# ENVIRONMENTAL ARCHAEOLOGY AT EXCAVATIONS IN IPSWICH.

## ARCHIVE REPORT

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September 2004

**List of Archive Tables**

49. IAS 5003. Plant macrofossils from layers and features of uncertain origin
50. IAS 5003. Other macrofossils

## 1. Introduction

An interpretative account of the palaeo-environmental and -economic studies undertaken at excavations in Ipswich during the late 20th century will be presented in the published text. Although some primary data will be presented in that report, the main aim will be to summarise, synthesise, and interpret. In this report, full supporting data are presented. Details of site locations are given in Archive Table 1, and Figure 1.

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**Archive Table 1: Excavations in Ipswich**

1. Cox Lane, 1958 (IAS 3503)
2. Shire Hall Yard, 1959 (IAS 6901)
3. Old Foundry Road, 1974 (IAS 1501)
4. Elm Street, 1975 (IAS 3902)
5. Great Whip Street, 1975 (IAS 7501)
6. St Helen's Street, 1975 (IAS 3601)
7. Vernon Street, 1975 (IAS 7402)
8. Lower Brook Street, 1975 (IAS 5502)
9. Turret Lane, 1978 (IAS 4302)
10. School Street, 1979 (IAS 4801)
11. Foundation Street/Star Lane, 1979 (IAS 5801)
12. Arcade Street, 1979 (IAS 1804)
13. Tower Ramparts, 1979/81 (IAS 0802)
14. Little Whip Street, 1980/81 (IAS 7404)
15. Tacket Street, 1980/81 (IAS 3410)
16. Bridge Street, 1980/81 (IAS 6202)
17. St Peter's Street/Greyfriars Road, 1982 (IAS 5202)
18. Key Street, 1981/82 (IAS 5901)
19. Shire Hall Yard, 1982 (IAS 6904)
20. Fore Street, 1982 (IAS 5902)
21. St Stephen's Church, 1982 (IAS 3203)
22. St Nicholas Street, 1983 (IAS 4201)
23. St George's Street, 1983 (IAS 9802)
24. St Helen's Street, 1983 (IAS 8804)
25. School Street/Foundation Street, 1983/85 (IAS 4801)
26. Smart Street/Foundation Street, 1984 (IAS 5701)
27. Wingfield Street/Foundation Street, 1985 (IAS 4601)
28. Greyfriars Road, 1986 (IAS 5203)
29. St Stephen's Lane, 1987/88 (IAS 3104)
30. Buttermarket, 1987/88 (IAS 3201)
31. Neptune Quay, 1989 (IAS 6601)
32. Greyfriars Road, 1989 (IAS 5204)
33. Franciscan Way, 1990 (IAS 5003)
34. 85-87 Fore Street, 1990 (IAS 6106).

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## 2. Methods

Central column samples, usually 350 x 350mm, subdivided usually at 100mm vertical intervals, were taken from pits and other features with well-drained gravel-based fills. The samples were usually processed in a bulk sieving/flotation tank, using 0.5mm collecting meshes. At some sites, however, smaller samples were collected for laboratory processing by manual water flotation/washover, again using 0.5mm meshes. Very dense deposits of charred material with little or no mineral matrix, especially charred grain deposits from cellared buildings as sites IAS 4601 and 3104, required special treatment. Samples were collected from discrete areas of charring to examine the spatial distribution of material. The samples were air-dried, and charcoal fragments >25mm were separated by dry sieving, for identification. Small, usually 250ml, samples of the finer fraction were then processed by manual flotation, using 0.5mm meshes.

Retrieval of mineralised (or, more strictly, mineral-replaced) macrofossils was incomplete. Only some of the mineralised material could be separated by machine or manual flotation: mush of it remained in the non-floating residues, which were generally too large to be sorted thoroughly under a binocular microscope. Consequently, only mineralised material from the flots was separated for identification. However, consistent methods were followed, so comparison between sites is possible.

Flots from features with dry fills were air dried before sorting under a binocular microscope at low power (x10 – x40).

Samples from waterlogged anoxic deposits were processed using the methods of Kenward *et al.* (1980). Organic fractions separated in the laboratory by washover were graded in a sieve bank prior to sorting under a binocular microscope at low power. Counts were made of macrofossils in the fraction >0.5mm; finer fractions were scanned, noting the presence of smaller macrofossils.

## 3. The data

### 3.1 Plant macrofossils from Middle Saxon and later contexts at sites IAS 0802, 3410, 4302, 5202, 5502, 5801, 5901, 5902, 6904, 7404 and 7402.

Identifications of mineral-replaced, waterlogged and charred plant remains from contexts at these sites (mainly pits) are given in Archive Tables 2 – 4.

### 3.2 Macrofossils from Bridge Street (IAS 6202)

The excavation at Bridge Street provided the first opportunity to examine anoxic waterfront deposits in the town. The investigations were intended at the time (1980-1) as a pilot study, to sample and analyse material from the Ipswich waterfront, and determine its potential. As it turned out, there has been very little opportunity since then for further work on the waterfront, apart from some assessment work undertaken by Val Fryer at Neptune Quay (see below).

The deposits of Bridge Street produced macrofossils of a wide range of taxa, including foraminifers, molluscs, crustaceans, insect, echinoids, bones of fish, small terrestrial

vertebrates and larger mammals and birds, avian eggshell, mosses, and macrofossils of higher plants including fruits, seeds, stems, leaves and wood.

### 3.2.2 Methods: general

With the exception of wood and large bones (which were collected by hand) biological remains were extracted from soil samples. Column samples were taken from the waterfront deposits at several locations in the trench (Samples 214, 225, 262, 406, 490), and spot samples from other locations of interests were also collected. The locations of the column samples are shown in Murphy (0000, Fig. 3.17). The column samples consisted of two parallel series of samples: large samples for bulk-sieving on site; and smaller samples for laboratory analysis.

