# Chapter 7: The Environmental Remains

## ANIMAL BONE REPORTS

### Introduction
*by Bob Wilson*

Animal bone assemblages were recovered from numerous sites published in this monograph, and reports on these are presented here in the same order as the site reports (see Chapters 3, 4 and 5, above). In accordance with the synthetic approach of the research design, the animal bone assemblages from 24–26 St Aldate's (the Police Station), 30–31 St Aldate's (Land adjoining the Police Station) and 56–60 St Aldate's were analysed together and are presented in a joint report by Miranda Armour-Chelu. The remainder were the work of the present author with other contributors, over a number of years.

An analysis of the broad trends of animal bone remains from the sites included in this volume has proved illuminating. Our purpose for the area of the Saxon river crossing was to address a number of questions relating to the local economy and trade which had been asked of both the pottery and bone finds. Research priorities for the other sites were in the more conventional area of diet, site usage and cultural affinities. Despite limited sample size, and the fact that most of the fieldwork was carried out without the benefit of modern sieving techniques, it was felt that useful results could be achieved. The approach to the bone assemblages here was to evaluate the material rapidly and identify the major trends in the deposits. Particular points which were targeted were: the 11th-century (Phase 3) pit deposits at All Saints Church in search of dietary evidence; the deposits and later pits at the margin of the Trill Mill Stream in case these should indicate any early move towards using the water's edge for butchery as occurred later in its history; and 24A St Michael's St to investigate how the rampart area was used in the later medieval period when it is assumed to have lost its banks but nevertheless was kept free of buildings.

### Animal bones from the Trill Mill Stream
(Tables 7.1, 7.2)
*by Bob Wilson*

Over 3007 bones from the features of Trill Mill Stream site were examined. Most came from layers of river silt and occasionally from silt-filled gullies. Phase 6 bones, however, consisted mainly of groups from pits but also gullies and other feature types. Bones were well-preserved, especially those from the earlier and deeper deposits where bones were usually stained a dark brown. Burnt fragments were rare except in Phase 6 and especially in pit 21 = 22 (Trench I).

Some 52% of bones were identified, the proportion reflecting the ease of identifying somewhat coarser debris or large fragments present in the collection, but also possibly the failure to recover the smallest bones; in pit 21 = 22 the percentage of small carpal and tarsal elements of the foot was less than one percent of the sheep bones.

Statistics of species and other general categories of identification are given in Table 7.1, showing a familiar range of domestic and wild species present. Table 7.2 shows the overall grouped skeletal element percentages of cattle and sheep, being the two most variable species in urban collections. Bone debris from the main meat carcass predominates and there is little evidence of a close link with butchery and associated trades, whether locationally or in the nature of the bone refuse. The bulk of the remains therefore appears to be domestic refuse. However, the material has a coarser component present in the slightly greater representation of cattle and horse bones, in the sizeable proportion of large fragments, and in the percentage of identified bones. Also, the remains of birds appear less common than usual and fish bones are scarcely present at all.

As at 24A St Michael's St (below), this suggests that many bones are one taphonomic stage removed from the domestic refuse typical of internal house deposits and deposits of bones thrown directly outside (for example, bones at 7–8 Queen St, below). This shift is most evident in the earliest deposits of Phases 1 and 2, and least evident in Phases 5 and 6. It indicates that domestic activity came progressively closer to the Trill Mill Stream trenches over the years, arriving adjacent to it perhaps during the 10th- to 12th-century period; initially much debris would have travelled 10–20 m or more, but less and less over the years as occupation activities came closer.

The low numbers of bones in the early phases suggest that there was no concerted rubbish dumping on the river sites until the 11th or 12th century. The nature of the bone deposition does not help in explaining the function of gullies and fences which precede this dumping on the early margin of the mill stream, and there is no direct support for any industrial activities in the bones from contexts 31, 32, 34 and 35 (Trench II, Phase 2).

### The faunal remains from 56–60 St Aldate's, 30–31 St Aldate's (Land adjoining the Police Station) and 24–26 St Aldate's (the Police Station)
(Tables 7.3–7.13; Plates 7.1 and 7.2)
*by Miranda Armour-Chelu*

#### *Summary*

A total of 3480 bones were examined from the three sites, St Aldate's (SA), land adjoining the Police Station (LA), and the Police Station (PS). Nine phases of occupation were recognised, ranging from the late Saxon period through to post-medieval deposits.

*Table 7.1 Fragment frequency at the Trill Mill Stream*

| Phase<br>Features | 1<br>layers | 2<br>layers/gullies | 3<br>layers etc | 4<br>layers etc | 5<br>layers/gullies | 6<br>pits etc | Total | % |
|---|---|---|---|---|---|---|---|---|
| Cattle | 12 | 39 | 71 | 42 | 70 | 296 | 530 | 34.1 |
| Sheep/goat | 5 | 24 | 88 | 38 | 143 | 438 | 736 | 47.4 |
| Pig | 2 | 24 | 33 | 23 | 39 | 105 | 226 | 14.6 |
| Horse | 3 | 4 | 8 | 3 | 4 | 13 | 35 | 2.3 |
| Dog | 4 | 5 | 2 | – | 1 | 3 | 15 | 1.0 |
| Cat | – | – | – | – | – | 2 | 2 | 0.1 |
| Red deer | – | – | 1 | 1 | – | – | 2 | 0.1 |
| Roe deer | 1 | 1+A | 1 | – | 1 | – | 4+A | 0.3 |
| Hare | – | – | – | 1 | – | 1 | 2 | 0.1 |
| Unidentified | 32 | 99 | 212 | 113 | 230 | 769 | 1455 | |
| **Total** | **59** | **196+A** | **416** | **221** | **488** | **1627** | **3007** | |
| Burnt | – | – | 3 | – | – | 86 | 89 | 3.0 |
| Large frags | 7 | 34 | 66 | 34 | 72 | 234 | 447 | 14.7 |
| Dom. fowl | – | 1 | 10 | 1 | 19 | 43 | 73 | |
| Dom. goose | – | – | 4 | 4 | 1 | 8 | 17 | |
| Other bird (a) | – | 1 | 3 | 1 | – | 1 | 6 | |
| Pike | – | – | 1 | – | – | – | 1 | |

(a): including 1 Plover (Phase 2); 1 Mallard/domestic duck, 1 Rook/crow, 1 small Gull (Phase 3); and duck cf. Garganey (Phase 4).
Identification of pike and less common bird bones by Alison Locker.

Pig, cattle and sheep comprised by far the greater proportion of the assemblage and a small number of goat, horse, dog and cat bones were also identified. Wild mammals were sparsely represented by a few bones of red, roe and fallow deer and otter. Birds, fish and amphibian bones were also present.

### *Introduction*

One of the objectives of this report was to determine the origin and nature of the faunal assemblage excavated from the sites. It was felt that the results of this analysis could assist in the interpretation of the early history of the Thames crossing at Oxford.

Two questions were asked initially. Firstly, was there any evidence for dietary differences between the assemblages excavated from the southern and northern bank during the Saxon period? Unfortunately the assemblages from Phases 2 and 3 were too small for any conclusions to be drawn but further excavation may augment the existing collection of material and resolve this question.

The second question was whether it was possible to distinguish between material that had been dumped (possibly from Oxford) in order to reclaim riverbed deposits, and the refuse that accumulated from occupation around the crossing. There are several instances from the Roman and medieval periods of bone waste being used as a building material. The use of butcher's waste to construct building platforms has been identified from the Roman levels at Blake Street, York (O'Connor forthcoming), and from Wroxeter (Armour-Chelu 1997). Armitage (1977) showed that much of the bone waste excavated from Baynards Castle, London, was butcher's refuse dumped in order to secure the medieval waterfront.

*Table 7.2 Percentages of head, foot and body elements at the Trill Mill Stream*

| Phase | 1&2 | 3&4 | 5 | 6 |
|---|---|---|---|---|
| **Cattle** | | | | |
| No. of frags | 51 | 113 | 70 | 296 |
| | % | % | % | % |
| Head | 14 | 22 | 10 | 16 |
| Foot | 29 | 27 | 26 | 23 |
| Body | 57 | 51 | 64 | 61 |
| **Sheep** | | | | |
| No. of frags | 29 | 126 | 143 | 438 |
| | % | % | % | % |
| Head | 21 | 33 | 34 | 24 |
| Foot | 14 | 10 | 11 | 16 |
| Body | 66 | 57 | 55 | 59 |

*Table 7.3 Number of bones identified from 56–60 St Aldate's (SA), 30–31 St Aldate's (LA) and 24–26 St Aldate's (PS)*

| Phase | SA | LA | PS | Total |
|---|---|---|---|---|
| 2 | 11 | | | 11 |
| 3 | 241 | | 12 | 253 |
| 4 | 182 | 34 | 87 | 303 |
| 5 | 340 | 295 | | 635 |
| 6 | 86 | 711 | 388 | 1185 |
| 7 | 267 | 170 | 129 | 566 |
| 8 | 97 | 342 | 83 | 522 |
| 9 | 5 | | | 5 |

*Table 7.4 Percentage of mammalian bones in each phase, sites SA, LA and PS*

| Phase | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Pig | * | 23 | 20 | 10 | 12 | 19 | 13 |
| Cattle | * | 55 | 27 | 44 | 29 | 35 | 38 |
| Goat | | – | – | * | – | * | * |
| Sheep | | 5 | 12 | 7 | 10 | 12 | 9 |
| Sheep/Goat | | 16 | 30 | 36 | 47 | 32 | 38 |
| Horse | | 1 | 9 | 2 | 3 | * | * |
| Dog | | – | – | – | – | – | * |
| Cat | | – | – | – | * | * | – |
| Red deer | | – | – | * | – | – | * |
| Roe | | – | * | – | – | – | – |
| Fallow | | – | – | – | – | * | – |
| Otter | | – | – | – | * | – | – |
| **Total no. bones** | | **104** | **137** | **256** | **460** | **187** | **186** |

* Low frequency of bone.

### *Methods*

One of the principal lines of enquiry of this report was to determine the depositional history of the assemblage under study. Two methods of analysis were adopted in order to accomplish this aim.

*Table 7.5 Numbers of mammalian bones identified to taxon from Phase 3, sites SA, LA and PS*

| | Pig | Cattle | Sheep | Sheep/Goat | Horse |
|---|---|---|---|---|---|
| Horncore | | 1 | | | |
| Skull | 2 | 9 | 2 | 1 | 1 |
| Mandible | 5 | 11 | | 4 | |
| Teeth | 1 | 1 | | | |
| Vertebra | 2 | 2 | | 2 | |
| Rib | | 4 | | | |
| Scapula | 1 | 4 | | 4 | |
| Humerus | 1 | 2 | | 1 | |
| Radius | 2 | 5 | | 1 | |
| Ulna | 1 | 1 | | | |
| Carpal | | | | | |
| Metacarpal | 1 | | 1 | 2 | |
| Innominate | 2 | 5 | | | |
| Femur | 1 | 2 | | | |
| Patella | | | | | |
| Tibia | 2 | 2 | 1 | 1 | |
| Fibula | | | | | |
| Calcaneum | 1 | 1 | | | |
| Astragalus | 1 | | | | |
| Scapho-cuboid | 1 | 1 | | | |
| Metatarsal | 1 | 4 | 1 | | |
| Phalange 1 | | | | | |
| Phalange 2 | | 1 | | | |
| Phalange 3 | | | | | |
| Metapodial | | | | | |
| **Total (of 104)** | **25** | **57** | **5** | **16** | **1** |
| % | **23** | 55 | **5** | **16** | **1** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified to taxon.

*Table 7.6 Numbers of mammalian bones identified to taxon from Phase 4, sites SA, LA and PS*

| | Pig | Cattle | Sheep | Sheep/ Goat | Horse | Roe deer |
|---|---|---|---|---|---|---|
| Horncore | | 2 | | | | |
| Skull | 5 | 1 | 1 | 1 | | |
| Mandible | 5 | 4 | | 9 | 1 | |
| Teeth | 2 | 1 | | 5 | 2 | |
| Vertebra | | 2 | | 3 | 3 | |
| Rib | | 5 | | | 3 | |
| Scapula | 1 | 1 | | 2 | | |
| Humerus | 2 | 4 | 2 | 1 | | |
| Radius | 2 | 4 | 2 | 3 | | |
| Ulna | 5 | | | | | |
| Carpal | | 2 | | | | |
| Metacarpal | 2 | 2 | 4 | 4 | | |
| Innominate | 1 | 3 | | 2 | 2 | |
| Femur | | | | | | |
| Patella | | | | | | |
| Tibia | 1 | 2 | | 9 | | |
| Fibula | | | | | | |
| Calcaneum | | | 1 | | | |
| Astragalus | | 2 | | | | |
| Scapho-cu- boid | | | | | | |
| Metatarsal | 2 | 2 | 7 | 2 | | 1 |
| Phalange 1 | | | | | 1 | |
| Phalange 2 | | | | | 1 | |
| Phalange 3 | | | | | | |
| Metapodial | | | | | | |
| **Total (of 137)** | **28** | **37** | **17** | **41** | **13** | **1** |
| % | **20** | **27** | **12** | **30** | **9** | – |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of identified taxon.

Firstly, the state of preservation of the assemblage was assessed by recording the degree of abrasion, weathering and colour of each bone. Secondly, the relative proportions of elements from each phase were scrutinised to determine whether they contained a significant proportion of butcher's or household waste.

The standard methodology used to distinguish between butcher's waste, waste derived from industrial activities such as horn working and hide preparation, and waste from domestic occupation (table waste) is to consider the relative proportions of various elements within each assemblage. Butcher's waste contains a high proportion of elements associated with the primary dressing of a carcass, such as mandibles and limb extremities, whereas table waste comprises the principal meat-bearing bones, such as upper limb elements, vertebrae and ribs. Butcher's waste also tends to be less fragmented than bones derived from table waste, as elements such as mandibles, metapodials and phalanges were not subjected to the same degree of processing as joints prepared for the table.

*Table 7.7 Numbers of mammalian bones identified from site SA (56–60 St Aldate's), Phase 4*

| | Pig | Cattle | Sheep/ Goat | Horse | Large ungulate | Small ungulate |
|---|---|---|---|---|---|---|
| Horncore | | 1 | | | | 1 |
| Skull | 3 | | | | 4 | 1 |
| Mandible | 2 | 4 | 8 | 1 | | |
| Teeth | 2 | 1 | 4 | | 5 | |
| Vertebra | | | 2 | | 31 | 3 |
| Rib | | 3 | | | 5 | 15 |
| Scapula | 1 | | 2 | | | |
| Humerus | 1 | | 2 | | | 2 |
| Radius | 1 | 1 | 2 | | | 2 |
| Ulna | 4 | | | | | 1 |
| Carpal | | 1 | | | | |
| Metacarpal | 2 | 1 | 7 | | | 1 |
| Innominate | 1 | | 2 | | 1 | 3 |
| Femur | | | | | | 3 |
| Patella | | | | | | |
| Tibia | | 1 | 2 | | | |
| Fibula | | | | | | |
| Calcaneum | | | 1 | | | |
| Astragalus | | 1 | | | | |
| Scapho-cuboid | | | | | | |
| Metatarsal | 1 | | 8 | | | 1 |
| Phalange 1 | | | | | | |
| Phalange 2 | | | | | | |
| Phalange 3 | | | | | | |
| Metapodial | | | | | | |
| Long bone shaft | | | | | 13 | 6 |
| Unidentified frags | | | | | 9 | 2 |
| **Total (of 182)** | **18** | **14** | **40** | **1** | **68** | **4** |
| % | **10** | **8** | **22** | – | **37** | **23** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified.

*Recovery*

The faunal assemblage was collected by hand-picking, which is not as efficient a means of recovery as wet sieving. This will have resulted in the loss of some material, particularly the bones of smaller-bodied animals such as small mammals, birds, fish and amphibians (Payne 1972).

## *Phase 2*

Eleven bones were recovered from this phase (site SA, contexts 54 and 515). Cattle (two elements) and pig (one element) were the only taxa identified.

It is difficult to comment upon such a small collection of bones, but cattle or large ungulate-sized ribs (four bones) were the most commonly occurring element. This would indicate that the bones from this phase are likely to be derived from domestic activity rather than butcher's waste.

## *Phase 3*

A total of 253 bones were recorded from this phase. The majority of these (241 bones) were recovered from silty deposits (site SA, contexts 52 and 53) around the early riverbank revetments. The assemblage was stained a deep brown colour, consistent with the bones having been in contact with organic-rich deposits. Overall the assemblage was well but not uniformly preserved, as some elements were slightly more abraded than others. This indicates either that the assemblage was not derived from a single dumping episode or that certain parts of the assemblage had suffered some damage *in situ*. Some bones were gnawed, probably by domestic dogs, but it was not possible to determine whether this occurred prior to deposition or whether they had been scavenged *in situ*.

The bones from site SA were comparatively unfragmented and contained a significant element of butcher's waste. Cattle maxillae and mandibles accounted for 35% of the bones identified to this taxon and some of these had been discarded as paired elements from the same animal (one mandible, context 52/2 and one maxilla, context 52). A pig mandible from context 52/2 was also disposed of as a paired element. Another item of interest was a complete pig cranium from context 52 (Plate 7.1); the occipital condyles had been chopped through to detach the skull from the atlas vertebra. Two relatively complete crania of sheep were also recovered from this context. These had not been cleaved sagittally as was recorded from later phases (Phases 4 to 8) at this site but the ventral part of the crania had been broken open, possibly to extract the brain.

Twelve bones were recovered from site PS, contexts 45, 47 and 48. (Context 45 has been reassigned subsequently to Phase 4.) These bones were in excellent condition and none of the elements showed evidence for gnawing, suggesting that they were rapidly buried after deposition.

Pig, cattle, sheep and horse were identified from these levels with bones of cattle comprising the larger part (55%) of animals processed for food, with pig and sheep present in roughly equal proportions (23% and 21% respectively).

## *Phase 4*

Some 303 mammalian bones were retrieved from this phase. Thirty-four bones were recovered from site LA, 182 bones from site SA and 87 bones from site PS. The greatest number of bones from site SA was recovered from context 50 (silt and fence). Overall the bones were well preserved although some evidence of abrasion was recorded. The bones were also relatively unfragmented as was noted from the material collected from Phase 3 at this site.

The high proportion of mandibles and metapodials amongst sheep/goat bones (57%) indicates the dumping of elements from the early stages of carcass processing (see Table 7.7). However, site SA also

*Table 7.8 Numbers of mammalian bones identified to taxon from Phase 5, sites SA, LA and PS*

| | Pig | Cattle | Goat | Sheep | Sheep/Goat | Horse | Red deer |
|---|---|---|---|---|---|---|---|
| Horncore | | 1 | 1 | 4 | 5 | 2 | |
| Skull | 2 | 9 | | | 18 | | |
| Mandible | 2 | 13 | | | 14 | | |
| Teeth | 3 | 4 | | | 2 | 1 | |
| Vertebra | 1 | 8 | | | | | |
| Rib | | 6 | | | | | |
| Scapula | 2 | 2 | | 1 | 8 | | |
| Humerus | 2 | 5 | | 5 | 4 | | |
| Radius | 1 | 6 | | 2 | 11 | 1 | |
| Ulna | 1 | 7 | | | 3 | | |
| Carpal | | | | | | | |
| Metacarpal | 1 | 6 | | 2 | 4 | | |
| Innominate | | 9 | | | 5 | 1 | |
| Femur | | 3 | | | 1 | | |
| Patella | | | | | 18 | | |
| Tibia | 4 | 4 | | 2 | | | |
| Fibula | 2 | | | | | | |
| Calcaneum | 2 | 9 | | | | | |
| Astragalus | | 1 | | | 1 | | |
| Scapho-cuboid | | 1 | | | | | 1 |
| Metatarsal | 1 | 7 | | 2 | 7 | | |
| Phalange 1 | 1 | 7 | | | | | |
| Phalange 2 | | 2 | | | | | |
| Phalange 3 | | 1 | | | | | |
| Metapodial | 1 | 1 | | | | | |
| **Total (of 256)** | **26** | **112** | **1** | **18** | **91** | **5** | **1** |
| **%** | **10** | **44** | **–** | **7** | **36** | **2** | **–** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified to taxon.

contains a significant proportion of cattle and large ungulate bones which could be characterised as table waste.

Sheep and goat accounted for 42% of bones identified to taxon and these were succeeded in importance by cattle (27%) and pig (20%). The relatively high percentage of horse bones in this assemblage (9%) was inflated by nine bones of this taxon recovered from site PS, context 43/3. These bones could well have derived from a single individual and possibly represent dumping from a knacker's yard.

The metatarsal of a peregrine falcon, *Falco peregrinus*, was identified from site SA, context 514. This bone was in very good condition, suggesting that it was deposited *in situ*.

### *Phase 5*

A total of 635 bones were examined from this phase, 295 fragments from site LA and a further 340 fragments from site SA. The assemblage from site LA was principally derived from pit and silt deposits. The highest number of bones were recovered from context 20 (silting) and this material was rather mixed, both in terms of preservation and in the degree of discolouration of the bones.

The condition of the assemblage from site SA was similar to that recorded from Phase 3 but slightly more weathered and abraded. Three of the five elements of horse identified from this phase were recovered from site SA (context 508/1), and these included a complete although fragmentary cranium of an aged animal and an innominate which had been gnawed, probably by a dog. The skull was stained a deep brown colour, suggesting that it had been deposited in silty deposits, but the surface of the bone was unevenly preserved. The posterior part of the cranium had lost some surface detail compared to the better preserved anterior part. This suggests that half of the cranium was lying in a more protected environment, and this could be consistent with the deposition of the cranium in muddy deposits where part of the bone was buried but the rest was exposed to the elements. Table 7.8 shows the distribution of elements identified from Phase 5. Cattle skull and foot bones and sheep mandibles accounted for a relatively high percentage of this assemblage (46% and 20% of bones identified to each taxon respectively). These elements were fairly randomly distributed across both sites except that most of the cattle skull bones were concentrated in site LA (18 bones), and most of the sheep mandibles were excavated from site SA (12 bones). A further

*Table 7.9 Numbers of mammalian bones identified to taxon from Phase 6, sites SA, LA and PS*

| | Pig | Cattle | Sheep | Sheep/ Goat | Horse | Cat | Otter |
|---|---|---|---|---|---|---|---|
| Horncore | | 4 | 6 | | | | |
| Skull | 6 | 4 | 3 | 4 | | | |
| Mandible | 6 | 11 | | 10 | | | |
| Teeth | 3 | 10 | | 11 | 3 | | |
| Vertebra | 5 | 3 | | 21 | 1 | | |
| Rib | | 6 | | | | | |
| Scapula | 4 | 6 | 1 | 7 | | | |
| Humerus | 2 | 4 | 9 | 15 | 1 | 1 | |
| Radius | 5 | 14 | 6 | 35 | 1 | | |
| Ulna | 9 | 4 | | 4 | 1 | | |
| Carpal | | 2 | | | | | |
| Metacarpal | 1 | 3 | 3 | 14 | 1 | | |
| Innominate | | 6 | 1 | 14 | | | 1 |
| Femur | 1 | 2 | 1 | 13 | | | |
| Patella | | | | | | | |
| Tibia | 5 | 10 | 2 | 47 | 1 | | |
| Fibula | 1 | | | | | | |
| Calcaneum | 2 | 4 | | 3 | 1 | | |
| Astragalus | | 8 | | 2 | | | |
| Scapho-cuboid | | 1 | | | | | |
| Metatarsal | 1 | 9 | 9 | 12 | | | |
| Phalange 1 | 1 | 9 | 3 | 3 | 1 | | |
| Phalange 2 | | 4 | | | 1 | | |
| Phalange 3 | | 3 | | | | | |
| Metapodial | 2 | 1 | | | 1 | | |
| **Total (of 456)** | **54** | **128** | **44** | **215** | **13** | **1** | **1** |
| **%** | **12** | **29** | **10** | **47** | **3** | **–** | **–** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of identified taxon.

*Table 7.10 Numbers of mammalian bones identified from pit contexts, site LA (30–31 St Aldate's), Phase 6*

| | Pig | Cattle | Sheep/ Goat | Horse | Large ungulate | Small ungulate |
|---|---|---|---|---|---|---|
| Horncore | | | 3 | | 3 | 5 |
| Skull | 3 | 3 | 4 | | 2 | 4 |
| Mandible | 3 | 3 | 4 | | | |
| Teeth | 1 | 4 | 8 | 2 | | |
| Vertebra | | | 4 | | 8 | 10 |
| Rib | | | | | 25 | 54 |
| Scapula | | 1 | 5 | | 4 | 4 |
| Humerus | | 1 | 9 | | | 2 |
| Radius | | 3 | 8 | | | 3 |
| Ulna | | | 8 | | 1 | |
| Carpal | | | | | | |
| Metacarpal | 1 | 3 | 3 | | | 2 |
| Innominate | | 1 | 5 | | 3 | |
| Femur | | | 2 | | | 7 |
| Patella | | | | | | |
| Tibia | 2 | | 7 | | | 1 |
| Fibula | | | | | | |
| Calcaneum | 1 | 2 | | | | |
| Astragalus | | | 1 | | | |
| Scapho-cuboid | | | | | | |
| Metatarsal | | 2 | 4 | | | |
| Phalange 1 | 1 | 2 | 1 | 1 | | |
| Phalange 2 | | 2 | | 1 | | |
| Phalange 3 | | 1 | | | | |
| Metapodial | | | | | | 1 |
| Long bone shaft | | | | | 21 | 35 |
| Unidentified frags | | | | | 28 | 9 |
| **Total (of 344)** | **12** | **28** | **76** | **4** | **95** | **137** |
| **%** | **3** | **8** | **20** | **1** | **28** | **40** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified.

small point of difference between the assemblages excavated from sites LA and SA was the percentage of prime meat-bearing bones of sheep. The assemblage from site SA contained 60% of these elements (including 16 of the 20 tibiae recovered), whereas these bones accounted for 46% of the assemblage excavated from site LA.

Cattle bones comprised 44% of elements identified to taxon and sheep and pig accounted for 43% and 10% of the assemblage respectively. The scapho-cuboid of a red deer was identified from site LA, context 107.

### *Phase 6*

A total of 1185 bones were recorded from this phase, comprising 711 fragments from site LA, 388 fragments from site PS and 86 fragments from site SA.

