bones from very young cattle and sheep, which is suggestive of production.

Perhaps these 'farmsteads' supplied the residents of Lundenwic with at least a proportion of their food. This trend represents a change from a purely tribute based system of food supply, although it should be stated that some livestock production by this time was taking place within Lundenwic. For instance, there was a 'piggery' at the Royal Opera House (Malcolm *et al* 2003, 65, 103). It is perhaps of interest that the faunal assemblage from the other notable Period 3 peripheral sites, at Hare and Church Court (see above), did not show any obvious 'production' traits (Fig 47).

In conclusion the faunal evidence for animal usage at this site reflects a general trend observed throughout Middle Saxon Lundenwic for a limited range of food species. This was typically cattle based, but there was a notable increase in sheep and a lessening of pig usage by the 9th century. The age and sex evidence at this site as elsewhere is suggestive of increased wool production amongst those outlets providing this settlement with its meat; perhaps this trend marked a significant step in the woollen industry becoming a major component of the English economy, which it was by the late 12th century (Postan 1972, 213–4). It has been argued that the faunal diversity pattern observed in Lundenwic was related to a tribute system of food renders, a system which may have changed during the final years of the settlement. However, there is contributory data indicative of some supplementary sources of food supply throughout the duration of Lundenwic, which latterly may have helped create a proto-market exchange system (Sykes 2006, 64).

Table 25. List of Lundenwic Middle Saxon sites

Site no.	**Site name**	**N**	**Ref**
1	Adelphi Building	1,866	
2	2-26 Shorts Gardens	2,876	Rielly (2012a, 147)
3	55-57 Drury Lane	1,153	Rielly (ibid)
4	68 Long Acre	1,299	Rielly (ibid)
5	Bruce House, 1 Kemble Street	1,917	Rielly (ibid)
6	Royal Opera House	6,081	Rielly (2003, 320)
7	London Transport Museum	4,393	Rielly (2012, 150)
8	27 James Street	315	Rielly (2012b)
9	28-31 James Street	1,708	Armitage (2001; 2004a)
10	26-27 Southampton Street	5,012	Rielly (2012a, 147)
11	National Gallery Basement	1,606	Rackham and West (1989)
12	National Gallery extension	462	Rackham and West (ibid)
13	National Portrait Gallery	1,164	Armitage (2004b; Armitage pers comm)
14	Church Court and Hare Court	476	Bendrey (2005, 64)

Key: N is the total number of hand collected cattle, sheep/goat and pig bones corresponding to Periods 1, 2 and 3

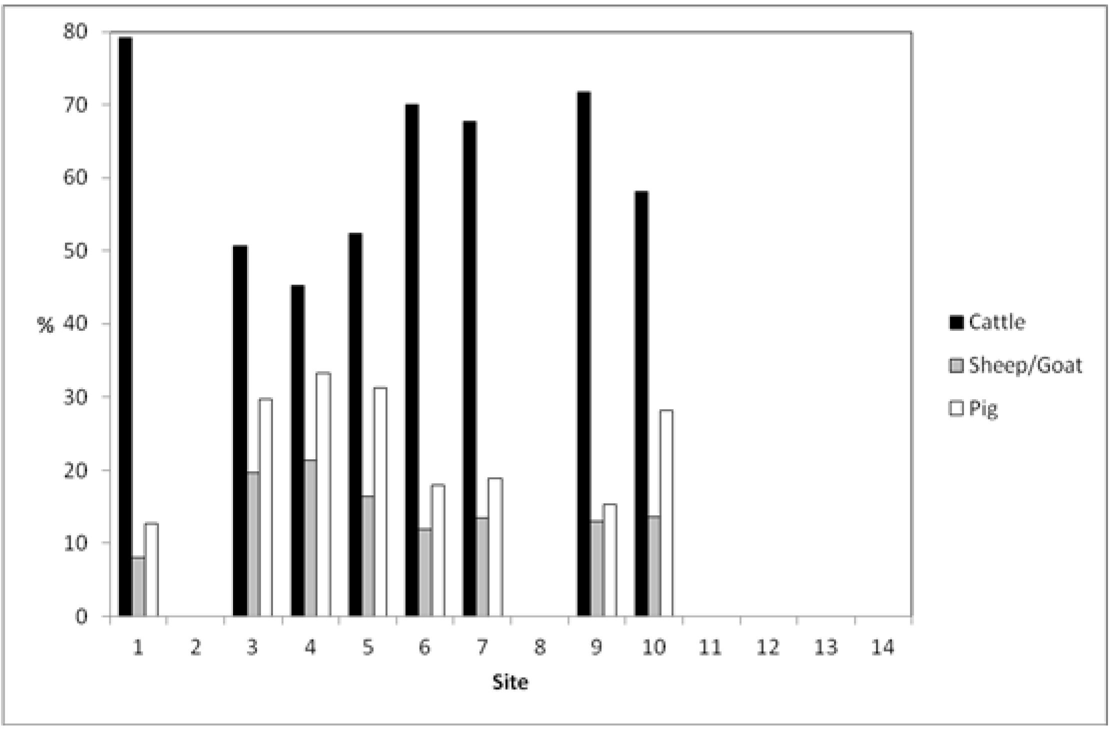

Fig 45. The percentage abundance of cattle, sheep/goat and pig based on Total fragment counts taken from late 7th- to mid-8th-century deposits (Period 1) within a selection of Middle Saxon sites from Lundenwic, (see Table 16 for sites used)

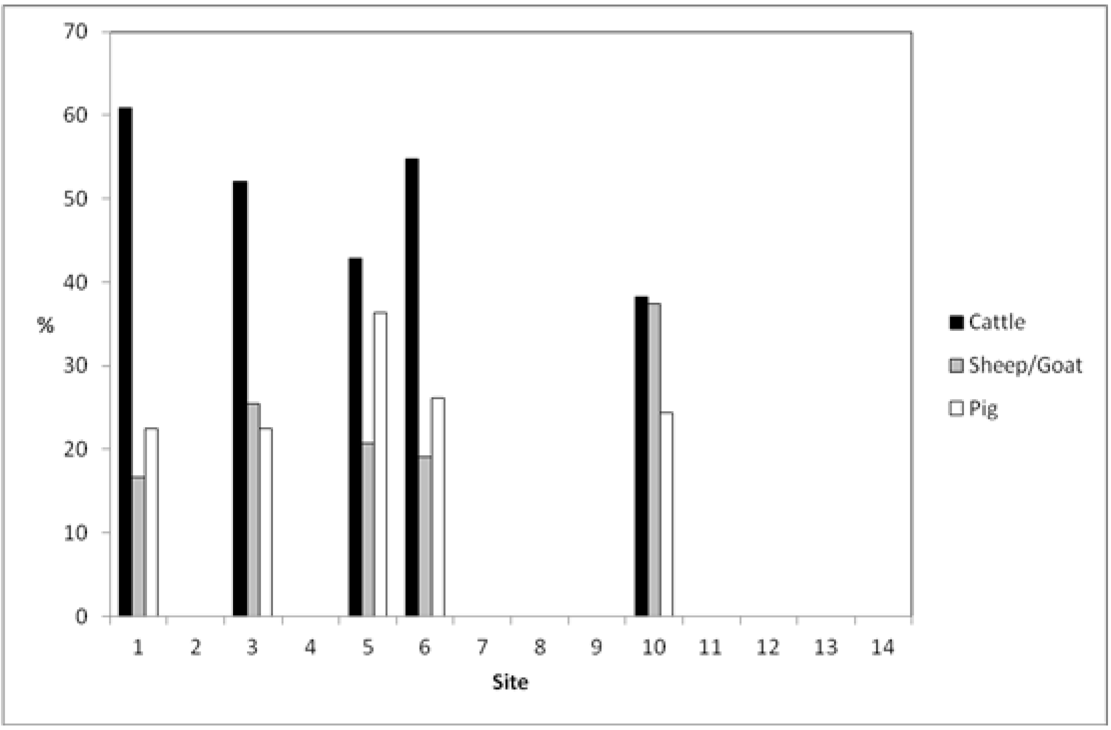

Fig 46. The percentage abundance of cattle, sheep/goat and pig based on Total fragment counts taken from 8th-century deposits (Period 2) within a selection of Middle Saxon sites from Lundenwic (see Table 16 for sites used)