Extraction methods for the laboratory samples were those of Kenward *et al*. (1980). The bulk samples, each normally consisting of a 100mm vertical sub-sample from a 200 x 200mm column, were processed in a bulk sieving/flotation tank. 1mm meshes were used for these samples, for it was evident that finer material would come from the laboratory samples.

### 3.2.3 Plant macrofossils

Plant remains were extracted from the disaggregated organic fractions of 1-2 kg soil samples in the laboratory, using a rack of sieves. The fine fraction (<0.5mm) was not totally sorted, but scanned. It commonly included abundant *Juncus* seeds, and occasional seeds and fruits of *Papaver, Typha, Arenaria, Hypericum*, with under-developed Chenopodiaceae. These, and other small-seeded taxa are therefore under-estimated (but consistently) throughout. It was considered that to sort completely this fine fraction would have added greatly to the time spent, without adding significant information.

The flots and residues from bulk-sieving were dried prior to sorting. No attempt was made to extract plant remains <2mm: the flots and residues were dry-sieved on a 2mm mesh before sorting. However, the finer fraction has been retained for possible future study.

Plant macrofossils recovered are listed in Archive Tables 5 and 6. Nomenclature follows Stace (1991), and identifications were verified by comparison with modern reference material.

### 3.2.4 Mosses (Dr R. Stevenson)

Identifications of mosses from laboratory and bulk samples are given in Archive Table 7.

### 3.2.5 Foraminifera (Professor B.M Funnell)

Occasional tests were noted whilst samples taken primarily for plant macrofossil retrieval were being sorted. It was plain that tests occurred only at low densities, and systematic extraction was therefore not attempted. However, a representative selection of tests >0.25mm was retained. Identifications, with ecological notes, are given in Archive Table 8.

### 3.2.6 Molluscs

Small shells and fragments, together with a few large shells, were extracted from the mineral fractions of the laboratory samples, after wet-sieving on a 0.5mm mesh (Archive Table 9). A

few shells were also present in the organic fractions. Larger shells and fragments were recovered by bulk-sieving, but only material >2mm has been identified (Archive Table 10). Mollusca were identified with reference to Kerney and Cameron (1979), Macan (1969), McMillan (1968) and Tebble (1966). Identifications were confirmed by comparison with modern reference material.

Shells were very variably preserved. Some were very abraded and fragmented, but some retained their periostraca, and articulated valves of *Musculus* came from context 446. Abraded and polished iron-stained shell fragments, probably from Pleistocene Crag deposits were present in 446, 257, and 250.

### 3.2.7 Insects (Dr H. Kenward)

Three samples from Bridge Street, Ipswich (IAS 6202) were submitted for examination. Two of these gave modest assemblages of insects, but sample 3 contained only small numbers of fossils.

A list of the insect species recorded is given in Archive Table 11.

Insects were extracted using standard methods (Kenward *et al.* 1980). The data from the insect assemblages have been computer-recorded and processed using a system (written in PASCAL by HK) which produces ordered lists and statistics of value in interpretation. These are stored in hard copy in archive at the Environmental Archaeology Unit, University of York (EAU), at the former Ancient Monuments Laboratory of the Historic Buildings and Monuments Commission, and a copy has also been submitted to the excavators. Original lists are retained in computer hard disk store and can be reprocessed at any time. Species lists and main statistics are also stored in the EAU database system. The insect material is currently stored at the EAU.

### 3.2.8 Crustacea and echinoderms

Besides the aquatic inveterate groups discussed above, samples examined in the laboratory produced remains of some other invertebrates, principally crustaceans. Most have not been specifically identified, but taxa present are listed in Archive Table 12. In column 406 the distribution of microscopic crustacea appears to be related to conditions of deposition. Ostracod carapaces, frequently articulated, were particularly common in the lower deposits, which include a high proportion of fluvial sands and silts. Ephippia of Cladocera, however, were not observed in these deposits, but were abundant in the upper deposits of the column, formed apparently in conditions where periodic drying occurred. Fragments of *Balanus* plates were present in most samples, and these presumably reached the site attached to mollusc shells, sea-weeds, drift-wood etc.

Exoskeleton fragments from decapod crustaceans were recovered from samples of three contexts examined in the laboratory (250, 257, 402) and further fragments were extracted from other contexts by bulk-sieving. No exoskeleton fragments were observed in pre-Late Saxon deposits. Most of the fragments are of chelae from chelipeds but carapace and other limb fragments are also present. From their size and surface patterning almost all of the fragments are thought to be from small specimens of the shore crab *Carcinus maenas*. Cast exoskeletons of this crab are a familiar constituent of strand-lines. A large robust fragment of

a dactylus from a cheliped, extracted from the 17th century well-fill, 164, is probably of the edible crab *Cancer pagurus* and is the only specimen suggesting a crab fishery.

Echinoids are represented by a single spine from 257 and by an intact test of *Echinocyamus pusillus* recovered by bulk-sieving from 176, a thirteenth century context. The former is iron-stained, and may perhaps be derived Crag fossil, but the latter shows no staining and is quite unabraded. *E pusillus* is common on British coasts on coarse sandy or gravelly bottoms in shallow depths (Mortensen 1977, 316).

### 3.2.9 Wood

Identifications of structural wood and timber are given in Archive Table 13. Oak wood suitable for tree-ring dating was submitted to the Sheffield Dendrochronology. Reports on dating will be published separately.

## 3.3 Plant macrofossils from Saxo-Norman features at Site IAS 4801 (1983 season)

Samples were taken from Saxo-Norman features at this site, principally for the recovery of fish bones. Preservation conditions for plant remains were poor. See Archive Table 14. Most of the material is charred, though a few features produced some mineral-replaced material. Modern roots were abundant.