Almost all of the assemblage recovered from site LA was derived from pits (344 bones) and layers of silt and gravel, which probably represent both episodes of land reclamation, and yards (359 bones). Typically, these bones were abraded, with some elements showing evidence for long-term exposure and transport. The bones from pit contexts were marginally more abraded than those from 'yards'. Two further indications that the assemblage had been modified by these factors were the quantity of material that could not be identified to taxa (64%) and the comparatively high proportion of loose teeth within the assemblage (3%).

These levels of the site have been identified as an area of land reclamation and occupation and it was hoped that the nature of the faunal assemblage might corroborate this interpretation. If the assemblage contained bone refuse dumped to reclaim the channel beds then one could envisage that the deposits would contain a significant proportion of butcher's or industrial waste. Bone refuse from these sources would be available in large quantities as well being more readily mobilised for this type of activity. As dumping implies the building up of a land surface one might further postulate that the features identified as 'yards' would be more likely to contain this type of deposit than pits. In order to determine whether there were any differences in the composition of the assemblage

*Table 7.11 Numbers of mammalian bones identified from yard contexts, site LA, Phase 6*

| | Pig | Cattle | Sheep/Goat | Otter | Large ungulate | Small ungulate |
|---|---|---|---|---|---|---|
| Horncore | | 1 | 2 | | | |
| Skull | 1 | | 1 | | 3 | 8 |
| Mandible | 1 | 4 | 2 | | | 1 |
| Teeth | 1 | 2 | 1 | | | |
| Vertebra | 3 | | 3 | | 6 | 9 |
| Rib | | 3 | 15 | | 32 | 47 |
| Scapula | 1 | 4 | 2 | | 5 | 10 |
| Humerus | | 1 | 4 | | | 1 |
| Radius | 2 | 5 | 3 | | 1 | 1 |
| Ulna | 6 | 2 | 3 | | | 2 |
| Carpal | | | | | | |
| Metacarpal | | | 12 | | | 1 |
| Innominate | | 1 | 5 | 1 | | 1 |
| Femur | 1 | 2 | 2 | | 4 | 1 |
| Patella | | | | | | |
| Tibia | | 2 | 18 | | | 5 |
| Fibula | 1 | | | | | |
| Calcaneum | | | | | | |
| Astragalus | | 2 | | | | |
| Scapho-cuboid | | | | | | |
| Metatarsal | | 3 | 10 | | | |
| Phalange 1 | | 4 | 1 | | | |
| Phalange 2 | | | | | | |
| Phalange 3 | | 2 | | | | |
| Metapodial | | | | | | 2 |
| Long bone shaft | | | | | 24 | 27 |
| Unidentified frags | | | | | 14 | 3 |
| **Total (of 359)** | **17** | **38** | **84** | **1** | **89** | **130** |
| **%** | **5** | **11** | **23** | **–** | **25** | **36** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified.

from site LA, pit and 'yard' contexts were analysed separately (see Tables 7.10 and 7.11).

The findings of this analysis showed that overall the two groups of bones were very similar in composition, with a few minor differences. Sheep metapodials were better represented in the 'yard' deposits by 22 bones, as opposed to 7 bones from pit contexts. The interpretation of this result is rather problematic. These bones could represent butcher's waste exported from the city, or equally some sheep may be been slaughtered on site; this activity might well have been carried out in a backyard.

Tables 7.10 and 7.11 also show the numbers of elements which could not be identified to taxon. The majority of these large and small ungulate bones would have derived from pig, sheep and cattle and overall they constitute 67% of the assemblage from the pit group and 61% of bones from yard contexts. A high proportion of the elements derived from animals of large and small ungulate size were identified as ribs, vertebrae and long bone shaft fragments, and these bones are typical of refuse from domestic activity. Ribs, vertebrae and long bone shaft fragments accounted for 57% of bones identified as large ungulate and 72% of bones identified as small ungulate from pit contexts. These elements accounted for 70% of large ungulate bones and 64% of small ungulate bones retrieved from yards.

It would seem that the major component of the assemblage excavated from pits and yards from site LA, Phase 6, was table waste, presumably discarded *in situ*. Although it is possible to argue that these contexts contain some butcher's refuse it is not present in sufficient quantity to indicate concerted dumping of this type of waste from the town.

One innominate bone from site LA (context 205) was identified as otter. This specimen was abraded and the possibility that it was transported material can not be ruled out. No evidence of butchery was observed. It is therefore not possible to determine whether this animal died of natural causes or was hunted for its pelt.

Thirty bones from site SA could be identified to taxon and the majority of these were derived from sheep/goat (16 bones) with cattle elements accounting for 11 bones. The distribution of elements from these two taxa indicate that most of the bones of sheep were derived from table waste (58%) whereas just over half of the cattle bones could be categorised as butcher's waste. Most of the assemblage examined from site PS was excavated from silt deposits (context 38). This context was excavated as a series of quadrants and the bones were subdivided accordingly. The condition of this material was rather variable. Some bones were stained a deep brown colour, suggesting that they had been buried in organic deposits, but others were not discoloured to the same extent. This indicates that the bones may have had a mixed origin, which would be consistent with the rather abraded nature of some of the material.

Of the 13 bones identified as horse from this phase, 9 were derived from site PS, and these elements were concentrated in context 38 (38/B/2, 38/C/2, 38D, 38/D/2 and 38F).

The bones of sheep/goat comprised the majority of elements identified from this phase (57%). Cattle and pig accounted for 29% and 12% of the assemblage respectively. The humerus of a cat was identified from site PS, context 38/B/2.

### *Phase 7*

A total of 566 bones were examined from this phase, 170 of these were collected from site LA, 267 from site SA and 129 fragments from site PS.

The bones from the floor levels in site SA were well preserved and were typically a pale, buff colour, indicating that they had not been in contact with any humic material. This evidence is incompatible with the interpretation of this context as a floor, but could be consistent with material derived from the gravelly deposits or stone drains adjacent to these floor levels.

*Table 7.12 Numbers of mammalian bones identified to taxon from Phase 7, sites SA, LA and PS*

| | Pig | Cattle | Goat | Sheep | Sheep/Goat | Horse | Cat | Fallow deer |
|---|---|---|---|---|---|---|---|---|
| Horncore | | 1 | | 3 | | | | |
| Skull | 2 | 2 | | 1 | 5 | | | |
| Mandible | 11 | 2 | | | 2 | | | |
| Teeth | 8 | 3 | | | 4 | 1 | | |
| Vertebra | 1 | 4 | | | 3 | | | |
| Rib | | 1 | | | | | | |
| Scapula | | 2 | | | | | | |
| Humerus | 2 | 5 | | 6 | 3 | | | |
| Radius | 3 | 3 | | 3 | 5 | | | 1 |
| Ulna | 1 | 5 | | | 1 | | | |
| Carpal | | | | | | | | |
| Metacarpal | | 7 | 1 | | 6 | | | |
| Innominate | | 5 | | | 4 | | | |
| Femur | | 3 | | | 6 | | 1 | |
| Patella | | | | | | | | |
| Tibia | 3 | 3 | | 1 | 13 | | | |
| Fibula | 1 | | | | | | | |
| Calcaneum | | | | | | | | |
| Astragalus | | 2 | | | | | | |
| Scapho-cuboid | | 1 | | | | | | |
| Metatarsal | 1 | 5 | | 5 | 7 | | | |
| Phalange 1 | 1 | 5 | | 3 | | | | |
| Phalange 2 | | 2 | | | | | | |
| Phalange 3 | | 2 | | | | | | |
| Metapodial | 2 | 2 | | | 1 | | | |
| **Total (of 187)** | **36** | **65** | **1** | **22** | **60** | **1** | **1** | **1** |
| % | **19** | **35** | – | **12** | **32** | – | – | – |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified to taxon.

Most of the pig bones excavated from this phase were concentrated in site SA (78% of the total identified to taxon). Mandibular elements were particularly well represented and accounted for 39% of the bones identified. Although most of these remains could be associated with the waste obtained from carcass dressing, 32% of the bones were derived from prime meat-bearing elements, such as tibiae (three bones). The interpretation of these findings is somewhat problematic. It is likely that sty pigs were reared by many households during this period, as they could be fed on domestic refuse and thus provided a cheap source of protein. Sty pigs would have been slaughtered locally and any waste would have been dumped within close proximity to the butchery site. The archaeological evidence shows that there was domestic occupation of this part of the site and therefore it is hard to escape the conclusion that these bones were dumped by local householders rather than representing butcher's waste from the city.

Sheep/goat bones comprised 44% of the assemblage identified to taxon from these levels, with cattle and pig accounting for 35% and 19% of the assemblage respectively. The radius of a fallow deer was identified from site SA, context 23, and the femur of a domestic cat was also identified from this site (context 8/1). One frog bone, *Rana* sp., was identified from site PS, context 3 (trial trench).

### *Phase 8*

Some 522 bones were recovered from this phase, 342 fragments from site LA, 97 fragments from site SA and a further 83 fragments from site PS. The majority of the bones (59%) from site LA were collected from a single pit (context 203). The bones from this pit were rather better preserved than those recorded from the pit groups in Phase 6 and this could suggest that they were buried soon after they had been discarded.

A high percentage of bones identified as sheep/goat from site LA were derived from elements associated with the early stages of carcass processing (62%). In fact, almost all of the sheep mandibles, metacarpals and metatarsals from this phase were excavated from this site (10 out of 13 mandibles, 12 of the 13 metacarpals and 5 of the 6 metatarsals). The proportion of elements derived from carcass dressing of sheep/goat was evenly distributed across sites SA and PS and accounted for 52% of bones identified. The total number of sheep/goat bones from sites SA and PS was rather low (29 elements) and this limits the value of any comparison between

*Table 7.13 Numbers of mammalian bones identified to taxon from Phase 8, sites SA, LA and PS*

| | Pig | Cattle | Goat | Sheep | Sheep/Goat | Horse | Dog | Red deer |
|---|---|---|---|---|---|---|---|---|
| Horncore | | 1 | | 3 | | | | |
| Skull | 2 | 2 | | 2 | 1 | | | |
| Mandible | 6 | 6 | | | 13 | | | |
| Teeth | 6 | 3 | | | 7 | | | |
| Vertebra | | 7 | | | 4 | | | |
| Rib | | 4 | | | | | | |
| Scapula | 1 | | | | 2 | | | |
| Humerus | 2 | 2 | | 1 | 3 | | | |
| Radius | | 6 | | | 4 | | | |
| Ulna | 3 | 5 | | | 1 | | 1 | |
| Carpal | 1 | | | | | | | |
| Metacarpal | | 4 | | 4 | 13 | | | |
| Innominate | | | | | 3 | | | |
| Femur | | 3 | | | 2 | | | |
| Patella | | | | | | 1 | | |
| Tibia | 2 | 2 | | | 9 | | | 1 |
| Fibula | 1 | | | | | | | |
| Calcaneum | | 3 | | | | | | |
| Astragalus | | 1 | | | | | | |
| Scapho-cuboid | | | | | | | | |
| Metatarsal | | 7 | 1 | 2 | 6 | | | |
| Phalange 1 | | 11 | | 3 | 1 | | | |
| Phalange 2 | | 2 | | | | | | |
| Phalange 3 | | 2 | | | 1 | | | |
| Metapodial | 1 | | | | | | | |
| **Total (of 186)** | **25** | **71** | **1** | **16** | **70** | **1** | **1** | **1** |
| **%** | **13** | **38** | **–** | **9** | **38** | **–** | **–** | **–** |

Notes: Synostosed radius and ulna fragments counted as radii. Percentages calculated from the total number of fragments identified to taxon.

the three sites. However, the evidence does suggest that a significant quantity of carcass dressing waste from sheep/goat was discarded at site LA, although it is difficult to determine whether this was of local origin or was dumped from the town.

The condition of the assemblage from site SA was rather mixed. Most of the bones from contexts 21, 37 and 42 were stained a deep brown colour and were slightly abraded. The bones excavated from context 4 were a light, buff colour and were also somewhat abraded.

The distribution of the elements identified as cattle and sheep/goat indicates that this assemblage was predominantly derived from butchery waste (73% of cattle bones and 50% of bones identified from sheep/goat). However, the numbers of bones identified to these taxa were very small (28 bones), and caution is required in the interpretation of these findings. Eight bones were identified as pig and these accounted for 32% of the elements identified to this taxon from this phase, representing a substantial drop in the frequency of this species in comparison with the previous phase.

Sheep/goat bones comprised 47% of elements identified to taxon from these levels and cattle and pig accounted for 38% and 13% of the assemblage respectively. The tibia of a red deer was identified from site PS, context 31/2.

### Age at death

The age at death of the mammals represented at these sites was estimated using evidence from the eruption and wear of the mandibular teeth (Grant 1982) and the state of fusion of the bones (Silver 1969).

The number of cattle mandibles that could be aged following Grant's system was disappointing and any interpretation of these data has to be somewhat circumspect. Two mandibles recovered from Phase 3 (site SA), were derived from animals which had died during the first year of life. Two maxillae recovered from this site were also culled from animals which had died at approximately one year of age. Two mandibles from Phase 4 were from mature animals which were at least four years old at the time of death. Two mandibles from Phases 6 and 7 were from elderly individuals, probably slaughtered because they had come to the end of their useful life.

Six mandibles identified as sheep/goat from Phase 4 could be aged. The mean tooth wear stages recorded ranged between 32 and 37. These animals were slaughtered between 30 and 36 months of age,


*Plate 7.1 Skull of juvenile pig from the late Saxon levels at 56–60 St Aldate's: above, dorsal view; below, lateral view.*

suggesting the marketing of sheep for the prime meat market after they had been shorn of two fleeces.

The age at death of the sheep/goat sample from Phase 5 was more variable, ranging from a mean wear stage of 20 to 41. This indicates the slaughter of three age groups. The youngest animals died during the second year of life, just over 50% died during the third year of life and four individuals were slaughtered after approximately four years.

### *The sexing of the remains*

The lower canines from seven pigs could be sexed and both sexes appeared to be equally represented.

There were very few measurable elements of cattle and this limited the assessment of the relative proportions of the sexes within the sample. The measurements of the metapodials were collated from all phases at the site, and the separation observed between metatarsal elements suggests that both sexes were present.

It was possible to sex ten innominates of sheep/goat according to the criteria outlined by Armitage (1977) and by morphology (Lemppenau 1964). Most of the innominates that could be sexed were recovered from Phase 6 (eight specimens), and six of these were from male animals.

*Plate 7.2 Cleaved sheep skulls from medieval levels: above, from the Police Station context 35; below, from Land adjoining the Police Station context 51/4.*

### *Butchery evidence*

The butchery evidence recorded from the assemblage indicates that carcass-chopping implements were most frequently used in processing, although a few cut marks were recorded.

Chopping implements were used for the early stages of carcass preparation such as the removal of horncores and detaching mandibles from crania and the extremities of limbs from the main body of the animal. The carcasses were further prepared by chopping through the articulations and shafts of the meat-bearing bones to produce joints for the table. Several skulls of pigs, calves and sheep had been cleaved along the sagittal plane (Plate 7.2) in order to extract the brain for consumption (sheep skulls from site LA, contexts 24/1, 51/4, 201, site PS, two specimens from context 35).

The elements of cattle were more intensively processed compared to those of pig and sheep, with a higher proportion of chop marks recorded from the articular ends of the long bones. This accounts for the relatively few measurements that could be taken from the mature bones of this taxon.

Cutmarks were recorded from nine elements of cattle. The maxilla of a cow from site SA (context 510/1) showed some cutmarks running around the anterior portion of the bone and a carpal from site LA (context 24) bore transverse cutmarks across the anterior aspect. These cutmarks are probably related to skinning. The other cutmarks recorded from elements of cattle could all be correlated to either disarticulation or filleting activities. Evidence for the use of knives to disarticulate various longbones and ribs was recorded from site LA (context 153), site PS (contexts 38C, 43/2), site SA (contexts 52, 54/1). Evidence for filleting was recorded from site SA (context 88). Evidence for cutmarks was recorded from six pig bones and all of these could be correlated to disarticulation of limb bone elements (radius, humerus, calcaneum, astragalus, tibia and femur). Cutmarks were recorded from ten elements of sheep, scapula (3), humeri (5), tibia (1) and an atlas vertebra. One of these sheep scapulae bore a series of transverse cutmarks across the blade which could be consistent with the production of slices of meat, similar to the modern 'gigot' cut. The cutmarks upon the tibia could be correlated with filleting activity. The rest of the cutmarks recorded could be interpreted as evidence for disarticulation of the major meat-bearing elements. A further 14 cutmarks were recorded from large ungulate rib elements and six from small ungulate ribs.

A horse metapodial from site SA (context 12/1) bore transverse cutmarks just above the distal articulation, indicating that the animal was skinned.

### *Pathology*

Five pathological bones were recorded from the assemblage. One cervical vertebra from a small ungulate-sized animal, probably sheep or goat, showed evidence of bone loss and resorption around the epiphysis (cranial end). This pathology was similar to that recorded by Clutton-Brock *et al.* (1991) from Soay rams which had engaged in combat, where the repeated trauma of head-butting resulted in damage to the epiphyses of the cervical vertebrae. Two ribs from a large ungulate-sized animal showed evidence for healed fractures. *Ante mortem* loss of the permanent second premolar was noted from two sheep/goat mandibles.

### *Summary and conclusions*

The analysis of the faunal remains excavated from the Saxon and medieval levels at these sites indicates that the assemblage contains refuse from both carcass dressing and domestic activity. A high proportion of the bones from site SA, Phase 3, could be identified as carcass waste, suggesting organised disposal of refuse along the south bank of the river during the Saxon period. The bones from Phases 4, 5 and 6 at this site were of mixed origin and suggest the deposition of butcher's waste and domestic refuse. The distribution of cattle and pig elements from Phase 7 shows a strong component of butcher's waste. However, the distinction between home butchery and butchery undertaken as part of a commercial concern cannot be readily drawn. It seems likely that cattle were generally purchased and butchered by people within the trade, but this would not necessarily have applied to the slaughter and processing of pigs or even possibly some sheep. The interpretation of butchery waste derived from pigs must be circumspect and the likelihood that pigs were raised and subsequently butchered *in situ* by many households cannot be ruled out. It seems probable that the relatively high proportion of pig bones from Phase 7, at site SA, may be explained by this kind of activity.

All of the assemblages examined from site LA were of medieval date. The bones of cattle and sheep from Phase 5 at this site contained a significant proportion of butcher's waste. Refuse from carcass dressing of cattle is also present in Phase 6 at this site but in general the assemblage seems to be largely composed of table waste. The assemblage excavated from Phases 7 and 8 suggests that elements derived from the carcass dressing of sheep comprise the majority of bones identified to this taxon. These assemblages were also better preserved than that recovered from Phase 6 at this site, and this is consistent with the condition of material derived from butcher's waste.

The number of bones excavated from site PS was generally rather low, especially from the early phases. The assemblage from Phase 6 at this site contains an element of butcher's waste, whereas the deposits from Phase 7 are characterised by a proportion of table waste elements. The concentration of horse bones from site PS, Phases 4 and 6, could indicate continuous use of the N bank of the river for sporadic, small scale dumping.

The pattern of exploitation of the common domesticates from the Saxon levels suggests that veal and good quality mutton were sold, indicating the presence of a luxury market. The evidence from the medieval levels shows that a wider range of age groups were represented, suggesting that although good quality meat was being sold in the town, some cheaper cuts were also available. The sale of poor quality beef and mutton is implied by the presence of mature and elderly cattle and sheep, probably culled from local farms after they had reached the end of their useful life. It is likely that most of the sheep slaughtered during Phase 6 were castrates, which implies the marketing of surplus wethers to the town by *c* 1200. Domestic geese, ducks and chickens were present in all of the medieval phases, and it is probable that these were raised within the town.

The frequency of pig bones declines from the early phases although this taxon is comparatively well represented in Phase 7. Cattle also decline in importance from the early to late phases, but these figures are skewed by the nature of the deposits. Cattle bones tend to be better represented in assemblages that contain a significant component of butcher's waste, whereas pig and sheep are better represented in table waste assemblages. Sheep/goat were comparatively scarce in the early phases, but from Phase 6 they were the most important livestock animals at these sites; the figures probably reflect a genuine increase in the importance of this taxon.

### Bones from the rampart at 24A St Michael's St (Tables 7.14, 7.20)
***by Bob Wilson***

Bones from St Michael's Street comprise another small but apparently characteristic collection of debris from peripheral town activities, being located at the bank, wall and ditch of the town defences. Identifications are summarised in Table 7.14.

Cattle and large bones are moderately abundant and thus the collection has a coarser component to it than other deposits more typical of domestic refuse in the town. At St Michael's St most bones appear to be derived, perhaps by rubbish clearance or scavenging, from domestic refuse dumps at some distance away but also entering pits as a result of other activities nearby. Pits 30 and 36 (Phase 5) contained higher percentages of head and foot debris of cattle (n = 47) and, to a lesser extent, of sheep (17) which indicate activities like tallow extraction which could have been either domestic or trade in origin. Much of the debris therefore appears not directly connected with domestic activities in housing, and instead indicates waste ground or gardens in the vicinity of the town defences.

Another indicator of this is the burial of the neck, forelimbs and anterior ribcage of a horse in pit 35. Bone measurements indicate this horse stood 14½ hands high. A minor growth of spongy bone or osteoperiostitis occurred on the anterior and lateral sides of one radius but may not have been a serious injury. No butchery marks could be distinguished on the bones and the carcass was probably buried whole apart from the removal of the skin.

*Table 7.14 Fragment frequency at 24A St Michael's Street*

| Phase<br>Features | 2 and 3<br>layers | 5<br>pits | 6<br>ditch | 7–8<br>pits/layers | Total | % |
|---|---|---|---|---|---|---|
| Cattle | 6 | 60 | 15 | 22 | 103 | 49.5 |
| Sheep | 2 | 39 | 15 | 19 | 75 | 36.1 |
| Pig | 1 | 12 | 3 | 6 | 22 | 10.6 |
| Horse (a) | 1 | 2 | – | – | 3 | 1.4 |
| Dog | – | 1 | – | – | 1 | 0.5 |
| Cat | – | 1 | – | 2 | 3 | 1.4 |
| Fallow deer | – | – | 1 | – | 1 | 0.5 |
| Subtotal | 10 | 115 | 34 | 49 | 208 | |
| Unidentified | 8 | 84 | 21 | 26 | 139 | |
| **Total** | **18** | **199** | **55** | **75** | **347** | |
| Burnt | 1 | 1 | – | 3 | 5 | 1.5 |
| Large frags. | 1 | 9 | 8 | 15 | 33 | 9.5 |
| Dom. fowl | – | 3 | 1 | 4 | 8 | |
| Dom. goose | – | 1 | – | – | 1 | |

(a) Excluding part skeleton of horse –36 bones and 5 ribs in Phase 5.

### Animal bones and marine shells from late Saxon levels at All Saints Church (Tables 7.15–7.18)
***by Bob Wilson with †Don Bramwell***

#### *Introduction*

The majority of animal bones from the church excavations are assigned to Phase 3, which is made up of pre-church deposits of early to mid 11th-century date. In terms of number they were largely derived from the infill of a cellar pit, AS 75 (65%) and other pits, for example AS 94 (21%) and AS 83 (6%). Other bone groups originated largely from floors or yard levels.

In all, 2,283 mammal bones were examined and 43% were identified; many of the remainder were rib fragments which are not recorded. Results of these identifications are shown in Table 7.15. Red deer was identified from a first phalanx; roe deer and fox from metatarsals; hare from pelvic and metatarsal bones. Two further fragments from pit 94 were part of a pike dentary.

#### *The evidence*

In Table 7.16, the skeletal element groupings of cattle, sheep and pig into head, feet, and body regions raise some difficulties of interpretation. Among the sites of medieval Abingdon, it appeared that the Market Place was exceptional in the quantities of bones which survived from the main carcass, that is exclusive of head and foot debris including hock and carpal joint bones (Wilson unpublished; Abingdon Market Place). In that analysis, Iron Age and Romano-British groups were used as indicators of unusual frequencies of grouped skeletal elements. In retrospect, it appears that some rural sites have a different amount of bone degradation compared to that among bones collected from medieval town sites, so may not provide a fair comparison. One also should be wary of varying levels of bone recovery and even the levels of identification in making inter-site comparisons.

Nevertheless, general comparison of results at All Saints with other sites in Oxford (Banks 1961–2, 64–7 [Logic Lane]; Jope and Pantin 1958, 79–83; Marples 1971, 28–31; Marples 1976, 302–4; Marples 1977, 166–7; Wilson 1980, Fiche E05–11; Wilson 1989a, 258–68),

*Table 7.15 Bone fragment frequency of species in major feature groups at All Saints Church*

| Phase<br>Assigned date (century AD) | 1<br>9th–e10th | 2<br>m-l.10th | 3<br>e-m11th | 4–6<br>11th–12th | Total | % |
|---|---|---|---|---|---|---|
| **Mammalian remains** | | | | | | |
| Cattle | 6 | 24 | 253 | 4 | 287 | 30 |
| Sheep | 12 | 29 | 356 | 8 | 405 | 42 |
| Pig | 12 | 28 | 206 | 3 | 249 | 25 |
| Horse | 2 | 1 | 7 | 1 | 11 | 1 |
| Other mammal | – | – | 18* | – | 18 | 2 |
| Total | 32 | 82 | 840 | 16 | 970(n) | |
| **Non-mammalian remains** | | | | | | |
| Domestic fowl | 11 | 1 | 71 | – | 83 | 8.6§ |
| Domestic goose | 1 | 1 | 5 | 3 | 10 | 1.0 |
| Wild birds | – | – | 8 | – | 8 | 0.8 |
| Oyster | 1 | 16 | 61 | 2 | 80 | 8.2 |

*Cat 11, roe deer 2, hare 2, red deer, dog and fox one each; all from pit 75.
§ Non-mammal remains expressed as percentage of the 970 total mammal remains.

indicated that the proportions of the bones from the main carcass, particularly of sheep, are relatively high. Vertebrae are quite common. Loose teeth however are less abundant, and crania of sheep from the larger features are largely intact so the fragmentation pattern across Oxford may yet require some future re-investigation.

By comparison, at least with later period groups (in Oxford, Abingdon and elsewhere), the results suggest that these bones are less connected with the early stages of commercial butchery and instead are domestic refuse. A more definite conclusion can be drawn if distinctive deposits of Saxon foot or head debris are recognised at other sites.

Minimum numbers of individuals were estimated from mandible debris of the major species: cattle 11, sheep 15 and pig 9 (Chaplin 1971, 70–5). Two individuals each of horse, cat and roe, and one each of red deer, hare, dog and fox were established from limb bone debris. A minimum of 39 oysters were counted, perhaps with an additional 10–30% to be comparable with the estimated abundance of mammal species.

