Reports from the Environmental Archaeology Unit, York

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Environmental Archaeology Unit
University of York
Heslington
York YO1 5DD

(01904) 433846/51
Fax: 433850

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Summary

An evaluation exercise at 44-5 Parliament Street, York, in 1994 revealed evidence of what appeared to be recent decay of organic remains in medieval deposits. A research project was initiated by York City Council, with funding from Marks and Spencer plc and support from English Heritage, to explore this phenomenon and to provide a baseline for further monitoring of in-ground preservation.

Sediment characteristics and preservational condition of plant remains, eggs of parasitic worms and insect macrofossils have been recorded for samples from four faces of a 3 x 3 m trench cut to 2 m below the floor, and limited investigations of samples from a borehole which reached a further 4.5 m were possible.

The conclusion drawn during the evaluation, that fossils which had been in good condition had recently undergone a phase of decay, could not be proved objectively but is still considered to be correct. The effect had penetrated throughout the top 2 m of the stratigraphy, but appeared to fall off beneath this. It is suggested that the most likely cause is dewatering during construction of the recently-demolished building, combined with the down-movement of salts from an overlying concrete slab.

Although the type of decay seen at Parliament Street is unusual, it is suggested that it would be most unwise to assume that at least the upper few metres of archaeological deposits in York are not generally threatened. Much of the city is penetrated by cellars, and much of its surface has been covered by concrete, while the use of crushed limestone for backfill may also pose a threat to the continued survival of organic remains. A programme of research to investigate an monitor in-ground decay should be initiated as a matter of urgency.

Keywords: 44-5 PARLIAMENT STREET; YORK; MEDIEVAL; OCCUPATION DEPOSITS; *IN SITU* DECAY; SEDIMENTS; PLANT REMAINS; PARASITIC WORMS; INSECT REMAINS; PRESERVATION

Authors' address:

Environmental Archaeology Unit
University of York
Heslington
York YO1 5DD
Telephone: (01904) 433843-51

Prepared for:

John Oxley
Directorate of Development Services
City of York Council
9 St Leonards Place
York YO1 2ET

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Introduction

Preservation strategies for the archaeological heritage currently centre on in-ground preservation, on the assumption that buried deposits are safe. This project examines that assumption for the internationally important deposits in York.

Early in 1995, staff of the Environmental Archaeology Unit, University of York, carried out an evaluation of biological remains from samples collected during excavations by York Archaeological Trust at 44-45 Parliament Street, York (site code 1994.3210; Figs. 1-2) on property being developed on behalf of Marks and Spencer plc. The biota were of interest in their own right as representative of early medieval (mid 11th-mid 13th century) occupation in the heart of York, apparently relating to yard deposits behind properties on Pavement; many of the sample layers were probably the fills of large pits, including cess pits. The most striking feature of the deposits and their biota, however, was the strong impression that both the matrix and the fossils had quite recently undergone oxidative decay, having formerly been well preserved (Carrott *et al.* 1995, 7). Shrinkage of the deposits also appeared to have occurred. The floor of the former Currys shop consisted of two concrete slabs, with a void of up to 10 cm between them, the lower slab having remained in contact with the deposits. This is interpreted as evidence of shrinkage of the deposits, the softer lower slab having slumped, the more robust upper one having remained in position.

It was recommended by Carrott *et al.* (1995, 9) that further excavation be undertaken of deposits at the site, to rescue a representative proportion of the threatened deposits and to permit more detailed study of the apparently decaying material. It was also suggested that a long-term monitoring programme should be set up to determine whether the decay was, as appeared likely on the basis of laboratory examination during the evaluation, to be continuing. The City Archaeologist of York, John Oxley, recognised the importance of the possibility of in-ground decay of deposits rich in organic matter in relation to the strategy adopted by the City to protect the buried heritage. He was able to secure generous funding from Marks and Spencer plc towards a programme in which the present state of the deposits and their contained fossils would be assessed and *in situ* monitoring of some sediment parameters would be instituted. The EAU was commissioned to carry out the former, and Hunting Land and Environment Ltd were engaged to undertake the physico-chemical monitoring of the buried deposits. A long-term study of the sediments themselves and their contained fossils within the building could not be established, however.

Further excavation, sampling, and installation of monitoring devices were carried out by York Archaeological Trust, EAU, and Hunting Land and Environment Ltd in June 1995.

Laboratory work by EAU consisted of examination of sampled sediments, characterisation of the biota of selected samples, detailed recording of preservation of fossils, and some chemical and physical tests on the sediments themselves.

Excavation and sampling in 1995

A trench of 3 x 3 m (Trench 1, Fig. 3) was opened to a depth of about 2 m by YAT at approximately the position of the 1994 evaluation trench. Samples of sediment were collected by EAU staff from the open sections at the positions shown in Figs. 4-7 and stored in 10 l plastic tubs. The sampled faces were cut back by about 10 cm to remove freshly dehydrated and potentially contaminated sediment. During sampling, it was noted that voids (of the scale of a few millimetres width and up to a few centimetres in length) throughout the sections had been infilled with a white microcrystalline ‘efflorescence’, which was sampled from several locations.

Additional samples were obtained during a programme of boring by Geodrive Ltd within the former Currys shop and through the pavement of Parliament Street to the west of the shop frontage (Fig. 3). The cores were sampled as fully as practicable in the field.

Dating and nature of deposits

The succession revealed in Trench 1 probably comprised a series of extensive external build-ups in yards behind properties fronting onto Pavement (Figs. 2-3), cut repeatedly by pits ranging from about 1-3 m in diameter and about 1-2 m deep. The deposits were dated (on the basis of pottery from the evaluation excavation) to the mid 11th to mid 13th centuries, with very little residuality and no later intrusive sherds.

Laboratory methods

Samples were stored under the best available conditions (in a cool, dark shed); it was not possible to store such a large volume of material in a temperature-controlled cold store, which would have been preferable. The tubs were opened and sediment descriptions made using a *pro forma* in October-December 1995, at which time 250 g subsamples were processed to extract plant and invertebrate macrofossils for an assessment of their preservational condition. Blocks of coherent sediment were taken from three samples for the preparation of thin sections; it is hoped that information from these will be available in due course.

The field descriptions of the cores were supplemented in the laboratory when the samples were inspected and segments selected for processing and assessment of preservation.

Subsamples for assessment of macrofossil preservation were processed using techniques described by Kenward *et al.* (1980), as modified by Kenward *et al.* (1986), but without the use of sodium carbonate (which might have further modified the condition of the already somewhat decayed remains).

Prior to this project, the preservation of 'waterlogged' plant remains was recorded only informally in the EAU. Preservation of insect remains had been recorded using two parameters: (a) 'erosion', i.e. supposed post-depositional chemical changes bringing about changes in appearance; and (b) 'fragmentation', i.e. an approximate measure of the degree of breakage of individual sclerites (skeletal plates). For both of these parameters, a scale of 1 (very good preservation) to 5 (very poor preservation) was employed.

More precise recording of preservation was clearly paramount for the present project, and considerable efforts were made to design methods which were objective, covered a wide range of characteristics, and were easy to implement. For the plant remains, this was surprisingly difficult: plant remains preserved by waterlogging do not consist of a single kind of material and represent a wide range of parts—fragments of woody and herbaceous organs, discrete items such as fruits and seeds, and whole or nearly whole organisms such as moss gametophytes ('shoots'). All of these have very different colours, textures and degrees of opacity, as well as different inherent rates of decay under any given preservational regime. In addition, plant remains will have undergone a very variable degree of pre-burial change, whether through natural decay or utilization by people. For these reasons it was found impracticable to institute a detailed recording scheme for preservation such as that adopted for the insect remains and a system of scoring as shown in Fig. 8 was used. The focus of recording was on a somewhat subjective three-point scale from excellent to very poor, with the use of two intermediate points, making a scale of five points in total. Scores were made for a variety of plant-derived components, and charred and mineralised material was recorded, as well as 'waterlogged'.

For the insects, the recording scheme could be somewhat more objective, and had the advantage that most insect remains have a fairly similar chemistry and degree of resistance to decay, as well as showing essentially similar responses to conditions in sediments. The *pro forma* employed is shown in Fig. 10. The scales previously used for erosion and fragmentation have been modified by adding intermediates and values above and below the former ones, giving a scale from 0.5 to 5.5. Degree of fragmentation of individual sclerite types (heads, elytra, etc.) is recorded where possible, and a record made of the proportions of each assemblage showing particular degrees of erosion and fragmentation where these are not consistent. Colour change is estimated in terms of direction ('towards brown', etc.) and degree. A series of other characteristics such as rolling, cracking, pitting and linear tracking, are recorded or estimated.

For the eggs of intestinal parasites the characteristics recorded are colour change, the loss of polar plugs and decay of the egg walls (for trichurids and capillarids) and, if appropriate, collapse.