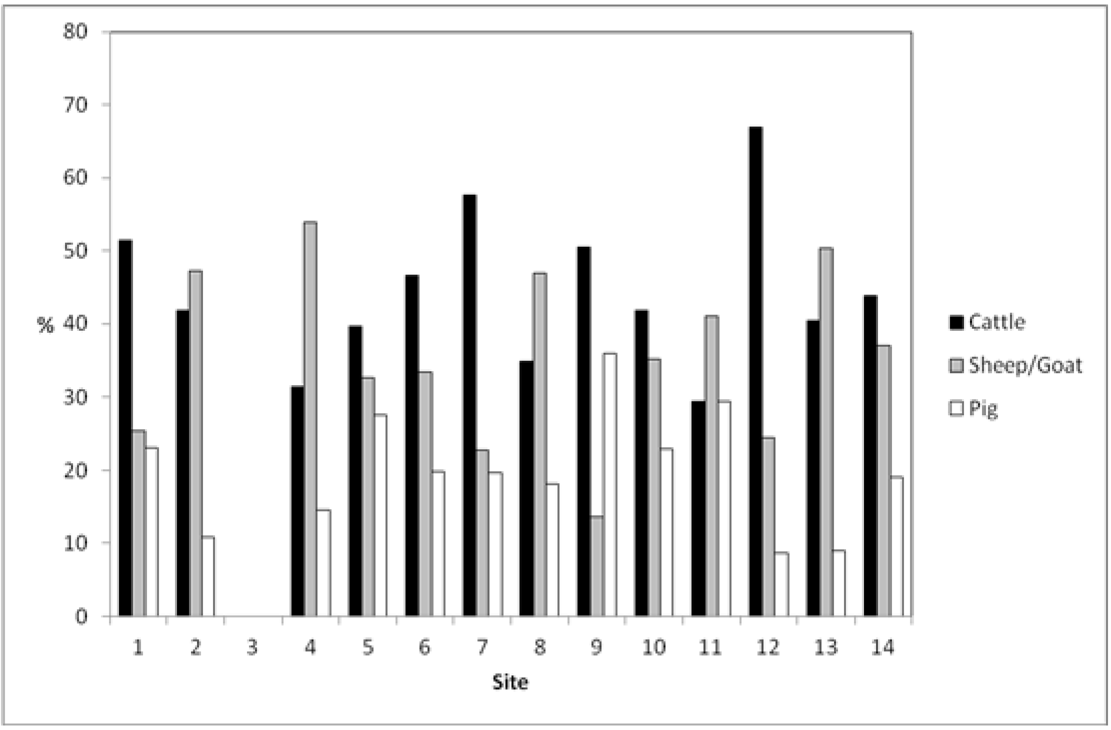

Fig 47. The percentage abundance of cattle, sheep/goat and pig based on Total fragment counts taken from late 8th- to mid-9th-century deposits (Period 3) within a selection of Middle Saxon sites from Lundenwic (see Table 16 for sites used)

THE FISH BONES

Philip L. Armitage

Introduction

Methodology

Over 60 fish bone elements/fragments from sieved samples were examined under low power (10X magnification) using a Motic binocular microscope. Identifications were made using the author's comparative collections and with reference to Lepiksaar (1994), Radu (2005) and Wouters *et al* (2007). Where individual species could not be determined in certain of the smaller *gadidae* (cod family) bones, these were categorised as 'small gadids', which probably comprised mostly immature cod. Similarly, the category 'plaice/ flounder' was applied for recording purposes when the precise species identification was uncertain for bones belonging to these two flatfishes.

Results

Of the 60 specimens examined, 40 (66.7% of the total) were identified to species and anatomy (part skeleton). The overall state of preservation of the fish bones was fair to good. There was no evidence of burning among the specimens submitted and only a single element, a salmon vertebra from a Phase 7 deposit [39], exhibited signs of tertiary butchery in the form of knife cut marks, probably made during consumption (cutting off the flesh from the bone).

Table 26 provides summarised counts of the numbers of identified specimens present (nisp) for each species represented, grouped in Phases 7, 9 and 10. Vertebrae comprised 92.5% of the overall total number of identified specimens, the three non-vertebrae elements were represented by a freshwater eel cleithrum, a pike dentary and a pike palantine bone. The total length of the freshwater eel represented by the cleithrum is estimated at 37cm (after Libois *et al* 1987); indicating it was an immature specimen (mature eels are over 40cm long – Newdick 1979, 88).

For such a relatively limited quantity of bones, there was a wide range of fish species represented. In numerical terms the major species are twait shad and flatfish (plaice/flounder). Although tench also appears to be a major component in Phase 9, the five vertebrae from the midden deposit [61] are probably derived from a single fish.

Interpretation and Discussion

Fish bones were identified from deposits assigned to Phases 7, 9 and 10 and each of these collections represent domestic dumps (kitchen/table waste), which confirm that the inhabitants of Lundenwic had access to a variety of freshwater, estuarine and

Table 26. Numbers of identified fish bones from each phase

Species	Phase 7	Phase 9	Phase 10
Marine			
Herring	2	2	
Flatfish (plaice/flounder)	3	3	1
Small flatfish (sp indet)		1	1
Subtotal	**5**	**6**	**2**
Migratory & estuarine			
Freshwater eel	1	2	1
Twaite shad		7	3
Flounder		1	2
Salmon	1		
Subtotal	**2**	**10**	**6**
Freshwater			
Pike	2	1	
Roach	1		
Tench		5	
Subtotal	**3**	**6**	**0**
Overall identified totals	**10**	**22**	**8**
Unidentified vert/spines	**3**	**17**	**0**

marine species. These assemblages add further support to the growing evidence that fish such as freshwater eels, twait shad, cyprinids and herring were regular items in the diet of the inhabitants of Lundenwic, contrary to the view that, in general, only a few fish were occasionally eaten by inhabitants of Middle Saxon *wics*, who instead relied primarily on the three main livestock taxa (cattle, sheep and pigs) for their food supply (O'Connor 2013, 4). This view is certainly challenged by the discovery of quantities of fish bones discovered at Maiden Lane (Locker 1988) and the presence of an estimated 30,000 fish bones recovered from 12 pits at the Lyceum site (Rackham & Snelling 2004, 64–5).

As at the other Lundenwic sites investigated to date, the presence of flounder, plaice and herring at the Adelphi Building site provides further confirmation that this Middle Saxon settlement traded with fisheries operating in the lower/outer estuary of the Thames. Twait shad may also have come from these same estuarine fisheries or caught locally in the Lundenwic reaches of the Thames, as historic records indicate that before the 19th century this migratory marine species was found in great abundance in the Thames as far upriver as Putney Bridge (Wheeler 1979, 143). Today the species is a rarity in the Thames. Eels and cyprinids are likely to have been caught in local freshwater rivers.

CHARCOAL ANALYSIS

Philip J Austin

Introduction

This report summarises the findings arising out of the charcoal assessment undertaken by Quaternary Scientific (QUEST) at the University of Reading of material recovered from the Adelphi Building. An environmental archaeological assessment of column and bulk samples was carried out by QUEST in 2015 (Young *et al* 2015; see below report), incorporating lithostratigraphic analysis and assessment of the palaeoecological remains (pollen, diatoms, plant/wood remains, charcoal and insects). This report concluded that further charcoal analysis was warranted.

Analysis of wood charcoal macro-remains is an effective means of recovering detailed information about past human interactions with trees and shrubs and their contemporary local ecosystems. The process of charcoalification, typically referred to as 'charring', transforms highly perishable wood into a significantly more robust material, charcoal, that is far less likely to disappear from the archaeological record, whilst also preserving wood anatomical features required for identification. Living trees and shrubs, and the products derived from them, for example timber, fuel-wood, fruits, nuts, and fibres, are key elements in maintaining the well-being of human communities. Identifying the type of woodland present provides direct evidence of which species were exploited, how they may have been exploited, and the probable ecological characteristics of the source environment(s) (Asouti & Austin 2005).

Aims and objectives

Charcoal analysis was undertaken on 10 samples recovered from Middle Saxon contexts from Phases 7 (4 samples), 8 (1 sample), 9 (3 samples) and 10 (2 samples) dating from the early 8th century AD until the final quarter of the 8th or possibly the early 9th century (see site narrative). The charcoal remains, recovered from contexts variously described as middens, dumps, layers, and rubbish pit fills, are probably largely derived from heath rake-out or fuel-wood that was collected along with other domestic rubbish before being dumped at the waterfront. The aim of the analysis was to provide direct evidence of contemporary local vegetation and modes of wood exploitation.

Methods

The charcoal investigated here was recovered through standard flotation methods. The analysis of the wood charcoal followed standard procedures as described in Hather (2000). Up to 100 fragments from each sample were examined (including x10 fragments per sample examined during assessment) under an incident light microscope at magnifications of up to x200. In the UK, 100 charcoal fragments is the optimum quantity for recovering an accurate representation of the full range of taxa present in a context (Keepax 1988). For the two samples containing fewer than 100 fragments, [96] <38> and [7] <1>, 100% of each sample was analysed (65 and 89 fragments respectively). Nomenclature follows Stace (2010).