*Table 7.16 Percentages of grouped skeletal elements in Phase 3, All Saints Church*

| Anatomical section | Cattle % | Sheep % | Pig % |
|---|---|---|---|
| Head | 25 | 19 | 23 |
| Feet | 29 | 18 | 21 |
| Body | 46 | 63 | 56 |
| Loose teeth | 5.5 | 1.1 | 6.8 |
| Mandible | 11.9 | 7.3 | 3.9 |
| Vertebrae | 15.4 | 18.8 | 14 |
| Carpal and hock joint | 12.3 | 2.8 | 1.5 |
| Metapodial | 7.9 | 12.9 | 18 |
| Phalanges | 8.7 | 2.0 | 1.5 |
| No. of bones | 253 | 356 | 206 |

Table 7.17 presents age information at a crude level. The inter-period comparison again might be qualified by taphonomic differences between sites, but indicates how the slaughtering of pigs, largely for meat, remains relatively constant while those of sheep and cattle fluctuate from period to period. In general the proportion of mature sheep killed increased from Iron Age to medieval times. At All Saints this trend is corroborated by 13 ageable mandibles of sheep, which indicate the slaughtering of relatively younger individuals than for instance

*Table 7.17 Percentages of fused epiphyses in groups of domestic mammal bones at sites of different periods*

| Site | Cattle | Sheep | Pig |
|---|---|---|---|
| All Saints | 81%<br>(93) | 79%<br>(179) | 30%<br>(90) |
| Broad Street/Old Gaol, Abingdon (medieval) | 74% | 81% | 29% |
| Barton Court Farm Villa (R-B) | 84% | 69% | 30% |
| Ashville (I.A.) | 74% | 53% | 27% |

Note: numbers in parentheses are total number of epiphyses.

*Table 7.18 Fragment frequency of domestic fowl at All Saints Church*

| Phase | 1 | 2 | 3 | 4–6 |
|---|---|---|---|---|
| Domestic fowl | 11 | 1 | 71 | – |
| Goose cf domestic | 1 | 1 | 5 | 3 |
| cf barnacle | – | – | 1 | – |
| Duck cf domestic | – | – | 2 | – |

Also in Phase 3: golden plover 1, woodcock 4, 'wild' duck 1 and rook/crow 1.

during the 12th to 15th centuries in Abingdon, the 12th to 16th centuries at the Hamel in Oxford, and the 11th to 16th centuries at Church Street in Oxford (Wilson 1980, Fiche E11–13, Wilson 1989a, 258–68, Wilson unpublished; Abingdon Market Place).

Bone measurements were few and were noted in the report on the Hamel (Wilson with Bramwell, in Palmer 1980, 198 and fiche).

### *General summary and discussion of All Saints evidence*

This collection of late Saxon bones is generally similar to most 11th- to 16th-century town deposits in the area, although some early to late medieval trends established at The Hamel, Oxford (eg of a greater differentiation of carcass part refuse) would qualify this generalisation (Wilson with Bramwell, in Palmer 1980, 198 and fiche). In addition pig bones and oyster shells are noticeably abundant at All Saints, though the percentage of pig is less than at Hinxey Hall (Wilson 1983, 68–9). Skeletal element percentages, particularly of sheep, have indicated that most bones are domestic refuse and less associated with commercial butchery than some later deposits. Mandibles indicate that the sheep were killed younger than during the medieval period, and although this group may be atypical (see Table 7.17) it seems to confirm a long-term trend.

The last three aspects could point to a good standard of diet on the High Street tenement which preceded the church, better than at most other local medieval and even other Saxon sites. Yet the level of prosperity is probably not very high in terms of social status, and may be inferior to the moderate level indicated by bone debris at Hinxey Hall, Oxford (Wilson 1983, 68–9). Both these late Saxon town-centre sites have a high proportion of domestic fowl bones compared to goose, in comparison with the suburban site of the Hamel (Wilson with Bramwell in Palmer 1980, 198 and fiche), which may suggest that such tenements on high ground mostly reared domestic fowl in their backyards, and not geese. Besides this evidence of home consumption, pigs also may have been kept locally, but the evidence at All Saints is less marked than at Hinxey Hall.

### **The Bird Bones from late Saxon deposits at All Saints** (Table 7.18)
***by †Don Bramwell***

The domestic fowl are a small variety which mostly fall within jungle fowl size range. At least 8 individuals, mainly females, are present. One scapula is fused solidly to a coracoid which must have restricted the use of the left wing of one of these fowl. Their bones are moderately common but those of other species seem far less so for a medieval site sample. Woodcock, golden plover and juvenile bones of rook or crow are of dietary note. The barnacle goose identification is based on an ulna length of 137 mm.

### **Animal Bones from 7–8 Queen St** (Tables 7.19, 7.20)
***by Bob Wilson with Alison Locker***

Some 1859 bones and fragments were examined from the 10th- to 13th-century features at 7 Queen Street, Oxford. A low 40% were identified due to the recovery of many unassignable scraps of bone. Sieved

*Table 7.19 Fragment frequency at 7–8 Queen Street*

| Phase<br>Features | 2<br>layers | 3<br>pits | 4<br>pits/layers | 5<br>pits | Total | % of subtotal | Sievings |
|---|---|---|---|---|---|---|---|
| Cattle | 60 | 20 | 85 | 60 | 225 | 30.4 | 4 |
| Sheep/goat | 73 | 20 | 166 | 72 | 331 | 44.8 | 7 |
| Pig | 45 | 22 | 62 | 46 | 175 | 23.7 | 5 |
| Horse | – | – | 2 | 1 | 3 | 0.4 | – |
| Dog | 1 | – | – | – | 1 | 0.1 | – |
| Cat | – | – | – | 1 | 1 | 0.1 | – |
| Hare | – | – | – | 3 | 3 | 0.4 | – |
| Subtotal | 179 | 62 | 315 | 183 | 739 | | 16 |
| Unidentified | 179 | 95 | 439 | 407 | 1120 | | 285 |
| **Total** | **358** | **157** | **754** | **590** | **1859** | | **301** |
| Burnt | 1 | – | 11 | 5 | 17 | 0.9 | 43 |
| Large frags. | 11 | 27 | 13 | 18 | 69 | 3.7 | – |
| Dom. fowl | 8 | 2 | 21 | 58 | 89 | | 2 |
| Dom. goose | 1 | – | 5 | 9 | 15 | | 2 |
| Other bird (a) | 1 | – | 2 | 2 | 5 | | – |
| Fish (b) | – | – | – | – | – | – | 38 |

(a) Including: Mallard/domestic duck 2 (Phases 4 and 5) and Partridge 2 (Phases 2 and 5).
(b) Eel (*Anguilla anguilla*) 6 (Phases 3–5); Herring 12 (Phases 4 and 5); and Cod 1, Pike 15, Whiting 2 and Roach 2 (all Phase 5). All fish and less common bird bones identified by Alison Locker.

*Table 7.20 Percentages of head, foot and body debris at 7–8 Queen St, 24A St Michael's St and the High Street Surface Water Drain*

| Phase | 7–8 Queen St | | | 24A St Michael's St | High St |
|---|---|---|---|---|---|
| | 3 | 4 | 5 | 5 | – |
| **Cattle** | | | | | |
| No. of frags | 20 | 85 | 60 | 60 | 24 |
| | % | % | % | % | % |
| Head | – | 16 | 35 | 45 | 42 |
| Foot | 20 | 15 | 15 | 28 | 42 |
| Body | 80 | 68 | 50 | 27 | 17 |
| **Sheep** | | | | | |
| No. of frags | 20 | 166 | 72 | 39 | 4 |
| | % | % | % | % | % |
| Head | 5 | 25 | 15 | 18 | – |
| Foot | 15 | 17 | 8 | 28 | – |
| Body | 80 | 57 | 76 | 54 | – |

debris of five small samples included an even lower proportion of identifiable fragments, 5%. These figures confirm the impression that the bone debris consists of quite small and fine material. This is borne out by the large bone fragments of cattle and horse being relatively less well represented in the collection while sheep, pig and domestic fowl are relatively abundant. Other species records are given in Table 7.19. Unsurprisingly, all the records of fish came from four sieved samples (Wilson 1989b, 409–10).

Such species abundances are typical of domestic refuse, especially table refuse, and also typical of internal house deposits (Wilson 1989c, 237–60). Much debris from Phase 4 is from layers relating to floors and hearths; the remaining bones are mostly from pits where, presumably, domestic refuse was thrown fairly directly.

The medieval domestic refuse is also typified by a high proportion of cattle and sheep remains from the elements of the body of main meat carcass. Head and foot elements are less well represented, as shown in Table 7.20, compared with 24A St Michael's St (see above) and the High St Surface Water Drain (below).

Thus from the 10th to 13th centuries domestic occupation of the site is very much in evidence.

### Animal bones from the High Street Surface Water Drain (Table 7.20)
***by Bob Wilson***

Although only one box of bones was recovered from the features of the High Street Surface Water Drain, the nature of the bones is consistent enough from the 12th-century kennel ditch group to the 13th- or 14th-century pit group to treat them as a single assemblage. Cattle bones predominate (24) with fewer examples of sheep/goat (4), pig (2) and roe deer (1), with 14 fragments remaining unidentified. Although the cattle bones constitute a small sample they consist of 42% cranial elements, including 16% horn cores, and 42% foot elements. Half of the recovered bones were more than 10 cm in size.

The kennel deposit therefore was comprised of a scatter of coarse debris, and its elemental composition suggests its derivation from slaughtering, butchery and related fellmongery trades like tanning and hornworking. Little obvious domestic refuse is represented. These findings are consistent with the historical evidence which locates the butchers' shambles in the High Street during the medieval period (*VCH* iv, 27, 305–06), until the butchery trade appears to have been reorganised during the 14th and 15th centuries with the location of slaughterhouses along Slaying Lane beside the Trill Mill Stream outside the town wall (*VCH* iv, 27).

### MAPPING THE HOUSEHOLD ACTIVITY OF EARLY OXFORD; THE SPREAD OF DOMESTIC AND OTHER BONE REFUSE
(FIG. 7.1; TABLE 7.21)
***by Bob Wilson***

As in many towns and cities, the archaeology of Oxford is a history of numerous small excavations and a few large ones, both with complicated stratigraphy. This means that the mapping of structural evidence of Saxon and early medieval buildings, even where abundant in the ground, will normally give only a problematic, fragmentary and disparate pattern. Consequently, it is still difficult to obtain a good idea of the extent of household activities in the early towns and cities.

There may, however, be better indicators of household activities. Distributions of common artefacts such as pottery may provide better information, and this is discussed by Mellor (Chapter 6, above). Bone debris also has obvious potential; not only are bones ubiquitous and abundant at settlements, but recent studies of the spatial patterning of bones show that some bone debris is more strongly indicative of former domestic activity than other debris. Moreover, the (at least theoretical) ability to separate town refuse into domestic and less domestic categories allow the possibility of mapping the distribution of domestic activity within a large settlement, providing that enough sites yielding bones have been sampled, dug and reported on.

The aim of this investigation is to explore the feasibility of mapping town refuse and to determine what the bone distribution indicates about the spread of human activities in Saxon and early medieval Oxford. No other published literature quite matches up to this intent and method. A history of investigating spatial patterning of bones and other site detritus has been reviewed elsewhere (Wilson 1994). Only the anthropological and Palaeolithic studies of Lewis Binford (1983) and other studies at sites of later periods in the Upper Thames valley are of much relevance (Wilson 1985). Thus regional work at rural sites such as Mingies Ditch (Allen and Robinson 1993), Claydon Pike (Booth *et al.*

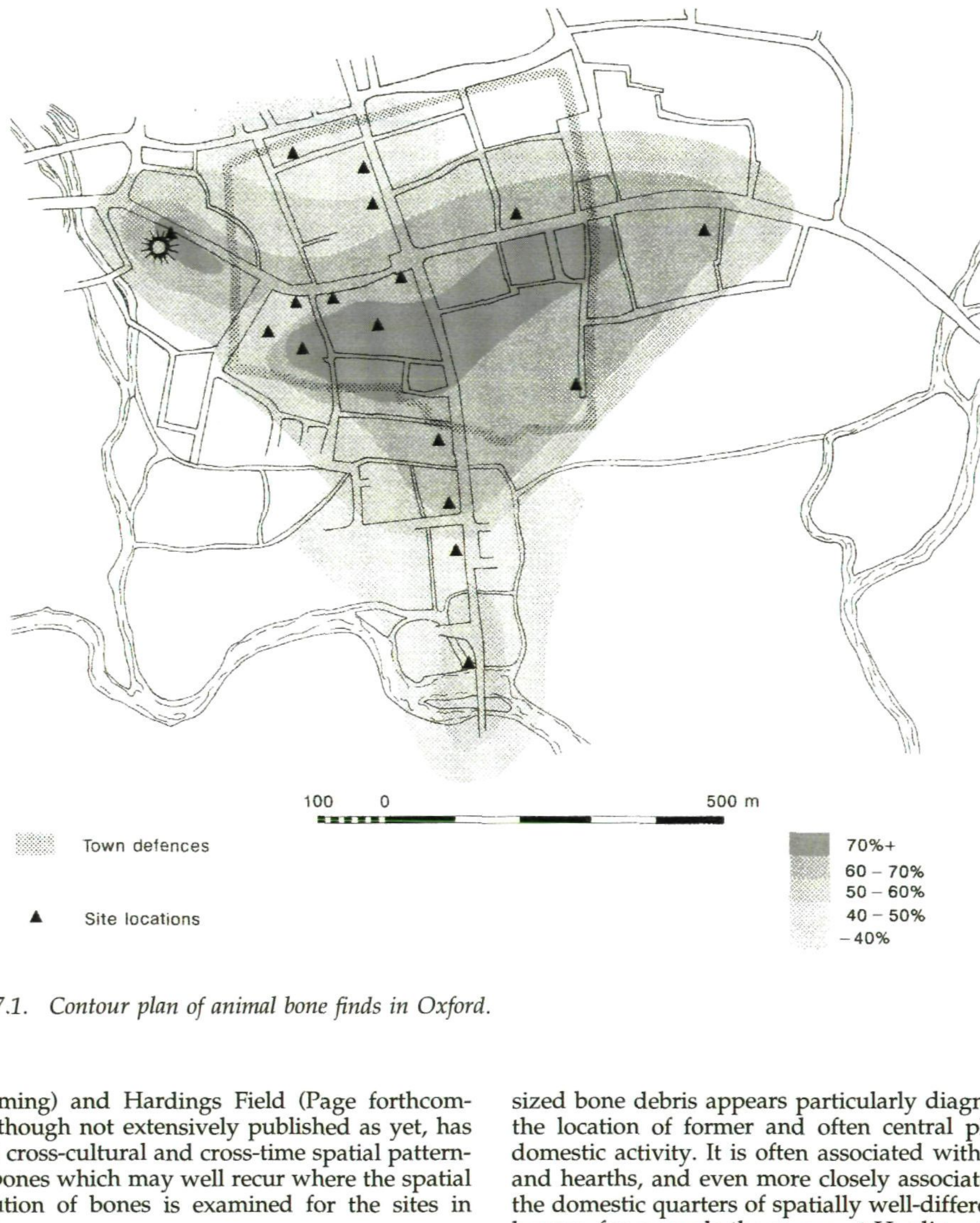


*Figure 7.1. Contour plan of animal bone finds in Oxford.*

forthcoming) and Hardings Field (Page forthcoming), although not extensively published as yet, has yielded cross-cultural and cross-time spatial patterning of bones which may well recur where the spatial distribution of bones is examined for the sites in Oxford.

Bone deposits appear broadly divisible into 'coarse debris' (typically of cattle and horse bones and large fragments of other species) and 'finer and small debris'. The latter can be subdivided into medium sized debris (typically of sheep and pig bones) and small sized debris (typified by the bones of smaller mammals like hare and rabbit, and bird and fish remains; bones of pets such as dog and cat are excluded from consideration). The smallest bone debris category, although characteristic of medieval sites, will not be discussed further here.

Coarse debris is diagnostic of peripheral and often less intensively used areas of settlement activities and also of building demolition deposits. Medium sized bone debris appears particularly diagnostic of the location of former and often central places of domestic activity. It is often associated with houses and hearths, and even more closely associated with the domestic quarters of spatially well-differentiated houses, for example the manor at Hardings Field.

Assuming that similar associations of medium coarse bones occurred at early Oxford sites, it appears worthwhile to map the percentages of sheep and pig bones (among those of the four most common species) at excavations in the city and to consider whether they constitute a meaningful spatial pattern.

Bone fragment number results from 21 sites of human activity in early Oxford have been collected and the percentage of sheep and pig bones in the total of the cattle, horse, sheep and pig bones at each site has been calculated. Results are given in Table 7.21, and have been collated from reports published in *Oxoniensia*, from unpublished reports, and from archive evidence. Further details of all sites

*Table 7.21 Percentages of sheep and pig bones in late Saxon to medieval bone groups from Oxford*

| **Site** | **Hinxey Hall** | **Church Street** | **Oxford Castle** | **All Saints Church** | **The Hamel** | **Greyfriars** | **7–8 Queen Street** |
|---|---|---|---|---|---|---|---|
| Period/ century | 10th–13th | 10th–13th | 11th | 11th–13th | 12th–13th | 13th | 10th–12th |
| Bone no. | 1,036 | 10,544 | 495 | 952 | 1948 | 62 | 715 |
| % sheep and pig | 78 | 74 | 70 | 69 | 69 | 68 | 65 |
| **Site** | **Trill Mill** | **Logic Lane** | **79–83 St Aldate's** | **Christ Church** | **23–26 Queen Street** | **24–26 St Aldate's** | **Westgate** |
| Period/ century | 10th–12th | Late Saxon | 10th–13th | 11th–13th | 10th–12th | 10th–11th | 11th–13th |
| Bone no. | 562 | 309 | 1253 | 104 | 917 | 241 | 192 |
| % sheep and pig | 65 | 64 | 63 | 63 | 62 | 59 | 58 |
| **Site** | **Clarendon Hotel** | **Selfridges** | **Littlegate** | **Blackfriars** | **St Michael's Street** | **65 St Aldate's** | **44–46 Cornmarket** |
| Period/ century | Late Saxon | Late Saxon | 12th–13th | 13th | 10th–16th | 11th–13th | 11th–13th |
| Bone no. | 341 | 105 | 98 | 453 | 123 | 264 | 172 |
| % sheep and pig | 54 | 53 | 53 | 52 | 44 | 43 | 31 |

in Table 7.21 can be found in the Gazetteer (Appendix 1, below). The writer is grateful to Miranda Armour-Chelu for permission to use her data for the Thames Crossing sites.

A general comparison of the results is reasonable although the dating of the deposits varies and the inclusion or exclusion of closely related bone groups is somewhat arbitrary. There may be sample size difficulties in the use of the small bone assemblages and it is possible that bone recovery at some sites, especially the earliest excavated ones, eg Cornmarket Street, may not be comparable to that of later sites. Other reservations concern the spatial sampling distribution. There are few samples from the eastern side of the town and almost none from the north-east quarter.

With these considerations in mind, the percentage of medium sized bone debris at each of 17 sites yielding late Saxon occupation bones was plotted onto a rudimentary map of Oxford waterways, streets and town defences, Figure 7.1. By inspection, contour lines at intervals of 10% in the distribution of sheep and pig bones were sketched in between the sample sites. These contours should be viewed as approximate guidelines rather than precise plots of the bone debris being investigated.

As expected from the spatial studies at other sites, generally the sites with lowest percentages of medium sized bone debris occurred at the periphery of the distribution, noticeably, with some inconsistency, on the north-south axis of Oxford but less obviously on a east-west axis. Highest percentages occurred centrally and at a western outlier, at levels predating Oxford Castle.

Within these trends other results show variation and some complexity. Most obviously the central concentration of highest percentages lies south of High and Queen streets which might well be regarded as a major alignment and focus of Saxon and early medieval town activities. As indicators of household activity, the percentages suggest this activity was concentrated and aligned east-west, mainly along the upper slope of the ground between the first and second river terrace gravels. With the exception of the Castle site on lower ground, most of this picked-out land lies within the suggested Saxon defences.

However, bone debris was spread over a much wider area and allowance ought to be made for bone debris which was carried some distance from households before dumping. In this, consideration must be given to the waste which was disposed of in pits which, probably being dug for other purposes like gravel quarrying for roads and paths, lay some distance from the houses.

Was pit digging a feature of the edge of the second terrace or were the majority of Saxon houses close by? The question cannot be answered yet although both buildings, like those at Hinxey Hall, and pits, like those at Church Street, existed in the area of the highest concentrations of domestic refuse. Saxon buildings also existed in the northern half of the defended town where domestic refuse is less apparent. Could this area have had a greater emphasis on craft and commercial activities? Working of horncores of Saxon cattle was noted in the Cornmarket Street report (Marples 1971).

Clearly too, while houses may have been packed together on main streets as seems evident south along

St Aldate's and west before the Castle was built, the ground buildings elsewhere may have been quite open. Indeed the bone spread does appear somewhat constricted away from the main medieval streets, particularly compared to two possible outliers of household activity or other dumping in the vicinity of Grandpont and to the west prior to the Castle.

Overall, the mapping of bone refuse seems to fit at least general spatial expectations of it, although its sample distribution and validity raise further questions. The interpretation of the evidence is not simple either but does open up avenues for future investigations.

## ENVIRONMENTAL REPORTS

### Environmental Investigations of the Trill Mill Stream (Tables 7.22–7.31)
***by Mark Robinson***

#### *Introduction*

The Trill Mill Stream was the northernmost channel of the Thames at Oxford during the later Saxon and medieval periods, running along the floodplain close to its edge with the Second Gravel Terrace. However, its origins are uncertain. During the medieval period it declined in importance and is now culverted. Two excavations at 89–91 St Aldate's extended through Saxon and earlier waterlogged sediments on the edge of the Trill Mill Stream to the Pleistocene gravels of the floodplain.

A total of fourteen samples was analysed for plant and invertebrate remains with the following main aims:

- to establish the sedimentary sequence
- to show the environmental changes that occurred on the floodplain
- to investigate the origin of the Trill Mill Stream
- to establish aspects of human activity alongside the channel.

#### *The samples*

*OXTMS 82 and OXTMS 85* The samples are listed in as near as possible to stratigraphic order through the sequence of sediments.

Sample 82/9, layer 19/3. Buff non-calcareous sandy silt, above the Pleistocene gravel of the floodplain. Organic remains absent.

Sample 82/5, layer 19/1. Grey/brown gravelly organic silt from general alluvial deposits above 19/3. Radiocarbon date of 800–260 cal BC (HAR-5342).

Sample 85/2, layer 657/1. Grey organic silt analogous to 19/1.

Sample 85/3, layer 657. Brown laminated silty peat with monocotyledonous rhizomes above 657/1. Radiocarbon date of 760–50 cal BC (HAR-8361).

Sample 85/7, layer 654. General deposit of blue/grey non-calcareous alluvial clay sealing 657. Organic remains absent.

Sample 85/1, layer 665. Grey/brown organic silt from the primary mill stream. Above 654. Radiocarbon date of cal AD 680–1020 (HAR-8363).

Sample 82/8, layer 16/2. Layer of grey/brown humic silt above equivalent clay layer to 654(18).

Sample 82/13, layer 34/1. Mixed brown gritty organic silt from gully.

Sample 82/4, layer 17/1. Brownish-grey humic very silty clay from the bottom of a small ditch cutting into the clay layer equivalent to 654.

Sample 82/3, layer 17. Brown very humic silt fill to ditch above 17/1. Radiocarbon date of cal AD 890–1290 (HAR-5344).

Sample 82/2, layer 15. Layer of dark brown highly humic silt above 17.

Sample 85/5, layer 651. Layer of dark grey organic silty clay above the primary Mill Stream sediments.

Sample 82/1, layer 11/1. Dark brown organic silt fill to gully. Radiocarbon date of cal AD 890–1220 (HAR-5346).

Sample 82/7, layer 20/1. Mixed brown to black organic debris with some silt. Bottom fill of early 13th-century cess pit.

#### *Analysis and results*

500 g of each sample was broken up and then washed over onto a stack of sieves down to 0.2 mm. The mineral residue remaining was sieved over a 0.5 mm mesh. Flots and residues were sorted for macroscopic plant and invertebrate remains, which were identified with reference to the collections in the University Museum, Oxford. The results for all the samples except Sample 82/7 are listed in Table 7.22 for waterlogged seeds, Table 7.23 for other waterlogged plant remains, Table 7.24 for charred plant remains, Table 7.25 for waterlogged Coleoptera, Table 7.26 for other waterlogged insects and Table 7.27 for Mollusca. Where an entire category of remains was absent from a sample, it has been omitted from the table. The results for Sample 82/7 are given in Table 7.28 for waterlogged seeds, Table 7.29 for other waterlogged plant remains, and Table 7.30 for insects. In addition, Sample 82/7 also contained single charred grains of *Hordeum* sp. and *Triticum* sp.—free threshing. Coarse sieving of further material from Sample 82/7 recovered a 'turd' that had remained intact due to some calcium phosphate deposition. It contained much cereal bran, probably *Triticum* sp., a broken seed of *Agrostemma githago* and a stone each of *Prunus spinosa* and *Prunus domestica* cf. ssp. *insititia*. Sub-samples from the turd and Sample 82/7 were analysed for pollen and nematode ova (Greig, this volume). The tables give the minimum number of individuals present in each sample or, when the number of individuals could not readily be quantified, f for few fragments and ff for many fragments. Nomenclature for higher plants follows Clapham *et al.* (1987), Kloet and Hincks (1977) for Coleoptera, Kerney (1976) for aquatic molluscs and Waldén (1976) for terrestrial molluscs.