The plant remains from the 250 g subsamples were characterised by examination of a proportion of the residue, a record of the major components being made together with notes on interpretatively important remains. For the plants and insects, additional subsamples of 2 kg from selected samples were processed in order to provide useful numbers of remains, which were semi-quantitatively scan-recorded (*sensu* Kenward 1992 for the insects).

Microfossils (diatoms, pollen and spores, phytoliths, and eggs of parasitic nematodes) were examined by means of 'squashes' (*sensu* Dainton 1992) but quality of preservation could only be assessed practicably for *Trichuris* eggs. The preservation of phytoliths and diatoms, both siliceous, is unlikely to be visibly affected by the processes apparently at work in the present deposits, and the numbers of pollen grains and spores observable using squashes were generally small. Squashes which gave one or a few *Trichuris* eggs were replicated in an attempt to provide sufficient numbers to represent the population.

The water and organic content of the sampled material were estimated using oven drying at 40 C to constant weight followed by loss-on-ignition at 850 C for at least 2 hours. In addition, pH was measured for a ~20 g subsample dispersed in ~100 ml of deionised water, using an electronic pH meter.

Chemical analysis of the white 'efflorescence' infilling voids was carried out by the Department of Chemistry, University of York, using infra-red spectroscopy.

Results

For the samples from boreholes, it was practicable only to obtain results for insect erosion and colour change. For this reason, most of the following discussion is concerned only with the approximately 2 m of stratigraphy sampled by excavation in Trench 1.

Sediment descriptions

Laboratory descriptions of the sediments examined are presented in Tables 1-5. The deposits ranged from very humic material with a silty texture to largely mineral sediments with a substantial clay component. In this, they were very typical of archaeological deposits seen previously in the Coppergate-Pavement area of York, for example at 16-22 Coppergate and 6-8 Pavement (Kenward and Hall 1995; Hall *et al.* 1983). However, none of the contexts seen in section in Trench 1 was as richly organic and obviously well preserved as many of the pit fills and even some floors and other layers at Coppergate. At the time of the evaluation, it was felt subjectively by two of us (AH/HK) that, on the basis of observations in the field and in the laboratory, some of the deposits had probably decayed from a state like that observed in some of the best-preserved layers at Coppergate. While some of the deposits (especially those from the upper parts of the north-west face of Trench 1, e.g. Context 1004) were distinctly 'jumbled' and clearly represented redeposited material, others were essentially homogeneous and there was little doubt that they were primary pit fills.

The most striking aspect of these deposits, and the characteristic which led to the initiation of the present project, was the macroscopic evidence observed during assessment (and amply supported during the second phase of investigation) suggesting that *in situ* decay might be occurring: zones of reddening and apparently change texture interpreted as recent oxidation and the precipitation of calcium salts in voids. It is difficult to describe in objective terms the very strongly characteristic nature of certain of these deposits as perceived subjectively—the subtleties of coloration (and its distribution) and of texture which made them stand out from almost all of the very large number of other deposits examined by the authors. Perhaps the most effective way of conveying these subtle impressions is by quoting from the discussion section of the evaluation report (Carrott *et al.* 1995, 7).

'These conclusions [concerning the history of decay of the remains] drawn from an examination of the fossils are strongly supported by direct observation of the samples of deposits. All of the deposits examined contained organic matter, in several cases in the form of concretions familiar to us from previous excavations as being faecal in origin. Some of these concretions showed signs of oxidation, with voids and the softer-textured areas rather orange in colour. The matrix in which these were contained was soft and spongy in texture, reddish in colour, and will undoubtedly decay to dust very quickly with exposure. Several samples contained wood, and there were four 'spot' finds also of wood; this material was generally very soft on the outside with a brittle core which may have been the result of mineralisation. It is our contention that organic material in this condition could not possibly have survived for nearly a millennium. We have seen deposits in a somewhat similar condition on a few occasions, when we have suspected that there had been recent changes in ground conditions allowing the onset of decay. The present site offers very much the best case for such recently initiated decay, however. There are also strong similarities to some of the samples from 16-22 Coppergate, which were in good condition when excavated but had become distinctly soft and friable in storage, although in [that] case there was more limited colour change and oxidation of fossils.'

Water content, pH and loss-on-ignition

Data for water content, pH and loss-on-ignition are presented in Table 6. The water content clearly increased with depth, although values were widely scattered (Fig. 12). If the succession is divided at its midpoint (approx. 13.0 m OD), the values for deposits above and below are as shown in Table 7. The values for pH were very scattered (Fig. 13) and the values in the upper and lower halves of the succession scattered to about the same extent about an identical mean (Table 8). Those for organic content were fairly scattered (Fig. 14), but with a moderately close fit to the regression line ($R^2 = 0.38$); values for the upper and lower halves of the succession are given in Table 9. Not surprisingly, the correlation between organic content and water content was very good (Fig. 15), with an R^2 value of 0.82.

It is obviously difficult to be sure whether the increasing water content with depth is primarily an effect of depth, or a result of the increasing organic content and consequent water retention, or, indeed, whether the increasing organic content results from better preservation brought about by a higher water content. Since there is no significant trend in quality of preservation of invertebrate or plant fossils (see below), however, we suspect that the former may apply. It might be argued that the trend could result more from essentially random differences in the feature types (which will affect preservation); this is not the case, since the estimates of mean organic content for deposits broadly classified as 'dumps' and 'pit fills' are effectively identical (22%, SD 7.2 and 23%, SD 6.5, respectively). It is worth noting that the correlation between height and organic content for the 'pit fills' is much better than that for the 'dumps' ($R^2 = 0.71$ and $R^2 = 0.25$ respectively, see also Figs. 16 and 17).

There was no correlation between pH and context type. When pH measurements were being made, it was noted that some samples gave an inky black suspension, and that these samples tended to have a high pH within the rather narrow range observed. It is possible that in these cases ash was present and that this was a source of basic ions. However, there was in fact no correlation between the coarse (>300 µm) charcoal component of the samples (as measured via the 250 g subsamples) and pH (Fig. 18); this is perhaps not surprising since charcoal is robust and may have entered deposits secondarily or be residual from leached ash, whereas the presence of very fine carbon particles suggests primary ash deposits which might be expected to be more strongly alkaline. It may be that pH measurements will add to the range of techniques available for identifying ash dispersed amongst other materials in archaeological deposits; this is something open to further research. No correlation between organic content and pH could be established (Fig. 19).

Chemical analysis

Analysis of the white 'efflorescence' showed the material to consist predominantly of calcium sulphate (approximately 95%) with a small quantity of calcium carbonate.

Precipitated white crystals in substantial quantities have not been noted previously by the EAU in 'waterlogged' deposits in York, and no analyses have been carried out in the past. It is suggested that the formation of the calcium sulphate at Parliament Street is related to the postulated oxidative degeneration of the deposits. A likely mechanism is downward movement of calcium ions from the overlying concrete raft in oxygen-bearing water, perhaps encountering sulphide ions in the highly organic and originally anoxic layers beneath.

Broad character of biota

Some comments on the plant and animal remains from 2 kg subsamples from selected layers from Trench 1 are presented in Table 10. The following account is based on these subsamples, but incorporates observations from the remaining squashes, the 0.25 kg subsamples used for estimation of preservation and the samples examined during the evaluation exercise (see especially Appendix).

For the purposes of this section, the question of preservation and possible recent decay has been ignored and the material approached conventionally.

The earliest deposits seem to be extensive build-up or dump layers; where appreciable numbers of biological remains were present they suggested mixed origins. These layers were cut into by a series of pits. As far as the plant remains are concerned, the deposits interpreted as pit fills are not dramatically different from those defined as 'dumps', though locally there were small concentrations of food remains with concretions which probably indicate faeces (not necessarily human). The numbers of *Trichuris* eggs were generally very small, offering some, but rather limited, evidence that the material incorporated only traces of human (or pig) faeces, although even these may have originated from other species.

The fills of cut 1108 included appreciable numbers of grain pests and in some cases hints of the presence of stable manure, but even here the impression was of the disposal of waste of more than one kind.

It appeared during excavation that the south-east and south-west faces of Trench 1 cut the fills of a very large pit, itself probably re-cut on more than one occasion. It was not entirely clear where the primary cut lay in the sequence, but it was probably 1113 (Fig. 5). This pit was therefore of the order of 3 m in diameter and 2 m in depth. It appears to have been infilled in stages with various kinds of material, but at at least one stage, represented by layer 1111, there was probably a hiatus during which the pit held open water which was colonised by aquatic beetles, *Daphnia* (water-fleas), and perhaps some diatoms.

The original evaluation excavation revealed an additional pit cut complex which does not appear in the sections. A sample from the fills of Cut 1011 (Context 1006), cut into 1013/1017, gave hints of the presence of faeces, probably human (see Appendix). A sample from Context 1007, a fill of Cut 1012, gave only limited biological evidence, reminiscent of some of the assemblages seen in the present exercise.

A further pit, Cut 1029 (Fig. 4) was sampled during evaluation but lay outside the columns used in the present exercise. A sample from its fill, Context 1027, gave strong evidence for faeces, almost certainly human. Similarly, Cut 1031, represented by samples from Contexts 1030 and 1028, appeared to contain faeces with a variety of other materials (Appendix).