## 3.4 Plant macrofossils from Late Saxon and medieval features at sites IAS 4302 and 5502.

Most deposits sampled were moist but aerobic, though some wet deposits were present at Lower Brook Street (0280) and in the bases of some features at Turret Lane. It seems that not all of these wet layers have remained permanently waterlogged. Some, notably 0047 and 4302 contained an active soil fauna, mainly of nematode worms. The plant remains in the aerobic deposits were preserved by charring and phosphatic mineralization (Archive Table 15).

## 3.5 Plant macrofossils from pits at site IAS 4201

Four samples of waterlogged deposits from pits 36 (0044), 42 (0049), 73 (0069) of Late Saxon date, and pit 40 (0070) of early Medieval date were assessed. Their contents are listed in Archive Tables 16 and 17.

## 3.6 Plant macrofossils from sites IAS 4601 and 4801 (1985 season)

These two major excavations were adjacent, and the results will therefore be presented together. The samples collected from Middle Saxon pits and wells, Late Saxon pits, wells, ovens and other contexts, Early Medieval pits and cellared buildings, and from graves associated with the monastic church at IAS 4801. Most material was preserved by charring, though there were some mineral-replaced macrofossils and, in a few deep features, waterlogged deposits. Results are presented in Archive tables 18-34.

## 3.7 Plant macrofossils from IAS 5701

Macrofossils, and sample assessments, are listed in Archive Tables 35-37.

### 3.8 Plant macrofossils from site IAS 5801, Medieval pit 0065.

Waterlogged brown (10YR 4/3) deposit; rare small subangular flints; abundant phosphatic concretions (up to 100mm); mineral-replaced fruits, seeds, textile fragments, fly puparia, woodlice; oyster and mussel shell fragments; fishbones; small mammal bone; avian eggshell. Plant material is listed in Archive Table 38. This is a typical medieval latrine deposit, containing a high proportion of plant residues which had passed through the human gut.

### 3.9 Wood from IAS 5001.

Identified wooden items are listed in Archive Table 39.

### 3.10 Plant macrofossils from sites IAS 3104 and 3201

Despite the large scale of excavations at IAS 3104, sampling was intentionally confined to a comparatively small number of contexts. Extensive sampling of pits was not undertaken. Instead, samples were taken principally from contexts of types not previously examined, and context types which earlier work had shown to be particularly informative. The sample groups were as follows:

1. Samples of organic stains etc. from the inhumation cemetery. These have not been analysed, but retained for possible future study.

2. Samples of charred plant remains from early medieval cellared buildings 29, 2022, 2140, 4801.

3. Samples from Middle Saxon kiln 2200.

4. Samples from other contexts, taken for preliminary assessment.

**Cellared buildings.**

In 2022 there was an extensive area of charring, including grain, charred loaves and charcoal from structural wood and timber. Cereals etc. were extracted by manual water flotation of 250ml sub-samples from 2022, using a 0.5mm collecting mesh (Archive Table 40).

Samples were collected from the main charred wooden items distinguished during excavation of all the buildings for identification and description. An attempt was made to lift the larger pieces of charcoal intact, but this was frequently unsuccessful. During storage and transportation these pieces tended to fragment by splitting along the rays (particularly oak charcoal) or along the annual rings (in the case of ash). Most samples received for examination consisted only of collections of fragments. For this reason, and also because the outer surfaces of many items had partly burnt away, little could be learnt about the original pieces of wood other than their species and (from characteristics of ring curvature) whether they were of timber (from trunks and large branches) or smaller roundwood. However, much of the small roundwood charcoal, some of the larger roundwood and some worked wooden items including boards, staves, pegs and a turned wooden bowl were still at least partly intact.

Areas of collapsed charred wattle/basketry presented particular difficulties. Detailed recording and sampling in the field proved impractical. Instead two sample areas were collected for laboratory examination: 2252 (Building 2022) and 4093 (Building 4081). After cleaning their upper surfaces, latex solution was poured over these areas and the latex was then reinforced with a plaster backing. The wattling/basketry could then be lifted for laboratory examination. In the laboratory the lower surfaces were cleaned and planned at a 1:1 scale. Charcoal samples were taken from the main longitudinal and transverse elements. The remaining charcoal and soil was then removed from the latex which could then be used as a mould to produce plaster casts which, when suitably painted, made excellent items for museum display.

Details of the larger charcoal samples are given in Archive Table 41.

**Ipswich Ware Kiln: IAS 3104, 2200**

Fifty of the charcoal fragments collected by hand from the kiln floor (S57) were identified. Sixteen of them were of mature oak wood (*Quercus* sp) and thirty four were stems of *Ulex/Cytisus* sp (gorse or broom). These stems, 5-17mm in diameter, show the oblique rows of vessels in TS characteristic of these plants and some, though not all, are distinctly ring porous, a feature generally more characteristic of broom. A 5kg soil sample from the stoke pit (S50) produced charred young twigs with sharply raised angles, closely matching stems of broom, and no charred spines were seen. Broom, therefore, seems to be the only leguminous shrub represented in these samples.

Other charred macrofossils present, but in very small quantities, include a rye grain (*Secale cereale*), nutlets of *Carex* sp and *Scirpus* sp, a grass caryopsis, unidentified seeds and pinnules of bracken (*Pteridium aquilinum*). These may represent plant materials used as kindling. A few scraps of burnt bone and mussel shell were also noted.

**Other contexts.**

0.5kg sub-samples were assessed from a range of other contexts.

IAS 3104

0897, S12 (Late Saxon pit 0891: ash layer). Charcoal common; occasional *Triticum* and *Secale* grains; avian eggshell fragments; mussel shell and bone fragments.