*Table 7.22 Waterlogged seeds from 89–91 St Aldate's (Trill Mill Stream)*

| Taxa | 82/5 | 85/2 | 85/3 | 85/1 | 82/8 | 82/13 | 82/4 | 82/3 | 82/2 | 82/5 | 82/1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Caltha palustris* L. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Ranunculus* cf. *repens* L. | 9 | 9 | 4 | 2 | 0 | 0 | 5 | 7 | 4 | 0 | 0 |
| *R. flammula* L. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *R. sceleratus* L. | 0 | 0 | 0 | 1 | 329 | 7 | 179 | 221 | 102 | 14 | 68 |
| *R. S. Batrachium* sp. | 4 | 5 | 27 | 4 | 0 | 1 | 0 | 2 | 0 | 5 | 0 |
| *Thalictrum flavum* L. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| *Nuphar lutea* (L.) Sm. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Papaver argemone* L. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| *P. somniferum* L. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Raphanus raphinistrum* L. | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rorippa cf. palustris* (L.) Bes. | 1 | 1 | 0 | 0 | 2 | 1 | 13 | 5 | 2 | 0 | 1 |
| *Nasturtium officinale* R. Br. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *N. microphyllum* (Boen.) Reich. | 0 | 1 | 0 | 2 | 0 | 0 | 10 | 9 | 0 | 0 | 0 |
| *Hypericum* sp. | 0 | 1 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Silene* cf. *latifolia* Poir. | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| *Agrostemma githago* L. | 0 | 0 | 0 | 2 | 1 | f | 1 | 1 | 0 | 0 | 1 |
| *Cerastium fontanum* Baum. | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Myosoton aquaticum* (L.) Moen. | 0 | 0 | 0 | 1 | 0 | 0 | 6 | 7 | 0 | 1 | 0 |
| *Stellaria media* gp. | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 2 | 6 | 1 |
| *Spergula arvensis* L. | 0 | 0 | 0 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| Caryophyllaceae gen. et sp. indet. | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Chenopodium album* L. | 1 | 1 | 0 | 4 | 5 | 3 | 5 | 8 | 0 | 0 | 11 |
| C. cf. *rubrum* L. | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 6 |
| *Atriplex* sp. | 0 | 1 | 1 | 4 | 1 | 0 | 1 | 4 | 2 | 0 | 1 |
| Chenopodiaceae gen. et sp. indet. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 2 |
| *Linum usitatissimum* L. | 0 | 0 | 0 | 2 | 0 | 0 | 5 | 1 | 0 | 0 | 0 |
| *L. catharticum* L. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Filipendula ulmaria* (L.) Max. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Rubus fruticosus* agg. | 0 | 0 | 0 | 0 | 0 | 12 | 1 | 0 | 0 | 0 | 0 |
| *Potentilla anserina* L. | 3 | 6 | 13 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 0 |
| *Potentilla* sp. (not *anserina*) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Aphanes arvensis* agg. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Prunus domestica* L. | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| *Lythrum salicaria* L. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Callitriche* sp. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Hydrocotyle vulgaris* L. | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| *Oenanthe pimpinelloides* gp. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *O. aquatica* gp. | 2 | 5 | 4 | 2 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| *Aethusa cynapium* L. | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Conium maculatum* L. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Apium graveolens* L. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *A. nodiflorum* (L.) Lag. | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 3 |
| *Torilis* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *Daucus carota* L. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Polygonum aviculare* agg. | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 | 1 | 0 | 1 |
| *P. persicaria* L. | 0 | 3 | 0 | 4 | 10 | 9 | 12 | 8 | 10 | 0 | 23 |
| *P. lapathifolium* L. | 0 | 0 | 0 | 0 | 1 | 2 | 17 | 5 | 4 | 0 | 3 |
| *P. hydropiper* L. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rumex maritimus* L. | 0 | 2 | 0 | 1 | 3 | 1 | 23 | 6 | 8 | 0 | 0 |
| *Rumex* sp. | 1 | 1 | 3 | 1 | 0 | 0 | 5 | 3 | 0 | 1 | 1 |
| *Urtica urens* L. | 0 | 0 | 0 | 0 | 1 | 5 | 2 | 1 | 2 | 0 | 0 |
| *U. dioica* L. | 3 | 0 | 0 | 0 | 5 | 0 | 6 | 13 | 4 | 2 | 14 |
| *Alnus glutinosa* (L.) Gaert. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Menyanthes trifoliata* L. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| *Myosotis* sp. | 0 | 0 | 3 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Hyoscyamus niger* L. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Solanum cf. nigrum* L. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 11 |

*Table 7.22 (Continued)*

| Taxa | 82/5 | 85/2 | 85/3 | 85/1 | 82/8 | 82/13 | 82/4 | 82/3 | 82/2 | 82/5 | 82/1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Veronica S. Beccabunga* sp. | 0 | 10 | 0 | 10 | 0 | 0 | 0 | 10 | 0 | 0 | 0 |
| *Pedicularis palustris* L. | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 |
| *Rhinanthus* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| *Mentha* cf. *aquatica* L. | 47 | 20 | 34 | 2 | 3 | 6 | 9 | 5 | 5 | 26 | 8 |
| *Lycopus europaeus* L. | 7 | 2 | 4 | 1 | 1 | 0 | 4 | 4 | 2 | 0 | 0 |
| *Satureja hortensis* L. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Prunella vulgaris* L. | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ballota nigra* L. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| *Plantago major* L. | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sambucus nigra* L. | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| *Valerianella dentata* (L.) Pol. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Bidens* sp. | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 2 | 0 | 0 |
| *Senecio* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| *Anthemis cotula* L. | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 |
| *Carduus* sp. | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| cf. *Cirsium* sp. | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Lapsana communis* L. | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 1 |
| *Sonchus olearaceus* L. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| *S. asper* (L.) Hill | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Compositae gen. et sp. indet. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| *Alisma* sp. | 1 | 5 | 1 | 1 | 0 | 2 | 2 | 1 | 0 | 1 | 1 |
| *Sagittaria sagittifolia* L. | 1 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *Potamogeton* sp. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Zannichellia palustris* L. | 2 | 6 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Juncus bufonius* gp. | 10 | 210 | 70 | 10 | 30 | 110 | 0 | 110 | 10 | 0 | 0 |
| *J. effusus* gp. | 30 | 20 | 10 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| *J. articulatus* gp. | 80 | 40 | 30 | 0 | 10 | 10 | 10 | 20 | 10 | 0 | 0 |
| *Juncus* spp. | 10 | 50 | 0 | 0 | 10 | 90 | 50 | 20 | 0 | 0 | 200 |
| *Iris pseudacorus* L. | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lemna* sp. | 0 | 0 | 0 | 0 | 1 | 5 | 6 | 10 | 1 | 0 | 3 |
| *Sparganium* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Typha* sp. | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Eleocharis S. Palustres* sp. | 8 | 3 | 10 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| *Schoenoplectus lacustris* (L.) Pal. | 1 | 22 | 20 | 1 | 0 | 0 | 1 | 1 | 0 | 2 | 0 |
| *Carex* spp. | 6 | 2 | 5 | 1 | 0 | 2 | 2 | 2 | 2 | 0 | 3 |
| *Glyceria* sp. | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cereal gen. et sp. indet. | 0 | 0 | 0 | 0 | 0 | f | 0 | 0 | 0 | 0 | 0 |
| Gramineae gen. et sp. indet. | 2 | 0 | 2 | 5 | 0 | 3 | 2 | 0 | 0 | 0 | 3 |
| Ignota | 0 | 1 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 2 | 3 |
| **Total** | **236** | **455** | **266** | **80** | **420** | **294** | **414** | **506** | **190** | **63** | **385** |

*Table 7.23 Other waterlogged plant remains from 89–91 St Aldate's (Trill Mill Stream)*

| Taxa | | 82/5 | 85/2 | 85/3 | 85/1 | 82/8 | 82/13 | 82/4 | 82/3 | 82/2 | 85/5 | 82/1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bryophyta | stem fragments | 0 | 0 | + | + | 0 | 0 | + | 0 | 0 | 0 | + |
| Bud scales (not *Salix*) | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | + |
| *Chara* sp. | oospores | 2 | 21 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Linum usitatissimum* L. | capsule fragments | 0 | 0 | 0 | 9 | 0 | 0 | 10 | 0 | 0 | 1 | 0 |
| *Malus* sp. | endocarp fragments | 0 | 0 | 0 | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 |
| *Salix* sp. | buds | 0 | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Salix* sp. | capsules | 0 | 0 | 0 | 4 | 0 | 0 | 0 | + | 0 | 0 | 0 |

*Table 7.24 Charred plant remains from 89–91 St Aldate's (Trill Mill Stream)*

| Taxa | | 82/8 | 82/4 | 82/3 |
|---|---|---|---|---|
| *Triticum* sp. | free-threshing grain | 0 | 1 | 0 |
| *Triticum* sp. | grain | 4 | 1 | 1 |
| *Triticum* sp. | tough rachis fragment | 0 | 0 | 1 |
| cf. *Secale cereale* L. | grain | 1 | 0 | 0 |
| *S. cereale* L. | rachis fragment | 0 | 0 | 1 |

*Table 7.25 Coleoptera from 89–91 St Aldate's (Trill Mill Stream)*

| Taxa | Iron Age samples | 85/1 | Late Saxon samples |
|---|---|---|---|
| *Elaphrus cupreus* Duft. | 1 | 0 | 0 |
| *Dyschirius globosus* (Hbst.) | 2 | 0 | 0 |
| *Trechus octusus* Er. or *quadristriatus* (Schr.) | 0 | 0 | 1 |
| *Bembidion biguttatum* (F.) | 2 | 0 | 0 |
| *Bembidion* sp. | 1 | 1 | 0 |
| *Pterostichus cupreus* (L.) | 1 | 0 | 0 |
| *P.* cf. *gracilis* (Dej.) | 1 | 0 | 0 |
| *P. melanarius* (Ill.) | 0 | 0 | 2 |
| *Agonum* cf. *viduum* (Pz.) | 0 | 0 | 1 |
| *Chlaenius vestitus* (Pk.) | 0 | 0 | 1 |
| *Hydroporus* sp. | 0 | 0 | 1 |
| *Colymbetes fuscus* (L.) | 1 | 0 | 0 |
| *Gyrinus* sp. | 1 | 0 | 0 |
| *Helophorus aquaticus* (L.) | 1 | 0 | 0 |
| *Helophorus* sp. (*brevipalpis* size) | 4 | 0 | 3 |
| *Coelostoma orbiculare* (F.) | 1 | 0 | 0 |
| *Cercyon* spp. | 5 | 4 | 4 |
| *Megasternum obscurum* (Marsh.) | 1 | 0 | 1 |
| *Hydrobius fuscipes* (L.) | 1 | 0 | 0 |
| *Laccobius* sp. | 1 | 0 | 0 |
| *Acritus* sp. | 0 | 0 | 1 |
| *Ochthebius* sp. | 2 | 0 | 3 |
| *Limnebius papposus* Muls. | 0 | 0 | 1 |
| Ptiliidae gen. et sp. indet. | 0 | 0 | 1 |
| *Platystethus cornutus* gp. | 1 | 0 | 0 |
| *P. nodifrons* (Man.) | 1 | 0 | 1 |
| *Anotylus rugosus* (F.) | 1 | 0 | 3 |
| *Lathrobium* sp. | 1 | 0 | 0 |
| *Rugilus orbiculatus* (Pk.) | 1 | 0 | 0 |
| *Gyrohypnus* sp. | 0 | 0 | 1 |
| *Xantholinus linearis* (Ol.) or *longiventris* Heer | 0 | 1 | 1 |
| *Philonthus* sp. | 2 | 0 | 2 |
| *Tachporus* sp. | 1 | 0 | 0 |
| *Tachinus* sp. | 0 | 0 | 2 |
| Aleocharinae gen. et sp. indet. | 2 | 0 | 3 |
| *Geotrupes* sp. | 1 | 0 | 0 |
| *Aphodius contaminatus* (Hbst.) | 2 | 0 | 0 |
| *A. rufipes* (L.) | 1 | 0 | 0 |
| *A.* cf. *sphacelatus* (Pz.) | 2 | 0 | 0 |
| *Aphodius* sp. | 1 | 0 | 3 |
| *Onthophagus ovatus* (L.) | 2 | 0 | 0 |

*Table 7.25 (Continued)*

| Taxa | Iron Age samples | 85/1 | Late Saxon samples |
|---|---|---|---|
| *Dryops* sp. | 2 | 0 | 2 |
| *Agrypnus murinus* (L.) | 1 | 0 | 0 |
| *Anobium punctatum* (Deg.) | 0 | 0 | 3 |
| *Ptinus fur* (L.) | 0 | 0 | 1 |
| *Lyctus linearis* (Gz.) | 0 | 0 | 1 |
| *Coccidula rufa* (Hbst.) | 0 | 0 | 1 |
| *Lathridius minutus* gp. | 0 | 0 | 2 |
| *Typhaea stercorea* (L.) | 0 | 0 | 1 |
| *Bruchus rufimanus* Boh. | 0 | 0 | 1 |
| *Donacia cinerea* (Hbst.) | 0 | 1 | 0 |
| *Donacia* sp. (Hbst.) | 1 | 0 | 2 |
| *Plateumaris* cf. *affinis* (Kun.) | 1 | 0 | 0 |
| *Chrysolina polita* (L.) | 0 | 0 | 1 |
| *Prasocuris phellandrii* (L.) | 0 | 0 | 2 |
| *Phyllotreta atra* (F.) | 0 | 0 | 1 |
| *P. nemorum* (L.) or *undulata* Kut. | 0 | 0 | 1 |
| *Longitarsus* sp. | 1 | 0 | 1 |
| *Chaetocnema concinna* (Marsh.) | 2 | 0 | 0 |
| *Apion* sp. | 1 | 0 | 2 |
| *Bagous* sp. | 1 | 0 | 0 |
| *Notaris acridulus* (L.) | 1 | 0 | 4 |
| Ceuthorhynchinae gen. et sp. indet. | 1 | 0 | 4 |
| *Scolytus intricatus* (Ratz.) | 0 | 0 | 1 |
| **Total** | **57** | **7** | **67** |

### Interpretation

The samples can conveniently be divided into six groups:

1 Pre-Iron Age inorganic sediment above the flood-plain gravels (Sample 82/9)

*Table 7.26 Other insects from 89–91 St Aldate's (Trill Mill Stream)*

| | | Iron Age samples | 85/1 | Late Saxon samples |
|---|---|---|---|---|
| Odonata *Agrion* sp. | | 0 | 0 | 1 |
| Hemiptera *Aphrodes* sp. | | 1 | 0 | 0 |
| Aphidoidea sp. | | 1 | 0 | 0 |
| Trichoptera *Ithytrichia* sp. | case | 3 | 0 | 0 |
| Trichoptera sp. (not *Ithytrichia*) | case | 2 | 0 | 3 |
| Trichoptera sp. (not *Ithytrichia*) | larvae | 1 | 0 | 0 |
| Hymenoptera sp. | | 1 | 0 | 0 |
| Diptera Chironomidae sp. | larva | 0 | + | + |
| Sphaeroceridae sp. | puparium | 0 | 0 | 1 |
| *Melophagus ovinus* (L.) | puparium | 0 | 0 | 1 |
| Diptera sp. | puparium | 3 | 0 | 15 |
| Diptera sp. | adult | 0 | 0 | 1 |

*Table 7.27 Mollusca from 89–91 St Aldate's (Trill Mill Stream)*

| | 85/2 | 85/1 | 82/8 | 82/4 | 82/3 | 82/2 | 82/1 |
|---|---|---|---|---|---|---|---|
| *Valvata cristata* Mull. | 2 | 2 | 2 | 2 | 2 | 0 | 1 |
| *V. macrostoma* Mor. | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| *V. piscinalis* (Mull.) | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Bithynia tentaculata* (L.) | 1 | 0 | 1 | 2 | 1 | 1 | 4 |
| *Bithynia* sp. | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| *Carychium* sp. | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| *Lymnaea truncatula* (Mull.) | 5 | 1 | 1 | 1 | 2 | 1 | 0 |
| *L. palustris* (Mull.) | 0 | 1 | 1 | 0 | 4 | 3 | 0 |
| *L. stagnalis* (L.) | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *L. peregra* (Mull.) | 4 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Planorbis planorbis* (L.) | 0 | 0 | 4 | 5 | 10 | 28 | 6 |
| *P. carinatus* Mull. | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| *Anisus leucostoma* (Milt.) | 0 | 0 | 0 | 4 | 4 | 2 | 0 |
| *A. vortex* (L.) | 0 | 0 | 1 | 0 | 4 | 0 | 0 |
| *Bathyomphalus contortus* (L.) | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| *Gyraulus albus* (Mull.) | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Planorbarius corneus* (L.) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| *Succinea* or *Oxyloma* sp. | 3 | 0 | 0 | 0 | 1 | 1 | 1 |
| *Vallonia* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Sphaerium corneum* (L.) | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Pisidium amnicum* (Mull). | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pisidium* sp. | 12 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Total** | **43** | **6** | **12** | **15** | **33** | **40** | **19** |

2 Iron Age organic sediments above any inorganic material on the floodplain surface (Samples 82/5, 85/2, 85/3)
3 A general deposit of inorganic clay sealing the Iron Age organic sediments (85/7)
4 Middle Saxon sediment related to the primary Mill Stream (85/1)
5 Late Saxon organic sediments related to the expanded Mill Stream (82/8, 82/13, 82/4, 82/3, 82/2, 85/5, 82/1)
6 Medieval organic material from a pit cutting reclamation dumps of sediment (82/7)

*Table 7.28 Waterlogged seeds from sample 82/7, 89–91 St Aldate's (Trill Mill Stream)*

| Taxa | 82/7 |
|---|---|
| *Ranunculus* cf. *repens* L. | 1 |
| *Papaver argemone* L. | 4 |
| *P. somniferum* L. | 1 |
| *Brassica* or *Sinapis* sp. | 1 |
| *Capsella bursa-pastoris* (L.) Medic. | 1 |
| *Reseda luteola* L. | 3 |
| *Agrostemma githago* L. | ff = *c* 60 |
| *Stellaria media* gp. | 46 |
| *Spergula arvensis* L. | 1 |
| *Chenopodium album* L. | 2 |
| *Atriplex* sp. | 1 |
| *Linum usitatissimum* L. | 1 |
| *Rubus fruticosus* agg. | 127 |
| *Rubus* sp. | 3 |
| *Prunus spinosa* L. | 16 |
| *P. domestica* L. cf. ssp. *insititia* (L.) Schn. | 15 |
| *P. avium* L. | 4 |
| *Malus sylvestris* Mil. or *domestica* Bor. | 17 |
| *Pyrus* or *Malus* sp. | 13 |
| *Scandix pecten-veneris* L. | 1 |
| *Torilis* sp. | 3 |
| *Polygonum aviculare* agg. | 90 |
| *Rumex* sp. | 3 |
| *Urtica urens* L. | 5 |
| *U. dioica* L. | 3 |
| *Satureja hortensis* L. | 23 |
| *Prunella vulgaris* L. | 1 |
| *Lamium* sp. | 5 |
| cf. *Marrubium vulgare* L. | 1 |
| *Sambucus nigra* L. | 16 |
| *Valerianella dentata* (L.) Pol. | 1 |
| *Bidens* sp. | 1 |
| *Anthemis cotula* L. | 21 |
| *Centaurea cyanus* L. | 4 |
| *C.* cf. *nigra* L. | 4 |
| *Sonchus oleraceus* L. | 12 |
| *S. asper* L. | 2 |
| *Leontodon* sp. | 1 |
| *Carex* spp. | 5 |
| Cereal bran fragments | ff |
| Gramineae gen. et sp. indet. | 7 |
| **Total** | **526** |

1 *The Pre-waterlogged Surface*. It is uncertain when the deposit represented by sample 82/9 accumulated. It is possible that the sandy silt was laid down shortly after the stabilisation of the floodplain, perhaps on the bed of a broad channel that had left a low area of floodplain gravels. The absence of preserved organic material and its non-gleyed appearance suggests that it had not always been waterlogged. It is even possible that some soil formation had occurred.
2 *The Iron Age Waterlogged Sediments*. Changed conditions in the Iron Age resulted in the deposition of sediments which remained permanently waterlogged. The molluscs from Sample 85/2 were almost all aquatic and the presence of *Pisidium amnicum* suggests well-oxygenated flowing water. The samples also contained cases of the flowing-water caddis *Ithytrichia* sp. These deposits accumulated on a channel bed or in marginal reedswamp/marsh. It is unlikely that there would have been such good organic preservation in overbank deposits due to seasonal dessication. The laminated peat with rhizomes of monocotyledonous plants of Sample 85/3 is indicative of reedswamp conditions but the gravel in Sample 82/5 suggests that they were preceded by a more active flow to the water.

*Table 7.29 Other waterlogged plant remains from sample 82/7, 89–91 St Aldate's (Trill Mill Stream)*

| Taxa | | 82/7 |
|---|---|---|
| Bryophyta | leafy stem fragments | + |
| Cereal type culm nodes | | ++ |
| *Malus* sp. | endocarp fragments | 234 |
| *Pteridium aquilinum* (L.) Kuhn | frond fragments | + |
| *Secale cereale* L. | rachis nodes | 16 |
| *Thuidium tamariscinum* (Hedw.) Br. Eur. | leafy stem fragments | + |

*Table 7.30 Insects from sample 82/7, 89–91 St Aldate's (Trill Mill Stream)*

| | 82/7 |
|---|---|
| Aphidoidea indet. | 4 |
| *Ptinus fur* (L.) | 1 |
| *Lathridius minutus* gp. | 1 |
| *Bruchus rufimanus* Boh. | 1 |
| Ceuthorhynchinae indet. | 1 |
| Hymenoptera indet. | 1 |
| *Leptocera* sp. (puparia) | 178 |
| cf. *Thoracochaeta* sp. (puparia) | 14 |
| *Fannia* sp. (puparia) | 2 |
| Diptera indet. (puparia) | 3 |

*Table 7.31 Percentages of terrestrial Coleoptera from 89–91 St Aldate's (Trill Mill Stream)*

| Species grouping | Iron Age (samples 82/5, 85/2, 85/3) | Late Saxon (samples 82/8, 82/13, 82/4, 82/3, 82/2, 82/5, 82/1) |
|---|---|---|
| (1. Aquatic | 33 | 18) |
| 2. Pasture/Dung | 21 | 5 |
| 3. ? Meadowland | 2 | 4 |
| 4. Wood and Trees | 0 | 2 |
| 5. Marsh and Aquatic Plants | 9 | 14 |
| 6. Disturbed Ground/Arable | 0 | 0 |
| 7. Dung/foul Organic Material | 16 | 14 |
| 8. Lathridiidae | 0 | 4 |
| 9. Synanthropic | 0 | 4 |
| 10. Esp. Structural Timbers | 0 | 7 |
| 11. On roots in grassland | 2 | 0 |
| Total numbers of terrestrial individuals | 43 | 57 |

N.B. Not all terrestrial Coleoptera have been classified into groups.

The seeds included some of floating-leaved aquatic plants such as *Ranunculus S. Batrachium* sp. (water crowfoot), *Nuphar lutea* (yellow water-lily) and *Potamogeton* sp. (pondweed), as well as emergent vegetation of *Oenanthe aquatica* (water dropwort), *Sagittaria sagittifolia* (arrow-head) and *Schoenoplectis lacustris* (bulrush). Waterside vegetation seems to have graded into wet grassland or grazed marsh, with many seeds of *Ranunculus* cf. *repens* (buttercup), *Potentilla anserina* (silver-weed), *Mentha* cf. *aquatica* (water mint) and *Juncus* spp. (rushes). The Coleoptera suggest a strong presence of domestic animals on the grassland with 21% of the terrestrial Coleoptera being scarabs, such as *Aphodius rufipes* and *Onthophagus ovatus*, which feed on the droppings of herbivores on pasture (Table 7.31, Species Group 2). Apart from a single seed of *Alnus glutinosa* (alder) in Sample 85/2 there was no evidence for woodland. Wood and tree-dependent Coleoptera (Species Group 4) were entirely absent. There was no evidence from the biological remains for human settlement.

3 *The blue/grey Alluvial Clay.* The accumulation of organic sediments abruptly gave way to the deposition of clay from which macroscopic biological remains were entirely absent. This suggests that the sediment load of the water had greatly increased. Deposition of the clay perhaps raised the general surface of the site above permanent water levels. It is possible that the clay was deposited during the Roman period.

4 *The Middle Saxon Primary Mill Stream.* During the Saxon period, a channel was re-established on the site, cutting through the clay. It is uncertain what part, if any, human intervention played in the creation of the channel. However, the water table rose and organic sediments were laid down. The molluscs from Sample 85/1 include one flowing-water species, *Valvata cristata*, but there were no obligate flowing-water insects and the remaining few aquatic molluscs can tolerate stagnant conditions. Emergent or waterside vegetation included *Veronica* S. *Beccabunga* sp. (brooklime or water speedwell) and *Oenanthe aquatica* gp. (water dropwort) although there no longer seems to have been the tall reedswamp. Neither was there such good evidence for wet pasture. Instead, a greater proportion of the seeds were from plants of disturbed ground such as *Chenopodium album* (fat hen). Remains of *Salix* sp. (willow) suggests a few trees overhung the channel.

Crop processing was occurring on the site during this period. The sample contained seeds and capsule fragments of *Linum usitatissimum* (flax). There were also seeds of arable weed *Agrostemma githago* (corn cockle). It is possible that the flax was being rippled (threshed) on the bank but is more likely that flax was being retted in the channel.

5 *The Late Saxon Expanded Mill Stream.* The rise in water table kept pace with sedimentation, and extensive organic deposits accumulated alongside the Trill Mill stream during the late Saxon period.

Various small ditches and gullies were interstratified and filled with these sediments, attesting to human activity on the site. Although some domestic refuse was present, dumped mineral material does not seem to have been a major component of these deposits. They mostly comprised alluvial clays to silts and organic debris from waterside vegetation and activities.

The alluvial origin of the sediments is confirmed by the occurrence of the flowing-water molluscs *Bithynia tentaculata* and *Valvata cristata* in the majority of the samples. However, the most abundant mollusc, *Planorbis planorbis*, is tolerant of stagnant conditions. The seeds suggest a flora of seasonally exposed mud with temporary ponds of water. The samples were dominated by seeds of *Ranunculus sceleratus* (celery-leaved crowfoot) an annual which favours wet, nutrient-rich habitats. This was variously in company with *Rorippa* cf. *palustris* (marsh yellow-cress), *Polygonum persicaria* (red shank), *P. lapathifolium* (pale persicaria) and *Rumex maritimus* (golden dock), all plants of similar habitats. Seeds of *Lemna* sp. (duckweed) suggest that this small floating plant carpeted stagnant pools of water left when general water levels receded. The various small water beetles from the samples can all live under such conditions.