Overall, the evidence indicates that the 11th-13th century deposits examined here formed in yards behind buildings fronting onto Pavement (Parliament Street being a much later thoroughfare), and were extensively excavated, probably with the intention of burying noxious waste.

Plant preservation (Table 11)

Remains of plants preserved by anoxic waterlogging were rather sparse in the samples examined during this exercise, although the humic content of the deposits presumably mostly originated through the decay of plant matter. Charred remains were restricted to charcoal (occasionally present in moderate to large amounts), and occasional charred propagules, almost always seeds of weeds, typically cornfield taxa.

Mineral-replaced material was sparse except for the samples with concretions, but even here there were few discrete fossils. A small number of layers showed at least local mineral deposition throughout the matrix, revealed by a 'biscuity' texture.

The anoxic, waterlogged plant material was generally poorly preserved; wood fragments were usually soft and amorphous, often pale in colour. Wood observed in the raw sediments was frequently extremely soft and crumbly, with a reddish or orange colouration; it is likely that this did not survive laboratory processing in large enough fragments to be recorded from residues. There was no correlation between wood preservation and stratigraphic depth (Fig. 20) or between preservation and pH (not shown). Other anoxically-preserved remains were generally somewhat eroded (except perhaps for fig, *Ficus carica* L., seeds, whose hard, shiny testa is in any case very resistant to decay). The colour of these remains was often paler than they would have been 'in life'. They were comparable in overall quality of preservation with those from the worst third of the range seen in deposits at 16-22 Coppergate. As Fig. 21 shows, there was a weak negative correlation between preservation and depth—perhaps because pit fills (with inherently better preservation and/or higher organic input) tended to be in the upper parts of the sequences, although the plot of fruit/seed preservation and organic content (Fig. 22) gives no support to the argument that at this site higher organic content is correlated with quality of preservation (rather, the opposite). Moreover, there was, as shown above, no significant difference in mean organic content between 'pit fills' and 'dumps'. There was a slight correlation between the degree of decay of fruits and seeds and pH (Fig. 23), which matches preconceptions about the causes effects of alkalinity in deposits of these kinds.

The charred remains were generally quite well preserved, although in some samples charcoal was very crumbly; there appeared to be no pattern to this with depth (Fig. 24) and observations of modern charcoal show that fresh material may range from almost crystalline to soft and powdery in texture.

The mineral-replaced plant material, whether in concretions or as discrete fossils, was usually very poorly preserved, the fabric being crumbly rather than having the glassy texture sometimes observed at other sites. This is probably not a function of post-depositional decay, but rather of the ground conditions during and immediately following deposition, since recent work has shown that mineral-replacement occurs rapidly following deposition (Allison and Briggs 1991; Briggs and Kear 1993a; 1993b). Some of the mineralised sediments appeared to be oxidising, being very delicate and in some cases extremely strongly orange in colour.

Parasite egg preservation

The eggs of *Trichuris* were sparse and generally rather to very poorly preserved (Table 12, Figs. 25 and 26), only a few specimens being in good condition (i.e. complete and with both polar plugs). Most also showed appreciable or strong loss of colour. As with the fruits and seeds, there is no real correlation between organic content and preservation (Figs. 27 and 29 or between pH and completeness (Fig. 28) or colour (not shown).

Insect preservation (Table 13)

Insect remains (mainly beetles and fly puparia) were present in small to modest quantities in most of the samples, providing sufficient data for any trends and correlations to be established. For the material from Trench 1, the degree of erosion of the remains was not generally extreme, most of the values ranging from 3 to 4, with a mean of 3.5 (Fig. 30). The fossils were thus not much worse preserved than in typical material from a wide range of sites with anoxic preservation (3 on the scale of erosion used here being, by coincidence rather than design, about the normal state of preservation for such material). Fig. 31 shows the distribution of erosion scores for Anglo-Scandinavian material from 16-22 Coppergate, for which the mean was 2.8 (i.e. appreciably better preserved). What sets the Parliament Street material aside from that from the great majority of other sites is the coloration of the insect fossils, most of which show a distinct change towards 'brown'. No systematic record of the kind used here has been made previously, but subjectively it may be stated that at most other sites poor preservation (in terms of chemical erosion) is reflected by a trend towards 'orange' or 'pale'. At the present site, it was (again, subjectively) thought likely that in many cases fossils recorded as 'pale' represented a stage beyond 'brown'.

There was no significant trend in the degree of chemical erosion or fragmentation of the insect remains with depth within Trench 1 (Figs. 32-3), although colour change (one component of erosion) appeared to be slightly greater in the upper layers (Fig. 34). However, including the data for Borehole 8 (which effectively extended the sequence below the floor of Trench 1) produced a rather different picture, with distinct trends of increasing degradation upwards (Figs. 35-6). This may suggest that the peculiar preservational change seen in Trench 1 had penetrated throughout the uppermost 2 m of stratigraphy, but that the effect was falling off below this, giving an indication of the depth which accelerated decay has reached.

The regressions for insect erosion versus water content and organic content were effectively flat (Figs. 37-8). There was no correlation between colour change of the insect remains and pH (not shown), but there was a weak positive correlation between chemical erosion and pH (Fig. 39).

Correlation between preservation of plants, worm eggs and insects

There was no correlation between the estimates of preservation for fruits/seeds, *Trichuris* eggs and insect remains (Figs. 40-2). While the plant remains and invertebrates are composed of very different materials, so that it might be argued that a correlation would not be invariably expected, the closer similarity of the egg shells and insect cuticles might have been expected to have led to at least a weak correlation. The explanation for the overall lack of correlation is probably that the deposits examined were very heterogeneous in their nature, the remains having different taphonomic histories and thus variable degrees of decay before final incorporation as well as small-scale variations within the samples.

Discussion

The importance of the present project is threefold: firstly, to record the current state of preservation of biological remains in the sediments at 44-5 Parliament Street; secondly, to make an attempt to explain the unusual preservation; and thirdly, to develop appropriate methods of recording preservation. The first aim, and to a large extent the second, depends upon the third, and the recording systems used require careful evaluation.

(a) Evaluation of recording systems

The recording systems for condition of plant and invertebrate remains preserved by anoxic waterlogging (and to a much lesser extent preserved by charring and mineral replacement), were developed for the present project. Although limited testing was carried out beforehand, the schemes for plant remains, *Trichuris* eggs, and insect remains were all to some degree tentative. Not surprisingly, all three have been found to have limitations, and some suggestions for future development are made below.

The preservation scale for plant remains could only be objectified with difficulty and in a complex way. As mentioned above, the essential problem in recording ‘waterlogged’ plant remains is the diversity of materials and the multifarious pathways by which they may have decayed, both prior to and after deposition. The plant remains stand aside from the invertebrates to a large extent because many will be the end product of human utilisation (fragments of wood from turning or building construction, fragments of straw or other litter, for example). Plants may have been subjected to processes which caused great chemical changes before burial, these changes in many cases probably predisposing the material to further decay or creating conditions conducive to preservation. The variety of chemical composition and density of plant structures means that judging the extent to which they have decayed is not simple; familiarity with the initial state and the typical rate of decay of remains is required, implying the need for great experience. Murphy and Wiltshire (1994) have suggested the use of pre-selected plant taxa and parts in estimating decay, but their system would have been unsuitable in the present case.

Wood presents particular difficulties since colour changes do not seem necessarily to be related to state of preservation. In broad terms, where wood has an orange cast it may be decaying aerobically and where it is dark it may be extremely well-preserved; however, some wood has an inherently orange coloration and wood which is dark may be poorly preserved where the darkening has happened through impregnation of sulphides *after* decay has progressed. Other plant remains similarly have different starting points for colour and may be subject to darkening, depending on their composition and burial history. Colour change in plant fossils, then, is not the most useful measure of preservation.

Measurement of the preservation scores for the several categories of plant remains shown in Table 11 were therefore necessarily subjective, based on the overall appearance of the material —its degree of surface erosion, softness, degree of fragmentation and the extent of colour change from the starting point of their known appearance when fresh, but with different standards for different kinds of remains (fig seeds, for example, seem very resistant to decay and even a slight erosion can be regarded as a moderate amount of decay; conversely, very delicate structures are regarded as well preserved even if decay has been considerable). This means that recording cannot easily be transferred to less experienced workers, depending as it does, on the fund of knowledge acquired over many years of observation.

The scales for preservation of *Trichuris* eggs are much simpler to apply, although that for colour presupposes sufficient experience of the range of possible states. The completeness scale relies on absolute characteristics and should be extremely robust.