0898, S13 (Late Saxon pit 0891: ash layer) Charcoal very common; fragments of mussel shell and bone; fishbones.

1056, S15 (Late 15$^{th}$/early 16$^{th}$ century Friary garderobe 1057: basal fill). Charcoal fairly common; rare cereal grains and rachis fragments; uncharred *Sambucus* seeds; mussel shell and bone fragments; fish and small mammal bones; phosphatic concretions.

1156, S22 (Late Saxon pit: basal fill). Charcoal rare; mineral-replaced stem fragments, *Rubus* fruitstones and *Sambucus* seeds; mineral-replaced arthropods; fishbones; matrix largely composed of phosphatic concretions.

2565, S339 (Early Medieval pit 2557: contents of Thetford Ware pot). Charcoal; rare cereal grains; mineral-replaced stems, wood, *Prunus* fruitstones and *Sambucus* seeds; mussel and oyster shell fragments; fishbones; abraded bone fragments; phosphatic concretions.

0897 and 0898 were sampled to assess whether domestic or industrial waste was represented. The range of food wastes implies the latter. The remaining three contexts all include phosphatic concretions and mineral- replaced macrofossils, fishbones and small bone fragments – all characteristic features of latrine pit fills. The plant macrofossils present comprised a limited range of taxa in a poor state of preservation. The samples were not analysed.

**IAS 3201**

Sampling was again on a small scale, samples being collected initially from a limited range of features for assessment. Samples of organic/mineral stains from 7$^{th}$- 8$^{th}$ century graves were also taken (0335, 0424). These have been retained but not examined.

0012 Middle Saxon well. A 100g sample from a localised concentration of charred material was flotated. It included charcoal, fruitstones of *Prunus spinosa*, seeds of *Malus* and a charred seed of *Vicia/Lathyrus*.

0055 Early Late Saxon pit. A 100g sample of 'organic' deposit contained abundant phosphatic concretions, fragments of mineral-replaced testa and hilum of *Pisum sativum* and *Vicia faba*, unidentified mineral-replaced seeds, stems and wood, some charcoal and fishbones. The dietary residues are of types common in latrine pits.

0068 Early Late Saxon pit. A 100g sample contained a high proportion of phosphatic concretions, with mineral-replaced *Agrostemma* testa, indeterminate seeds, stems and wood, abundant fly puparia, some charcoal and charred cereal grains, scraps of *Mytilus* shell, fishbones and bone fragments. The layer appears to represent a latrine deposit.

0104 Middle Late Saxon pit. A 1.8kg sample of charred material from the western half of 0326 was flotated. Large charcoal fragments and other charred plant remains were abundant (Archive Tables 42-43).

0148 Late 15$^{th}$/early 16$^{th}$ century wood-lined pit. Samples of planks (0188, 0192) and an organic layer at the base (0020) were examined, primarily to assess whether the feature had any industrial function. The wood samples were heavily mineral-replaced and were not identified. A 350g sample of 0200, a dark brown moist minerogenic sediment was flotated and wet-sieved. The flot included abundant macrofossils of *Ficus carica*, fragments of *Vitis vinifera*, *Malus*, and *Sambucus*, with scraps of testa from *Agrostemma* and *Fallopia convolvulus*, and seeds of ruderals including *Conium maculatum*, *Chenopodium album* and *Rumex*. Mineral-replaced stem fragments, fly puparia, woodlice and beetles were also present. The residue was composed of phosphatic concretions, chalk and charcoal, with fishbones and abraded bone fragments. Whatever, the original function of this feature, it was last used as a latrine pit.

**3.11 Plant macrofossils from IAS 5203 and 5204 (Greyfriars Road), 1986 and 1989.**

**IAS 5203**

Middle and Late Saxon pits were sampled as 35cm square central columns, sub-divided at 10cm vertical intervals. The flots from the 10cm units were first assessed, and selected samples were analysed.

0046 Middle Saxon pit. Flots from 30-40, 40-50 and 80-90cm were particularly rich in charred plant material (Archive Table 44).

0596 Middle Saxon pit. There was little variation in composition between sub-samples in this 100cm column. The sample from 40-50cm seemed typical, and was analysed.

0594 Late Saxon pit. Flots from a 140cm column were assessed. The upper fills included low densities of charcoal, with occasional cereal grains. Samples below 110cm produced charred and mineral-replaced material: internal casts of Prunus fruitstones, stem fragments, arthropods, small fish bones, and abraded bone scraps. These macrofossils establish that the feature was a latrine pit, subsequently back-filled with less organic deposits. Analysis was not thought appropriate.

Cellared building 0064. Four 5kg samples were collected and processed from layer 0356 in this feature (Archive Table 45).

**IAS 5204**

Eleven samples were collected for assessment during the 1989 excavation, from features of Middle Saxon to Early Medieval date. The samples were of organic and mineralised fills (Archive Table 46), and two were of laminated, highly-mineralised concretions, which could not be disaggregated.

The large quantities of cereal periderm, *Fallopia* and *Agrostemma* testa fragments, phosphatic concretions, and the presence of fruitstones in several samples indicates that most samples were of latrine deposits. Samples from 0118 and 0129 contained more charcoal fragments, and fewer phosphatic concretions, suggesting that these features were general refuse pits. Analysis was not undertaken.

### 3.12 Macrofossils from Saxon graves at IAS 7914.

Nine samples were processed by manual flotation from contexts associated with the Saxon cemetery.