To gain some sense of the abundance of the species represented in the assemblage and in individual contexts, quantification of the charcoal remains was undertaken by recording absolute fragment count and weight (g) for each taxon in each sample. During analysis the degree of thermal degradation was recorded, as was any evidence of biodegradation, specifically fungal hyphae and insect holes, tunnels, or frass. Seasonal growth ring quantity and characteristics were noted. Growth rings provide evidence of variation in growth rates, marked by ring width and early/late wood ratios, and the probable form of the pre-charred wood (twig, stem, branch, or root). Ring counts, whilst typically incomplete, can indicate a minimum age and an indication of the relative maturity of the wood. In instances when the pith or inner-most wood or outer-most wood or bark is present, an absolute age, or even last moment of growth (season of felling), may be determined.

Results and Interpretation of the Charcoal Analysis

A total of 954 fragments were examined, of which 119 fragments were not identified. This figure includes 40 non-wood fragments, a single nutshell fragment (*cf Corylus*), and 79 fragments of indeterminate diffuse porous hardwoods (angiosperms) and bark. A summary of the results, inclusive of data from the assessment, is presented in Table 27. This table also shows the ranking of taxa according to weight, fragment count, and ubiquity by phase and for the assemblage as a whole. Full results for each sample are listed in Table 28.

Of the 12 species of trees and shrubs identified 11 are native to England (Table 27). Scots Pine is native to Scotland (ssp *Scotia*) and has been widely re-introduced throughout England, from Scottish and European stock, where it is now fully naturalised. Scots Pine is the only softwood (gymnosperm) identified in this study. The remaining identified species are all hardwoods. Determining the identity of the woods was possible in most instances to much the same level as that of uncharred wood. It is not possible to differentiate between the two native species of oak. Nor is it possible to differentiate on the basis of wood anatomy between the Amygdaloideae (formerly Maloideae, Table 27) a sub-family of the Rosaceae, which includes hawthorns, whitebeams, service tree, apple, and pear. The wood of the willows and poplars cannot be anatomically differentiated with certainty, though the high occurrence of mostly heterogeneous rays suggests that the majority of willow/poplar fragments are probably derived from willow species. Due to the incompleteness of diagnostic features (*ie* the bars of sclariform perforation plates), a fragment of Betulaceae could not be differentiated other than excluding hornbeam (*Carpinus* sp), as a possibility because it has simple perforation plates. Woods deemed 'indeterminate' (excluding bark fragments) typically lacked key diagnostic features, particularly in transverse section (TS) of the smaller fragments, or diagnostic features were grotesquely distorted, through growth variations or radial splitting, or features were obscured by heavy mineral deposition. Mineral deposits were present to some degree in almost every fragment, having accrued over the centuries following burial. Whilst mineral deposits within fragments were occasionally heavy, in most instances mineral accumulation was more or less confined to vessel elements rather than embedded throughout the wood structure.

Fungal hyphae were present in some fragments from each phase but, where present, fungal attack was not in any way extensive and none of the fragments could be considered to be in either a moderate or advanced state of decay. Similarly, evidence of insect attack was also negligible. In the entire assemblage conspicuous frass deposits and/or invertebrate boreholes were observed in only a single fragment, a fragment of hazel wood recovered from a Phase 7 midden deposit [34] <15>.

Growth ring curvature, growth ring width, and ring densities, along with the presence of features such as tyloses, indicate that the wood recovered from each of the contexts and phases studied represent eclectic mixes of slow grown mature timbers, fast grown branch wood, stem and branch wood of modest growth rate, and some twig wood. A fragment of oak root wood was inconclusively identified from context [10], <3>, Phase 10. The presence of bark fragments suggests that some of the wood was almost certainly unconverted round wood.

Thermal degradation of most fragments was within a range more associated with non-industrial processes. Incidences of acute thermal degradation, indicated by part or full vitrification of structural elements, was uncommon and not associated with any specific taxon, sample, or context type.

Without doubt oak was the most abundant wood represented in the assemblage. Oak accounted for around half (420) of the total number of all identified fragments (835). Oak was also the most dominant taxon by weight, accounting for 80.371g of the assemblage total of 168.415g. Hazel was the next most abundant taxon in the assemblage (212 fragments; 38.457g). Both oak and hazel are present in all 10 samples examined and are thus also the most abundant taxa in terms of ubiquity.

Whilst significantly less abundant than either oak or hazel, field maple (46 fragments, 11.512g), willow/poplar (41 fragments, 7.942g), are well represented, being present in 8 of the 10 samples. Alder, present in 6 samples (39 fragments, 7.866g) is also fairly well represented, as is the sub-family Amygdaloideae (23 fragments, 2.592g), which is present in 5 samples.

The remaining 5 taxa, beech, purging buckthorn, ash, scots pine, and Betulaceae, are minor components of the assemblage. By phase, oak was the most abundant taxon by far in Phases 7, 9 and 10, whereas in Phase 8 hazel was the most common wood by fragment count (29) (8.640g) and weight. Oak was the second most abundant wood by fragment count (20) and weight (4.217g) in this phase.

Discussion and Conclusions

The analysis of the wood charcoal from the Adelphi Building provides clear evidence of the various woods available to and used by the people living and working within the area during the Middle Saxon period (Phases 7–10: dating from the early 8th century AD until the final quarter of the 8th or possibly the early 9th century). The nature of the deposits, middens and dumped fire debris, provide a broad overview of the woods used at the site rather than a detailed account of woods used for specific events or purposes over much shorter periods of time; for example, the selective use of fuel-woods in a particular domestic hearth. None of the charcoal was recovered from the location where it was created, with one possible exception.

Charcoal from sample [34], <15>, Phase 8, is associated with the only building recorded during excavation, a domestic structure of uncertain function, which had burnt down. It is possible therefore, but not certain, that some of the charcoal in this sample may have derived from this building and/or its contents. Whilst it is feasible that some of the woods represented in other phases were also incidentally charred in a conflagration, and may have been structural timbers, furniture or artefacts, it remains uncertain what the majority of woods identified were used for or how they came to be charred. However, the fact that these samples are charred and were found in association with debris from domestic activities, including food preparation and consumption, strongly suggests that much of the wood recovered was used as fuel on domestic hearths and certainly many of the taxa identified are good fuel woods.

Daily demand for wood to fuel domestic hearths and bread ovens would have been considerable, as would the requirements of industrial activities. As in Roman London, it would have been necessary to import fuel-wood and timber from the surrounding hinterlands to fulfil demand. Large quantities of trees or shrubs are unlikely to have grown in the immediate vicinity of the site. Any trees present locally may have been valued for their amenity value, cultural attributes, or produce (*eg* fruit), rather than as a source of timber or fuel-wood. Whilst most of the wood present is believed to reflect fuel use, some of the charcoal may have derived from artefacts rather than from structural or fuel use. This might be the case for the woods represented in low quantities, such as beech, pine and buckthorn. Some of the oak fragments derived from large timbers and would have been suitable for structural purposes. From early prehistory onwards hazel, and willow, has been commonly used to construct hurdles, and in wattle and daub constructions. It is possible that the presence of the charcoal of these woods reflect such use.

Wooded Environments

The range of taxa identified reflect various habitat types and can be roughly divided into trees of wetland and riverine habitats, trees of dry neutral-alkaline soils, and trees tolerant of a broad range of edaphic conditions. Alder, birch, various willows and poplars, thrive in riparian habitats. Field maple, buckthorn, and whitebeams favour calcareous soils. Beech is predominantly associated with alkaline soils today but thrives also on acid soils. Similarly, ash is associated with alkaline soils, but can survive in more acidic soils. Oak, hazel, pine and hawthorn, are tolerant of a broad range of soil conditions. The ecological preferences of the identified taxa indicate that the woods derived from different locations.

Wetland taxa could have been acquired from nearby riverside and marshy areas. Taxa preferring more calcareous soils are well represented and would have been imported from further afield, perhaps as distant as the mixed deciduous woodlands found on chalklands to the north (the Chilterns), or to the south (the Weald), as happened subsequently in early medieval London (Galloway *et al* 1996).

Several tree taxa are not represented in this assemblage, but are likely to have grown in mixed woodland and scrub communities in association with the woods represented; for example: holly (*Ilex* sp), elm (*Ulmus* sp), blackthorn and cherry (*Prunus* sp), lime (*Tilia* sp), and hornbeam (*Carpinus* sp). These 'missing' taxa are good fuel woods and also useful for other purposes. It is unclear why none of these taxa are represented in the assemblage; possibly they were present in low quantities or were avoided for some reason.