Like plant remains, the insects have an immense variety of initial states, in terms of density, robustness, and colour. Despite this, it is considerably easier to devise a recording scheme for many characteristics. The stages of fragmentation can be defined reasonably objectively and in very general terms the erosion and colour trends of the entire population of fossils can be judged without an intimate knowledge of all the species involved. The multifarious 'other' properties are generally absolutes, again open to recording without excessive prior experience. It is not very easy, however, for an inexperienced worker to make estimates of erosion and colour change at the level of individual taxa, since this presupposes a knowledge both of the typical original surface appearance and coloration, and the normal taphonomic course of these characteristics for each species. In the present exercise, it was found that the presence of the inherently tough and dark-coloured remains of the grain weevil *Sitophilus granarius* gave rise to low estimates of the degree of decay of the remains, for example.

The scale for erosion used for a decade or so was intended to record only a general impression of the overall state of the remains, ignoring individual fossils. When the sheet presented here (Fig. 10) was designed, it was the intention to maintain this approach, merely refining the record obtained. Attempting to make very detailed and precise records for the Parliament Street material has led to a fundamental rethinking, and it is now considered that the remains should be seen more as a collection of individuals, i.e. recording should be fossil-orientated, not assemblage-orientated, yet providing a record of assemblage characteristics. Obviously it is not practicable to record every fossil individual, but it is desirable to record the range of degrees of decay manifested by individual fossils and to estimate the modal value and the strength of the mode of the degree of erosion (or to record an even distribution or the presence of more than one mode). Thus, the preservation might be recorded as 'e1-4, continuous, mode 3' if there were a normal distribution of values (as estimated subjectively), or as 'e2-4, modes 2(10%), 4(80%)' if there were a bimodal pattern. There are two other likely types of pattern: skewed (e.g. 'e1-4, continuous, mode 4(70%)') and flat (e.g. 'e3-5, continuous, even'). A modified form for recording has been produced (Fig. 11). A record of this kind could be made much more rigorous where there was some need, by recording preservation characteristics species by species during the identification phase and pooling the results. Much interesting information concerning variations in taphonomic pathways as evidenced by differential preservation might emerge from such an approach. In a pit fill assemblage, for example, are 'house fauna' taxa systematically less well preserved (for those species) than the 'foul decomposers', and are the 'post-depositional invaders' best preserved of all?

(b) Evaluation of preservation records

This project has provided a rather detailed record of the preservational condition of a wide range of organisms as well as measurements of three deposit parameters considered important in the survival of delicate remains (water content, pH and organic content).

Is the record we have made good enough: were the parameters chosen appropriate, and were they measured adequately? The answer to the first question is probably 'yes', within the physical and financial constraints of the project. It is unlikely that more complex analyses would have provided any additional information, especially in view of the remarkable lack of correlation between most of the parameters which *were* recorded. Pollen, for example, might have been included amongst the groups whose preservation was estimated (the data in Table 12 are merely records of the presence of pollen and spores with no information concerning the taxa present). However, the cost of making adequate preparations and the need to estimate preservation for a large number of pollen taxa (and hence to examine very large numbers of grains in deposits where the concentration of grains would generally be expected to be low) led to the rejection of the estimation of pollen preservation as a practicable component of the project. Intensive chemical analysis of the deposits would also have been prohibitively expensive and it is suspected that in the present state of knowledge of the chemistry of archaeological sediments that the results would not readily be open to interpretation.

Larger subsamples would have been better for the estimation of quality of preservation of plant and insect remains, the sample size having been chosen on the basis of the samples seen in the evaluation (Carrott *et al.*, 1995), whose concentration of remains was rather higher than that observed in the present material. For the same reason, the samples examined in detail for environmental reconstruction gave somewhat limited results.

Despite these reservations, the detailed examination of the sediments and their inclusions has not detracted from our original hypothesis of a recent episode of decay, although it has not produced *conclusive* evidence to support it.
The observations of the deposits in the field and measurements of water and organic contents (mean values for which were approximately 40% and 20%, respectively) suggest that the deposits should be favourable for the preservation of delicate organic remains by anoxic waterlogging. That many of the remains show distinct taphonomic change means that either decay had occurred during deposition, or there had been an episode of decay at some subsequent point. For the insects, at least, the condition of these remains was not at all like that seen in friable deposits of the kind in which decay has often been suspected to have occurred during deposit formation. The principle manifestation of decay is an unusual one, a trend towards brown coloration. This must surely be post-depositional, bearing in mind that it has been observed through nearly 2 m of varied stratigraphy. The hypothesis that this decay, and the oxidation of some of the deposits themselves (as well as of some concreted matter) occurred during an episode of reduced water content, is the most obvious one. The fact that orange coloration could be observed in many parts of the stratigraphy where the general sediment colours were those of typical organic-rich urban layers strongly supports this kind of decay.

We would argue that if such adverse conditions had continued over a long period, most of the remains of insects and the more delicate plant material would have decayed completely, or at least (in the case of the insects) have been reduced to the pale orange to colourless filmy fossils occasionally seen at other sites, where water content was low. Assemblages of such fossils are often considered unworthy of detailed recording, but have occasionally been examined more carefully, for example the material from an 18th century pit at Berrington Street, Hereford (Kenward 1985).

In addition to the clear traces of zonal oxidation, evidenced by strong orange colours along cracks and on the surfaces of voids within the sediment, the presence of substantial quantities of crystals of calcium sulphate (with a trace of calcium carbonate) is regarded as the most significant pointer to the cause of the observed atypical decay.

The overlying concrete slab, which was laid directly onto the sediment surface and had remained in contact with it, was of soft, open-textured concrete, from which mobile ions might easily be leached. We suggest that these crystals formed as a result of the downward movement of water of high pH, charged with calcium ions, probably paired with hydroxyl, from the lime in the slab. It is hypothesised that, until the lower slab was laid, these deposits were in the same condition as those observed at nearby sites, anoxic conditions giving excellent preservation of plant and invertebrate fossils having been generated by a high water content, impeded water flow, and the initial decay of the abundant organic matter in most of the layers. Calcium sulphate is considered to be a likely precipitate when the down-moving water met sulphides in the anoxic layers. This process may have been facilitated by dehydration of the sediments when they were exposed during construction of the Currys building, the resulting voids in the deposits allowing ready access of water from above. The building is believed to have been erected in the middle decades of the present century, which presumably gives a date for the onset of the processes postulated here. How long the episode lasted is hard to estimate, but it seems likely that most of the ions released from the concrete had been immobilised by decay products of the organic sediments by the time the samples analysed here were collected.

Is the Parliament Street site representative of urban deposits?

Is the process observed at the Parliament Street site occurring elsewhere in York's deep, anoxic archaeological deposits? If it is, the implications for in ground preservation and policy regarding development are profound, for clearly continued preservation of organic remains cannot be guaranteed. It might be argued that the Parliament Street site is peculiar on the grounds that deposits showing extensive calcium sulphate efflorescence have not previously been noted in York by the authors during 20 years. The abnormal coloration of the insect fossils would support this view. The combination at Parliament Street of an overlying slab and an adjacent deep cellar (located between Trench 1 and the Pavement frontage) may have produced a sudden episode during which water was withdrawn from the upstanding block of stratigraphy cut by Trench 1 at the same time as or immediately before a profound change in sediment chemistry. It is, however, unlikely that the site is unique in this respect. York (and other towns) has seen cellaring on a very large scale and it is probable that most deposits with anoxic organic preservation are within a few metres (laterally) of cellars. Similarly, a very large proportion of the built-up surface of York is covered by concrete or other building materials containing lime. In this respect, the use of crushed limestone to backfill old excavations may be creating a serious problem for the future, providing drainage and perhaps also a source of base-rich groundwater. The fact that the trend towards brown coloration seen in the insect fossils from Parliament Street has not been encountered elsewhere is perhaps more a result of the very small proportion of York which has been examined for insects than of exceptional conditions at Parliament Street.

If the degradation seen in these plant and invertebrate fossils was the result of a temporary episode of corrosive ground conditions, was this an isolated event which simply moved the fossils a step down their decay trajectory, or has it made fossils more susceptible to continued decay in the future? We would argue that the often rather high pH values recorded in the deposits, combined with the clear evidence that they are still zonally oxidised, indicate that the fossils are likely to decay further and probably quickly.

As a rule, later medieval and post-medieval deposits in York, as elsewhere, tend to give rather poorer preservation of organic remains than Anglo-Scandinavian to early medieval layers. In the past, we have assumed that this resulted from (a) a lower organic input in the more hygiene-conscious later period and (b) a lower water content, partly because of (a) and partly because the deposits are higher above the permanent water-table. These assumptions may be true, but it is also possible that the remains in the later deposits were better preserved until recent damage caused by lowered local water-tables, themselves partly caused by cellaring and drainage, but also by lower regional water-tables and also perhaps by reduced rainfall.

If our argument regarding the likely rapid destruction of well-decayed fossils (and therefore also of organic artefacts) in the deposits at Parliament Street is true, then perhaps all of the poorly preserved material in the upper parts of the archaeological sequence throughout York is under threat. If so, the potential loss of a crucial component of the archaeological heritage is huge and is a problem which must be addressed immediately. We cannot prove that there is a general threat in York (or elsewhere), but the consequences of incorrectly assuming that Parliament Street is an exceptional case would be to rob future generations of a resource which we claim to be preserving for them on the grounds that they will have better techniques of study available.