All samples included modern contaminants including fibrous roots, seeds and mollusc shells. Sample 46 produced a charred stem fragment, 47 included charred seeds of indeterminate Chenopodiaceae and a possible *Vicia/Lathyrus* seed, and a single indeterminate charred cereal grain came from 49. All samples except 34 contained rare, small fragments of charcoal. Mineral-replaced wood fragments were noted in 36 and 46, and mineral concretions occurred in 34, 36 and 38. Black porous ‘cokey’ material occurred in 1, 2 and 38. Mineral-replaced textile fragments were found in 36 and 38. 1 and 2 produced abundant burnt bone fragments. Other material noted included fuel ash slag, metallic globules, black glassy fragments, and small pieces of coal.

### 3.13 Plant and other macrofossils from IAS 5003 (Greyfriars Road)

Material from this site was assessed but not analysed.

Forty three samples were processed from contexts of possible Middle Saxon to Late Medieval date. For the purposes of this report the samples have been divided by feature type as identified by the excavators, namely pits, layers, well, hearth deposits, smithing features and features of uncertain function.

Thirty dry samples were processed by manual water flotation using a 500 micron mesh sieve. The flots were dried before sorting. Thirteen samples from waterlogged deposits were processed by manual water flotation/washover, using a 250 micron mesh sieve. A small percentage of the wet flot was assessed with a view to selecting representative samples for further analysis. Two samples (30 and 68) were finally selected. Plant remains identified are listed in Archive Tables 47-49. Other material extracted from the flots is identified in Archive Table 50. Despite the possibility of some degree of modern contamination, all material has been tabulated.

Charred cereals and chaff were recovered from twenty samples, generally at very low densities. All samples were of Late Saxon date with the exception of 29 and 38 which were from possible Middle Saxon contexts. Preservation was poor, many grains having become puffed during carbonisation. Very fragmentary waterlogged cereal periderm fragments were found in five samples.

Grains of *Triticum* sp. were recovered from five samples (8, 14, 38, 44 and 57). Examples from samples 44 and 57 were very rounded and are probably of *T. aestivum* (bread wheat) type. A single rachis node of bread wheat was found in sample 2. Wheat periderm fragments showing pitting of the transverse cell walls were found in sample 63.

Gains of *Hordeum* sp. were recovered from samples 12, 13, 14, 38 and 67, and rachis nodes were found in sample 12. Preservation was not sufficient to allow identification to species.

Grains of *Avena* sp. were found in samples 8, 11, 12, 38 and 43. Further grains from samples 14 and 38 were still within their inflorescences, the basal scars of which indicate that both *A. sativa* (cultivated oat) and *A. fatua* (wild oat) are present. Periderm fragments of *A. sativa* were found in sample 68. A single mineral replaced fragment of oat awn was found in sample 11.

Grains of *Secale cereale* were recovered from samples 29, 33, 38 and 48. Rye chaff was more common that that of other cereals; rachis fragments and rachis nodes were present in samples 1, 8 and 12 and abundant in sample 38. Rye periderm fragments with sickle shaped thickenings on the shorter cell walls were found in sample 68.

Remains of other potential food plants were present in samples of possible Middle Saxon and Late Saxon date, but at very low densities, with the exception of seeds and endocarp fragments of *Malus* sp. (apple). Stones of *Prunus domestica* subsp. *insititia* (damson/bullace) were found in sample 68 and two larger stones (20mm and 23mm in length) of a plum variety were recorded from samples 14 and 63 respectively. Apple seeds and endocarp fragments were found in four samples (5, 17, 18 and 30) and were abundant in sample 68. Other food crops include *Pisum sativum* (pea), *Vicia faba* (horsebean), *Brassica* sp. (cabbage family) and *Linum usitatissimum* (flax). Remains of *Prunus spinosa* (sloe), *Corylus avellana* (hazel),

*Rubus* sp. (bramble family), *Sambucus nigra* (elderberry) and *Crataegus monogyna* (hawthorn), although utilised as food sources may also have been growing as scrub on the site.

Charred or waterlogged seeds and fruits were preserved in all but two samples (3 and 4), generally at low densities. The species present are indicative of a weedy coastal grassland vegetation, for example *Ranunculus* sp. (buttercup), *Euphorbia helioscopia* (sun spurge), *Urtica* sp. (nettles), *Conium maculatum* (hemlock), *Triglochin maritima* (sea arrow grass), *Lamium* sp. (dead nettle), *Vicia* sp. (vetch), *Medicago/Trifolium* sp. (medick/clover) and indeterminate grasses. Many common segetal species were also recovered including *Agrostemma githago* (corn cockle), *Fallopia convolvulus* (black bindweed), *Raphanus raphanistrum* (wild radish), *Chenopodium album* (fat hen), *Rumex acetosella* (sheep's sorrel), *Lapsana communis* (nipplewort), *Stellaria* sp. (chickweed), *Anthemis cotula* (stinking mayweed), *Rumex* sp. (dock), *Polygonum aviculare* (knotgrass) and *Galium* sp. (goosegrass).

Other material recovered included metallic and vitreous residues, siliceous globules, textile and leather fragments, fish/amphibian/mammal bone, mineralised concretions (probably largely cess deposits) and charcoal. The majority of the latter was too small (<5mm) for identification, but of the large pieces, the lining of a Late Saxon pit 0009 (samples 1 and 2) was identified as *Fraxinus excelsior* (ash). Fragments of porous 'cokey' material and black glassy concretions are probably residues of burnt cereal grains.

**The pits**

These can be subdivided into refuse pits (0101, 0238, 0554, 0952 and 0365) of Late Saxon and Early Medieval date (containing, for example, weed seeds, dietary residues, cereal remains and domestic refuse including *Pteridium aquilinum* (bracken) probably used as litter or bedding). A cess pit (0985)containing predominantly cereal periderm and food residues, and an open feature (0783) of Late Medieval date. Of the refuse pits, 0554 was possibly little used, but with a range of grassland weeds accumulating naturally. Open feature 0783 contains a similar range of species but appears to contain no refuse. Provisional interpretations of this feature by the excavators indicate fish stocking tanks or uses associated with the cloth, linen or leather industries. However, no aquatic species were recovered from the assemblages.