Somewhat drier areas, perhaps beyond the limits of the excavation, seem to have supported a flora of disturbed or waste nutrient-rich ground, with seeds of *Chenopodium album* (fat hen) and *Urtica dioica* (stinging nettle). There was little evidence for the background environment of the Second Gravel Terrace itself, although the insects suggest open conditions. There seem to have been some marsh plants, such as *Mentha* cf. *aquatica* (water mint) and *Lycopus europaeus* (gypsy wort), growing along the margin of the channel, but seeds of tall reedswamp plants were almost entirely absent. The beetle *Prasocuris phellandrii* suggests that aquatic Umbelliferae (water dropwort etc) grew in the river.

There was much more evidence from the plant and insect remains for varied human activity on the site. Flax processing continued on the site, Sample 82/4 from a small ditch containing most remains with both seeds and capsule fragments. The occurrence of seeds of *Rhinanthus* sp. (yellow rattle) in the same sample suggests that hay was being imported to the site, or more likely hay waste was being deposited on it. A puparium of *Melophagus ovinus* (the sheep ked) in Sample 82/13 hints that sheep were being washed, or wool in some way processed, in the vicinity. The sheep ked is a wingless fly that is an ectoparasite of sheep (Edwards *et al.* 1939, 123–4). It cannot survive long after either removal from, or the death of, its host. *Apium graveolens* (celery) is a native plant of salt marshes, so the presence of a seed of it in Sample 82/2 was most probably related at some stage to its cultivation. However, it does sometimes escape onto marshy waste ground and conditions on the site would probably have been suitable for it to become established.

There were many plant and invertebrate remains in this group of samples which can be related to domestic activity. Whether they resulted from habitation in the immediate vicinity or had been amongst organic refuse brought to the site is rather harder to determine.

Sample 82/13, from a gully, probably contained some sewage. There was cereal bran, fragments of *Agrostemma githago* (corn cockle) seeds, pips of *Rubus fruticosus* agg. (blackberry), endocarp fragments of *Malus* sp. (apple core) and stones of *Prunus domestica* (plum, damson etc). There was also a single seed of *Satureja hortensis* (summer savory). It is unlikely that sewage would be transported far and it is possible that a latrine on higher ground discharged directly into the gully.

A small quantity of charred grain and chaff of free-threshing wheat (*Triticum* sp.) and rye (*Secale cereale*) in the samples was probably domestic waste. A bean beetle, *Bruchus rufimanus* from Sample 82/12 had probably emerged from stored *Vicia faba* (field/broad bean).

Beetles of dead organic material provide good evidence for buildings and human habitation. The woodworm beetles *Anobium punctatum* and *Lyctus linearis* (Table 7.31, Species Group 10) were well represented. Various other beetles that were present, such as *Ptinus fur* and *Typhaea stercorea* (Species Group 9) favour indoor habitats. Beetles that feed on accumulations of dung and foul organic material (Species Group 7) were no more abundant in the samples than in the late Bronze Age/Iron Age but scarab dung beetles (Species Group 2) were much less numerous, perhaps suggesting a difference in the decaying remains.

6 *The Medieval Cess Pit and Tenement*. Dumping during the early medieval period resulted in much of the site being reclaimed above the water table and probably above ordinary flood levels too. During the early 13th century, a cess pit was cut through the reclamation silts to the water table. The plant remains in Sample 82/7, from organic remains in the bottom of the pit, showed how much conditions on the site had changed since the late Saxon period. The seeds suggest a flora of annual weeds of well-drained nutrient-rich soil: *Stellaria media* (chickweed), *Polygonum aviculare* agg. (knotgrass) and *Anthemis cotula* (stinking mayweed) were the best represented. Seeds of the wet-ground weeds, such as *Ranunculus sceleratus*, were entirely absent.

The majority of plant remains in the pit, however, were the result of its use as a cess pit rather than being derived from the vegetation of the site. There was a considerable quantity of cereal bran, most probably wheat. The flour consumed by the users of the latrine was by no means pure. The deposit contained numerous fragments of ground seeds of *Agrostemma githago* (corn cockle) and a few seeds of *Centaurea cyanus* (cornflower), both cornfield weeds with seeds that were harvested with the grain and could not readily be separated from it during seed-cleaning procedures. They were formerly serious contaminants of flour.

Fruit remains were much in evidence. There were pips/stones of *Rubus fruticosus* agg. (blackberry), *Prunus spinosa* (sloe), *Prunus domestica* cf. ssp. *insititia* (bullace, damson etc), *Prunus avium* (sweet cherry) and *Malus sylvestris* or *mitis* (crab apple or cultivated/self-seeded apple). Numerous fragments of *Malus* endocarp (apple core) had been swallowed along with the pips. With our present liking for a sweet diet, the astringent fruit of sloe might seem a rather unlikely food item. However, my son at the age of 20 months, before he had been corrupted by sweet foods, was sufficiently keen on eating sloes that he would ask to have them picked if taken past a bush of them. Confirmation that the sloes were indeed being consumed comes from the 'turd' from the pit, which contained both a sloe stone and a bullace-type stone as well as cereal bran and an *Agrostemma* seed (economical plum pudding?). The status of another fruit, *Sambucus nigra* (elder), remains uncertain and the pips in the pit could have been from bushes growing in the vicinity. There were also many seeds of an aromatic herb, *Satureja hortensis* (summer savory) which was likely to have been used to flavour meat dishes.

The pit also contained some non-sewage plant refuse including cereal straw and frond fragments of *Pteridium aquilinum* (bracken), perhaps human or animal bedding. Fragments of the moss *Thuidium tamariscinum*, which grows in flat sheets, had perhaps been used for purposes of toilet.

The insect assemblage from the pit had a very restricted range of species. A few individuals, such as the beetles *Ptinus fur* and *Bruchus rufimanus*, had perhaps been amongst indoor refuse dumped into it. The majority of the remains, however, were puparia of sewage flies: *Leptocera* sp. cf. *Thoracochaeta* sp. and *Fannia* sp. Their larvae would have been able to flourish under the conditions of semi-liquid organic-rich effluent in the pit, which would be a very hostile environment for most insects.

### *Conclusions*

The sedimentary sequence showed the drowning of a low-lying part of the Thames floodplain during the early Iron Age followed by clay alluviation at some stage between the late Iron Age and the early Saxon period. Organic sediments accumulated during the middle and late Saxon periods primarily as a result of alluviation on seasonally exposed surfaces but increasingly under human influence. At the end of the Saxon period the site was reclaimed by dumping.

The drowned surface supported a flora of shallow water fen fringed by grazed marsh or wet pasture. It is possible that grazed marshland spread over the whole area as the clay sedimentation raised the level of the site. During the middle Saxon period, there was some evidence for waterside vegetation and plants of disturbed ground. In the late Saxon period, the flora was predominantly one of wet, nutrient-rich mud, probably the result of human activity on the site. Following the dumping, conditions were changed and a dry ground annual weed flora could become established.

Although the site sequence was dominated by hydrological and alluvial change, the first definite evidence of a discrete Trill Mill channel was middle Saxon. The levels of the top of the Pleistocene gravels at this site, 79–80 St Aldate's (Durham 1977, fig. 9) and at the Blackfriars (Lambrick 1985, 140) are similar. It is possible that the top of the gravel on all three of these sites was part of the bed of a broad, shallow Late Devensian channel of the Thames sweeping around the peninsula of the Second Gravel Terrace to the north on which the walled town of Oxford was built. This channel remained dry through much of the Holocene, only to be re-activated in the late Bronze Age or early Iron Age. A radiocarbon date of 1010–400 cal BC (HAR 209) was obtained on organic sediments above the gravel and sealed beneath clay deposits at Linacre College (Durham 1977, 174–5). This agrees well with the earliest radiocarbon dates from the Trill Mill excavations. The subsequent clay alluviation would have interfered with the drainage patterns of the floodplain. Probable Roman clay alluvium was also discovered at 79–80 St Aldate's and Blackfriars (Robinson and Lambrick in Durham 1984a, 79–80). It is possible that the Trill Mill channel did not become established until after this sedimentation. If, however, there is indeed an early deep Trill Mill channel, it is most likely that it would have had its origin in a Late Devensian channel eroding the edge of the Second Gravel Terrace and remains to be found to the north of the excavation.

The sequence from the excavation agrees well with that proposed by Robinson and Lambrick (1984) for the Holocene hydrology and alluviation of the Upper Thames floodplain: a rise in the water table during the late Bronze Age, Iron Age flooding, clay alluviation underway by the Roman period, a possible early Saxon cessation of alluviation but continuing flooding, and a resumption of alluviation in the late Saxon period. Excavations on the floodplain of the Thames above Oxford at Yarnton by Gill Hey (Hey forthcoming) have revealed a palaeochannel which helps in the understanding of the Trill Mill developments because work could be undertaken on a much larger scale. The Yarnton channel was active in the late Devensian, but during the earlier Holocene its broad bed supported a dry-ground molluscan fauna and trees were able to grow even in the deepest part of it. The rise in the water table during the late Bronze Age re-activated the channel, and organic deposits formed around a timber structure which had been built in it.

Clay alluviation subsequently filled much of the channel and reduced it to a series of pond-like features in which peat accumulated during the Saxon period. A managed drainage system was established and further alluviation took place. Apart from the lack of any land reclamation at Yarnton, this sequence is similar to the one suggested by the evidence from the Trill Mill Stream site and 79–80 St Aldate's.

Human activity on the Trill Mill Stream site up until the Saxon period was no more than the maintenance of an open grazed landscape. During the middle Saxon period, flax retting was occurring on the site, as elsewhere in St Aldate's (Brown in Durham 1977, 169–72). The late Saxon period saw a wider range of bankside activities and probable sewage suggests nearby habitation. The early 13th-century privy on the site gave evidence of what was probably a relatively low status diet. Fig, grape and strawberry pips, for example, were absent. The contents of the turd, however are of more than scatological interest. There have been many finds of sloe stones from medieval cess pits (eg Greig 1981) but until now there has been doubt as to whether they were consumed or waste from some sort of industrial process. The stone in the turd gives an unequivocal answer.

### *Acknowledgements*

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### The pollen from 89–91 St Aldate's (the Trill Mill Stream), Sample 82/7, layer 20/1 (Table 7.32)
***by James Greig***

The material was from a medieval cess pit. Two pollen samples were prepared, one from the general fill, and the other from a piece of turd, using normal methods. One part of each was acetolysed, one was not. The slides were mounted in glycerine jelly.

The cess pit fill produced a rather mucky preparation, although this is sometimes more the result of lumps sticking together during preparation than a characteristic of the material itself, and the acetolysis may not have been very efficient. The pollen, however, was quite plentiful and provided a good count in 16 traverses of one slide. This slide, and a second one, were then scanned for any extra pollen types. The turd did not contain so much pollen, but what was present was well-preserved, and bran was noticed.

*Table 7.32 Pollen analysis results from deposit 20/1, 89–91 St Aldate's (Trill Mill Stream)*

| Identification | Description | Pit fill No | % | Turd No | % |
|---|---|---|---|---|---|
| *Ranunculus* tp. | Buttercups | 1 | + | – | – |
| Papaveraceae | Poppies | 4 | 2 | – | – |
| Cruciferae | Cabbage family | 4 | 11 | – | – |
| Caryophyllaceae | Chickweed family | 2 | 1 | – | – |
| Chenopodiaceae | Goosefoot family | 1 | – | – | – |
| Malvaceae | Mallow family | 1 | + | – | – |
| *Lotus* | Birdsfoot trefoil | 5 | 2 | – | – |
| *Lathyrus* | Vetchling | 1 | + | – | – |
| Leguminosae | Pea family | 3 | 1 | – | – |
| *Filipendula* | Meadowsweet | 1 | + | – | – |
| *Potentilla* | Cinquefoil | 1 | + | – | – |
| Umbelliferae | Umbellifers | 9 | 4 | 1 | 3 |
| *Polygonum bistorta* tp. | Bistort | 6 | 2 | – | – |
| *Urtica* | Nettles | – | – | 1 | 3 |
| *Betula* | Birch | 7 | 2 | + | + |
| *Salix* | Willow | 1 | + | – | – |
| *Rhinanthus* tp. | Yellow rattle | 3 | 1 | – | – |
| *Lamium* tp. | Dead-nettles | 14 | 6 | – | – |
| *Plantago media* | Hoary plantain | 1 | + | – | – |
| *Plantago lanceolata* | Ribwort plantain | 5 | 2 | 1 | 3 |
| *Galium* tp. | Goosegrass | 1 | + | – | – |
| *Artemisia* tp. | Mugwort | 1 | + | – | – |
| *Aster* tp. | Daisies | 1 | + | – | – |
| *Anthemis* tp. | Mayweeds etc. | 14 | 6 | – | – |
| *Cirsium/Carduus* tp. | Thistles | + | + | – | – |
| *Centaurea scabiosa* | Greater knapweed | + | + | – | – |
| *Ranunculus* tp. | Buttercups | 1 | + | – | – |
| *Centaurea cyanus* | Cornflower | 23 | 9 | 1 | 3 |
| *Centaurea nigra* | Knapweed | 4 | 2 | – | – |
| Liguliflorea | Hawkweeds etc. | 9 | 4 | 1 | 3 |
| Cyperaceae | Sedges etc. | 2 | 1 | – | – |
| Gramineae <40 microns | Grasses | 55 | 22 | 2 | 7 |
| Gramineae >40 microns | Cereals | 69 | 29 | 21 | 70 |
| Total pollen | | 250 | 100 | 28 | 100 |
| Indet. Pollen | | 9 | | 2 | |
| Parasite ova | | | | | |
| *Ascaris* | Maw-worm | 29 | 12 | 29 | 97 |
| *Trichuris* | Whip-worm | + | + | 42 | 140 |

### *Discussion*

The presence of large numbers of ova of the intestinal parasites *Ascaris* and *Trichuris* shows that this deposit contained faecal material, and the amount, roughly equal to the number of pollen grains, has been found in such material from medieval cess pits, showing that it was equivalent material. The turd contained mostly cereal pollen, which together with the bran shows that this was the result of a mainly cereal diet. The other pollen grains, such as the cornflower, could have been attached to food, or entered from other sources. The cess pit flora included a substantial amount of *Centaurea cyanus* pollen, from a cornfield weed that was evidently often consumed in food as shown by milled seeds together with bran in faecal material from other sites (Chester). Other taxa such as Cruciferae, Caryophyllaceae, *Artemisia* and *Anthemis* sp. could also be from such weeds. The much richer pollen flora in the pit fill might reflect the presence of a variety of rubbish, with vegetational groups such as grassland represented (*Centaurea scabiosa*, *Ranunculus*, ?*Rhinanthus* type). The presence of cornflower would be most usual in material deposited after about AD 1200.

**Environmental investigations at the Thames Crossing: 56–60 St Aldate's, 24–26 St Aldate's (the Police Station) and 30–31 St Aldate's (Land adjoining the Police Station)**
(Tables 7.33–7.36)
***by Mark Robinson***

***Introduction***

The Shirelake was a major channel of the Thames at Oxford during the middle Saxon period but by the late medieval period was only one of many minor channels crossed by Grandpont. Excavations on three sites in St Aldate's have enabled Saxon and medieval deposits on both the N and S banks of this channel to be investigated at Grandpont.

A total of 13 samples were analysed for plant and invertebrate remains with the following main aims:
- to establish the sedimentary sequence
- to show the effects of human alterations to the channel
- to establish aspects of terrestrial human activity adjacent to the channel and on land reclaimed from it.

***The samples***

*OXLAPS 87, Land adjoining Police Station*: the samples were from terrestrial deposits on the N side of the channel downstream from the crossing.

Sample 101, Feature 203 Dark brown organic loam from a 14th- to 16th-century pit

Sample 102, Feature 153 Brown/black organic silt loam with some grit from a 13th-century pit.

Sample 103, Feature 19 Dark brown organic silt loam with some gravel from 12th- to 13th-century yard or reclamation levels.

*OXPS88, Police Station*: the samples were from a series of 11th-century or earlier fine sediments in the Shirelake channel on the north side, downstream of the crossing. Some of these deposits were associated with a fenced waterfront. Sample 205 was the earliest in the sequence and 201 the latest.

Sample 201, layer 43/3 Grey-brown organic clay sediments in the channel

Sample 202, layer 43/2 Buff organic clay around the fence stakes

Sample 204, layer 47/3 Grey clay sediments in the channel

Sample 205, layer 49/2 Light brown organic clay in the channel

*OXSASL88 56–60 St Aldate's*: samples 324–302 comprised a sequence of sediments extending from before the earliest Saxon activity through to the 12th century upstream of the crossing in the channel near to the south bank. The remaining sample was from a house floor

Sample 301, layer 29 Yellow sandy gravel mixed with brown clay loam and charcoal from the floor of a 13th- to 14th-century building against the bridge

Sample 302, layer 508/1 Dark grey-brown peaty loam with a little gravel from 12th-century channel deposits next to the bridge

Sample 303, layer 513 12th-century channel deposit of grey-brown organic silty clay just upstream of the bridge

Sample 314, layer 56 Grey-brown organic clay associated with wattles in the channel

Sample 315, layer 58 Buff coarse organic sand with some silt below the earliest archaeological deposits in the channel

Sample 316, layer 59 Brown rooty peat below sample 315.

***Analysis and results***

100 g of each sample was broken up and then washed over onto a stack of sieves down to 0.2 mm. The mineral residue remaining was sieved over a 0.5 mm mesh. Flots and residues were sorted for macroscopic plant and invertebrate remains, which were identified with reference to the collections in the University Museum, Oxford. The results are listed in Table 7.33 for waterlogged seeds, Table 7.34 for other waterlogged plant remains, Table 7.35 for insects and Table 7.36 for mollusca. In addition, sample 301 contained an unidentified cereal grain and some fragments of *Quercus* (oak) charcoal. The tables give the minimum number of individuals present in each sample or, when the number of individuals could not readily be quantified, f for few fragments and ff for many fragments. Nomenclature for higher plants follows Clapham *et al.* (1987), Kerney (1976) for aquatic molluscs and Waldén (1976) for terrestrial molluscs.

***Interpretation***

*Sample 316* This represented a reedswamp deposit which had probably accumulated in shallow water. Despite comprising almost entirely organic material, preservation was poor and it contained many rootlets. The deposit had perhaps accumulated slowly over a long period.

*Sample 315* There had evidently been at least a local change in channel conditions, for the sample comprised the sandy bed of a flowing channel. The molluscan fauna reflected a well oxygenated flowing water habitat, with species such as *Theodoxus fluviatilis*, *Bithynia leachii* and *Pisidium amnicum*. The insects suggested similar conditions, cases of the flowing water caddis *Ithytrichia* sp. being the most abundant remains. The seeds show that the channel was fringed with a reedswamp of *Schoenoplectus lacustris* (bulrush) and *Oenanthe aquatica* gp.

*Table 7.33 Waterlogged seeds from 56–60 St Aldate's, Police Station and Land adjoining the Police Station*

| Sample | 56–60 St Aldate's | | | | | | Police Station | | | | Land adjoining the Police Station | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 316 | 315 | 314 | 303 | 302 | 301 | 205 | 204 | 202 | 201 | 103 | 102 | 101 |
| *Ranunculus* cf. *acris* L. | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *R.* cf. *repens* L. | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 |
| *R. flammula* L. | – | – | – | – | 1 | – | – | – | – | – | – | – | – |
| *R. sceleratus* L. | – | – | – | – | – | – | – | – | – | – | 12 | – | – |
| *R.* S. *Batrachium* sp. | – | 1 | – | 4 | – | – | 2 | – | 1 | – | – | – | – |
| *Thalictrum flavum* L. | – | – | – | – | – | – | – | – | 1 | – | – | – | – |
| *Barbarea vulgaris* R. Br. | – | – | – | – | 1 | – | – | – | – | – | – | – | – |
| *Rorippa* cf. *palustris* (L.) Bes. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Silene* sp. | – | – | – | – | – | – | – | – | 1 | – | – | – | – |
| *Agrostemma githago* L. | – | – | f | – | f | – | – | – | – | f | f | 1+ff | 1+f |
| *Cerastium* cf. *fontanum* Baug. | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Myosoton aquaticum* (L.) Moen. | – | – | – | 1 | – | – | – | – | 1 | 1 | – | – | – |
| *Stellaria* cf. *media* L. | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| Caryophyllaceae indet. | – | 1 | – | – | – | – | – | – | – | – | – | – | |
| *Chenopodium polyspermum* L. | – | – | 1 | – | – | – | – | – | – | – | 2 | – | 1 |
| *C. album* L. | – | – | – | 1 | – | – | – | – | – | – | – | – | 1 |
| *Atriplex* sp. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| Chenopodiaceae indet. | – | – | – | – | – | – | – | – | – | – | 1 | – | – |
| *Rubus fruticosus* agg. | – | 1 | – | – | – | – | – | – | – | – | – | 7 | – |
| *Potentilla anserina* L. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Agrimonia eupatoria* L. | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Rosa* sp. | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| *Prunus domestica* L. cf. ssp. *insititia* (L.) Schn. | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| *Malus sylvestris* Mill. | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| *Oenanthe aquatica* gp. | – | 3 | – | 5 | – | – | – | – | – | 1 | – | – | – |
| *Bupleurum rotundifolium* L. | – | – | – | – | – | – | – | – | – | – | 1 | – | – |
| *Apium graveolens* L. | – | – | – | 1 | – | – | – | – | – | – | – | – | 2 |
| *A. nodiflorum* (L.) Lag. | – | – | – | – | – | – | – | – | 1 | – | – | – | – |
| *Torilis* sp. | – | – | – | – | 1 | – | – | – | – | – | – | – | – |
| Umbelliferae indet. | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Polygonum persicaria* L. | – | – | – | – | – | – | – | – | 2 | – | – | – | – |
| *P. lapathifolium* L. | – | – | – | 2 | – | – | – | – | 1 | 5 | – | – | – |
| *Fallopia convolulus* (L.) Löve | – | – | – | – | 1 | – | – | – | – | – | – | – | – |
| *Rumex maritimus* L. | – | – | 1 | – | – | – | – | – | 1 | – | – | – | – |
| *Rumex* sp. (not *maritimus*) | – | – | 1 | – | 1 | – | – | – | – | – | – | – | 1 |
| *Urtica urens* L. | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| *U. dioica* L. | – | – | – | – | – | – | – | – | 2 | – | – | 4 | – |
| *Cannabis sativa* L. | – | – | – | – | – | – | – | – | – | – | – | – | 5+f |
| *Corylus avellana* L. | – | – | – | – | – | – | – | – | – | 1 | f | – | f |
| *Solanum* cf. *nigrum* L. | – | – | – | – | – | – | – | – | – | – | 2 | – | – |
| *Solanum* sp. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Veronica* S. *Beccabunga* sp. | – | – | 10 | 10 | – | – | – | – | – | – | – | – | – |
| *Mentha* cf. *aquatica* L. | – | 3 | – | 1 | – | – | 2 | – | – | 1 | 1 | – | – |
| *Lycopus europaeus* L. | 1 | – | – | – | – | – | – | – | – | – | – | – | – |
| *Plantago major* L. | – | 2 | – | – | – | – | – | – | – | – | – | – | – |
| *Senecio* sp. | – | – | – | – | 2 | – | – | – | – | 1 | – | – | – |
| *Anthemis cotula* L. | – | – | – | – | 2 | – | – | – | – | – | – | – | – |
| *Centaurea cyanus* L. | – | – | – | – | – | – | – | – | – | – | – | 2 | – |
| *Lapsana communis* L. | – | 1 | – | – | – | – | – | – | – | – | 1 | – | – |
| *Alisma* sp. | 1 | 1 | – | 1 | – | – | – | – | 1 | – | – | – | – |
| *Sagittaria sagittifolia* L. | – | – | – | – | – | – | – | – | 1 | – | – | – | – |
| *Potamogeton* sp. | – | 3 | – | – | – | – | – | – | – | – | – | – | – |
| *Zanichellia palustris* L. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Juncus effusus* gp. | – | 20 | – | – | – | – | – | – | 20 | – | – | – | – |
| *J. bufonius* gp. | – | – | 30 | – | – | – | – | – | – | – | – | – | – |

*Table 7.33 (Continued)*

| Sample | 56–60 St Aldate's | | | | | | Police Station | | | | Land adjoining the Police Station | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 316 | 315 | 314 | 303 | 302 | 301 | 205 | 204 | 202 | 201 | 103 | 102 | 101 |
| *J. articulatus* gp. | – | 30 | 30 | 10 | – | – | – | – | – | 10 | – | – | – |
| *Eleocharis* S. *Palustres* sp. | – | – | – | – | – | – | – | – | 2 | – | 1 | – | – |
| *Schoenoplectus lacustris* (L.) Pal. | – | 23 | 2 | 4 | – | – | – | – | – | 1 | – | 1 | – |
| *Carex* spp. | – | 1 | – | – | 2 | – | 1 | – | – | 1 | 1 | 4 | 3 |
| Cereal | – | – | – | – | – | – | – | – | – | f | – | ff | ff |
| Gramineae indet. | – | – | – | – | 1 | – | – | – | 1 | 1 | – | – | 1 |
| **Total (excluding unquantified fragments)** | **2** | **96** | **75** | **40** | **12** | **0** | **5** | **0** | **36** | **27** | **24** | **21** | **20** |

f: few fragments.
ff: many fragments.

(water dropwort). There were relatively few seeds of terrestrial plants but wet pastureland is suggested by such species as *Ranunculus* cf. *repens* (buttercup), *Potentilla anserina* (silverweed), *Plantago major* (great plantain) and *Juncus* spp. (rushes). Such vegetation was widespread, fringing the Thames from at least the late Bronze Age onwards. The woodland element which characterises Neolithic and earlier riverine deposits was absent.

*Samples 314, 303, 205, 204, 202, 201* The assemblages from these samples showed great similarity. The absence of molluscs from sample 205 and seeds from sample 204 was probably due to factors of preservation rather than deposition. All these deposits were clays which had accumulated in the channel under conditions of slowly-moving water. Paired valves of the mollusc *Sphaerium corneam* were found in several of the samples from both 56–60 St Aldate's and the Police Station. They had probably been living in the mud of the channel bed and remained *in situ* after death. Well-oxygenated water evidently flowed above the mud as evidenced by *Ithytrichia* sp., *Bithynia* spp. and *Pisidium amnicum*. The vegetation again included an emergent aquatic element, with *Veronica* S. *Beccabunga* sp. (brooklime, water speedwell) joining *S. lacustris* and *O. aquatica* gp. The bankside species, however, tended to be plants of mud such as *Polygonum lapathifolium* (pale persicaria) and *Rumex maritimus* (golden dock). *Salix* (willow) trees were also present.