Only by initiating a programme of survey and long-term monitoring of the state of preservation of both the matrix and enclosed fossils can we be sure that the current mitigation policy for archaeological deposits in York (and elsewhere) is not simply saving the evidence from destruction by development or excavation but leaving it to rot where it lies. We recommend that every opportunity be taken to:

(I) record the state of preservation of deposits and their fossils throughout York, relating the data to other deposit parameters and the relationship of the stratigraphy to cellaring and other structures such as concrete floors and old excavations now backfilled with crushed limestone; and

(ii) continue monitoring at the Parliament Street site and establish other locations where similar monitoring of ground-water variables can be linked to longer-term observations of the preservational state of plant and animal remains.

It is further recommended that:

(iii) funding for detailed recording of sediment character and preservational condition of fossils should be a condition of future interventions (adopting a suitable sampling strategy such that continuous columns of sediment can be analysed).

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List of Figures

Figure 24. Trench 1, 44-5 Parliament Street, York: plot of values for charcoal preservation against OD height of deposits.

Figure 25. Trench 1, 44-5 Parliament Street, York: plot of values for Trichuris *egg completeness against OD height of deposits.*

Figure 26. Trench 1, 44-5 Parliament Street, York: plot of values for Trichuris *egg colour change against OD height of deposits.*

Figure 27. Trench 1, 44-5 Parliament Street, York: plot of values for Trichuris *egg completeness against organic content (as measured by loss-on-ignition).*

Figure 28. Trench 1, 44-5 Parliament Street, York: plot of values for Trichuris *egg completeness against pH.*

Figure 29. Trench 1, 44-5 Parliament Street, York: plot of values for Trichuris *egg colour change against organic content (as measured by loss-on-ignition).*

Figure 30. Trench 1, 44-5 Parliament Street, York: frequency plot of values for insect erosion (n = 36, mean = 3.51).

Figure 31. Anglo-Scandinavian levels at 16-22 Coppergate, York: frequency plot of values for insect erosion (n = 212, mean = 2.78).

Figure 32. Trench 1, 44-5 Parliament Street, York: plot of values for insect erosion against OD height of deposits.

Figure 33. Trench 1, 44-5 Parliament Street, York: plot of values for beetle fragmentation against OD height of deposits.

Figure 34. Trench 1, 44-5 Parliament Street, York: plot of values for insect colour change against OD height of deposits.

Figure 35. Trench 1 and Borehole 8, 44-5 Parliament Street, York: plot of values for insect erosion against OD height of deposits.

Figure 36. Trench 1 and Borehole 8, 44-5 Parliament Street, York: plot of values for insect colour change against OD height of deposits.

Figure 37. Trench 1, 44-5 Parliament Street, York: plot of values for insect erosion against water content.

Figure 38. Trench 1, 44-5 Parliament Street, York: plot of values for insect erosion against organic content (measured by loss-on-ignition).

Figure 39. Trench 1, 44-5 Parliament Street, York: plot of values for insect erosion gainst pH.

Figure 40. Trench 1, 44-5 Parliament Street, York: plot of values for fruit/seed preservation against Trichuris *egg completeness.*

Figure 41. Trench 1, 44-5 Parliament Street, York: plot of values for insect erosion against Trichuris egg *completeness.*

Figure 42. Trench 1, 44-5 Parliament Street, York: plot of values for fruit/seed preservation against insect erosion.

List of Tables

Table 1. 44-5 Parliament Street, York: sediment descriptions for samples from Section 1 (north-west), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 4. All sediments were recorded as 'moist' or 'just moist'.

Table 2. 44-5 Parliament Street, York: sediment descriptions for samples from Section 2 (south-east), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. . All sediments were recorded as 'moist' or 'just moist'.

Table 3. 44-5 Parliament Street, York: sediment descriptions for samples from Section 3 (south-west), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 6. All sediments were recorded as 'moist' or 'just moist'.

Table 4. 44-5 Parliament Street, York: sediment descriptions for samples from Section 4 (north-
Table 8. 44-5 Parliament Street, York: some statistics for estimates of pH.

Table 9. 44-5 Parliament Street, York: some statistics for estimates of organic content.

Table 10. 44-5 Parliament Street, York: comments on biota from selected samples from Trench 1. In each case, the subsample weight was 2 kg.

Table 11. 44-5 Parliament Street, York: scores for quality of preservation of organic components recorded from residues. For preservation codes, see Figure 8;'wood' refers to wood recorded under 'other wood' on the recording sheet.

Table 12. 44-5 Parliament Street, York: scores for completeness and colour of Trichuris *eggs, together with semi-quantitative abundances of organic and inorganic sediment particles and*

east), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 7. All sediments were recorded as 'moist' or 'just moist'.

Table 5. 44-5 Parliament Street, York: sediment descriptions for samples from boreholes. 'Depth (m AOD)' is nominal, a rounded value for the middle of the sampled segment.

Table 6. 44-5 Parliament Street, York: pH, loss-on-ignition, water content data. C—Context; S—Sample; TWW—Total wet weight (g); CW—Crucible weight (g); WWS—Wet weight of sample (g); TDW—Total dry weight (g); DW—Dry weight of sample (g); TWI—Total weight after ignition (g); SWI—Sample weight after ignition (g); WW—Water content (g); WP—Water content; OW—Organic content (g); OP—Organic content %; MW—Mean water content %; MO—Mean organic content %. pH was measured from separate subsamples to those for which water and organic content were estimated.

Table 7. 44-5 Parliament Street, York: some statistics for estimates of water content.
other microfossils. Key—column heads: NS—no. slides examined; n—no. Trichuris *eggs recorded; O/M—proportions of organic and mineral matter; P—phytoliths; D—diatoms; FH—fungal hyphae; FS—fungal spores; P/S—pollen/spores; N—other nematode eggs. Frequency scores—+ = present; F = few; S = several; M = many; VM = very many; ++ = predominant component; 1:1 = roughly equal proportions. Other nematodes: A =* Ascaris*; O =* ?Oxyurus equi. *Where more than one slide has been examined, the records of remains other than* Trichuris refer to the first slide examined.

Table 13. 44-5 Parliament Street, York: record of preservation of insect remains. Generally 'pale' seems to be a successor to 'brown' in the decay pathway. Sample 8013 showed decay which was apparently different from the remainder of the material. The fossils appeared 'dull' in an undefinable way, possibly a result of separate 'darkening' and 'paling' processes.

Organic components—preservation assessment

Excellent: specimens firm, uneroded, retaining delicate tissues, **G**ood, **M**oderate, **P**oor, **V**ery poor: specimens soft and/or strongly eroded and/or lacking delicate tissues; only the more robust kinds of remains present

Percentage by volume 'light fraction' %, of which % charcoal

	'waterlogged'			charred			mineralised		
	E	M	V	E	M	V	E	M	V
leather									
eggshell mem.									
roundwood									
twigs									
wood chips									
other wood									
charcoal									
concretions									
free 'bran'									
'grassy'/ 'strawy' detritus									
nutshell									
moss									
fruitstones									
other fruits & seeds:									

Evidence of partly-charred or partly-mineralised plant remains?

Figure 8. Plant preservation recording sheet (the categories 'Good' and 'Poor' are interpolated during recording on the grid lines between Excellent and Moderate and Moderate and Very Poor, respectively.

A. Completeness

A five-point scale has been employed as follows:

Scale point	Shell condition	Polar plugs
1	complete	both present
2	complete	1 present
3	complete	both lost
4	outer membranes incomplete	normally both lost
5	outer membranes absent	normally both lost

Where no eggs were observed, the value ‘0’ is used.