**The layers**

0946 was probably a scatter of refuse of Late Saxon date, although it is very similar in character to the hearth and smithing deposits (see below). 0362 was a cess deposit which also contained possible small fragments of burnt herbivore dung and a small quantity of general refuse. 0845 was described by the excavator as a hearth deposit, but it is comprised of cess, the waterlogged organic fraction consisting almost entirely of cereal periderm fragments (bran). 0362 and 0845 are both dated to the Late Saxon period.

**The well**

Samples 52 and 53 were taken from the base of a late Saxon well (0802). The assemblage, which confirms that this was an open feature, contained seeds and fruits of grassland species.

**The hearth**

0739, 0756, 0761, 0786 and 0830 were identified during excavation as hearth deposits in a pit of Late Saxon date. All contain similar assemblages of small charcoal fragments, siliceous globules (probably the result of the combustion of grass/straw) and seeds of grassland species, probably indicating that the grass was used as kindling.

**The Smithing features**

Ten samples from smithing deposits of possible Middle Saxon to Early medieval date were studied. As with the hearths above, five samples contained seeds and fruits of grassland species, probably indicating the use of grass or straw as kindling. Sample 38 also contained burnt cereal grains and chaff, possibly the residue of crop cleaning. Five samples contained little with the exception of charcoal, siliceous globules or metallic residues, possibly the result of high temperatures of combustion destroying any floral remains.

**Other features of uncertain function**

Of the samples from these features, four (17, 18, 34 and 63) from contexts of possible Middle Saxon to Late Saxon date contained quantities of cess concretions and dietary residues, and four (samples 8, 27, 30 and 31) are probably deposits of refuse, samples 30 and 31 from an open feature with a naturally accumulated assemblage of grassland species.

**3.14 IAS 6601. Plant macrofossils and microfossils**.

Four samples were taken from a column through a sixteenth to seventeenth century (Period III.1) context (0787) forming part of a bank deposit (0827) accreted adjacent to quay wall 0542.

Five hundred grams of each sample were processed by manual water flotation/washover, collecting the flots in a 500 micron mesh sieve. As the samples were taken from waterlogged anaerobic conditions, the flots were kept wet and were sorted under a binocular microscope at low power. The plant macrofossils and other remains noted are listed in Archive Table 51. All tabulated material was preserved by waterlogging unless otherwise stated.

Remains of cereals and other food plants were extremely rare. A single indeterminate charred cereal grain was noted, as were testa fragments of cabbage/swede/turnip (*Brassica* sp.) seeds and possible small walnut (*Juglans regia*) shell fragments. Other possible food sources included elderberries (*Sambucus nigra*) and blackberries (*Rubus* sp.) although these may equally have been growing as scrub plants on or adjacent to the quay.

Seeds/fruits of common weed species were noted at a low to moderate density in all samples and included corn cockle (*Agrostemma githago*), orache (*Atriplex* sp.), fat-hen (*Chenopodium album*), corn marigold (*Chrysanthemum segetum*), thistle (*Cirsium* sp.), poppy (*Papaver* sp.), indeterminate grasses, knotgrass (*Polygonum aviculare*), meadow/creeping/bulbous buttercup (*Ranunculus acris/repens/bulbosus*), dock (*Rumex* sp.), knawel (*Scleranthus annuus*), spiny sow-thistle (*Sonchus asper*), milk-thistle (*S. oleraceus*), chickweed (*Stellaria media*) and stinging nettles (*Urtica dioica*).

Seeds/fruits of wetland and aquatic plants were also recovered and included bur-marigold (*Bidens tripartita*), sedge (*Carex* sp.), spike-rush (*Eleocharis* sp.), rush (*Juncus* sp.), ragged robin (*Lychnis flos-cuculi*), gipsy wort (*Lycopus europaeus*), fine-leaved water dropwort (*Oenanthe aquatica*) and celery-leaved crowfoot (*Ranunculus sceleratus*).

Fragments of waterlogged root, rhizome or stem were abundant in all samples and bracken (*Pteridium aquilinum*) pinnule fragments were also common throughout. Other plant macrofossils included ling (*Calluna vulgaris*) capsules, heather (Ericaceae indet.) florets and indeterminate buds, culm nodes, moss fragments, seeds, thorns and twigs.

With the exception of waterlogged arthropods, other materials/macrofossils were extremely rare but fragments of black porous 'cokey' material, egg shell and fish bone were noted.

Terrestrial and freshwater/estuarine mollusc shells were present in all samples at a low to moderate density with the freshwater/estuarine species being predominant. Terrestrial species included specimens from all four of Evans (1972) ecological groups, namely woodland/shade loving species (*Clausilia* sp.), open country species (*Pupilla muscorum*), catholic species (*Trichia hispida* group) and marsh/freshwater slum species (*Lymnaea truncatula* & *Vertigo* sp.). Freshwater/estuarine species included *Bithynia* sp., *Hydrobia ulvae*, *H. ventrosa* group, juvenile *Littorina* sp., *Pisidium* sp. and *Valvata cristata*.

The matrix of the samples appeared very compacted and well laminated, yet the material disaggregated well in water and proved to consist predominantly of degraded stem/root fragments. Other plant macrofossils were not common and although the tabulated species list is relatively comprehensive, the seeds/fruits noted were often present as single specimens.