These sediments ranged in date from the late 9th century to the 11th century. They accumulated relatively rapidly, probably as a result of human modifications to the channel, such as the construction of wattle fences and possibly bridgeworks. This was reflected in a relatively low concentration of mollusc shells in some of these samples, particularly samples 204–201 where the preservation was good.

The earliest sample in this group, sample 314, was pre 10th-century in date and was associated with a line of wattles. Other evidence for a human presence came in the form of a fragment of a seed of *Agrostemma githago* (corn cockle), a cereal weed which was a common contaminant of flour and was probably derived from sewage in this sample. Cereal bran and *A. githago* seed fragments, again probably from sewage, were present in sample 201, the uppermost from the Police Station sequence. Samples 201 and 202 contained a few capsule fragments of *Linum usitatissimum* (flax) which could have resulted either from the rippling (threshing) of flax near the channel or from flax retting somewhere upstream.

*Table 7.34 Other waterlogged plant remains from 56–60 St Aldate's, Police Station and Land adjoining the Police Station*

| Sample | 56–60 St Aldate's | | | | | | Police Station | | | | Land adjoining the Police Station | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 316 | 315 | 314 | 303 | 302 | 301 | 205 | 204 | 202 | 201 | 103 | 102 | 101 |
| Brassiceae (siliqua) | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Bryophyta (stems) | – | – | – | – | – | – | – | – | – | – | – | – | + |
| Bud scales (not *Salix*) | – | 1 | – | – | 1 | – | – | – | – | – | – | – | – |
| *Chara* sp. (oospores) | – | 20 | 10 | 10 | – | – | – | – | – | – | – | – | – |
| *Linum usitatissimum* L. (capsule fragments) | – | – | – | – | – | – | – | – | 3 | 2 | – | – | – |
| *Malus sylvestris* Mill. (endocarp fragments) | | – | – | – | – | – | – | – | – | – | 4 | 2 | – |
| *Salix* cf. *viminalis* L. (leaf fragments) | – | – | – | – | – | – | – | – | – | – | – | – | + |
| *Salix* sp. (buds) | – | – | 1 | 2 | – | – | – | – | 1 | – | – | – | 2 |

*Table 7.35 Insects from 56–60 St Aldate's, Police Station and Land adjoining the Police Station*

| Sample | 56–60 St Aldate's | | | | | | Police Station | | | | Land adjoining the Police Station | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 316 | 315 | 314 | 303 | 302 | 301 | 205 | 204 | 202 | 201 | 103 | 102 | 101 |
| *Orthotrichia* sp. (case) | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Ithythrichia lamellaris* Eat. or *clavata* Mort. (case) | – | 8 | 1 | 1 | – | – | – | – | – | – | – | – | – |
| Trichoptera indet. (case) | – | 2 | – | – | – | – | – | – | – | 2 | – | – | – |
| Trichoptera indet. (larvae) | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Clivina collaris* (Hbst.) or *fossor* (L.) | – | – | – | – | – | – | – | – | – | – | 1 | – | – |
| *Helophorus aquaticus* (L.) or *grandis* Ill. | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Helophorus* sp. (*brevipalpis* size) | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Cercyon* sp. | – | – | – | – | – | – | 1 | – | – | 1 | 1 | – | – |
| *Ochthebius* cf. *minimus* (F.) | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Aphodius* sp. | – | – | – | – | – | – | – | – | – | – | 1 | – | – |
| *Oxyomus sylvestris* (Scop.) | – | – | – | – | 1 | – | – | – | – | – | – | – | – |
| *Dryops* sp. | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Donacia semicuprea* Pz. | – | – | – | – | – | – | 1 | – | – | – | – | – | – |
| *Donacia* sp. | – | 1 | – | 1 | – | – | – | – | – | 1 | – | – | – |
| *Chaetocnema concinna* (Marsh.) | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| Sphaeroceridae indet. (puparia) | – | – | – | – | – | – | – | – | – | – | 3 | – | – |

The only evidence of chronological change from the contents of these samples was the restriction of economic plant remains in the Police Station sequence to the uppermost two samples, 201 and 202, which post-dated the fenced waterfront. There were no other obvious differences between the biological assemblages in the Police Station sequence or between them and the two samples from 56–60 St Aldate's upstream and on the other bank.

*Samples 302 and 103* These samples were both from 12th-century deposits which accumulated in the top of the channel and contained dumped material including some gravel. Even though sample 302 was just upstream from one of the arches of the

*Table 7.36 Molluscs from 56–60 St Aldate's, Police Station and Land adjoining the Police Station*

| Sample | 56–60 St Aldate's | | | | | | Police Station | | | | Land adjoining the Police Station | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 316 | 315 | 314 | 303 | 302 | 301 | 205 | 204 | 202 | 201 | 103 | 102 | 101 |
| *Theodoxus fluviatilis* (L.) | – | 5 | – | 1 | – | – | – | – | – | – | – | – | – |
| *Valvata cristata* Müll. | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – |
| *V. piscinalis* (Müll.) | – | 7 | 2 | 5 | – | – | – | 1 | – | 2 | – | – | – |
| *Bithynia tentaculata* (L.) | – | 4 | 6 | 4 | – | – | – | 2 | 2 | 2 | – | – | – |
| *B. leachii* (Shep.) | – | 2 | 1 | 3 | – | – | – | – | – | – | – | – | – |
| *Bithynia* sp. | – | 2 | 3 | 6 | – | – | – | – | 1 | – | – | – | – |
| *Lymnaea truncatula* (Müll.) | – | – | – | – | – | – | – | – | – | – | – | – | – |
| *L. palustris* (Müll.) | – | – | – | – | – | – | – | 1 | – | – | – | – | – |
| *Planorbis planorbis* (L.) | – | – | – | – | – | – | – | – | 1 | – | – | – | – |
| *Anisus vortex* (L.) | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| *Gyraulus albus* (Müll.) | – | 2 | 1 | 5 | – | – | – | – | – | – | – | – | – |
| *Hippeutis complanatus* (L.) | – | – | – | 1 | – | – | – | – | – | – | – | – | – |
| *Planorbarius corneus* (L.) | – | – | – | – | – | – | – | – | 1 | – | – | – | – |
| *Ancylus fluviatilis* Müll. | – | 2 | – | – | – | – | – | – | – | – | – | – | – |
| *Vallonia* sp. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Unio* or *Anodonta* sp. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Sphaerium corneum* (L.) | – | – | 1 | 1 | – | – | – | – | 1 | 1 | – | – | – |
| *Sphaerium* sp. | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| *Pisidium amnicum* (Müll.) | – | 2 | – | 1 | – | – | – | – | 1 | 2 | – | – | – |
| *Pisidium* spp. | – | 5 | 2 | 1 | – | – | – | 1 | – | – | – | – | – |
| **Total** | **0** | **35** | **16** | **28** | **0** | **0** | **0** | **5** | **7** | **9** | **0** | **0** | **0** |

bridge, the majority of the plant remains were from terrestrial weeds such as *Anthemis cotula* (stinking mayweed) and obligate aquatic species were absent. Fragments of *A. githago* seeds were present. There was a strong contrast between sample 302 and the underlying deposits such as sample 303. The underlying deposits were clays which accumulated under permanent moving water, whereas sample 302 had a much higher proportion of coarse organic debris primarily of terrestrial origin. It is possible that flow under this arch of the bridge had become seasonal and that for much of the year the arch spanned a pool of stagnant water into which refuse was thrown.

Sample 103 was from a waterlogged yard surface. The plant remains were from annual weeds of wet nutrient-rich habitats such as *Ranunculus sceleratus* (celery-leaved crowfoot) and *Polygonum lapathifolium* (pale persicaria) and from food plants. The latter included core fragments of *Malus sylvestris* (apple) and nutshell fragments of *Corylus avellana* (hazel). They were probably domestic refuse. Aquatic plants and invertebrates were absent.

*Sample 301* The remains from sample 301, a charred cereal grain and some *Quercus* (oak) charcoal, were consistent with its interpretation as a house floor. Organic remains had not survived, suggesting that the deposit was not permanently waterlogged.

*Samples 102 and 101* These samples were from pits and it is clear from their contents that they were both cess pits. Both contained numerous bran fragments and ground fragments of *A. githago* (corn cockle) seeds. Sample 102, which was from a 13th-century pit, also contained a couple of seeds of another cereal contaminant, *Centaurea cyanus* (cornflower), apple core fragments and a stone of *Prunus domestica* ssp. *insititia* (bullace or damson). The other food remains in sample 101, from a 15th- to 16th-century pit, were a couple of seeds of *Apium graveolens* (celery) and an apple pip. Interestingly, sample 101 contained both intact and fragmented seeds of *Cannabis sativa* (hemp). Hemp was grown as a fibre crop and it is possible that hemp was being retted near the site, making use either of water-filled ditches or pits dug below the water table. However, the occurrence of fragmented seeds and their context, a cess pit, raises the possibility that ground *Cannabis* seeds had been consumed for medicinal purposes.

### *Conclusions*

The sedimentary sequence of the river on the line of the Thames crossing can be divided into four phases. The first two, which are undated, comprised a reedswamp followed by more active conditions in the channel during which sand was deposited. The third phase lasted from the late 9th century until the 11th century, when clay sediments were deposited in the channel by the river. During the fourth phase, from the 12th century onwards, the dumping of soil and refuse was the main agent of sedimentation and at least part of the channel became reclaimed land.

It is possible that the transition from reedswamp to actively flowing conditions was the result of human modification of the channel but on present evidence it could have been due entirely to natural agencies. The Saxon phase of sedimentation was probably facilitated by the construction of timber and wattle waterfront structures and the bridge, all of which would have obstructed the flow. The late Saxon period was also a time when the waters of the Thames carried a heavy load of fine sediment (Robinson and Lambrick 1984). The final phase of dumping and land reclamation followed the pattern seen elsewhere in St Aldate's (Durham 1984a, 87).

The earliest evidence of human activity adjacent to the channel was from the bottom of the clay sediments on the south side and was probably the result of sewage entering the water. Biological evidence of bankside activities on the northern side of the channel was later but flax debris towards the top of the clay sediments suggested that flax retting was taking place in the vicinity. There was evidence of Saxon flax retting on the floodplain at Oxford at 79–80 St Aldate's (Brown in Durham 1977, 169–72) and beneath the Blackfriars Priory (Robinson in Lambrick 1985, 195). The final sedimentary phase had plenty of evidence, particularly from food waste, for domestic activity.

## Environmental investigations at the British Telecom Tunnel

(Tables 7.37–7.42)

***by Mark Robinson***

### *Introduction*

The excavation of a tunnel across St Aldate's north of Folly Bridge gave an opportunity to investigate the sediments directly related to the Grandpont and earlier crossings of the Thames. Despite difficult conditions on site, a total of ten samples suitable for analysis for plant and invertebrate remains were taken. The main aims of this investigation were as follows:

- to establish the sedimentary sequence
- to establish the nature of the crossing
- to establish aspects of human activity on and alongside the crossing.

### *The Samples*

*OXSAM 91* The samples are listed in the order in which the results are discussed. The first five were from Manhole One, the remainder were from Tunnel One.

Sample 4, layer 10 Blue/grey sandy clay and gravel with some organic preservation. Lime encrustation on the larger stones. Radiocarbon date of 7530–6700 cal BC (OxA-4354).

*Table 7.37 Waterlogged seeds from the BT tunnel samples*

| Sample No. | 4 | 3 | 18 | 17 | 16 | 13 | 7 | 6 |
|---|---|---|---|---|---|---|---|---|
| *Ranunculus* cf. *repens* L. | 1 | 3 | | 1 | 3 | 4 | 20 | 2 |
| *R. flammula* L. | | | | | | 1 | | |
| *R. sceleratus* L. | | | | 3 | 1 | | | |
| *R.* S. *Batrachium* sp. | 4 | 8 | | 1 | | 2 | | |
| *Thalictrum flavum* L. | | 3 | 1 | | | | | |
| *Nuphar lutea* (L.) Sm. | 3 | 1 | | | | | | |
| *Papaver rhoeas* tp. | | | | | 15 | | | |
| *P. argemone* L. | | | | | 6 | | | |
| *Brassica* or *Sinapis* sp. | | | | | | | 1 | |
| *Capsella bursa-pastoris* (L.) Med. | | | | | | 5 | | |
| *Silene* cf. *vulgaris* (Moen) Gk. | | | | 1 | | | 2 | 2 |
| *Lychnis flos-cuculi* L. | | | | | 1 | | | |
| *Agrostemma githago* L. | | | | | | 1 | 19 | 1 |
| *Cerastium* cf. *fontanum* Baum. | 1 | | | | | 1 | | |
| *Myosoton aquaticum* (L.) Moen. | 1 | | | | | | | |
| *Stellaria media* gp. | | | | 3 | 1 | 11 | | |
| *Spergula arvensis* L. | | | | 2 | | 1 | | |
| *Chenopodium album* L. | 1 | | | | | | 2 | 4 |
| *Atriplex* sp. | 1 | | | | 10 | 4 | 2 | 1 |
| *Ulex* sp. | | | | | | | | 9 |
| *Medicago lupulina* L. | | | | | | | 1 | |
| *Filipendula ulmaria* (L.) Max. | | 1 | | | | 2 | | |
| *Potentilla anserina* L. | 1 | | | | | 1 | | |
| *Cornus sanguinea* L. | 1 | | | | | | | |
| *Hydrocotyle vulgaris* L. | | | | | | 1 | | |
| *Scandix pecten-veneris* L. | | | | | | | 2 | 1 |
| *Sium latifolium* L. | 1 | 1 | | | | | | |
| *Oenanthe pimpinelloides* gp. | | | | | | 1 | | |
| *O. aquatica* gp. | 27 | 21 | | | | | | |
| *Conium maculatum* L. | | | | 1 | | 3 | | |
| *Apium nodiflorum* (L.) Lag. | | 2 | | | | 1 | | |
| *Torilis* sp. | | | | | 1 | | | |
| *Polygonum aviculare* agg. | 1 | | | | 2 | 24 | 5 | 1 |
| *P. persicaria* L. | 1 | | | 12 | 1 | 32 | | |
| *P. lapathifolium* L. | 2 | 1 | | 2 | | 6 | | |
| *Fallopia convolvulus* (L.) Löv. | | | | | | | 4 | 2 |
| *Rumex conglomeratus* Mur. | 3 | | | | | 7 | | 1 |
| *R. maritimus* L. | 1 | | | | | | | |
| *Rumex* sp. (not *maritimus*) | 2 | | | | 9 | 8 | 4 | 2 |
| *Urtica urens* L. | | | | | | 3 | | |
| *U. dioica* L. | 2 | 2 | 1 | 2 | 20 | 106 | | 1 |
| *Humulus lupulus* L. | | | | | | | 1 | |
| *Solanum* cf. *dulcamara* L. | 1 | | | | | | | |
| *Veronica* S. *Beccabunga* sp. | | | | | | 10 | | |
| *Pedicularis palustris* L. | | | | | | 1 | | |
| *Euphrasia* or *Odontites* sp. | | | | | 1 | | | |
| *Mentha* cf. *aquatica* L. | 6 | 6 | 1 | 1 | 1 | | | |
| *Lycopus europaeus* L. | | 1 | | | | 4 | | 1 |
| *Stachys* sp. | | 1 | | | | | | |
| *Plantago major* L. | 2 | 1 | | | 1 | 1 | | |
| *Galium aparine* L. | | | | | | | 2 | |
| *Galium* sp. | 1 | | | | | | | |
| *Sambucus nigra* L. | | | | | | 1 | | |

*Table 7.37 (Continued)*

| Sample No. | 4 | 3 | 18 | 17 | 16 | 13 | 7 | 6 |
|---|---|---|---|---|---|---|---|---|
| *Valerianella dentata* (L) Pol. | | | | | | | | 1 |
| *Valeriana* sp. | | | | | | 1 | | |
| *Bidens* sp. | | | | | | 1 | | |
| *Senecio* sp. | 1 | | | | | 2 | | |
| *Eupatorium cannabinum* L. | | 5 | | | | | | |
| *Anthemis cotula* L. | | | | | 11 | | 5 | |
| *Chrysanthemum segetum* L. | | | | | | | 1 | |
| *Leucanthemum vulgare* Lam. | | | | | | | | 1 |
| cf. *Cirsium* sp. | | | | | 3 | | | |
| *Centaurea cyanus* L. | | | | | | | 13 | |
| *Leontodon* sp. | | | | | | 1 | 1 | |
| *Picris hieracioides* L. | | | | | | 1 | | |
| *Sonchus asper* (L.)Hill | | | | | 6 | 2 | | |
| *Taraxacum* sp. | 1 | | | | | | | |
| *Baldelia ranunculoides* (L.) Parl. | | 3 | | | | 1 | | |
| *Alisma* sp. | 4 | 8 | | | 3 | 1 | | |
| *Sagittaria sagittifolia* L. | 4 | 5 | 1 | | | 1 | | |
| *Potamogeton* sp. | 4 | 1 | | | | | | |
| *Juncus effusus* gp. | | | | | | 10 | | |
| *J. bufonius* gp. | 20 | | | | | 10 | | |
| *J. articulatus* gp. | 40 | | | | | 10 | | |
| *Luzula* sp. | | | | | | | 1 | |
| *Typha* sp. | | | 10 | | | | | |
| *Eleocharis* S.*Palustres* sp. | 6 | | | | 1 | 2 | | 1 |
| *Schoenoplectus lacustris* (L.) Pal. | 33 | 2 | | | | | | |
| *Carex* sp. | 6 | 2 | 2 | 2 | 1 | 9 | | 4 |
| Cyperaceae indet. | | 2 | | | | | | |
| *Hordeum* sp. - hulled | | | | | | | 5 | |
| cereal indet. - crushed | | | | | | | 19 | |
| Gramineae indet. | 1 | 2 | | | 1 | 1 | 13 | |
| ignota | | | | | 1 | | | |
| **Total** | **184** | **82** | **16** | **31** | **100** | **295** | **123** | **35** |

Sample 3, layer 9 Dark brown laminated organic silty clay with some monocotyledonous stems. Above layer 10. Radiocarbon date of cal AD 560–890 (OxA-4353).

Sample 18, layer 8 Brown organic silty clay above layer 9.

Sample 17, layer 7 Brown slightly organic gravelly clay loam above layer 8.

Sample 16, layer 6 Black slightly organic gravelly loam with much fine charcoal above layer 7.

Sample 14, layer 112 Pale blue/grey inorganic clay below layer 110.

Sample 13, layer 110. Black organic gravelly loam above layer 111, the stones of the causeway. Dendrochronological date of AD 577–619 (Sample BT 823).

Sample 8, layer 155 Grey/black inorganic gritty clay loam with fine charcoal fragments.

Sample 7, layer 148 Brown laminated organic material including straw and animal hairs with small pockets of more comminuted greenish

*Table 7.38 Other waterlogged plant remains from BT tunnel samples*

| Sample No. | | 4 | 3 | 18 | 17 | 16 | 13 | 7 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| *Betula pendula* Roth. /*pubescens* Eh. | catkin scale | 1 | | | | | | | |
| Bryophyta | stem fragment | + | + | + | | + | + | + | |
| Bud scale (not *Salix*) | | 1 | | | | | | | |
| Cereal indet. | straw fragment | | | | | | | + | |
| *Chara* sp. | oospore | 53 | 1 | | | | | | |
| *Crataegus* or *Prunus* sp. | thorn | + | | | | + | | | |
| Deciduous leaf | abscission pad | | | | 1 | | | | 1 |
| *Linum usitatissimum* L. | capsule fragment | 1 | 5 | | | 1 | | | |
| *Pteridium aquilinum* (L.)Kuhn | frond fragment | | | | | | + | | |
| *Rumex* sp. | stem with peduncles | | | | | | | 2 | |
| *Rubus* sp. | prickle | | | | | | 1 | | |
| *Salix* sp. | bud | 2 | | | 1 | | 4 | | |
| *Salix* sp. | capsule | | | | | | 3 | | |
| *Trifolium* sp. | calyx | | | | | | | 1 | |
| *Triticum* sp. (free threshing) | glume | | | | | | | 1 | |
| *Ulex* sp. | thorn | | | | | | | | + |
| *Vicia* or *Lathyrus* sp. | pod | | | | | | | 1 | |

brown organic material. Above layer 155. Radiocarbon date of cal AD 1400–1620 (GU-5334).

Sample 6, layer 232 Dark brown organic gritty silt with some woody fragments.

### *Analysis and results*

1 kg of Sample 4 and 150 g of each of the other samples was broken up and washed over onto a stack of sieves down to 0.2 mm. The mineral residue remaining was sieved over a 0.5 mm mesh. Flots and residues were sorted for macroscopic plant and invertebrate remains, which were identified with reference to the collections of the University Museum, Oxford. The results for all the samples are listed in Table 7.37 for waterlogged seeds, Table 7.38 for other waterlogged plant remains, Table 7.39 for charred plant remains, Table 7.40 for waterlogged Coleoptera (beetles), Table 7.41 for other waterlogged insects and Table 7.42 for Mollusca. Where an entire category of remains was absent from a sample, it has been omitted from the table. Nomenclature for higher plants follows Clapham *et al.* (1987), Kloet and Hincks (1977) for Coleoptera, Kerney (1976) for aquatic molluscs and Waldén (1976) for terrestrial molluscs.

*Table 7.39 Charred plant remains from BT tunnel samples*

| Sample No. | | 16 | 8 | 6 |
|---|---|---|---|---|
| *Papaver rhoeas* tp. | seed | 1 | | |
| *Silene* sp. | seed | 1 | | |
| *Ulex* sp. | prickle | | | + |
| cf. *Vicia/Lathyrus* sp. | seed | 1 | | |
| *Quercus* sp. | charcoal | + | + | |
| *Lithospermum arvense* L. | seed | 1 | | |
| *Anthemis cotula* L. | seed | 16 | | |
| *Triticum* sp.—free threshing | grain | 16 | 1 | |
| *Triticum* sp.—free threshing | rachis node | 1 | | |
| *Secale cereale* L. | grain | 2 | | |
| *S. cereale* L. | rachis node | 3 | | |
| *Hordeum* sp.—hulled | grain | 1 | | |
| *Avena* sp. | grain | 2 | | |
| cereal indet. | grain | 10 | | |
| Gramineae indet. | seed | 1 | | |
| weed indet. | seed | 3 | | |

Dr R Macphail (this volume) undertook a soil micromorphological investigation of a sample from layer 112.

### *Interpretation*

The samples can conveniently be grouped into two sequences plus one isolated sample:

1 A stratigraphic sequence from Manhole One (Samples 4, 3, 18, 17, 16)
2 A stratigraphic sequence from Tunnel One (Samples 14, 13, 8, 7)
3 Sample 6 from Tunnel One

*The Manhole One Sequence.* The earliest sample in the sequence, Sample 4, was from the bed of a Mesolithic river channel. The invertebrate remains suggest the channel held clean, well-oxygenated flowing water, with the molluscs *Theodoxus fluviatilis*, *Bithynia tentaculata* and *Pisidium amnicum* and the caddis *Ithytrichia* sp. The majority of the seeds were from aquatic and marginal plants and most of the Coleoptera occur in similar habitats. Floating-leaved aquatic plants included *Nuphar lutea* (yellow water lily) while emergent vegetation fringing the channel

*Table 7.40 Waterlogged Coleoptera from BT tunnel samples*

| Sample No. | 4 | 3 | 18 | 17 | 16 | 13 | 7 |
|---|---|---|---|---|---|---|---|
| *Dyschirius globosus* (Hbst.) | | | | | 1 | 1 | |
| *Bembidion quadrimaculatum* (L.) | | | | | | 1 | |
| *B. gilvipes* Sturm | | | | | | 1 | |
| *B.* cf. *assimile* Gyl. | 1 | | | | | | |
| *B. guttula* (F.) | | | | 1 | | 1 | |
| *Pterostichus strenuus* (Pz.) | | | | | | 1 | |
| *Agonum* sp. | | 1 | | | | | |
| *Amara* sp. | | | | | | 1 | |
| *Hygrotus inaequalis* (F.) | | | | | | 1 | |
| *Potamonectes depressus* (F.) | 1 | | | | | | |
| *Agabus* sp. (not *bipustulatus*) | | 1 | | | | | |
| *Gyrinus* sp. | | 1 | 1 | | | | |
| *Orectochilus villosus* (Müll.) | | 1 | | | | | |
| *Helophorus grandis* Ill. | | 1 | | | | | |
| *H. nubilus* F. | | | | | | 1 | |
| *Helophorus* sp. (*brevipalpis* size) | 1 | 1 | | | | | |
| *Cercyon* sp. | | 1 | | | 1 | | |
| *Megasternum obscurum* (Marsh.) | | | | 1 | | 6 | |
| *Cryptopleurum minutum* (F.) | | | | | | | 1 |
| *Hydrobius fuscipes* (L.) | | 1 | | | | 1 | |
| *Laccobius* sp. | | 1 | | | | | |
| *Hister bissexstriatus* F. | 1 | | | | | | |
| *Hydraena testacea* Curt. | | 1 | | | | | |
| *Lesteva longoelytrata* (Gz.) | | | | | 1 | | |
| *Oxytelus sculptus* Grav. | | | | | 1 | | |
| *Stenus* sp. | | 1 | | | | 1 | |
| *Rugilus* cf. *orbiculatus* (Pk.) | | | | | | 1 | |
| *Leptacinus* cf. *batychrus* (Gyl.) | | | | | | 1 | |
| *L.* cf. *pusillus* (Step.) | | | | | 1 | | |
| *Xantholinus longiventris* Heer | | | | | | 1 | |
| *X.linearis* (Ol.) or *longiventris* Heer | | | | | | 1 | |
| *Philonthus* sp. | | 1 | | | | | |
| *Tachinus* sp. | | 2 | | | | | |
| Aleocharinae indet. | | | | | 1 | 1 | |
| *Aphodius ater* (Deg.) | | | | | | 1 | |
| *A. pusillus* (Hbst.) | | | | | | 1 | |
| *A.* cf. *sphacelatus* (Pz.) | | | | | | 3 | |
| *Aphodius* sp. | | 1 | | | 1 | 1 | |
| *Dryops* sp. | | 1 | | | | 1 | |
| *Anobium punctatum* (Deg.) | | | | 1 | | | |
| *Ptinus fur* (L.) | | | | | | 1 | |
| *Coccidula rufa* (Hbst.) | | | | | | 1 | |
| *Lathridius minutus* gp. | | | | | 1 | | |
| Corticariinae indet. | | | | | 1 | | |
| *Donacia clavipes* F. | 1 | 1 | | | | | |
| *D. dentata* Hop. | 1 | 2 | | | | | |
| *D. impressa* Pk. | | 2 | | | | | |
| *D. simplex* F. | | 1 | | | | | |
| *Donacia* sp. | | 1 | 1 | | | | |
| *Prasocuris phellandrii* (L.) | | 1 | | | | | |
| *Phyllotreta exclamationis* (Thun.) | | | | | | 1 | |
| *Longitarsus* sp. | | | | | | 2 | |
| *Chaetocnema concinna* (Marsh.) | | 1 | | | | | |
| *Sitona* sp. | | | | | | 1 | |
| *Alophus triguttatus* (F.) | | 1 | | | | | |
| *Bagous* sp. | 1 | 1 | | | | | |
| *Notaris acridulus* (L.) | 1 | 2 | | | | 4 | |

*Table 7.40 (Continued)*

| Sample No. | 4 | 3 | 18 | 17 | 16 | 13 | 7 |
|---|---|---|---|---|---|---|---|
| *Thryogenes* sp. | | 1 | | | | | |
| Ceuthorhynchinae indet. | | 1 | | | 1 | 1 | |
| *Mecinus pyraster* (Hbst.) | | 1 | | | | | |
| **Total** | **8** | **32** | **2** | **3** | **10** | **39** | **1** |

included *Oenanthe aquatica* gp. (water dropwort), *Sagittaria sagittifolia* (arrow-head) and *Schoenoplectus lacustris* (true bulrush). There were a few seeds of plants of well-illuminated disturbed ground such as *Chenopodium album* (fat hen) and *Polygonum lapathifolium* (pale persicaria) which perhaps colonised sediment deposits exposed by the river. There was a slight presence of tree and shrub remains: *Cornus sanguinea* (dogwood), *Salix* sp. (willow) and *Betula pendula* or *pubescens* (tree birch). They are all appropriate to the early Mesolithic radiocarbon date obtained on *Salix* wood from the deposit. *Betula* sp. was entirely displaced by *Alnus glutinosa* (alder) on the floodplain of the Upper Thames during the later Mesolithic, not to return until planted for ornament in recent times, particularly within the past 40 years. The only item from the sample inconsistent with the radiocarbon date was a capsule fragment of *Linum usitatissimum* (flax). Given that there was a hiatus of more than 7000 years between the deposition of this layer and the overlying sediments, the occurrence of some intrusive material is unsurprising. Indeed, flax capsule fragments were also identified from the layer above.