Landscape, Woodland Management, and Silviculture

It is now more or less accepted that little, if any, 'wildwood' remained in Britain by the Late Bronze Age and none by the time of the Saxon period (Rackham 2006). Though large expanses of dense closed canopy woodland still existed these would have been affected by human activities of varying intensity and forms and, therefore, cannot be regarded as pristine. Two opposing models are promoted as the probable dominant form of ancient wooded landscape: extensive closed woodland, interspersed with woodland openings, or, alternatively, extensive sparse open wooded grasslands, 'wood-pasture', with islands of closed canopy woodland. The latter model, known as the 'Vera hypothesis', argues that large herbivores (initially 'wild', subsequently replaced by domesticates) suppressed the expansion and density of woodland cover and maintained open landscape through intensive grazing. The Vera hypothesis has many flaws however and has been shown to be inappropriate for early medieval Europe (Birks 2005; Szabó 2009). Nonetheless the nature of the Anglo-Saxon wooded landscape, inferred from studies of charters, place names, and pollen analyses, suggest that wood-pasture was more common than, and considered distinct from, closed woodland in Saxon England (Hooke 2010). Rackham (2006) suggested that the Roman landscape was little altered during the Early Saxon period. He estimates that dense woodland cover in pre-Domesday Saxon England was no more than 20–25%. Trees and woodland were an essential element in the wider economy. Woodlands were multi-purpose and heavily utilised. In addition to timber production and fuel-wood provision, woods provided pannage, facilitated hunting, and accommodated a growing charcoal industry.

Possible evidence for coppicing or related silvicultural practices was recorded in the structure of the wood. Some fragments displayed periods of initial rapid growth (broad earliest rings with much late wood) followed by reduced ring growth (narrow rings with little or no late seasonal growth). This growth pattern is considered to indicate wood that has been coppiced (Rackham 1977). However, the fragmented nature of the remains in this assemblage means that few fragments were sufficiently intact to confirm the presence of this pattern. Also, variability in wood growth can be caused by local and regional environmental factors, such as drought, and stress and so it cannot be assumed that the fragments reflect the use of wood derived from managed resources. That said, it is likely that much of the wood represented on site did derive from managed wood resources. The majority of taxa identified do respond well to management. The most abundant taxa in the assemblage, oak and hazel, respond particularly well to silvicultural techniques such as coppicing and pollarding, techniques known to have been practised from later prehistory onwards. It may be significant that field maple, beech, ash, willow, and alder, are also commonly coppiced or pollarded.

Features recorded during analysis of the charcoal suggest that much of the wood was derived from small diameter branch wood. Larger timbers present in the assemblage, predominantly from mature oak wood, may have been converted to smaller timber prior to use. Some of the oak examined was very slow grown and probably came from mature trees of considerable age. The apparent universal lack of decay shows that the woods were in good condition when charred and suggests that it is unlikely that any of the woods were gathered opportunistically from the woodland floor. The impression gained from the physical attributes and pre-charring condition of the wood, and range of taxa, is that the woods were selectively cropped from well-maintained managed woodlands, primarily for use as fuel.

Table 27. Charcoal analysis, summary of results

		Taxon values by Phase (no. of samples)								Taxon aggregate values: all contexts & samples					
		10 (2)		9 (3)		8 (1)		7 (4)		Frag Count		Weight (g)		Ubiquity	
Taxon	**Common name**	**Qty**	**Wt.**	**Qty**	**Wt.**	**Qty**	**Wt.**	**Qty**	**Wt.**	**Qty**	**Rank**	**Wt.**	**Rank**	**No.**	**Rank**
Quercus spp	oak	93	11.912	152	36.617	20	4.217	155	27.625	420	1	80.371	1	10	1=
Corylus avellana	hazel	18	2.309	55	9.069	29	8.640	110	18.439	212	2	38.457	2	10	1=
Acer campestre	field maple	6	0.386	12	3.274	11	1.984	17	5.868	46	3	11.512	3	8	2=
Salix/Populus spp	willow/poplar	2	0.100	13	2.155	1	0.100	25	5.587	41	4	7.942	4	8	2=
Alnus glutinosa	alder	2	0.150	13	4.839	6	0.649	18	2.228	39	5	7.866	5	7	3
Betula spp	birch	3	1.845	1	0.614	12	0.835	10	1.236	26	6	4.530	6	6	4
Rosaceae (Amygdaloideae[1]): *Sorbus* spp; *Crataegus* spp; *Malus* sp; *Pyrus* sp	whitebeams, service tree, rowan, hawthorns, apple, pear	13	0.576	7	1.547	-	-	3	0.469	23	7	2.592	7	5	5
Fagus sylvatica	beech	5	0.676	10	1.219	-	-	-	-	15	8	1.895	8	4	6
Rhamnus cathartica	buckthorn	-	-	4	1.221	5	0.596	-	-	9	9	1.817	9	2	7
Fraxinus excelsior	ash	-	-	-	-	-	-	2	0.195	2	11	0.195	11	1	8=
Betulaceae	birch family	-	-	-	-	-	-	1	0.205	1	12=	0.205	10	1	8=
Pinus sylvestris	scots pine	-	-	1	0.078	-	-	-	-	1	12=	0.078	12	1	8=
Indeterminate	(unknown hardwood/bark)	14	0.632	25	5.149	16	2.288	24	2.886	79	-	10.955	-	10	-
Total		**156**	**18.586**	**293**	**65.782**	**100**	**19.309**	**365**	**64.738**	**914**		**168.415**		**10**	

[1]Formerly Maloideae: listed as Sub-family Spiraeoideae in Stace 2010, however from 2011 sub-family renamed Amygdaloideae (incorporating former Maloideae genera). Values listed include assessment data and exclude all non-woody fragments (x39) & nutshell (x1).

Table 28. Charcoal analysis, full results

Context no.	Context description	Phase	Sample no.	Identification	Count	Wt.(*g*)
7	layer; compact stony surface	10 Middle Saxon	1	*Acer campestre*	2	0.286
				Corylus avellana	6	1.508
				Fagus sylvatica	2	0.501
				Amygdaloideae[1]	4	0.038
				Quercus sp	34	2.666
				indeterminate (hardwood)	8	0.374
				indeterminate (not wood)	33	-
				6 taxa	89	5.373
10	layer; compact stony surface	10 Middle Saxon	3	*Acer campestre*	4	0.100
				Alnus glutinosa	2	0.150
				Betula sp	3	1.845
				Corylus avellana	12	0.801
				Fagus sylvatica	3	0.175
				Amygdaloideae	9	0.538
				Quercus sp	59	9.246
				Salix/Populus sp	2	0.100
				indeterminate (hardwood)	6	0.258
				8 taxa	100	13.213
19	heavily compacted layer sealing destruction horizon of Saxon Building	9 Middle Saxon	7	*Acer campestre*	2	0.426
				Alnus glutinosa	8	0.478
				Corylus avellana	21	3.018
				Fagus sylvatica	6	0.773
				Amygdaloideae	7	1.547
				Quercus sp	43	12.175
				Pinus sylvestris	1	0.078
				Salix/Populus	6	1.582
				indeterminate (hardwood)	5	1.202
				nutshell (cf *Corylus*)	1	-
				8 taxa	100	21.279
20	pit fill: contains fire debris from Saxon building	9 Middle Saxon	8	*Acer campestre*	2	0.825
				Alnus glutinosa	5	4.361
				Betula sp	1	0.614
				Corylus avellana	14	3.917
				Fagus sylvatica	4	0.446
				Quercus sp	47	17.063
				Rhamnus cathartica	4	1.221
				indeterminate (hardwood)	17	3.592
				indeterminate (not wood)	6	-
				7 taxa	100	32.039
61	layer; large oyster shell content	9 Middle Saxon	28	*Acer campestre*	8	2.023
				Corylus avellana	20	2.134
				Quercus sp	62	7.379
				Salix/Populus sp	7	0.573
				indeterminate (hardwood)	3	0.355
				4 taxa	100	12.464
34	layer of dumped fire debris (burnt clay frags)	8 Middle Saxon	15	*Acer campestre*	11	1.984
				Alnus glutinosa	6	0.649

	below Saxon building			*Betula* sp	12	0.835
				Corylus avellana	29	8.640
				Quercus sp	20	4.217
				Rhamnus cathartica	5	0.596
				Salix/Populus sp	1	0.100
				indeterminate (hardwood)	16	2.288
				7 taxa	100	19.309
35	oyster shell midden	7 Middle Saxon	17	*Acer campestre*	12	4.304
				Betula sp	7	0.914
				Corylus avellana	36	5.005
				Fraxinus excelsior	2	0.195
				Amygdaloideae	1	0.072
				Quercus sp	30	5.045
				Salix/Populus sp	4	0.744
				indeterminate (hardwood)	8	1.114
				7 taxa	100	17.393
39	dump layer; high organic content, high oyster content	7 Middle Saxon	20	*Acer campestre*	5	1.564
				Alnus glutinosa	2	0.215
				Betula sp	2	0.241
				Corylus avellana	38	9.370
				Quercus sp	42	7.901
				Salix/Populus sp	8	2.161
				indeterminate (hardwood/bark)	3	0.489
				6 taxa	100	21.941
64	later foreshore dumping	7 Middle Saxon	31	*Alnus glutinosa*	13	1.490
				Betula sp	1	0.081
				Betulaceae	1	0.205
				Corylus avellana	12	1.836
				Amygdaloideae	2	0.397
				Quercus sp	56	11.05
				Salix/Populus sp	7	1.674
				indeterminate (hardwood/bark)	8	1.244
				7 taxa	100	17.977
96	dumping layer; high organic content	7 Middle Saxon	38	*Alnus glutinosa*	3	0.523
				Corylus avellana	24	2.228
				Quercus sp	27	3.629
				Salix/Populus sp	6	1.008
				indeterminate (hardwood/bark)	5	0.039
				4 taxa	65	7.427
Total					**954**	**168.415**

[1]Sub-family Amygdaloideae includes all genera of former Maloideae sub-family (renamed 2011)

Notes

[1] The species of the vessel was identified by Philip Austin as alder.