The material would appear to be derived from diverse sources, as is common in riverine contexts, for example Cannon Wharf, Norwich (Fryer and Murphy, in prep.) and King's Lynn, Norfolk (Fryer and Murphy, in prep.). The range of common segetal weeds including orache, fat-hen, corn marigold, poppy, knot-grass, wild radish and dock may indicate that a very low level of cereal processing debris is present, although chaff was not noted and only a single charred grain was recovered. The presence of sewage residues is probably suggested by the testa fragments of an indeterminate *Brassica* and corn cockle, the latter frequently occurring as a contaminant of wholemeal bread flour. Domestic refuse may include the bracken fronds and heather which are probably derived from flooring, thatch or litter. Finally seeds/fruits of riverine, marsh and terrestrial plants which formed part of the local flora are also probably present.

The wide range of molluscs is also typical of tidal deposits. Terrestrial species occur as accidental inclusions but the riverine nature and origin of the deposits is indicated by the predominance of shells of *Hydrobia ulvae* and *H. ventrosa* group, both of which species 'browse' in large numbers on algae on the surface of estuarine muds.

In conclusion, although the list of plant macrofossils and other remains present is relatively comprehensive, the origin of the assemblage is far from certain and it appears most likely that the deposit consists of material derived from several different sources. As quantitative analysis of the samples is unlikely to further ascertain their source, no further work is recommended.

**Palaeoenvironmental analysis of a small box core by Dr Mike Godwin**

A small box core sample was removed from layer *0787*, a naturally accreted component of the 16$^{th}$-17$^{th}$ century (Period III.1) bank deposit *0827*. This feature was believed to be formed by

a combination of alluvial deposition and deliberate dumping at the base of the quay wall, close to its junction with a tributary entering the main channel from the north.

Four samples were cut from the core at 0-5 cms (top); 10-15 cms and 27-32 cms (base). These were washed with warm water over a 125 micron sieve and the residues dried at 60 deg. C for 1 hour. The residues were examined under a light microscope on a sorting tray.

The Neptune Quay site although within a short distance from the coast, and therefore possibly subject to brackish water incursions during the medieval period, would appear to have remained fluvial (rather than estuarine) in character due to the proximity of a tributary inflow. No brackish water microfauna (ostracods or foraminifera) were detected in the samples. The preservation of calcitic remains was poor but sufficient material remained to exclude the possibility of the total loss of brackish water fauna.

The samples between 0 and 25 cms had very sandy residues, mainly quartz with accessory amounts of rock and coal fragments. The sediment was immature with angular to sub-angular clasts. Some thin walled molluscan shell debris was present, partially decalcified and pale brown in colour. This coarse fraction of the sediment (fine grained sand and above) probably represents reworked Pleistocene material. Some algal calcispheres were also present, suggesting the sediment was deposited in freshwater conditions.

The basal sample (27-32 cms) contained a high proportion of organic material with many wood and charcoal fragments. The sediment was otherwise similar to that found above.

### 3.15 Plant macrofossils from IAS 0703

A single 6 litre bulk sample from a Middle Saxon pit group (0000) was assessed. Charred cereal grains were present at very low densities, together with charred fruits and seeds of *Rumex*, Polygonaceae, Chenopodiaceae, *Carex* and fragments of *Corylus* nutshell. Charcoal was abundant, with root and stem fragments. Mineralised concretions and fuel ash were present. Other material included bone and small coal fragments. Mollusc shells included *Vertigo* spp, *Clausilia* sp, Helicidae, Zonitidae and *Cecilioides acicula*. The sample was not analysed.

## 4. References.

See published text.

**Archive Tables 2 to 33: See Excel spreadsheet.**

**Archive Table 34. Assessment of other soil samples from sites IAS 4601 and 4801.**

The following notes are on samples scanned, but not analysed. It was not thought that these would add significant information to that from the analysed samples.

**IAS 4601.**

415. 5kg.
Small mineralised faecal concretions; plant macrofossils preserved by waterlogging and mineralization, including seeds, plant fibres etc.; fly puparia and beetle elytra; small mammal bone.

432. 5kg.
Mineralised faecal concretions with Agrostemma testa; rare plant macrofossils preserved by waterlogging and mineralization, including poorly preserved seeds, mosses etc; charred cereals, nutshells etc; charcoal; rare beetle elytra; rare scraps of marine mollusc shell; fishbone and small mammal bone.

473. 5kg.
Mineralised faecal concretions; mineralised plant remains, including wood, fruitstones, bean testa and seeds; charred cereals and weed seeds; charcoal; mineralised woodlice and fly puparia; abundant small fishbones; large mammal bone frags.

648. 5kg.
Small mineralised faecal concretions; rare mineralised plant remains including bean testa and seeds; charred grain; charcoal; mineralised fly puparia and woodlice; scraps of Mytilus shell; fishbones common; fragments of large mammal bone.

654. 5kg.
Large ferrimanganiferous concretions; rare charred cereals and uncharred Sambucus seeds; rare fishbone and large mammal bone fragments.

668. 5kg.
Large abundant mineralised faecal concretions; rare mineralised plant remains including fruitstones, pulse testa, seeds etc; charred nutshells, cereals and pulses; charcoal; mineralised fly puparia and woodlice; fragments of Ostrea and Mytilus shell; fishbones; small mammal bones and fragments of large mammal bone.

1121 5kg.
Rare charred nutshells, cereals and seeds; charcoal; rare fishbone and mammal bone fragments.

1122. 5kg.
Large abundant mineralised faecal concretions; abundant plant macrofossils preserved by waterlogging and mineralization, including fruitstones, pulses, seeds etc; charred cereals; charcoal; mineralised fly puparia, woodlice and beetles; scraps of Mytilus shell; rare fishbones and mammal bone fragments.

**IAS 4601 Charcoal samples (excluding those from 0677)**

491 Quercus sp. Mature wood fragments
Fraxinus sp. Twigs (embedded in daub)
548 Quercus sp. Mature wood fragments
699 Quercus sp Large fragments of mature wood, including fragments of radial boards c. 28mm thick. Some branch fragments.
Fraxinus sp. Handle of tool? Fragments from a round cross-sectioned piece of wood, c. 28mm diameter, cut from mature wood.
857 Quercus sp. Fragments of mature wood.