The top of layer 10, from which Sample 4 was derived, contained cobbles of Corallian limestone. These stones were abraded and heavily encrusted with calcium carbonate, suggesting that they had lain exposed on the river bed for a long period. It is possible that the sorting action of the river could have resulted in the development of an 'armoured' bed to the channel by carrying away the smaller stones from the terrace gravels. However, Corallian limestone is not a major component of the gravels of the floodplain terrace. It is thought more likely that

*Table 7.41 Other waterlogged insect remains from BT tunnel samples*

| Sample No. | | 4 | 3 | 18 | 17 | 16 | 13 |
|---|---|---|---|---|---|---|---|
| Hemiptera Aphidoidea indet. | | | 1 | | | | |
| Trichoptera *Ithytrichia* sp. | case | 9 | 5 | | | | |
| *Orthotrichia* sp. | case | 2 | 2 | 1 | | | |
| Trichoptera indet. | case | 2 | 1 | 1 | | | 1 |
| Trichoptera indet. | larva | 1 | 3 | 1 | | | |
| Trichoptera indet. | adult | | 1 | | | | |
| Diptera Chironomidae indet. | larva | + | | | | | |
| Diptera indet. | puparium | | | 1 | 1 | 2 | 5 |

*Table 7.42 Mollusca from BT tunnel samples*

| Sample No. | 4 | 3 | 17 | 16 | 14 | 13 | 8 |
|---|---|---|---|---|---|---|---|
| *Theodoxus fluviatilis* (L.) | 2 | | | | | | 1 |
| *Valvata cristata* Müll. | 5 | | 1 | | | 1 | |
| *V. piscinalis* (Müll.) | 9 | | | | | 1 | |
| *Bithynia tentaculata* (L.) | 6 | 1 | | | | 2 | |
| *Bithynia* sp. | 12 | | | | 2 | 1 | |
| *Carychium* sp. | | | | | | 1 | |
| *Lymnaea truncatula* (Müll.) | 4 | | | 1 | 3 | 2 | 1 |
| *L. peregra* (Müll.) | | | 1 | | | 1 | |
| *Planorbis planorbis* (L.) | 1 | | 1 | | 1 | 1 | 1 |
| *Anisus leucostoma* (Milt.) | 1 | | 1 | | | | |
| *A. vortex* (L.) | | | | | | 2 | |
| *Bathyomphalus contortus* (L.) | 3 | | | | | 1 | |
| *Gyraulus albus* (Müll.) | 5 | | | | | | |
| *Armiger crista* (L.) | 2 | | | | | | |
| *Ancylus fluviatilis* Müll. | 3 | | | | | | |
| *Succinea* or *Oxyloma* sp. | | | 1 | | | | |
| *Vertigo pygmaea* (Drap.) | | | 1 | | | | |
| *Vallonia pulchella* (Müll.) | 1 | | | | | | |
| *Arion* sp. | + | | | | + | | |
| *Limax* or *Deroceras* sp. | 1 | | | | | | |
| Unionidae indet. | 1 | | | | | | |
| *Sphaerium* sp. | | | | | | 1 | |
| *Pisidium amnicum* (Müll.) | 1 | | | | | | |
| *Pisidium* sp. | 4 | | 1 | | | 3 | |
| **Total** | **61** | **1** | **7** | **1** | **6** | **17** | **3** |

the cobbles represent a deliberately placed ford surface.

When the sediments above the possible ford were laid down in the middle Saxon period, conditions had changed. Either the rate of water flow had decreased or the water carried a greater fine sediment load. This caused organic silty clay to be deposited under reedswamp conditions. However, there was still sufficient flow that Sample 3 contained cases of the caddis *Ithytrichia* sp. and despite conditions not being very favourable to the preservation of mollusc shells, *Bithynia* sp. was also present. Seeds of all the floating-leaved and emergent aquatic plants mentioned for Sample 4 were also identified from Sample 3. The beetles included various Chrysomelidae that feed on the reedswamp vegetation such as *Donacia clavipes* on *Phragmites australis* (reed), *D. dentata* on *Sagittaria* and *Alisma* spp. (arrow-head and water plantain), *D. impressa* on *Schoenoplectus lacustris* (bulrush) and *Prasocuris phellandri* on aquatic Umbelliferae including *Oenanthe aquatica* (water dropwort). The remainder of the insect fauna was appropriate to bankside or aquatic habitats. The few seeds of terrestrial plants were all of plants which readily grow at the edge of the water, such as *Filipendula ulmaria* (meadow sweet) and *Eupatorium cannabinum* (hemp agrimony). The sample did, however, contain five flax capsule fragments, possibly the result of flax being retted in the channel.

The deposition of organic silty clay continued, but obligate flowing-water species were absent from Sample 18. For example, the only caddis identified, *Orthotrichia* sp., can live in stagnant water. Preservation of seeds was poor, but the flora appears to have remained one of reedswamp with plants such as *Sagittaria sagittifolia* and *Typha* sp. (reedmace).

The nature of sedimentation changed higher up the profile with the dumping of gravelly soil. Sample 17 suggested a flora of damp, disturbed ground or mud, with plants such as *Ranunculus sceleratus* (celery-leaved crowfoot), *Stellaria media* gp. (chickweed) and *Polygonum persicaria* (red shank). The reedswamp element was almost absent. Obligate flowing-water molluscs were absent, but the occurrence of some aquatic species including *Planorbis planorbis* suggests at least seasonal flooding or the reworking of aquatic sediments.

The ground level continued to be raised by the dumping of gravelly soil. The proximity of wet habitats was still suggested by a few seeds of *Alisma* sp. (water plantain), but the majority of the plant and invertebrate remains from Sample 16 are typical of Saxon or medieval settlement sites. The most numerous seeds were all from plants of various disturbed and in some cases nutrient-rich habitats such as *Papaver rhoeas* tp. (poppy), *Urtica dioica* (stinging nettle) and *Anthemis cotula* (stinking mayweed). The beetles were mostly species which occur in various sorts of decaying organic material, such as *Oxytelus sculptus* and *Lathridius minutus* gp., and would be favoured by domestic or agricultural waste. Some crop processing debris was present in the form of charred chaff and grain of free-threshing *Triticum* sp. (wheat) and *Secale cereale* (rye). There were also charred weed seeds including *P. rhoeas* tp. and *A. cotula*.

*The Tunnel One Sequence*. Sample 14, the earliest deposit in the sequence, comprised blue/grey alluvial clay. Although organic biological remains were absent, it contained some shell fragments of the flowing water mollusc *Bithynia tentaculata*, confirming its alluvial origin.

The deposit which formed on the stones of the ford which had been set on top of the blue/grey clay contained materials of both aquatic and terrestrial origin. A range of aquatic mollusc shells was present in Sample 13, again including *B. tentaculata*. Apart from a few seeds of *Ranunculus* S. *Batrachium* sp. (water crowfoot), a trichopteran case and a few water beetles such as *Hygrotus inaequalis*, there was little evidence from the other biological remains for fully aquatic conditions. However, there were seeds of various marsh and waterside plants, for example *Lycopus europaeus* (gypsy wort), *Carex* sp. (sedge) and *Eleocharis palustris* or *uniglumis* (spike rush) as well as a weevil, *Notaris acridulus*, which feeds on some of them.

The majority of the seeds were from plants of disturbed ground, seeds of *Stellaria media* gp. (chickweed), *Polygonum aviculare* agg. (knotgrass), *P. persicaria* (red shank) and *Urtica dioica* (stinging nettle) being the most numerous. There seems to have been a significant presence of domestic animals in the vicinity, suggested by various dung beetles from the genus *Aphodius* and also the beetle *Megasternum obscurum*. Interestingly, given the early Saxon date of the deposit, there was some slight evidence for the proximity of human habitation, or at least the dumping of settlement refuse. There was a single individual of the beetle *Ptinus fur*, which tends to occur in indoor habitats. There were also frond fragments of *Pteridium aquilinum* (bracken), a fern which only grows on the hills above Oxford but was brought to sites in the valley bottom, perhaps for use as bedding.

The ratio between aquatic and terrestrial biological remains in Sample 13 suggests that the deposit accumulated on a surface which, although wet, was above water level for some of the year, rather than that it had formed over a ford on the bed of a river channel.

The next sample, Sample 8, came very much later in the stratigraphic sequence. The deposit it was from contained 12th- to 13th-century pottery and formed inorganic backfill to a pit or ditch. The aquatic mollusc shells in it had probably been reworked. Cut into this backfill was one of a series of curious late medieval slots containing dung-like material with some animal hairs. Sample 7 from this slot was dominated by what seemed to be waterlogged crop cleaning remains, with numerous seeds of *Agrostemma githago* (corn cockle) and *Centaurea cyanus* (cornflower) as well as hulled grains of *Hordeum* sp. (barley). Although cereal caryopses from the sample had been crushed, they had not been ground to the bran which characterises medieval human sewage. Although various other explanations are possible, the simplest is that the material comprised the dung of horses which had been fed on crop cleanings. The almost complete absence of insect remains suggests that the material was not allowed to stand around under aerobic conditions but was promptly deposited in the slot.

*Sample 6.* The isolated sample from the tunnel, Sample 6, contained a few waterlogged weed seeds but more interestingly, there were both waterlogged and charred spines of *Ulex* sp. (gorse). Gorse is another plant restricted to the acid soils of the high ground around Oxford but was imported to fuel bread ovens.

### *Conclusions*

The sequence from Manhole One showed a transition in the early or middle Saxon period from several millennia of almost stable flowing water conditions with very little sedimentation to a regime of fine silting under reedswamp conditions. Subsequently, further alluvial sedimentation combined with dumping filled in this part of the channel and raised it above general river level.

The sequence from Tunnel One was different. The earliest deposit, overbank alluvium laid down before the mid-Saxon period, could not be matched to any of the Manhole One sediments. It suggested the sequence to have been on the bank of the channel rather than within it. The water table seems to have risen in the Saxon period, resulting in the preservation of organic material above the stony surface and thereafter, deposits were associated with human activity at the crossing.

It is possible that the blue/grey clay alluvium of the Tunnel One sequence was part of a general Roman deposit of alluvial clay on the Thames floodplain which has been postulated on the basis of observations at 79–80 St Aldate's (Robinson and Lambrick in Durham 1984a, 79–80) and at the Trill Mill excavation (Robinson, this chapter, above). The Trill Mill site also showed evidence for a Saxon rise in water table.

Flax retting seems to have been an important activity on the floodplain of the Thames to the south of Oxford but the early/middle Saxon evidence from the Manhole One sequence is the earliest so far discovered. During the middle Saxon period, flax retting was occurring in the Trill Mill Stream (Robinson, this chapter, above) and in gullies at 79–80 St Aldate's (Brown in Durham 1977, 169–72). The other activities which took place on the site in the Saxon and medieval periods, such as land reclamation and the dumping of refuse, are what would be expected given the nature of the crossing.

## Pedological analysis of a sample of blue/grey clay 112 from the British Telecom Tunnel
***by Richard I Macphail***

A thin section, manufactured at the University of Stirling from an undisturbed sample of 'grey clay' 112 from the BT tunnel site, was received. A soil micromorphological investigation was carried out as a means of ascertaining whether this grey clay was *in situ* alluvium or dumped causeway material for a Thames crossing, possibly of Saxon age, now sealed by the Norman stone bridge, Grandpont.

The sample had soil water removed by acetone replacement and was made into a thin section (Murphy 1986). The soil thin section was described according to Bullock *et al.* (1985) and an interpretation was made of its microfabric (Courty *et al.* 1989).

The micromorphological description given below shows that a calcareous silty clay, with some evidence of slight upward fining, was deposited. It contained evidence of once containing plant fragments (now generally as oxidised and ferruginised remains in planar voids). A scatter of mollusc fragments and fine charcoal was present. Some probable brief weathering took place as the deposit was laid down, and this was mainly related to root activity. Later, major vertical rooting took place, and the deposit became vegetated. The site was generally waterlogged, and mobile iron (in a reduced state) affected oxidising sites such as structural surfaces and especially these root channels. Some calcium carbonate was leached out and iron and manganese were deposited as mottles. Some root material was ferruginised. Later, perhaps during the post-burial history of the site, secondary calcium carbonate (perhaps leached from higher up the sediment) was deposited as nodular infillings of voids and as pseudomorphic replacement of roots.

These features are typical of alluvium, and a very similar Saxon calcareous silt loam on the Thames floodplain has been previously described from thin sections from Drayton Cursus (Macphail 1990, plate 1, 27–30; Lambrick 1992, fig. 20.6). The sediment at Drayton was rather more heterogeneous than the BT sample, but had been similarly affected by mild leaching, gleying and secondary calcium carbonate deposition.

In conclusion, layer 112 is an *in situ* overbank alluvium. There is no heterogeneity nor pedofeature evidence of it being dumped or having subsided, and rooting features are related to the present way up. It closely resembles calcareous Thames alluvium of similar age.

### Description

*Structure:* massive with coarse crack and vertical channel pattern, forming pseudoprismatic structure on drying out.

*Porosity:* 10%; dominant coarse to medium cracks (well accommodated planar voids) with frequent medium to coarse open vughs interconnected with fine, medium and coarse vertical channels; few fine vughs and very few small channels pseudomorphic of fine roots and fine, medium to coarse planar void pseudomorphs of probable plant fragments.

*Mineral:* Coarse:Fine (limit at 10 ìm), homogeneous at 15:85 becoming 20:80 with depth.

*Coarse:* dominant fine to medium sand-size and common silt-size quartz, with common aragonite/calcite, few mollusc shell fragments, very few generally rounded biogenic calcite formations (eg. from earthworms and slugs, transported?) and a single gravel-size oolitic clast. Deposit becomes rather more silty and sandy half-way down the slide.

*Fine:* dominant grey to brownish grey (PPL) according to amount of weak iron-staining, with very dark brown to opaque (PPL) where iron and manganese staining (mottling) is greatest; high to low interference colours (XPL) with few isotic areas (again according to mottling); dominant grey and pale yellow with common bright orange (OIL) reflecting iron-depleted and ferruginous zones.

*Organic:*

*Coarse:* occasional to many fine to medium (*c* 500 ìm across) root traces (commonly partially preserved by calcium carbonate, occasionally preserved by iron impregnation); occasional medium to fine plant fragments (again partially preserved by iron impregnation).

*Fine:* rare to occasional amorphous organic matter; occasional fine charcoal.

*Fabric:* crystallitic (calcitic fabric), open porphyric; occasionally isotic (iron staining).

*Pedofeatures:*

*Depletion:* many calcite-depleted areas associated with iron staining.

*Crystalline:* occasional pseudomorphic micritic and microsparitic replacement of some root tissue. Occasional total infilling of fine to coarse voids by an outer layer of micrite, with an inner fill of microsparite. General calcitic impregnation of much of the fabric.

*Amorphous:* abundant weak to very strong iron and manganese impregnation of fine fabric as mottles, especially associated with channels and some planar voids. Occasional replacement of plant fragments and fine roots.

*Fabric:* Generally homogeneous with slight coarsening of sediment downwards (slight upward fining).

*Excrements:* No extant excremental fabric, but sediment appears to have been generally biologically homogenised.

*Hierarchy of Features:* Sedimentary deposition of a calcareous deposit was followed by general biological homogenisation (for example, through rooting), and included plant material that became mainly oxidised. Gleying (depletion of calcium carbonate and iron impregnation) followed, mainly affecting the soil's porosity. Lastly, calcium carbonate solutions produced secondary calcium carbonate, sometimes pseudomorphically replacing extant roots.

## Environmental evidence from 42–43 St Aldate's, the Head of the River

(Tables 7.43–7.48)

***by Mark Robinson***

### Introduction

The building of student accommodation at 42–3 St Aldate's and in the car park of the Head of the River by Hertford College provided an opportunity to investigate sediments and land reclamation between Folly Bridge and the Trill Mill Stream. Seven samples were taken for analysis for plant and invertebrate remains from the sedimentary sequence exposed in Trench 3, in the front cellar of 42 St Aldate's. Field observations were made on the sediments exposed in Trenches 1 and 2, in the car park. The main aims of this investigation were as follows:

- to establish the sedimentary sequence
- to establish aspects of human activity on the site, particularly in relation to the river crossing and land reclamation.

### The Samples

The samples from Trench 3 are listed in stratigraphic sequence, starting with the earliest.

*Table 7.43 Waterlogged seeds from the Head of the River*

| Sample No. | 11 | 10 | 9 | 8 | 7 |
|---|---|---|---|---|---|
| *Ranunculus* cf. *repens* L. | 3 | 1 | 1 | 1 | – |
| *R. flammula* L. | – | – | 1 | – | – |
| R. S. *Batrachium* sp. | 13 | – | 7 | 17 | – |
| *Thalictrum flavum* L. | 1 | 1 | – | – | – |
| *Nuphar lutea* (L.) Sm. | – | – | – | 1 | – |
| *Brassica* or *Sinapis* sp. | – | 1 | – | 2 | – |
| *Cerastium* cf. *fontanum* Baum. | 1 | – | – | – | – |
| *Myosoton aquaticum* (L.) Moen. | 1 | – | – | – | – |
| *Aphanes arvensis* L. | 1 | – | – | – | – |
| *Callitriche* sp. | – | – | – | 1 | – |
| *Sium latifolium* L. | 2 | – | – | – | – |
| *Berula erecta* (Huds.) Cov. | 1 | – | – | – | – |
| *Oenanthe aquatica* gp. | 16 | 6 | 3 | 7 | – |
| *Apium nodiflorum* (L.) Lag. | 3 | – | – | 2 | – |
| *Rumex conglomeratus* Mur. | 1 | 1 | – | – | – |
| *Rumex* sp. (not *maritimus*) | 1 | 1 | – | – | – |
| *Urtica dioica* L. | – | 1 | – | 4 | – |
| *Corylus avellana* L. | – | – | – | – | 1 |
| *Menyanthes trifoliata* L. | – | – | – | 1 | – |
| *Mentha* cf. *aquatica* L. | 24 | 10 | 13 | 27 | – |
| *Lycopus europaeus* L. | 7 | – | – | – | – |
| *Stachys* sp. | 1 | – | – | 1 | – |
| *Ballota nigra* L. | – | – | 1 | – | – |
| *Plantago major* L. | – | – | 1 | 1 | – |
| *Galium aparine* L. | – | – | 1 | – | – |
| *Eupatorium cannabinum* L. | – | 1 | – | – | – |
| cf. *Cirsium* sp. | – | – | – | 1 | – |
| *Sonchus asper* (L.) Hill | 1 | 1 | – | – | – |
| *Alisma* sp. | 2 | 3 | 5 | 7 | – |
| *Sagittaria sagittifolia* L. | 17 | 1 | – | 2 | – |
| *Juncus articulatus* gp. | 10 | – | – | – | – |
| *Sparganium* sp. | 1 | – | – | – | – |
| *Eleocharis* S. *Palustres* sp. | 2 | – | – | – | – |
| *Schoenoplectus lacustris* (L.) Pal. | 26 | – | 4 | 20 | – |
| *Carex* sp. | 8 | 1 | 3 | 3 | 2 |
| Cyperaceae indet. | 2 | – | – | – | – |
| *Glyceria* sp. | – | 2 | – | 1 | – |
| Gramineae indet. | – | 3 | – | 3 | – |
| ignota | – | – | – | 1 | – |
| **Total** | **145** | **34** | **40** | **103** | **3** |

*Table 7.44 Other waterlogged plant remains from the Head of the River*

| Sample No. | | 11 | 10 | 9 | 8 |
|---|---|---|---|---|---|
| Bryophyta | stem fragment | + | – | – | – |
| *Chara* sp. | oospore | 73 | 20 | 10 | 30 |
| *Linum usitatissimum* L. | capsule fragment | 2 | – | – | – |

*Table 7.45 Charred plant remains from the Head of the River*

| Sample No. | | 8 | 7 | 6 | 5 |
|---|---|---|---|---|---|
| *Quercus* sp. | charcoal | + | + | – | + |
| cereal indet. | grain | – | – | 1 | – |

*Table 7.46 Coleoptera from the Head of the River*

| Sample No. | 11 | 10 | 9 | 8 |
|---|---|---|---|---|
| *Dyschirius globosus* (Hbst.) | 1 | – | – | – |
| *Bembidion properans* Step. | – | – | – | 1 |
| *B. doris* (Pz.) | – | – | – | 1 |
| *B. biguttatum* (F.) | 1 | – | – | 1 |
| *B. guttula* (F.) | – | – | 1 | – |
| *Pterostichus melanarius* (Ill.) | 1 | – | – | – |
| *P. cupreus* (L.) or *versicolor* (Sturm) | 1 | – | – | – |
| *Agonum viduum* (Pz.) | 1 | – | – | – |
| *Agabus bipustulatus* (L.) | – | 1 | – | – |
| *Agabus* sp. (not *bipustulatus*) | – | 1 | – | – |
| *Colymbetes fuscus* (L.) | 1 | – | – | – |
| *Orectochilus villosus* (Müll.) | 1 | – | – | – |
| *Helophorus aquaticus* L. or *grandis* Ill. | 1 | – | – | – |
| *Helophorus* sp. (*brevipalpis* size) | 2 | 1 | – | – |
| *Cercyon* sp. | 1 | 1 | 1 | 2 |
| *Hydrobius fuscipes* (L.) | 1 | – | – | – |
| *Ochthebius* cf. *minimus* (F.) | 1 | 1 | – | – |
| *Hydraena* cf. *riparia* Kug. | 1 | – | – | – |
| *Anotylus rugosus* (F.) | – | – | – | 1 |
| *A. sculpturatus* gp. | 1 | – | – | – |
| *Stenus* sp. | – | – | – | 1 |
| *Lathrobium* sp. | – | – | – | 1 |
| *Gyrohypnus* sp. | 1 | – | – | – |
| *Philonthus* sp. | 1 | 1 | – | – |
| *Tachinus* sp. | 1 | – | 1 | – |
| *Colobopterus erraticus* (L.) | – | – | 1 | – |
| cf. *Cyphon* sp. | 1 | – | – | – |
| *Dryops* sp. | – | – | 1 | 1 |
| *Oulimnius* sp. | – | 1 | – | – |
| *Stenelmis canaliculata* (Gyll.) | 1 | – | – | – |
| *Enicmus transversus* gp. | 1 | – | – | – |
| *Donacia clavipes* F. | 1 | 1 | – | – |
| *D. dentata* Hop. | 1 | – | – | – |
| *D. semicuprea* Pz. | – | 1 | 1 | – |
| *Donacia* sp. | – | – | – | 1 |
| *Plateumaris* cf. *sericea* (L.) | – | 1 | – | – |
| *Oulema melanopa* (L.) | 1 | – | – | – |
| *Prasocuris phellandrii* (L.) | 1 | – | – | – |
| *Phyllotreta nemorum* (L.) or *undulata* Kuts. | 1 | – | – | – |
| *Longitarsus* sp. | – | 1 | 1 | – |
| *Altica* sp. | 1 | – | – | – |
| *Apion* sp. | 1 | – | – | 1 |
| *Bagous* sp. | 1 | – | – | – |
| **Total** | **29** | **11** | **7** | **11** |

Sample 11, layer 327 Black organic silt with some shells and a little sandy gravel
Sample 10, layer 326 Black organic shelly silt
Sample 9, layer 325 Dark brown organic silty clay
Sample 8, layer 325 Dark brown organic silty clay
Sample 7, layer 324 Dark grey gravelly clay loam
Sample 6, layer 323 Greenish grey somewhat gravelly clay

*Table 7.47 Other insects from the Head of the River*

| Sample No. | | | 11 | 10 | 9 | 8 |
|---|---|---|---|---|---|---|
| Hemiptera | Heteroptera indet. | | – | 1 | – | – |
| Aphidoidea | indet. | | – | – | – | 3 |
| Trichoptera | *Ithytrichia* sp. | case | 6 | 3 | – | – |
| | *Orthotrichia* sp. | case | 3 | 8 | – | – |
| | Trichoptera indet. | case | 21 | 20 | 6 | 14 |
| | Trichoptera indet. | larva | 5 | 2 | 2 | – |
| | Trichoptera indet. | adult | 1 | 1 | – | – |
| Hymenoptera | *Myrmica* sp. | adult male | 1 | – | – | – |
| | Hymenoptera indet. | adult | – | 1 | – | – |
| Diptera | indet. | adult | – | 2 | – | – |
| | Diptera indet. | puparium | 1 | – | 3 | 1 |

Sample 5, layer 321 Dark grey somewhat gravelly very clayey loam

### Analysis and results

500 g of Sample 11 and 250 g of each of the other samples were broken down and washed over onto a stack of sieves down to 0.2 mm. The mineral residue remaining was sieved over a 0.5 mm mesh. Flots and residues were sorted for macroscopic plant and invertebrate remains, which were identified with reference to the collections of the University Museum, Oxford. The results are listed in Table 7.43 for waterlogged seeds, Table 7.44 for other waterlogged plant remains, Table 7.45 for charred plant remains, Table 7.46 for waterlogged Coleoptera, Table 7.47 for other waterlogged insects and Table 7.48 for Mollusca. Where an entire category of remains was absent from a sample, it has been omitted from the table. Nomenclature for higher plants follows Clapham *et al.* (1987), Kloet and Hincks (1977) for Coleoptera, Kerney (1976) for aquatic molluscs and Waldén (1976) for terrestrial molluscs.