[2] MOLA Resource Library 2014 edition, https://www.mola.org.uk/roman-ceramic-building-materials-fabrics-dating fabric-groups-sources-and-distribution-codes (accessed 17 May 2019).

[3] Compiled by the author for his PhD research.

[4] Period 1 corresponds with Phases 2–6 (early 7th century AD until the early 8th), Period 2 with Phases 7 and 8 (early to mid-8th century) and Period 3 with Phases 9 and 10 (late 8th century until the mid-9th), see the narrative text for further details concerning the dating of Phases 2–10, which are slightly different to above date ranges.

ENVIRONMENTAL SAMPLES: INSECTS, MOLLUSCS, POLLEN AND PLANT REMAINS

Daniel S. Young, Chris P. Green, C. Robert Batchelor and Scott A. Elias

A series of bulk and column samples were obtained for environmental archaeological assessment, this work was undertaken by Quaternary Scientific (QUEST), University of Reading. The assessment was carried out on selected samples, including columns <21> and <22> from the south side of the excavation (north-facing section – S1) and columns <47> and <48> from the east side of the excavation (west-facing section – S5). The methodologies used are detailed in the assessment report (Young *et al* 2015)

Results and Interpretation of the Pollen Assessment (Table 29)

Pollen was recorded in a very high concentration of grains in a moderate to good state of preservation in all 11 of the 12 assessed samples. In each sample, the assemblage was characterised by high values of herbaceous taxa: Lactuceae (dandelion family) and/or Poaceae (grass family; 1.38m OD) dominate with *Centaurea nigra* (knapweed), Asteraceae (daisy family), *Cirsium* type (thistles), *Sinapis* type (*eg* charlock) and sporadic occurrences of *Chenopodium* type (*eg* fat hen), Cyperaceae (sedges), *Cereale* type (*eg* barley), *Plantago* type/*Plantago lanceolata* (plantain/ribwort plantain), *Ranunculus* type (buttercup), *Rumex acetosa*/*acetosella* (sorrel), Caryophyllaceae (pinks), *Malva* (mallow) and possibly *Armeria* type (thrift), *Erodium* (storksbill) and *Campanula* type (bellflower). Tree taxa was largely absent (occasional grains of *Quercus* (oak), *Pinus* (pine), *Betula* (birch) and *Alnus* (alder) only), whilst shrub taxa included *Calluna vulgaris* (heather), *Corylus* type (*eg* hazel) and sporadic occurrences of Ericaceae (heath) and *Lonicera periclymenum* (honeysuckle). Minimal spore values were recorded (*Filicales* (ferns), *Sphagnum* (moss), *Pteridium aquilinum* (bracken) and *Polypodium vulgare* (polypody). Microcharcoal was present in moderate to abundant concentrations. The assemblage was largely consistent between samples/contexts; however, a greater concentration of cereal pollen was recorded in contexts [40], [42], [97] and [99].

The pollen assemblages are indicative of an open environment dominated by herbaceous taxa. Low concentrations of arboreal and shrub taxa including oak and hazel indicate either the sporadic occurrences of these trees locally to the site, the presence of hedgerows or the distant growth of woodland. Isolated occurrences of alder also indicate its limited growth within the wetland environment. The nearby limited growth of heather is also indicated. A range of different environments are indicated by the herbaceous taxa present. Firstly, the limited presence of sedges, and most likely some of the grasses (*eg Phragmites australis* – common reed) is indicative of damp conditions, correlating with the evidence for nearby wetland woodland. The possible occurrence of thrift is also of interest as it may indicate a saline influence at the site. Cereal pollen grains were also commonly recorded together with their associated weeds, including fat hen, black knapweed and charlock. This suggests cultivation or crop processing and/or utilisation took place on the site or nearby. Many of the herbs listed may also have originated from a pastoral or meadow-type community (*eg* ribwort plantain; sorrel; buttercup) and disturbed ground (*eg* fat hen; dandelion; thistle and mallow).

Table 29. Results of the pollen assessment of column samples <21>, <22>, <47> and <48>

	Column sample	**<21>**			**<22>**				**<48>**				**<47>**
	Depth (m OD)	**1.70**	**1.54**	**1.38**	**1.80**	**1.72**	**1.54**	**1.38**	**1.08**	**1.00**	**0.92**	**0.84**	**0.60**
	Context	**14**	**14**	**14**	**12**	**12**	**40**	**42**	**97**	**97**	**97**	**99**	**101**
Latin name	**Common name**												
Trees													
Alnus	alder						1	1					
Quercus	oak		1		3	1			1	1	2	1	
Pinus	pine		1		3	1	2						
Picea	spruce						1						
Betula	birch			1									

Shrubs													
Calluna vulgaris	heather	2	2	1			1	1	1			1	
Ericaceae	heath		1										
Corylus type	*eg* hazel		2	1			2	1	2	4	2	2	
Lonicera periclymenum	honeysuckle	1											
Herbs													
Cyperaceae	sedge family		1	1	1			4		1			
Poaceae	grass family	3	4	20	2	1	8	2	21	17	8	6	
cf *Cereale* type	cereal pollen			4			2	2	2	11	7	9	
Lactuceae	dandelion family	17	25	8	14	6	12	6	3	1		4	
Asteraceae	daisy family	2	2	1		5	4	5	3	1		2	
Cirsium type	thistle	1	1	1									
Chenopodium type	*eg* fat hen		1	1		1	1	1	1	1		1	
Caryophyllaceae	pinks								1		1		
Centaurea nigra	knapweed	4	5	1	1	2	3	1	1		1		
Plantago type	plantain			1			1			1			
Plantago lanceolata	ribwort plantain							1	1	1	1		
Rumex acetosa/ acetosella	sorrel									1	1		
Filipendula	meadowsweet									1			
Apiaceae	carrot family						1						
Ranunculus type	buttercup			1					2				
Sinapis type	*eg* charlock	2	2			1	2	1			1	1	
cf *Campanula* type	bellflower								1		2		
cf *Erodium*	storksbill	1											
cf *Armeria type*	thrift	1											
Malva	mallow							1					
Spores													
Filicales	ferns	1					2		1				
Sphagnum	moss				2								
Pteridium aquilinum	bracken			1		1						1	
Polypodium vulgare	polypody				1								
Unknown				4			4	6	5	4	9	6	
Unidentifiable		1	3	3									
Total land pollen (grains counted)		35	49	47	25	18	46	33	46	46	35	33	0
Concentration*		5	5	5	4	3	5	5	5	5	5	5	0
Preservation**		3–4	3–4	3–4	3	3	3–4	3–4	4	4	4	3–4	0
Microcharcoal concentration***		5	5	3–4	5	5	5	5	4–5	3–4	3	5	1
Suitable for analysis		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**

Key: *Concentration: 0 = 0 grains; 1 =1–75 grains; 2 = 76–150 grains; 3 =151–225 grains; 4 = 226–300; 5 = 300+ grains per slide
**Preservation: 0 = absent; 1 = very poor; 2 = poor; 3 = moderate; 4 = good; 5 = excellent
***Microcharcoal concentration: 0 = none; 1= negligible; 2 = occasional; 3 = moderate; 4 = frequent; 5 = abundant

Results and Interpretation of the Plant Macrofossil Assessment (Table 30)

Seed Identifications

The assemblage in samples <1>–<8> and <18> (Phases 9 and 10) was composed primarily of waterlogged (uncharred) seeds of *Sambucus nigra*/*racemosa* (elder) and charred seeds of *Hordeum*/*Triticum* sp (barley/wheat), with occasional seeds of Poaceae (grass family) and *Ranunculus repens* (creeping buttercup). The occurrence of herbaceous taxa was limited in these samples, perhaps suggesting that they are more typical of waste deposits in which the remains of edible taxa have accumulated.