**IAS 4801. Macrofossils from soil samples**

274. 1.7kg
Rare charred cereals and seeds; charcoal; fragments of Mytilus and Ostrea shell; small mammal and fishbone fragments.

284. 2.6kg
Rare charred cereals, Corylus nutshell and seeds; charcoal common; fragments of Mytilus and Cerastoderma shell; fishbones; mammal bone fragments (many burnt).

296.
Small fragments of indeterminate replaced wood in brown sandy concretions.

376 0.5kg.
Abundant plant macrofossils preserved by waterlogging, including cereals, weed seeds, poorly preserved mosses etc; some wood fragments; charcoal; insect remains, mostly beetles; small scraps of marine mollusc shell; small scraps of mammal bone.

380. 0.2kg.
Rare small charcoal fragments; uncharred Rubus fruitstones; rare mineralised arthropods; shells and fragments of Vallonia, Ostrea and Mytilus; bone chips.

734. 0.6kg.
Charred seeds fairly common – some cereals and Calluna florets; large charcoal fragments fairly common; small scraps of burnt mammal bone.

822. 0.2kg.
Large charcoal fragments common; rare charred cereals and seeds.

1015. 2.0kg.
Some soil concretions; charcoal common; rare charred cereal grains, seeds and Corylus nutshell; fragments of Ostrea and Mytilus shell; rare fishbone and scraps of mammal bone (some burnt).

1138. 7.4kg.
Very small mineralised faecal concretions; rare charcoal, charred cereals, seeds and Corylus nutshell; fragments of Ostrea and Mytilus shell; fragments of mammal bone (some burnt).

1583. 15.3kg.
Mineralised faecal concretions common; mineralised fruitstones, seeds, stems; abundant large charcoal fragments; charred grass/cereal culm nodes and bases, cereal grains and rachis, Pteridium pinnules, Corylus nutshell and seeds; mineralised fly puparia, beetles and woodlice; scraps of Ostrea and Mytilus shell; fishbone; small mammal bone; fragments of large mammal bone (some burnt).

1650. 5.0kg.
Small rare mineralised faecal concretions; charcoal; charred cereals, Corylus nutshell and seeds; shells and fragments of Pupilla, Buccinum, Ostrea and Mytilus; fishbone; amphibian and small mammal bone with scraps of large mammal bone.

1668. 18.4kg.
Small soil concretions; charcoal, rare charred cereals and weed seeds; rare mineralised seeds; Ostrea and Mytilus shells and fragments; fishbone; fragments of mammal bone (some burnt).

2304. 6.0kg.
Charcoal common; some charred cereals and seeds; mineralised woodlice; scraps of Ostrea and Mytilus shell; common amphibian bone; some small mammal bone and scraps of large mammal bone.

2399. Charcoal sample.
Quercus sp. Fragments of mature wood; 15mm diameter dowel.
Fraxinus sp. Fragments of mature wood and branches.

2401. 5kg.
Abundant large charcoal fragments; charred cereals and seeds; amphibian bone and small mammal bone, with large mammal bone fragments (some burnt).

2543. 5.0kg.
Charcoal; charred cereals and seeds; mineralised seeds, Sambucus very common; mineralised fly puparia; shells and fragments of Littorina, Mytilus and Ostrea; fishbones; small mammal bone and scraps of large mammal bone.

2837. 2.4kg.
Black ferrimanganiferous concretions; white concretions; black replaced wood fragments; charcoal flecks; charred cereals.

2838. 2.4kg.
Black ferrimanganiferous concretions; some black replaced wood; charcoal flecks.

2891. 1.8kg.
Common charcoal; charred cereals and seeds; some small mineralised concretions; rare small fragments of bird and mammal bone.

2896. 3.2kg.
Small mineralised faecal concretions; mineralised fruitstones and seeds; charcoal, charred cereals and seeds; mineralised fly puparia and woodlice; fishbones (some in concretions); small fragments of large mammal bone.

2905. 2.3kg.
Large charcoal fragments very common; charred cereals, nutshells, seeds; burnt fragments of large mammal bone.

**Archive Table 35: see Excel Spreadsheet**

**Archive Table 36. IAS 5701. Assessment of macrofossils from soil samples.**

0033. 5kg.
Plant macrofossils preserved by waterlogging (twigs, thorns, seeds etc.); rare charcoal; charred grains of Triticum; fly puparia, beetle elytra, woodlice; scraps of Ostrea shall; abundant amphibian bone, rare small mammal bone, fishbone and scraps of large mammal bone; scrap of thread from textile.

0085. 1.0kg.
Large common mineralised faecal concretions; plant macrofossils preserved by mineralization and waterlogging, including wood, stems, twigs, seeds etc.; charcoal; fly puparia (mostly mineralised) and beetle elytra common; scraps of Balanus and Mytilus shell; avian eggshell; fishbones; rare scraps of large mammal bone.

0088. 5.0kg.
Some plant macrofossils preserved by waterlogging, but in poor condition; charred cereals and seeds; rare insect remains; rare mammal bone fragments and amphibian bone.

0119. 3.8kg.
Rare charred cereals, nutshells and seeds; rare charcoal; very rare mineralised seed fragments; scrap of Mytilus shell; rare fishbone and mammal bone fragments.

0127 (190-200cm). 5.0kg.
Small rare faecal concretions; rare charred cereals, nutshells and seeds; rare mineralised seeds; scraps of Ostrea and Mytilus shell; mineralised fly puparia and woodlice; fishbone, bird and mammal bone fragments.