B. Colour

A three-point scale has been employed as follows:

Scale point	Colour
1	dark (as fresh)
2	intermediate
3	pale

For each squash, the observed eggs were individually categorised using these scales. A value for the whole squash was obtained by taking the rounded averages for all the eggs, thus:

Context 1115, Sample 20012

Completeness score	Colour score	No. eggs	Notes
2	1	1	mostly organic matter phytoliths S
2	2	1	
2	3	1	
3	2	3	
3	3	2	
4	2	2	
4	3	3	
Mean 3 Range +1/-1	Mean 2 Range +1/-1	Total 13	

Figure 9. Preservation scale for Trichuris *eggs. In the example at the foot of the page, ‘S’ indicates ‘several’ on a semi-quantitative scale.*

Date:	Recorded by: Site code:	Context: Sample: /

Approximate adult beetle and bug MNI:	<10	10-20	20-30	30-50	50-100	100-200	200-500	>500	

Approximate numbers of other insects:	None	Few	Few tens	Several tens	Few hundreds	Many hundreds

Enough fossils for realistic estimation of preservational characters?	Yes	Borderline	No

Some rotted completely away?	Yes	Perhaps	No	If yes, guess what proportion:	Some	Many	Most

Property	Degree range		Proportions if discontinuous						[N - none; T - trace; S - several; M - many] Comments on E and F characteristics, including distribution across ecological groups (See separate sheet for E and F scale definitions):
Erosion	From		N	T	S	M	Most	All	
	To		N	T	S	M	Most	All	
Fragmentation	From		N	T	S	M	Most	All	
	To		N	T	S	M	Most	All	
Degree of fragmentation of:			Typical number of fragments/sclerite						
	Heads		1	2	3	S	M		
	Pronota		1	2	3	S	M		
	Elytra		1	2	3	S	M		
	Abdomens		1	2	3	S	M		

Colour change to: None (i.e. as newly dead)?																			
Dark	From		Cont	N	T	S	M	Most	All	Brown	From		Cont	N	T	S	M	Most	All
	To			N	T	S	M	Most	All		To			N	T	S	M	Most	All
Red	From		Cont	N	T	S	M	Most	All	Pale	From		Cont	N	T	S	M	Most	All
	To			N	T	S	M	Most	All		To			N	T	S	M	Most	All
Yellow	From		Cont	N	T	S	M	Most	All	Other	From		Cont	N	T	S	M	Most	All
	To			N	T	S	M	Most	All		To			N	T	S	M	Most	All

Proportion scale as above; degree: 1 - slight; 2 - distinct; 3 - strong; 4 - very strong. Use 'from' if consistent. Name taxa in notes if appropriate.

Other colour properties:

Other properties: name taxa in notes if appropriate. Scale as above.

Abrasion	N	T	F	M	Most	All	Cong. mut.	N	T	F	M	Most	All
Crushing	N	T	F	M	Most	All	Ass. sclerites	N	T	F	M	Most	All
Rolling	N	T	F	M	Most	All	Local holing	N	T	F	M	Most	All
Compression	N	T	F	M	Most	All	Pitting	N	T	F	M	Most	All
Cracking	N	T	F	M	Most	All	Linear tracks	N	T	F	M	Most	All
Soft/pale	N	T	F	M	Most	All	Fresh, 'oily'	N	T	F	M	Most	All

Notes:

Ring choices to mark them.

Figure 10. Insect preservation recording sheet used for this project.

Date:	Record ed by:	Site code:	Context:	Sample: /

Approximate adult beetle and bug MNI: <10 10-20 20-30 30-50 50-100 100-200 200-500 >500

Approximate numbers of other insects: None Few Few tens Several tens Few hundreds Many hundreds

Enough fossils for realistic estimation of preservational characters? Yes Borderline No

Some rotted completely away? Yes Perhaps No If yes, guess what proportion: Some Many Most

Property	Degree		Modes				Distribution type
Erosion	From	To	Mode 1	%	Mode 2	%	Normal Skewed + Skewed - Flat
Fragment -ation	From	To	Mode 1	%	Mode 2	%	Normal Skewed + Skewed - Flat

[N - none; T - trace; S - several; M - many]

Comments on E and F characteristics, including distribution across ecological groups (See separate sheet for E and F scale definitions):

Degree of fragmentation of:		Typical number of fragments/sclerite					
	Heads	1	2	3	S	M	
	Pronota	1	2	3	S	M	
	Elytra	1	2	3	S	M	
	Abdomens	1	2	3	S	M	

Colour change to: None (i.e. as newly dead)?

Dark	From		Cont	N	T	S	M	Most	All	Brown	From		Cont	N	T	S	M	Most	All
	To			N	T	S	M	Most	All		To			N	T	S	M	Most	All
Red	From		Cont	N	T	S	M	Most	All	Pale	From		Cont	N	T	S	M	Most	All
	To			N	T	S	M	Most	All		To			N	T	S	M	Most	All
Yellow	From		Cont	N	T	S	M	Most	All	Other	From		Cont	N	T	S	M	Most	All
	To			N	T	S	M	Most	All		To			N	T	S	M	Most	All

Proportion scale as above; degree: 1 - slight; 2 - distinct; 3 - strong; 4 - very strong. Use 'from' if consistent. Name taxa in notes if appropriate.

Other colour properties:

Other properties: name taxa in notes if appropriate. Scale as above.													
Abrasion	N	T	F	M	Most	All	Cong. mut.	N	T	F	M	Most	All
Crushing	N	T	F	M	Most	All	Ass. sclerites	N	T	F	M	Most	All
Rolling	N	T	F	M	Most	All	Local holing	N	T	F	M	Most	All
Compression	N	T	F	M	Most	All	Pitting	N	T	F	M	Most	All
Cracking	N	T	F	M	Most	All	Linear tracks	N	T	F	M	Most	All
Soft/pale	N	T	F	M	Most	All	Fresh, 'oily'	N	T	F	M	Most	All

Notes:
Ring choices to mark them.

Figure 11. Suggested revision of insect preservation recording sheet: to follow.

Table 1. 44-5 Parliament Street, York: sediment descriptions for samples from Section 1 (north-west), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 4. All sediments were recorded as 'moist' or 'just moist'.

Context	Height (m AOD)	Sample	Type of deposit	Sediment description
1004	13.7	10001	pit backfill (ss) or levelling deposit	lumps of pure light-mid grey clay in a matrix of mid-dark reddish/orange grey-brown firm (working crumbly, then plastic), slightly sandy clay silt with fragments of very rotted wood and rotted mortar to 10 mm, traces of charcoal and mm-scale yellowish 'ochre' patches; patch of white 'efflorescence'
1004	13.6	10002	ditto	essentially as 10001; lump of limestone to 150 mm and bone to 200 mm
1004	13.5	10003	ditto	matrix essentially as 10001/10002 but very little clay
1004	13.4	10004	ditto	essentially like 10003 but some apparently somewhat indurated 'earthy' lumps; mortar to 50 mm, twig fragments and tile all present
1017	13.2	10005	?surface deposit, perhaps dump rather than build-up	mid-dark grey-brown, just consolidated (working plastic), slightly sandy silty clay or clay silt with some organic detritus; mm-scale lighter and darker mottling; some 6-20 mm stones, mortar/plaster, brick/tile, pot, charcoal and small and large mammal bone fragments
1017	13.1	10006	ditto	as 10005 but more homogeneous and more organic
1020	13.0	10007	ditto	mid-dark slightly purplish-brown, soft, crumbly (working plastic) amorphous organic sediment with a clay silt texture; traces of limestone >60 mm and charcoal present; rare mm-scale orange patches (presumably oxidised herbaceous detritus and/or decayed wood)
1020	12.9	10008	ditto	mid-dark slightly orange- and purple-brown, soft, crumbly (working slightly plastic) amorphous organic sediment with some pot, large and small mammal bone fragments, fish bone and eggshell and appreciable quantities of leather fragments
1025	12.9	10009	ditto	mid-dark chocolate-brown, very soft, crumbly (working barely plastic) amorphous organic sediment (having very much the look of food debris) with some brick/tile, leather, wood (some mineral-replaced), nutshell, white 'efflorescence', small and large mammal bone fragments, marine mollusc shell, copper-corrosion products and fungal mycelium, the last presumably modern
1025	12.8	10010	?surface deposit, perhaps dump rather than build-up	mid-dark brown (with a gingery-orange cast) very soft, crumbly amorphous organic sediment showing some efflorescence of white crystals on surfaces within tub; ?dog coprolite and abundant wood present
1026	12.6	10011	ditto	dark grey-brown, crumbly, somewhat crisp (working just plastic), slightly sand clay silt in texture, with ?faecal concretions
1026	12.5	10012	ditto	as 10011 but slightly lighter and even more soft and crumbly; some pot present

1026	12.4	10013	ditto	dark grey (with orange/red cast), crumbly (working plastic) sandy clay silt with a well-rotted humic component; some burnt large and small mammal bone, and marine mollusc shell fragments; clear evidence of linear voids ('burrows') giving oxidation locally
1032	12.3	10014	ditto	a charcoal-rich deposit, very heterogeneous; matrix very dark grey, crisp (working almost plastic) sandy clay silt (texture) with pale orange reticulate mottling at mm-scale; large and small mammal bone fragments present; has the appearance of bonfire ash
1033	12.4	10015	ditto	mid-dark brown, just unconsolidated, crumbly (working just plastic), slightly sandy clay silt in texture; mottled darker and lighter at mm-scale and containing very dense ?concretions; one live earthworm!

Table 2. 44-5 Parliament Street, York: sediment descriptions for samples from Section 2 (south-east), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 5 . All sediments were recorded as 'moist' or 'just moist'.