The assemblage in samples <34>–<45> (Phase 2–7 and one sample from Phase 9) was composed primarily of uncharred seeds of herbaceous taxa, including *Ranunculus sceleratus* (celery-leaved buttercup), *Chenopodium album* (fat-hen), *Rumex*/*Polygonum* sp (dock/sorrel/knotweed), *Ranunculus repens* (creeping buttercup), Apiaceae (carrot family), Poaceae (grass family), *Persicaria* sp (smartweed), *Silene*/*Stellaria* sp (campion/stitchwort), *Eleocharis* sp (spikesedge), *cf Scirpus* sp (bulrush), *Lycopus europaeus* (gypsywort) and *cf Carex* sp (sedges). Shrub taxa were also present, including *Sambucus nigra*/*racemosa* (elder), *Rubus fruticosus* (blackberry) and *Prunus cf spinosa* (blackthorn). Charred taxa were present in selected samples and included *Hordeum*/*Triticum* sp (barley/wheat) and *Vitis cf vinifera* (common grape vine).

The assemblage in these samples is typical of a relatively damp, open environment dominated by herbaceous taxa, with an indication of wet conditions nearby in selected samples from Phases 2 and 5 (*eg* <45> [153] (layer/bank), <44> [100] (layer). Taxa typical of those found in waste deposits are occasionally recorded, including charred remains of barley/wheat, common grape vine and blackthorn.

Table 30. Results of the plant macrofossil assessment of flots

Sample no.	**Context no.**	**Phase**	**Context description**	**Charcoal identification**	**Quantity**	**Weight (g)**	**Seed identification (c) = charred**	**Quantity**
1	7	10	layer; compact stony surface	*Corylus avellana*	2	1.358	*Sambucus nigra*/*racemosa*	>50
				Fagus sylvatica	2	0.501	*Hordeum*/*Triticum* sp (c)	11
				Quercus sp	6	1.112	Poaceae	1
3	10	10	layer; compact stony surface	*Corylus avellana*	1	0.221	*Sambucus nigra*/*racemosa*	>50
				Maloideae	1	0.093	*Hordeum*/*Triticum* sp (c)	2
				Quercus sp	8	3.894		
4	11	9	layer; compact stony surface	-	-	-	*Sambucus nigra*/*racemosa*	>50
							Hordeum/*Triticum* sp (c)	1
5	12	9	pit fill	-	-	-	*Sambucus nigra*/*racemosa*	>50
							Hordeum/*Triticum* sp (c)	1
6	14	9	ditch fill	-	-	-	*Sambucus nigra*/*racemosa*	>50
							Hordeum/*Triticum* sp (c)	4
7	19	9	layer; possible destruction horizon of Saxon building	*Corylus avellana*	2	0.607	*Sambucus nigra*/*racemosa*	10
				Fagus sylvatica	1	0.394	*Ranunculus repens*	1
				Maloideae	3	1.204		
				Quercus sp	4	3.172		
8	20	9	pit fill; contains probable fire debris from Saxon building	*Corylus avellana*	2	1.429	*Sambucus nigra*/*racemosa*	19
				Quercus sp	6	4.889	*Ranunculus repens*	1
				cf Rhamnus sp	2	0.987	*Hordeum*/*Triticum* sp (c)	2
18	36	9	layer	-	-	-	*Sambucus nigra*/*racemosa*	>50

							Hordeum/*Triticum* sp (c)	1
28	61	9	layer; large oyster shell content	*Acer campestre*	1	1.505	-	-
				Corylus avellana	1	0.170		
				Quercus sp	8	2.076		
36	89	9	pit fill; base of a pit excavated higher up in the sequence	-	-	-	*Sambucus nigra*/*racemosa*	>50
							Chenopodium album	25
							Ranunculus repens	2
							Hordeum/Triticum sp (c)	2
							Rumex/*Polygonum* sp	1
							Prunus cf *spinosa*	1
15	34	8	layer of dumped fire debris below Saxon building	*Acer campestre*	1	0.595	-	-
				Corylus avellana	5	6.047		
				Quercus sp	3	2.281		
				Indeterminate (hardwood)	1	0.310		
17	35	7	oyster shell midden	*Betula* sp	1	0.139	-	-
				Corylus avellana	1	0.556		
				Fraxinus excelsior	1	0.065		
				Quercus sp	7	1.937		
20	39	7	layer; high organic content.	*Acer campestre*	1	0.251	-	-
				Betula sp	1	0.158		
				Corylus avellana	1	0.091		
				Quercus sp	7	1.350		
31	64	7	layer; foreshore dumping	*Quercus* sp	8	3.528	-	-
				Salix/*Populus* sp	2	1.254		
37	95	7	layer; animal bone, oyster shell, high organic content	-	-	-	*Chenopodium album*	4
							Persicaria sp	2
							Ranunculus repens	2
							Ranunculus sceleratus	2
							Rumex/*Polygonum* sp	1
							Hordeum/Triticum sp (c)	1
38	96	7	layer; high organic content	*Corylus avellana*	3	0.355	*Chenopodium album*	43
				Quercus sp	4	1.367	*Ranunculus repens*	6
				Salix/*Populus* sp	3	0.639	*Rumex*/*Polygonum* sp	2
							Silene/*Stellaria* sp	1
34	75	6	layer; very high organic content	-	-	-	*Rubus fruticosus*	1
							Chenopodium album	1
39	97	6	layer; high organic content	-	-	-	*Chenopodium album*	11
							Rumex/*Polygonum* sp	1
							Ranunculus sceleratus	1
							Rubus fruticosus	1
							Ranunculus repens	1
							Apiaceae	1

							Persicaria sp	1
41	98	5	layer; high organic content	-	-	-	*Chenopodium album*	6
							Rumex/*Polygonum*	3
							sp *Ranunculus repens*	2
							Persicaria sp	2
							Ranunculus sceleratus	2
							Eleocharis sp	1
42	99	5	layer; very organic in patches, compressed or compacted vegetation	-	-	-	*Ranunculus sceleratus*	12
							Chenopodium album	5
							Vitis cf vinifera (c)	3
							Ranunculus repens	3
							Hordeum/Triticum sp (c)	3
							Rubus fruticosus	1
							Rumex/*Polygonum* sp	1
							Apiaceae	1
							Persicaria sp	1
44	100	5	layer; rich in organic matter	-	-	-	*Chenopodium album*	3
							Ranunculus sceleratus	2
							cf *Scirpus* sp	1
							Prunus cf *spinosa*	1
							Ranunculus repens	1
							Hordeum/Triticum sp (c)	1
							Lycopus europaeus	1
45	153	3	layer/bank; wattle/brushwood fragments within sample, possible plant remains, animal bone; one of earliest deposits	-	-	-	*Rumex*/*Polygonum* sp	1
							cf *Carex* sp	1
							Poaceae	1
46	154	2	layer; earliest foreshore deposits	-	-	-	*Chenopodium album*	3
							Prunus cf *spinosa*	3
							Rubus fruticosus	2
							Lycopus europaeus	1
							Hordeum/Triticum sp (c)	1

Results of the Waterlogged Plant Macrofossil Assessment (Table 31)

As might be expected the assemblage recorded in the wet-sieved bulk samples (samples <32>–<46>) is very similar to that recorded in the corresponding flots (see above). It is composed mainly of uncharred seeds of herbaceous taxa, including *Ranunculus sceleratus* (celery-leaved buttercup), *Chenopodium album* (fat-hen), *Rumex*/*Polygonum* sp (dock/sorrel/knotweed), *Ranunculus repens* (creeping buttercup), *Persicaria* sp (smartweed), *Eleocharis* sp (spikesedge), *Lycopus europaeus* (gypsywort) and *Carex* sp (sedges). The aquatic taxa *Sparganium erectum* (bur-reed) and *Ranunculus fluitans* (river water crowfoot) were also present as were shrub and tree taxa, including *Sambucus nigra*/*racemosa* (elder), *Corylus avellana* (hazelnut) and *Alnus* sp (alder).

Charred taxa were present in selected samples (including <36> [89] (pit fill), <41> [98] (layer with a high organic content) and included *Hordeum*/*Triticum* sp (barley/wheat) and *Vitis cf vinifera* (common grape vine).