*Table 7.48 Mollusca from the Head of the River*

| Sample No. | 11 | 10 | 9 | 8 | 6 | 5 |
|---|---|---|---|---|---|---|
| *Theodoxus fluviatilis* (L.) | 8 | 1 | – | – | – | – |
| *Valvata cristata* Müll. | 8 | 8 | 7 | – | – | – |
| *V. macrostoma* Mörch | – | – | 1 | 1 | – | 1 |
| *V. piscinalis* (Müll.) | 134 | 32 | – | – | – | – |
| *Bithynia tentaculata* (L.) | 22 | 11 | – | – | – | – |
| *B. leachii* (Shep.) | 12 | – | – | – | – | – |
| *Bithynia* sp. | 58 | 21 | 1 | 1 | 5 | 1 |
| *Carychium* sp. | – | – | – | – | 1 | – |
| *Physa fontinalis* (L.) | 8 | 2 | – | – | – | – |
| *Lymnaea truncatula* (Müll.) | 1 | 2 | – | – | – | 1 |
| *L. peregra* (Müll.) | 6 | 2 | 2 | 1 | – | – |
| *Planorbis planorbis* (L.) | 3 | 3 | – | – | 1 | 1 |
| *P. carinatus* Müll. | 3 | – | 1 | – | – | – |
| *Anisus leucostoma* (Milt.) | 6 | 7 | 2 | – | – | – |
| *A. vortex* (L.) | 1 | – | – | – | – | – |
| *Bathyomphalus contortus* (L.) | 1 | 1 | – | 1 | 1 | – |
| *Gyraulus albus* (Müll.) | 12 | 11 | – | – | – | – |
| *Hippeutis complanatus* (L.) | 1 | 13 | – | – | – | – |
| *Armiger crista* (L.) | 2 | 10 | 1 | – | – | – |
| *Planorbarius corneus* (L.) | – | 1 | – | – | – | – |
| *Acroloxus lacustris* (L.) | 6 | 9 | – | – | – | – |
| *Succinea* or *Oxyloma* sp. | 4 | 3 | – | – | – | – |
| *Vallonia pulchella* (Müll.) | – | – | – | – | – | 1 |
| *Vallonia* sp. | – | – | – | – | 1 | 2 |
| *Arion* sp. | – | – | – | – | + | + |
| *Zonitoides nitidus* (Müll.) | – | – | – | – | – | 2 |
| *Trichia hispida* gp. | – | – | – | – | 1 | – |
| *Arianta arbustorum* (L.) | – | – | – | – | 1 | – |
| *Pisidium amnicum* (Müll.) | 5 | 2 | – | – | – | – |
| *P. henslowanum* (Shep.) | 4 | – | – | – | – | – |
| *Pisidium* spp. | 96 | 15 | – | – | 1 | 1 |
| **Total** | **401** | **154** | **15** | **4** | **12** | **10** |

### Interpretation

Sample 11, the earliest in the sequence, overlay the Pleistocene gravel of the Floodplain Terrace. It comprised finer sediments that had begun to accumulate on the bed of a palaeochannel. The invertebrate remains suggest that clean, well-oxygenated water flowed along the channel, with numerous shells from the genera *Valvata*, including *V. piscinalis*, *Bithynia*, including *B. leachii* and *Pisidium*, including *P. amnicum* and *P. henslowanum*. There were many juvenile remains of Trichoptera (caddis flies). Cases of a flowing water caddis, *Ithytrichia* sp. outnumbered cases of *Orthotrichia* sp., a caddis of stagnant water or slowly-moving water in reedswamps. Of particular interest is an example of the elmid beetle *Stenelmis canaliculata*. This very rare beetle is now restricted to four drainage systems in Britain and no longer occurs in the Thames (Ormerod 1985). In Europe, *S. canaliculata* lives in clean, well oxygenated water in weirs, rapids and on submerged plants in flowing water (Freude *et al.* 1979, 277).

The macroscopic plant remains show the channel to have been well vegetated. The submerged plants included *Chara* sp. (stonewort) and *Ranunculus* S. *Batrachium* sp. (water crowfoot). Tall emergent vegetation of *Oenanthe aquatica* gp. (water dropwort), *Sagittaria sagittifolia* (arrow-head) and *Schoenoplectus lacustris* (true bulrush) fringed the channel, perhaps giving way to a marsh community of *Ranunculus* cf. *repens* (creeping buttercup), *Mentha* cf. *aquatica* (water mint), *Lycopus europaeus* (gypsy wort) and *Carex* spp. (sedges) along the bank. Conditions beyond the channel were apparently open, as tree and shrub remains were entirely absent, and very wet because there were very few seeds from plants of drier ground.

The phytophagous Coleoptera from Sample 11 support and extend the evidence of the seeds, with *Prasocuris phellandrii* feeding on *O. aquatica*, *Donacia dentata* on *S. sagittifolia* (and *Alisma* spp.) and *Donacia clavipes* on an additional reedswamp species, *Phragmites australis* (common reed). The non-aquatic beetles were mostly species of damp or marshy habitats such as *Agonum viduum* and included some which readily occur in bankside accumulations of dead vegetation, such as *Cercyon* sp.

There was little evidence for human activity from Sample 11 apart from the presence of two capsule fragments of flax (*Linum usitatissimum*), which was probably the result of flax being retted in the channel.

The rate of flow in the channel either continued to decline or the water carried a greater fine sediment load, resulting in the deposition firstly of organic silt (Samples 10 and 9) and then organic silty clay (Sample 8). The molluscan assemblage from Sample 10 still contained a flowing water element but *Bithynia leachii* was no longer present, leaving *B. tentaculata* as the only member of this genus. The concentration of shells was much lower in Samples 9 and 8, perhaps as a result of shells being leached by decaying organic material. The ratio between the number of cases of the Trichoptera *Ithytrichia* sp. and *Orthotrichia* sp. was reversed in Sample 10 compared with the previous sample, with the stagnant water genus predominating.

The seeds and Coleoptera from Samples 10–8 mostly indicate similar conditions to those from Sample 11, with little more than local variation in the reedswamp vegetation. There was only slight evidence for drier ground, with, for example, a single seed of *Ballota nigra* (black horehound), a plant of waysides. The only indications of human activity, other than the absence of woodland, were a few fragments of *Quercus* (oak) charcoal.

At some stage probably prior to the late 12th century, the sedimentation changed, with the dumping of gravelly clay loam (Sample 7–5). Very little organic material survived in these samples, but a few mollusc shells were present. The shells included flowing-water species, but they could readily have been reworked with the dumped material.

The southern end of Trench 2 exposed the surface of Pleistocene gravel, which had a heavy concretion of calcium carbonate on it. Cemented into this material were shells of *Theodoxus fluviatilis*, *Valvata piscinalis* and *Bithynia tentaculata*. This suggests that the gravel surface had been the bed of a stable channel for a long period during which little sedimentation was occurring. Sedimentation only began over this layer in the 12th to 13th century.

Trench 1 had horizontally-bedded waterlain sediments of mid 14th-century date at the bottom containing the mollusc *Valvata piscinalis*. At some stage in the 14th century, a timber structure was inserted that perhaps helped to confine the flow of water along the Trill Mill Stream.

### *Conclusions*

The sequence from Trench 3 showed 1.10 m of fine sedimentation under conditions of declining flow occurred in the channel before it was reclaimed by dumping which probably served to raise it above general river level. The remainder of the site was also shown to be palaeochannel with silting / reclamation gradually extending eastwards towards Trench 1 and southwards towards Trench 2 from the line of Grandpont, defining the confluence of the Trill Mill Stream with what is now a major channel of the Thames.

There are numerous mid to late Saxon records of flax remains in palaeochannels in the St Aldate's area (Robinson, this chapter), which strongly suggests a Saxon date for the sediments in the bottom of the trench. The evidence from Trench 3 is very similar to that from Manhole One of the Telecom Tunnel excavation (Robinson, this chapter), and the palaeochannel encountered in Trench 3 was apparently a continuation southwards of the channel exposed in Manhole One. The Manhole One sequence shows fine organic sediments of late Saxon date containing flax remains above the stones of a ford and they were sealed beneath reclamation deposits of dumped material.

Full details of the channel topography are given elsewhere in this volume (Chapter 3) but one very important point to emerge from these excavations was that the channel bed in Trench 2 was at a much higher level than the bottom of channel sediments in Trenches 1 and 3. Given evidence from the other sites in the St Aldate's area for a rising water table, it is possible that the channel did not extend over Trench 2 until the later Saxon period, after the sedimentation had begun in Trench 3.

### Environmental evidence from 24A St Michael's Street (Table 7.49)
***by Mark Robinson***

A sequence of samples was taken from the soil sealed beneath the Saxon rampart. Samples were also taken from a prehistoric ditch, and from alluvial clay which had been incorporated into the rampart.

*Table 7.49 Mollusca from 24A St Michael's Street*

| | Buried soil | | Saxon rampart |
|---|---|---|---|
| Sample No. | 46/1 | 45 | 42/4 |
| *Carychium* sp. | 0 | 0 | 2 |
| *Lymnaea truncatula* (Müll.) | 0 | 0 | 5 |
| *Anisus leucostoma* (Millet) | 0 | 0 | 5 |
| *Succinea* or *Oxyloma* sp. | 0 | 0 | 2 |
| *Cochlicopa* sp. | 0 | 1 | 3 |
| *Vertigo antivertigo* (Drap.) | 0 | 0 | 1 |
| *V. pygmaea* (Drap.) | 0 | 4 | 1 |
| *Pupilla muscorum* (L.) | 0 | 1 | 0 |
| *Vallonia pulchella* (Müll.) | 0 | 0 | 2 |
| *V. excentrica* Sterki | 2 | 0 | 0 |
| *Vallonia* sp. | 5 | 2 | 5 |
| *Limax* or *Deroceras* sp. | 1 | 0 | 0 |
| *Helicella itala* (L.) | 4 | 1 | 0 |
| *Trichia hispida* gp. | 0 | 2 | 6 |
| *Arianta* or *Cepaea* sp. | 1 | 0 | 0 |
| **Total** | **13** | **11** | **32** |

Granules from slugs of the genus *Arion* were also present in the above samples.

1 kg of each sample was sieved though a stack of sieves down to 0.5 mm, the residues dried and then sorted for molluscs. The number of shells of each species in the samples is listed in Table 7.49.

### *The Buried Soil*

0–0.23 m Red-brown silt loam with some leached limestone gravel. Above the Pleistocene gravel of the Second Terrace. Shells absent, 46/2.
0.23–0.30 m Red-brown gravelly loam, 46/1.
0.30–0.335 m Pale red-brown loam, 45.

### *The Prehistoric Ditch 48*

Red-brown silt loam with a little leached limestone gravel. Sealed by layer 46/2. Shells absent.

### *Saxon Rampart Material 42/4*

Buff silty clay mixed with a little red-brown sandy loam.

### *Interpretation*

The sample from the prehistoric ditch was typical of the upper fills of Bronze Age ring ditches on the Second Terrace of the Thames in the Oxford Region. The gravel content of the buried soil suggests that it had been cultivated. However, the absence of stones from the top 35 mm suggests that ploughing had ceased and that some worm-sorting had taken place prior to the construction of the rampart. The lowest part of the profile, from 0–0.23 m, had not been disturbed by the most recent cultivation and was perhaps the bottom of a Roman ploughsoil. Mollusc shells survived in the most recent cultivation horizon between 0.23 and 0.30 m and indeed they comprised the restricted range of species which can tolerate arable conditions. In contrast, the worm-sorted horizon at the top of the profile contained a grassland fauna, with species such as *Vertigo pygmaea*. Earthworm casting causes stone-free soil to accumulate on the surface of grassland at a rate of about 5 mm per annum (Darwin 1881, chapter 3). The thickness of this layer, at 35 mm, suggests that cultivation ceased about seven years prior to the construction of the rampart, and grassland developed.

The occurrence of marsh and aquatic molluscs such as *Anisus leucostoma* in the clay inclusions in the body of the rampart confirms its alluvial origin. The most likely source would have been the floodplain of the Castle Mill Stream about 150 m to the west of the site. However, the absence of any obligate flowing-water molluscs leaves open the possibility that this material could have been dug out of an earlier, partly silted, ditch in front of the rampart.

### *Charcoal from the Saxon Rampart*

During the excavation of the Saxon rampart at 24A St Michael's Street, stains were noted of the revetment posts and bracing timbers. They were sampled and subjected to water flotation onto a 0.5 mm sieve. The flots contained small fragments of a black apparently amorphous material. However, on inspection at x20 magnification under a binocular microscope, the large rays and vessels of *Quercus* (oak) could be observed in a few of the fragments, although much clogged with a black deposit. Some of the material was treated with concentrated nitric acid. It mostly dissolved, but a small quantity of elemental carbon remained.

It is suggested that traces of wood survived under the moist aerobic conditions of the rampart because the surface of the timbers had been charred in an attempt to reduce the rate of decay. Although little of the wood had been reduced to carbon, the less volatile pyrolysis products survived and prevented complete decay. Remains of oak were confirmed for timber stains 42/31, 42/33 and 51 but could not be distinguished amongst the flots from 42/32 and 52.

## Environmental evidence from All Saints Church
(Table 7.50)
***by Mark Robinson***

### *Carbonised grain deposit*

Layer 113/9 consisted of mixed fired soil and unburnt brown loam in which charred grain was

*Table 7.50 Charred grain from All Saints Church*

| Sample size | | 2 kg | 100 g |
|---|---|---|---|
| *Triticum* sp. (free-threshing short grain) | wheat | 0 | 55 |
| *Triticum* sp. (free-threshing long grain) | wheat | 0 | 58 |
| *Triticum* sp. (free-threshing) | wheat | 4525 | 225 |
| *Triticum* cf. *spelta* L. | spelt wheat | 1 | 4 |
| *Triticum* sp. | wheat | 15 | 9 |
| *Hordeum vulgare* L. emend. (hulled lateral grain) | six-row barley | 25 | 0 |
| *Hordeum* sp. (hulled median grain) | barley | 17 | 1 |
| *Hordeum* sp. (hulled) | barley | 23 | 1 |
| Cereale ignota | | 2 | 4 |
| *Agrostemma githago* L. | corn cockle | 7 | 6 |
| Caryophyllaceae gen. et sp. indet. | | 1 | 0 |
| *Vicia hirsuta* (L.) Gray | hairy tare | 1 | 0 |
| *Vicia* or *Lathyrus* sp. | tare/vetch | 3 | 0 |
| *Fallopia convolvulus* (L.) Lov. | black bindweed | 0 | 1 |
| *Lithospermum arvense* L. | corn gromwell | 1 | 0 |
| *Galium aparine* L. | goose grass | 1 | 0 |
| *Centaurea* sp. | cornflower/ knapweed | 0 | 1 |
| *Bromus* sp. | brome grass/ chess | 10 | 0 |
| *Avena* sp. | oats | 2 | 0 |
| Gramineae gen. et sp. indet. | grass | 3 | 0 |
| Ignota | | 6 | 1 |
| **Total** | | **4643** | **366** |

very much in evidence; indeed some parts of the layer were mostly grain. In 1973, a sample of 2 kg of this layer was floating onto a 1 mm mesh sieve and sorted to obtain material for a radiocarbon determination. A counted number of grains identified at the time as *Triticum aestivo-compactum* was submitted for dating. The remaining seeds were identified with assistance from M K Jones. Cereal chaff was absent and relatively few weed seeds were found.

By modern standards, a 0.5 mm sieve ought to have been used to ensure the recovery of smaller weed seeds and the full range of chaff items. With the recent discovery that a tetraploid free-threshing wheat, probably *Triticum turgidum*, rivet wheat, was being cultivated alongside hexaploid free-threshing wheat *T. aestivum* sl. (which includes *T. aestivo-compactum*), bread-type wheat, during the medieval period, it was decided that a second sample ought to be analysed. These two wheats can only be reliably separated on the basis of their chaff morphology. Therefore, in 1992, a 100 g sample of the deposit was floated onto a 0.5 mm mesh. The results for both samples are listed in Table 7.50. Chaff and smaller weed seeds were again absent from the second sample. The sample showed no evidence of cereal silica from fully oxidised chaff.

Although the wheat could not be identified to species, a wide range of grain shapes was noted. The deposit contained both the short, fat grains which are typical of Saxon assemblages in the region and longer grains which at their extreme come close in size and shape to those of spelt wheat. An attempt was made to differentiate between the wheat grains in the second sample but many are intermediate in shape. All the barley grains had fragments of palea and lemma adhering to them. The ratio between symmetrical (median) and twisted (lateral) barley grains was 1:1.4. Therefore it is probable that most if not all of the barley was *Hordeum vulgare* (hulled six-row type).

The All Saints grain deposit represents the charring of a large stock of threshed and fully cleaned free-threshing wheat (*Triticum turgidum* or *T. aestivum*). The barley need be no more than grains from volunteer plants growing amongst the wheat crop. The weed seeds were all from cornfield species but the assemblage was very pure, with over 90% grain. The weed seeds were mostly of a size and weight that they would have remained with the grain during whatever winnowing and sieving processes were used to clean it. The assemblage is unusual in that it seems to have been the result of a major accident to stored grain rather than the result of a minor spillage of grain into a fire or the burning of crop-processing waste. The mixed nature of layer 113/9 suggests that the grain was not charred *in situ* but had been spread by subsequent levelling of the site.

### *Wood*

Two very much decayed and shrunken timber fragments were examined from the timber voids of the Saxon cellar. SF No. 221 was oak, while SF No. 234 was probably oak.

### *Charcoal*

*The charcoal burial SF No. 123*

All the charcoal in this sample had become very badly distorted by heat but was possibly *Fagus* (beech).

*The charred fence (SF Nos 159, 189, 192, 193, 194 and 195)*

All the upright posts from the fence (SF Nos 159, 192, 194, 195) and a possible beam (SF No. 193) were relatively substantial pieces of *Quercus* (oak). The fence wattles (SF No. 189) were mostly *Corylus* (hazel) rods but there was also a fragment of another type of wood with a fine grain, narrow rays and diffuse-porous rings.

Some of the hazel wattles showed evidence of insect damage, with many round holes resembling the tunnels of *Anobium punctatum* (Deg.) and rather fewer holes oval in cross-section, resembling the flight holes of *Gracilia minuta* (F.). Several pieces of charcoal were split open in an attempt to discover charred adult beetles and thus confirm the identifications. No Coleoptera were found, but at the end of one of the tunnels with a round cross-section, were five minute Hymenoptera, *Theocolax formiciformis* West. Although preserved by charring, the surface detail on the insects was extremely clear, and many of their appendages were intact, including the distinctive tibial combs on one individual (Hickin 1975, 68–9). *T. formiciformis* is a parasite of *Anobium* spp. and is the hymenopterous parasite of *A. punctatum*, the woodworm beetle, most frequently encountered in Britain (Hickin 1975, 68; Graham 1969, 63). *A. punctatum* will infest a wide range of both hardwood and softwood structural timbers. *Gracilia minuta* has a much more restricted group of host plants, all hardwoods in the form of dead twigs and branches with the bark *in situ*, but it sometimes does serious damage to hazel wickerwork (Hickin 1975, 241 n. 1).

## **Biological Remains from the High Street Surface Water Drain** (Table 7.51)
***by Mark Robinson***

A sample of 12th-century sediment from the bottom of the Kennel along Oxford High Street was investigated for biological remains. 0.5 kg of brown gritty and gravelly loam with some iron panning and lenses of very rotten organic material was washed through a stack of sieves down to 0.5 mm and sorted. The results are listed in Table 7.51.

The molluscs, such as *Bathyomphalus contortus*, were all aquatic species which can tolerate stagnant conditions. The presence of seeds from *Alisma* sp. (water plantain), a marsh and waterside plant, suggests that the Kennel was open along at least part of its length. Most of the other seeds, such as *Papaver*

*Table 7.51 Environmental material from soil sample 2, deposit 7, High Street Surface Water Drain*

| Type and Taxa | Number |
|---|---|
| **Seeds** | |
| *Sambucus nigra* | 16 |
| *Eleocharis* sp. | 2 |
| *Papaver* sp. | 12 |
| *Carex* sp. | 1 |
| *Alisma* sp. | 4 |
| *Hypericum* sp. | 1 |
| *Mentha* sp. | 1 |
| Gramineae indet. | 2 |
| **Insecta** | |
| **Coleoptera** | |
| *Ptinus fur* | 1 |
| Bruchidae indet. | 1 |
| *Cercyon* sp. | 2 |
| **Diptera** | |
| puparia indet. | 6 |
| **Mollusca** | |
| *Bathyomphalus contortus* | 2 |
| *Anisus leucostoma* | 3 |
| *Lymnaea truncatula* | 2 |
| **Fishes** | |
| scale fragments | 17 |

sp. (poppy) were likely to have been from plants growing on disturbed or waste ground in the town. The insect remains included *Ptinus fur*, a beetle which most usually occurs in indoor habitats, and a member of the Bruchidae, most probably a bean beetle. The only food remains were fragments of fish scales.

## Tree-Ring Analysis of Timbers From the Thames Crossing Sites (Table A2.1)
### *by Jennifer Hillam and Dan Miles*

This report is a summary of 'Tree-ring Analysis of Timbers from the Oxford Shire Lake Project', English Heritage Ancient Monuments Laboratory Report 75/92, by J Hillam and D Miles.

Fifty timbers were analysed from six sites along the Thames Crossing: Land adjoining the Police Station, the Police Station, 33 St Aldate's, 56–60 St Aldate's, 89–91 St Aldate's (the Trill Mill Stream) and the BT Tunnel (Hillam and Miles 1992, table 1). The timbers best suited to dendrochronology were those from the Trill Mill Stream, which produced felling date ranges in the 10th and 11th century AD and a tree-ring chronology covering the period AD 632–1001. The remaining timbers had fewer rings but, despite this, tree-ring dates for three other sites were obtained. A felling date range of AD 577–619 was obtained for a plank from silts at the BT Tunnel site. Timbers from the Police Station site produced a felling date range of AD 973–1018, whilst a single timber from 56–60 St Aldate's was felled after AD 1099. The final site master curves span the periods AD 435–577 and AD 632–1089. The dates obtained are set out in Appendix 2 Table A2.1 of this volume. No samples from Land adjoining the Police Station or 33 St Aldate's were datable.

### Results

#### *The Police Station*

Of the six oak timbers from the waterfront revetment (ctx. 41), four were suitable for dating purposes; samples 212 and 219 had insufficient rings. The measured samples came from radially split planks and contained 57–117 rings; three of them could be dated (see Table A2.1). Only sample 214 had any sapwood. Its last heartwood ring dates to AD 963, giving a probable felling date range of AD 973–1018. Samples 213 and 218 have *termini post quem* for felling of AD 945 and AD 919 respectively and are probably contemporary with sample 214.

#### *56–60 St Aldate's*

Fifteen samples were taken from the 55 and 54 series waterfronts and from contexts 508 and 510 in trench 2. Only sample 318, from timber 55/4, produced a date. It had no sapwood, and the last measured ring dates to AD 1089, giving a *terminus post quem* for felling of AD 1099.

#### *89–91 St Aldate's (the Trill Mill Stream)*

Twenty-two oak timbers were sampled, although eleven were rejected because they had insufficient rings. All the samples came from Trench 7, from the timber structures of Phase 4. The measured samples were from large timbers cut from relatively long-lived trees. Samples 703 and 704 (ctx. 782/1 and 782/2) both had 247 rings and, as neither had sapwood or pith, the parent trees are likely to have been well over 300 years old when felled. The timber was also of good quality, being straight-grained and free from knots. It is interesting to note that the variable levels of correlation between the measured curves suggest that timbers originated from different woodlands (Hillam and Miles 1992, 7), and the high *t* values between the Trill Mill sequences and the London/Winchester chronologies might indicate that the same woodland areas were exploited to produce timbers for all three cities. In addition, the lack of uniformity between the TMS individual timbers might signify that the samples had been brought from a timber yard.

Nine timbers produced dates, eight of them appearing to be contemporary. Samples 702 and 710 have 14 and 2 sapwood rings respectively; 702 has a last heartwood ring dating to AD 911 and a last measured sapwood ring of AD 925. This gives a felling date range of AD 925–965. The last heartwood ring of 710 dates to AD 908, producing a similar felling date range of AD 918–963. If these two ranges are combined, the felling date for the group becomes AD 925–963. This probably dates the primary construction of the feature, although if the timbers were stockpiled, a date in the middle or end of this range is perhaps more likely.

Sample 701 is distinctly more recent than the other dated timbers, and may be intrusive from a later phase. It ends in AD 1001 with what is possibly its last heartwood ring, and was therefore felled after AD 1011; if the last ring is the sapwood boundary, it was probably felled before AD 1056.

### *BT Tunnel*

Six samples were taken, being oak piles 821/5 and 838. Only 823 and 824 were suitable for dating purposes. Sample 824 was a squared timber shaped from less than a quarter of the trunk. It contained 55 rings, but remains undated. The only dated sample, 823, was a radially-split segment, similar in width to 824, but containing 143 very narrow rings. When the ring sequence was tested against dated Saxon chronologies, consistent results were found for the period AD 435–577. This sample has 13 sapwood rings. The outer heartwood ring dates to AD 564, and the last measured sapwood ring to AD 577. It therefore has a probable felling date range of AD 577–619.

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