Context	Height (m AOD)	Sample	Type of deposit	Sediment description
1101	13.4	20001	pit fill in secondary cut 1108	very heterogeneous, mid-dark orangeish-grey-brown, crumbly (working slightly plastic), slightly sandy clay silt, with varicoloured mottlings at mm-scale; abundant white 'efflorescence', some rotted mortar, brick/tile, charcoal and large mammal bone fragments
1101	13.3	20002	ditto	very heterogeneous, mid brown to mid grey-brown crumbly (working slightly plastic), slightly sandy, slightly clay silt with decayed amorphous organic sediment, showing orangeish patches; stones 20-60 mm present, also charcoal and very decayed wood and abundant brick/tile; much white 'efflorescence'
1102	13.2	20003	ditto	very heterogeneous, light greyish-brown, crumbly (working plastic) clay with amorphous organic sediment and fine herbaceous detritus; rotted mortar and very decayed wood present; some white 'efflorescence'
1104	13.1	20004	ditto	very dark brown, crumbly (working plastic), moderately humic silty clay/clay silt with 20-60 mm oolitic limestone fragments, white 'efflorescence', brick/tile, bark fragments, charcoal, and very decayed wood
1105	13.0	20005	ditto	slightly heterogeneous light to mid greyish sandy silty clay, just crumbly (working plastic); white 'efflorescence', mortar, brick/tile and charcoal all present
1106	12.9	20006	ditto	moderately heterogeneous, mid-dark greyish- to brownish, crumbly (working plastic), slightly sandy silty clay, perhaps showing an incipient ped structure; with limestone at 6-60 mm, white 'efflorescence and very decayed twig fragments
1111	12.8	20007	fill of very large pit (cut may be 1113)	dark grey-brown, crumbly (working just plastic), slightly sandy silt, with abundant mortar/plaster, brick/tile common and some very decayed wood, twigs, large mammal bone fragments and white 'efflorescence'
1111	12.6	20008	ditto	dark grey-brown, crumbly, humic, slightly sandy silt, with some large mammal bone and white 'efflorescence' and appreciable quantities of wood, some with bark
1114	12.5	20009	fill of very large pit (cut may be 1113)	dark grey-brown, just brittle to crumbly (working just plastic), slightly sandy clay silt, with pot, ?daub, very decayed wood, burnt large mammal bone, and moderate quantities of white 'efflorescence'
1114	12.5	20010	ditto	dark grey-brown, crumbly, slightly sandy clay silt with limestone 2-6 mm, brick/tile, pot, wood, large mammal bone, fish bone, leather, oyster shell, eggshell and white 'efflorescence'

1115	12.5	20011	ditto	dark grey-brown, slightly brittle to crumbly, humic, slightly sandy silt, with limestone 20-60 mm, mortar, brick/tile, wood, large mammal bone and oyster shell; a little mould growth (presumably recent)
1115	12.4	20012	ditto	moderately heterogeneous, slightly layered, mid to dark brown amorphous organic sediment, locally yellowed and blackened with (faecal) concretions, with a little grey-buff ash; a further important component is mid grey, slightly sandy (crumbly) clay silt
1116	12.3	20014	ditto	heterogeneous: essentially light and mid brown amorphous organic sediment, with light grey silt/ash and mid-dark grey silt patches, somewhat layered; with slight mineral deposition and faecal concretions
1120	12.4	20013	ditto	sample from very top of 1120; lithologically more like Sample 20012 from Context 1115
1120	12.2	20015	?lowermost fill of pit or layer into which pit was cut	dark grey-brown, crumbly (working just plastic) humic, slightly sandy silt, with colour mottles at 1 mm; some rotten mortar, brick/tile, pot, charcoal, burnt large mammal bone and oyster shell

Table 3. 44-5 Parliament Street, York: sediment descriptions for samples from Section 3 (south-west), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 6. All sediments were recorded as 'moist' or 'just moist'.

Context	Height (m AOD)	Sample	Type of deposit	Sediment description
1004	13.6	30001	surface deposit or uppermost extant fill of large pit 1015	heterogeneous, soft, amorphous organic sediment and buff silty clay/clay silt in dark grey-brown humic clay, with stones to 10 mm, mortar and white 'efflorescence'
1004	13.5	30002	ditto	very heterogeneous: dark brown (oxidising in places to reddish-brown) soft, crumbly (working plastic) silty clay with lumps of organic sediment; stones 6-20 mm, brick/tile and some white 'efflorescence' present
1008	13.3	30003	fill of pit 1015	mid-dark grey-brown, crumbly (working plastic) , sandy silty clay with small clasts of pale grey clay, traces of white 'efflorescence', charcoal, wood (chips from black to orange; very rotted); fruitstones in concretions; large mammal bone
1014	12.9	30004	ditto	mid, slightly ochreish-brown, just crumbly (working plastic and slightly stick) silty clay with 1- and 10-mm scale mottles more grey and more orange, and mortar, white 'efflorescence' and wood
1020	12.9	30005	very thick layer into which pit 1015 was cut	dark brown, soft, crumbly, slightly structured (working just plastic) silty amorphous organic sediment with stones 2-6 mm, ?mortar, brick/tile, small patches of white 'efflorescence', wood (mineral-replaced in part), and large mammal bone fragments
1032	12.5	30006	ditto (probably part of same context as last)	very dark brown, slightly soft to crumbly (working plastic), silty amorphous organic sediment with slight darker and lighter mottling, some pot, charcoal, wood, burnt bone and oyster shell; an iron object also present

Table 4. 44-5 Parliament Street, York: sediment descriptions for samples from Section 4 (north-east), Trench 1. The order follows the stratigraphic sequence, from uppermost downwards to facilitate cross-reference to Fig. 7. All sediments were recorded as 'moist' or 'just moist'.

Context	Height (m AOD)	Sample	Type of deposit	Sediment description
1107	13.5	40002	?extensive surface build-up or dump	heterogeneous: mid-brown to dark-grey plastic, slightly sandy clay silt with 1-10 mm-scale mottles, flecks of white amorphous material, clasts of pale grey clay, a well-rotted organic component, patches of ?peat and 1 mm patches of amorphous charcoal; brick/tile and mammal bone also present
1107	13.2	40003	ditto	very heterogeneous, jumbled on the 1 mm scale, typically dark grey-brown, more orange in places, crumbly, slightly plastic, humic slightly sandy clay silt/very rotted amorphous organic sediment; stones >60 mm and rotted mortar and brick/tile present, together with traces of mycelium
1109	12.9	40004	ditto	very heterogeneous: principally mid-dark grey-brown crumbly (working plastic), sandy clay silt texture with fine herbaceous detritus and amorphous organic sediment, and multicoloured clays ranging from mid-dark greyish- to reddish-brown; stone >60 mm, brick/tile, charcoal, large mammal bone and very rotted oyster shell present and very decayed wood common
1121	12.5	40005	ditto	heterogeneous on mm-scale, typically mid-dark grey-brown, crumbly (working plastic), slightly compressed, slightly sandy clay silt with fine herbaceous detritus and amorphous organic sediment; stones 20-60 mm (including very rooted oolitic limestone), very soft charcoal, very decayed wood, large mammal bone all present

Table 5. Sediment descriptions for samples from boreholes. 'Depth (m AOD)' is nominal, a rounded value for the middle of the sampled segment.

Context (and depth below datum)	Depth (m AOD)	Sample	Type of deposit	Sediment description
BH2 0.68-1.6m	13.2	2002	unknown	homogeneous, dark grey-brown, crumbly, sandy clay silt, with some wood 30-40 mm
BH2 2.50-2.55m	11.8	2007	ditto	dark, slightly greyish-brown, crumbly, slightly structured (working just plastic), slightly sandy humic silt, with small stones (<20 mm) and brick/tile
BH8 1.95-2.15m	12.3	8001	ditto	mid orange-brownish grey, crumbly (working slightly plastic), slightly sandy clay silt with ?amorphous organic material and fragments of charcoal, bone, limestone or mortar and brick/tile; mottled on mm scale with orange and grey, perhaps clasts of different sediments; some mould growth
BH8 2.15-2.28m	12.1	8002	ditto	mid-dark grey, crumbly(working plastic), sandy clay with flecks of charcoal; some mm-scale light brown patches and traces of mould growth
BH8 2.45-2.70m	11.8	8004	ditto	dark grey-brown, crumbly (working slightly plastic), slightly sandy humic silt with leather, well-preserved wood, bone and oyster shell; traces of mould growth
BH8 3.22-3.48m	11.0	8005	ditto	dark grey-brown, crumbly (working slightly plastic), slightly sandy silt with wood fragments; some mould growth
BH8 3.50-3.59m	10.8	8006	ditto	dark brown, crumbly, somewhat layered, (working just plastic), very humic sandy silt; wood common, 2-20 mm stones present; heterogeneous at cm-scale with patches of light brown fine sand and grey gritty silt
BH8 3.95-4.50m	10.1	8007	ditto	essentially as 8006, with oyster shell, limestone and reddish-brown decayed wood
BH8 4.75-4.95m	9.5	8008	ditto	pinkish-buff, plastic, slightly silty clay; some mould growth
BH8 4.95-5.35m	9.2	8009	ditto	mid-dark grey, slightly sandy clay silt; heterogeneous: quite crumbly in places and grey soft clay in others
BH8 5.35-5.50m	8.9	8010	ditto	heterogeneous: mixture of pale orange-brown crumbly (working plastic) silty clay and dark grey crumbly (more easily working plastic) gritty sandy clay silt; some mould growth
BH8 6.45-6.70m	7.7	8013	ditto	very humic (with some herbaceous detritus), crumbly (working plastic) sandy 'silt'

Table 6. 44-5 Parliament Street, York: pH, loss-on-ignition, water content data. C—Context; S—Sample; TWW—Total wet weight (g); CW—Crucible weight (g); WWS—Wet weight of sample (g); TDW—Total dry weight (g); DW—Dry weight of sample (g); TWI—Total weight after ignition (g); SWI—Sample weight after ignition (g); WW—Water content (g); WP—Water content; OW—Organic content (g); OP—Organic content %; MW—Mean water content %; MO—Mean organic content %.. pH was measured from separate subsamples to those for which water and organic content were estimated.