Table 31. Results of the plant macrofossil (seeds) assessment of wet-sieved bulk samples

Sample no.	Context no.	Phase	Context description	Waterlogged seeds: Latin name	Common name	No.
36	89	9	pit fill; base of a pit excavated higher up in the sequence	*Sambucus nigra/racemosa*	elder	5
				Chenopodium album	fat-hen	2
				Carex sp	sedges	1
				Vitis cf vinifera (charred)	*cf* common grape vine	1
32	67	7	layer	*Carex* sp	sedges	2
				Chenopodium album	fat-hen	1
				Rumex/Polygonum sp	dock/sorrel/knotweed	1
37	95	7	layer; animal bone, oyster shell, high organic content	*Ranunculus sceleratus*	celery-leaved buttercup	1
				Chenopodium album	fat-hen	1
				Rumex/Polygonum sp	dock/sorrel/knotweed	1
				Ranunculus repens	creeping buttercup	1
38	96	7	layer; high organic content	*Chenopodium album*	fat-hen	9
				Eleocharis sp	spike sedges	1
				cf *Corylus avellana* nut shell	*cf* hazelnut	1
				Alnus sp fruit	alder	1
33	76	6	layer	*Chenopodium album*	fat hen	2
				Corylus avellana nut shell	hazelnut	1
34	75	6	layer; very high organic content	*Ranunculus sceleratus*	celery-leaved buttercup	8
				Carex sp	sedges	2
				cf *Ranunculus* sp	*eg* creeping buttercup	1
				Sparganium erectum	bur-reed	1
				Chenopodium album	fat-hen	1
				Ranunculus repens	creeping buttercup	1
39	97	6	layer; high organic content	*Ranunculus repens*	creeping buttercup	2
				Ranunculus sceleratus	celery-leaved buttercup	1
				Persicaria sp	smartweed	1
				Carex sp	sedges	1
41	98	5	layer; high organic content	*Ranunculus sceleratus*	celery-leaved buttercup	2
				Chenopodium album	fat-hen	1
				Ranunculus repens	creeping buttercup	1
				Hordeum/Triticum sp (charred)	wheat/barley	1
42	99	5	layer; very organic in patches, compressed or compacted vegetation	*Ranunculus sceleratus*	celery-leaved buttercup	14
				Ranunculus repens	creeping buttercup	2
				Sambucus nigra/racemosa	elder	2
				Chenopodium album	fat-hen	1
				Lycopus europaeus	gypsywort	1
44	100	5	layer; rich in organic matter	*Ranunculus sceleratus*	celery-leaved buttercup	1
46	154	2	layer; earliest foreshore deposits	*Chenopodium album*	fat-hen	1
				Ranunculus fluitans	river-water crowfoot	1

The assemblage in these samples is typical of a relatively damp, open environment such as the margins of a fen or reed swamp, with an indication of wet conditions supporting the growth of aquatic taxa nearby. There are no clear indications in the seed assemblages for a saline influence. Taxa typical of those found in waste deposits were recorded in two samples (<36> [89], <41> [98]), common grape vine, perhaps indicative of disturbance of these deposits.

Results and Interpretation of the Insect Assessment (Table 32)

Sample <38> [96] (Phase 7)
This was a very poor assemblage, with only the remains of 4 taxa identified. The rove beetle *Gyrohypnus angustatus* lives in herbivore dung and decaying grasses, and the cylindrical bark beetle *Aglenus brunneus* lives in barns, stables, cellars, where it is typically found in mouldy hay and chicken manure. Thus, this small assemblage appears to represent a synanthropic environment – perhaps a barn.

Sample <34> [75] (Phase 6)
This sample yielded only 9 taxa, including very abundant fly puparia, suggesting the presence or either carrion, dung, or other rotting organic materials. The ground beetle *Trechus quadristriatus* is the only real upland indicator in the fossil assemblage. It is found in dry, open, grassy uplands. The sandy banks of standing water are indicated by the presence of the water scavenger beetle *Cercyon bifenestratus.* Standing pools of vegetation-choked water are indicated by the aquatic weevil *Tanysphyrus lemnae* that feeds on duckweed. Damp marshland and the presence of herbivore dung are indicated by another water scavenger beetle, *Cryptopleurum crenatum*. The presence of herbivore dung is also indicated by dung beetles in the genus *Aphodius*. This appears to be an ‘outdoor’ assemblage, near standing water, but close to domesticated livestock – perhaps a paddock near a pond.

Sample <42> [99] (Phase 5)
This was the most productive sample, yielding 19 identified taxa. There were a number of wetland species identified. The ground beetle *Bembidion guttula* lives on clay-rich soil with vegetation by water where it preys on small insects. Another including charred remains of barley/wheat and predator, the rove beetle *Lesteva longoelytrata*, is found on swampy, muddy shores, especially in alder carr. The water scavenger beetle *Cercyon marinus* lives in damp organic debris in marshes or by running water, and the riffle beetle *Dryops auriculatus* is found in pools, swamps, and swampy meadows.

The only natural upland habitat indicator is the weevil *Holotrichapion pisi*, which feeds exclusively on *Medicago* (burclover) and other Fabaceae.

The remainder of the fauna are all associated with dung and/or synanthropic environments. Those associated with dung include the rove beetle *Philonthus corruscus* that preys on small insects in herbivore and human dung, and also in carrion, and the dung beetles *Aphodius contaminatus* and *Geotrupes mutator*, both typically found in horse, cow and sheep dung. *Aglenus brunneus* usually lives in barns, stables, cellars, and is typically found in mouldy hay and chicken manure. Finally, the bark beetle *Hylurgops palliatus* is found under the bark of dead conifers, including rough outbuilding beams made of pine, fir or spruce, and piles of stacked conifer firewood.

Taken as a whole, this insect assemblage suggests a human settlement with barns and domesticated animals, situated close to a wet, vegetation-rich lowland such as an alder carr.

Sample <45> [153] (Phase 3)
This was a moderate sized sample of 12 identified taxa. Again, the presence of damp, vegetation-rich lowlands is indicated by the presence of *Lesteva longoelytrata* and *Dryops auriculatus*. Another rove beetle, *Euryusa sinuata*, is found in damp, rotting wood, especially ash and oak. Rotting oak is also the habitat of the bark beetle *Scolytus intricatus*, especially large, dead trees.

The synanthropic environment is indicated by the water scavenger beetle *Cercyon unipunctatus*, which is usually found in manure or heaps of rotting vegetation, such as rotting hay.

Table 32. Results of the insect assessment of bulk samples

Sample	**<38>**	**<34>**	**<42>**	**<45>**
Context no.	**[96]**	**[75]**	**[99]**	**[153]**
Phase	**7**	**6**	**5**	**3**
Taxon				
Carabidae				
Bembidion guttula(F)			1	
Trechus quadristriatus (Schrank)		2		

Pterostichus sp			1	
Hydrophilidae				
Cercyon bifenestratus Küster		1		
Cercyon marinus Thoms			7	
Cercyon unipunctatus (L)				1
Cercyon spp	1	1		1
Cryptopleurum crenatum (Panz)		1		
Hydraenidae				
Ochthebius sp			1	
Staphylinidae				
Arpedium quadrum (Grav)				
Lesteva longoelytrata(Goeze)			3	1
Euryusa sinuata Er				1
Anotylus sculpturatus (Grav)				1
Gyrohypnus angustatus Steph	2			
Philonthus corruscus (Grav)			1	1
Philonthus sp			1	
Quedius spp		2		1
Stenus sp			1	
Atheta sp		1	1	
Scarabaeidae				
Aphodius cf *contaminatus* (Hbst)			1	
Aphodius spp		1	2	1
Geotrupes cf *mutator* (Marsham)			1	
Scirtidae				
Cyphon sp				1
Dryopidae				
Dryops auriculatus (Fourc)			1	1
Elateridae				
Ctenicera sp			1	
Colydiidae				
Aglenus brunneus (Gyll)	1		1	
Apionidae				
Holotrichapion pisi (F)			1	
Apion (sensu lato) sp			1	
Curculionidae				
Tanysphyrus lemnae (Payk)		2		
Scolytus intricatus (Ratz)				1
Hylurgops palliates (Gyll)			2	
Diptera				
Fly puparia indet	4	13	5	1

The rove beetles *Anotylus sculpturatus* and *Philonthus corruscus* live in herbivore dung and carrion. This assemblage suggests a similar environment to that reconstructed for sample <42> [99], typical of a human settlement perhaps with barns and domesticated animals, situated close to a wet, vegetation-rich lowland (such as an alder carr).

Results and Interpretation of the Molluscan Assessment (Table 33)

A total of nine samples were assessed for molluscs. Three of the samples (<13>, <20>, <38>) consisted of shells already separated from flot and comprised only a small number of individuals (<10>). The remaining six samples consisted of unsorted flot each containing several hundred individual shells and large amounts of shell debris.

All the molluscan assemblages derived from the six unsorted flot samples (<1>, <3>–<6>, <18>; Phases 9 and 10) were closely similar in terms of the principal species represented and in terms of the relative numbers of those species. In all these samples *Bithynia tentaculata* was present in large numbers: a total of 761 were counted in a sub-sample of sample <6> and in all the other samples it was the overwhelmingly dominant species. Only two other species, *Valvata piscinalis* and *Trichia*, were represented in any of the samples by more than 50 individuals. All other species were represented by fewer than 50 individuals, in some cases by only one or two individuals in only one of the samples, *eg Balea perversa* and *Vertigo* in samples <18> and <6> respectively. All the assemblages were mixtures of freshwater and terrestrial species. Freshwater habitats were principally represented by *Theodoxus fluviatalis, Valvata*, *Bithynia*, the *Lymnaeae* and the Planorbids; terrestrial habitats principally by *Trichia, Cochlicopa, Carychium* and the Zonitoides all of which prefer moist conditions. Other terrestrial habitats were represented by small numbers of other species, such as *Discus rotundatus*, often found in woodland and a single specimen of the tree-dwelling species *Balea perversa*. The presence of the burrowing snail *Cecilioides acicula* in all the unsorted flot samples indicates that the deposit from which these samples came either included soil material or was affected by soil forming processes. This conclusion is supported by the occurrence of worm granules, noted in sample <4> and is consistent with the presence of terrestrial species in the mollusc fauna.

In five of the samples, single specimens of marine species were present, immature whelks (*Buccinum undatum*) in samples <1>, <4> and <20>, winkles (*Littorina* sp) in samples <6> and <38>, and a single valve of a juvenile oyster (*Ostrea edule*) in sample <6>. There was also typical oyster shell debris in all the unsorted flot samples. Two other notable features of the molluscan assemblage are, firstly the complete absence from all the unsorted flot samples of the opercula of *Bithynia*, despite the large numbers of this species present in all the samples; and secondly the general absence of the Sphaeridiiae. Only one valve, probably of a *Pisidium* species was recorded.

In attempting to understand the significance of these molluscan assemblages, it is essential to recognise that they are all associated with deposits that have been substantially affected by human activity and probably in all cases redistributed away from their primary depositional context. Samples <1>, <3> and <4> came from levelling layers overlying the remains of a Middle Saxon building. Sample <5> came from a pit [13] cut into these layers and samples <6> and <18> came from a ditch [15] also cut into these layers. Judging by the similarity among the molluscan assemblages in samples <1>, <3> and <4>, the material forming the layers from which these samples came was all derived from the same depositional source. The molluscan assemblages from the pit and ditch cut into these layers resemble closely the assemblages in the layers themselves, indicating that the fills were largely, if not entirely, derived from the layers, or possibly from the same source as the layers. The presence of a few specimens of edible marine species in these samples and the common occurrence of probable oyster shell debris suggests that the deposits from which the samples came were contaminated with food waste, or that food waste contaminated the layers after they were dumped. It is also possible that once the layers had been put in place they became the habitat of mollusc species other than those present within the original deposit.

The species represented in the samples consist largely of a mixture of species characteristic of large, well-oxygenated water bodies, *eg Theodoxus, Valvata* and *Bithynia*, and species characteristic of moist terrestrial habitats, *eg Cochlicopa* and *D rotundatus*. Bearing in mind the preponderance of *Bithynia*, the lack of *Bithynia* opercula and the lack of the Sphaeriidae, such a mixture might be found on the floodplain of a large river in moist hollows subject to seasonal flooding. However, some of the species present, such as *Helix aspersa* and *Trichia* could relate to habitats developing on the new land surface created by the dumping of the layers forming contexts [7], [10] and [11].

Table 33. Results of the Molluscan assessment of flots

Sample	**<1>**	**<3>**	**<4>**	**<5>**	**<6>**	**<18>**	**<13>**	**<20>**	**<38>**
Context no	**7**	**10**	**11**	**12**	**14**	**36**	**26**	**39**	**96**
Phase	**10**	**10**	**9**	**9**	**9**	**9**	**8**	**7**	**7**
Taxon									
Littorina sp					1				1
Buccinum undatum	1		1					1	
Ostrea sp	x	x	x	x	1	x			
Theodoxus fluviatilis	1		1	1	1	1			
Valvata piscinalis	2	2	2	2	3	3			
Bithynia tentaculata	4	4	4	4	4	4	1	1	
Carychium minimum	2	2	2	2	2	2			
Lymnaea truncatula	2	2	2	2	2	2			
Lymnaea peregra	2	2	2	2	2	2			
Planorbis sp	1	1	1	1	1	1			
Anisus sp	2	2	2	2	2	2			
Succineidae					1	1			
Cochlicopa lubrica	2	2	1	2	2	2			
Vertigo sp					1				
Vallonia sp	1	1	1	2	2	2			
Discus rotundatus	1		2	1	2	1			
Zonitidae	2	2	2	2	2	2			
Ceciloides acicula	2	1	1	2	2	1			
Balea perversa						1			
Trichia hispida	3	2	3	3	2	3	1		
Cepaea nemoralis				1		1			
Helix aspersa	1		1	1	1				
Sphaeriidae							1		

Key: 1 = number of specimens = <10; 2 = 11-50; 3 = 51-100; 4 = >100

Sample <13> came from a deposit tentatively identified as the burnt clay floor of the Saxon building underlying the layers described in the previous paragraph. The sample consisted of shells already separated from flot or hand-picked from bulk samples. Very few snails were submitted for assessment in this sample, but both aquatic and terrestrial species were present suggesting a broad similarity with the overlying layers.

Samples <20> and <38> (Phase 7) were both from layers underlying the Saxon building mentioned above. The field evidence suggests that these layers were put in place in Saxon times to raise the level of the ground above the level of diurnal flooding to form a surface for building construction. The samples examined consisted of shells already separated from flot or hand-picked from bulk samples. They comprised single specimens of *Buccinum* (whelk) and *Bithynia* in sample <18> and a single specimen of *Littorina* (winkle) in sample <38>. The presence of edible species is consistent with the field evidence that these layers 'were composed principally of domestic waste, a large proportion of which was related to food supply in the form of animal bones and oyster shells.

Conclusions

Column Samples

In all four column samples the pollen assemblages are indicative of an open environment dominated by herbaceous taxa, with an indication of damp conditions close to the site where sedges and perhaps some of the grasses (*eg Phragmites australis* – common reed) were growing, along with a limited cover of wetland woodland in the form of alder. The possible occurrence of thrift in the herbaceous assemblage may indicate a saline influence at this location; however, it should be noted that this taxa is only present in sample <21> context [14]. The arboreal taxa within the assemblages are indicative of either sporadic occurrences of trees locally to the site and the presence of hedgerows, or the distant growth of woodland. Cereal pollen grains are commonly recorded together with their associated weeds, particularly in contexts [40], [42], [97] and [99], and are indicative of cultivation or crop processing and utilisation either at or nearby to the site. Many of the herbs in the assemblage may also have originated from a pastoral or meadow-type community and disturbed ground.

Bulk Samples

The species represented in the molluscan assemblages consist largely of a mixture of species characteristic of large, well-oxygenated water bodies and species characteristic of moist terrestrial habitats; such a mixture might be found on the floodplain of a large river in moist hollows subject to seasonal flooding. However, some of the species present could relate to habitats developing on the new land surfaces created by the dumping of the layers forming contexts [7], [10] and [11]. The presence of edible species in selected samples is consistent with the field evidence that these layers were composed principally of domestic waste, a large proportion of which was related to food supply in the form of animal bones and oyster shells' The seed assemblages in samples <1>–<8> and <18> (Phases 9 and 10) were composed primarily of uncharred seeds of elder and charred seeds of barley/wheat, with occasional seeds of Poaceae (grass family) and creeping buttercup. The occurrence of herbaceous taxa was limited in these samples, perhaps suggesting that they are more typical of waste deposits in which the remains of edible taxa have accumulated.

The seed assemblage in the flots and wet-sieved sub-samples from samples <32>–<46> (Phases 2–7 and one sample from Phase 9) was composed primarily of uncharred seeds of herbaceous taxa, including celery-leaved buttercup, fat-hen, dock/sorrel/knotweed, creeping buttercup, Apiaceae (carrot family), Poaceae (grass family), smartweed, campion/stitchwort, spikesedge, bulrush, gypsywort and sedges. Aquatic or marginal taxa including bur-reed and river water crowfoot were also present, along with tree and shrub taxa including alder, hazel, elder, blackberry and blackthorn. Charred taxa, including barley/wheat and common grape vine, were present in selected samples. The assemblage in these samples is consistent with the results of the pollen, molluscan and insect assessments of the column and bulk samples, indicative of a relatively damp, generally open environment dominated by herbaceous taxa, with an indication of wetter conditions nearby in selected samples. However, there are no clear indications in the seed assemblages for a saline influence at the site. The presence of charred cereal grains and weed/disturbed ground taxa is indicative of cultivation or crop processing nearby, whilst the presence of charred seeds of common grape vine is indicative of viticulture. The insect assemblages from bulk samples from Phases 3, 5, 6 and 7 were all indicative of synanthropic environments close to wet, vegetation rich ground. There were indications in all the samples of dung or fodder associated with domesticated livestock.

Much of the material recorded in the samples is not in its primary depositional context but has been brought to the site from elsewhere and dumped. And thus no further analysis was undertaken as it would provide only a very generalised indication of local environments in the source area.

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PCA refers to Pre-Construct Archaeology Limited

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