C	S	pH	TWW	CW	WWS	TDW	DW	TWI	SWI	WW	WP	OW	OP	MW	MO
1004	10001	7.0	28.0	14.4	13.6	23.6	9.2	22.6	8.2	4.4	32%	1.0	11%	32%	11%
1004	10001		29.1	14.0	15.1	24.4	10.4	23.3	9.3	4.7	31%	1.1	11%		
1004	10002	6.9	28.4	14.0	14.4	23.2	9.2	21.5	7.5	5.2	36%	1.7	18%	33%	14%
1004	10002		25.3	14.8	10.5	22.1	7.3	21.4	6.6	3.2	30%	0.7	10%		
1004	10003	6.5	25.0	14.9	10.1	21.4	6.5	20.4	5.5	3.6	36%	1.0	15%	36%	18%
1004	10003		23.4	13.4	10.0	19.7	6.3	18.4	5.0	3.7	37%	1.3	21%		
1004	10004	6.2	30.2	19.6	10.6	26.2	6.6	24.8	5.2	4.0	38%	1.4	21%	37%	20%
1004	10004		25.6	14.3	11.3	21.4	7.1	20.0	5.7	4.2	37%	1.4	20%		
1017	10005	6.6	33.0	18.6	14.4	27.4	8.8	25.7	7.1	5.6	39%	1.7	19%	39%	19%
1017	10005		30.5	19.2	11.3	26.0	6.8	24.7	5.5	4.5	40%	1.3	19%		
1017	10006	6.4	24.4	14.1	10.3	20.4	6.3	19.2	5.1	4.0	39%	1.2	19%	39%	20%
1017	10006		25.5	14.2	11.3	21.0	6.8	19.6	5.4	4.5	40%	1.4	21%		
1020	10007	6.3	25.3	14.6	10.7	20.7	6.1	19.3	4.7	4.6	43%	1.4	23%	42%	23%
1020	10007		23.9	13.9	10.0	19.8	5.9	18.4	4.5	4.1	41%	1.4	24%		
1020	10008	6.7	26.7	14.2	12.5	21.7	7.5	20.0	5.8	5.0	40%	1.7	23%	41%	23%
1020	10008		25.8	13.6	12.2	20.7	7.1	19.0	5.4	5.1	42%	1.7	24%		
1025	10009	6.8	25.5	14.9	10.6	20.7	5.8	19.1	4.2	4.8	45%	1.6	28%	42%	26%
1025	10009		24.7	14.2	10.5	20.6	6.4	19.1	4.9	4.1	39%	1.5	23%		

1025	10010	6.9	29.2	18.9	10.3	24.3	5.4	22.3	3.4	4.9	48%	2.0	37%	50%	40%
1025	10010		24.0	13.8	10.2	18.6	4.8	16.5	2.7	5.4	53%	2.1	44%		
1026	10011	6.8	25.8	15.5	10.3	21.2	5.7	19.8	4.3	4.6	45%	1.4	25%	46%	27%
1026	10011		24.3	13.9	10.4	19.4	5.5	17.8	3.9	4.9	47%	1.6	29%		
1026	10012	6.8	26.2	14.9	11.3	21.8	6.9	20.3	5.4	4.4	39%	1.5	22%	39%	22%
1026	10012		25.5	14.7	10.8	21.2	6.5	19.7	5.0	4.3	40%	1.5	23%		
1026	10013	7.0	24.3	13.5	10.8	20.9	7.4	19.7	6.2	3.4	31%	1.2	16%	38%	21%
1026	10013		26.9	14.8	12.1	21.6	6.8	19.8	5.0	5.3	44%	1.8	26%		
1032	10014	7.3	26.2	14.5	11.7	21.4	6.9	19.7	5.2	4.8	41%	1.7	25%	42%	26%
1032	10014		26.3	14.7	11.6	21.4	6.7	19.6	4.9	4.9	42%	1.8	27%		
1033	10015	7.2	25.1	14.6	10.5	20.9	6.3	19.5	4.9	4.2	40%	1.4	22%	41%	23%
1033	10015		25.9	14.9	11.0	21.3	6.4	19.8	4.9	4.6	42%	1.5	23%		
1101	20001	6.9	25.3	14.9	10.4	21.5	6.6	20.0	5.1	3.8	37%	1.5	23%	35%	20%
1101	20001		24.4	14.4	10.0	21.1	6.7	19.9	5.5	3.3	33%	1.2	18%		
1101	20002	7.0	52.6	39.0	13.6	48.3	9.3	47.2	8.2	4.3	32%	1.1	12%	30%	12%
1101	20002		51.4	39.1	12.3	48.0	8.9	46.9	7.8	3.4	28%	1.1	12%		
1102	20003	7.2	30.7	14.1	16.6	25.9	11.8	24.5	10.4	4.8	29%	1.4	12%	31%	13%
1102	20003		28.8	14.8	14.0	24.1	9.3	22.7	7.9	4.7	34%	1.4	15%		
1104	20004	7.0	26.8	13.9	12.9	21.8	7.9	20.0	6.1	5.0	39%	1.8	23%	40%	24%
1104	20004		30.6	19.0	11.6	25.9	6.9	24.2	5.2	4.7	41%	1.7	25%		
1105	20005	6.8	52.5	39.4	13.1	47.3	7.9	45.7	6.3	5.2	40%	1.6	20%	39%	21%

1105	20005		56.4	40.2	16.2	50.3	10.1	48.2	8.0	6.1	38%	2.1	21%		
1106	20006	6.6	28.8	18.1	10.7	24.4	6.3	23.2	5.1	4.4	41%	1.2	19%	42%	22%
1106	20006		25.3	15.3	10.0	21.0	5.7	19.6	4.3	4.3	43%	1.4	25%		
1111	20007	6.8	25.2	14.2	11.0	21.0	6.8	19.4	5.2	4.2	38%	1.6	24%	38%	23%
1111	20007		25.2	14.2	11.0	21.1	6.9	19.6	5.4	4.1	37%	1.5	22%		
1111	20008	6.6	49.3	37.2	12.1	44.6	7.4	42.8	5.6	4.7	39%	1.8	24%	39%	25%
1111	20008		52.8	36.3	16.5	46.2	9.9	43.7	7.4	6.6	40%	2.5	25%		
1114	20009	6.5	49.7	36.5	13.2	43.7	7.2	41.7	5.2	6.0	45%	2.0	28%	46%	30%
1114	20009		60.5	41.1	19.4	51.5	10.4	48.1	7.0	9.0	46%	3.4	33%		
1114	20010	6.7	52.1	39.5	12.6	46.5	7.0	44.6	5.1	5.6	44%	1.9	27%	43%	26%
1114	20010		50.5	39.2	11.3	45.8	6.6	44.2	5.0	4.7	42%	1.6	24%		
1115	20011	6.7	25.6	14.6	11.0	20.5	5.9	18.7	4.1	5.1	46%	1.8	31%	46%	31%
1115	20011		25.9	14.6	11.3	20.8	6.2	18.8	4.2	5.1	45%	2.0	32%		
1115	20012	6.5	47.3	36.8	10.5	41.7	4.9	39.8	3.0	5.6	53%	1.9	39%	48%	32%
1115	20012		47.6	36.5	11.1	42.9	6.4	41.3	4.8	4.7	42%	1.6	25%		
1120	20013	6.7	56.2	45.3	10.9	50.9	5.6	49.2	3.9	5.3	49%	1.7	30%	50%	32%
1120	20013		51.5	39.2	12.3	45.1	5.9	43.1	3.9	6.4	52%	2.0	34%		
1116	20014	6.8	52.3	40.5	11.8	46.9	6.4	45.1	4.6	5.4	46%	1.8	28%	46%	28%
1116	20014		52.5	39.6	12.9	46.6	7.0	44.6	5.0	5.9	46%	2.0	29%		
1120	20015	6.7	57.9	36.0	21.9	49.0	13.0	46.2	10.2	8.9	41%	2.8	22%	41%	22%
1120	20015		55.3	38.8	16.5	48.5	9.7	46.4	7.6	6.8	41%	2.1	22%		

1004	30001	6.7	51.7	38.8	12.9	46.5	7.7	45.0	6.2	5.2	40%	1.5	19%	39%	18%
1004	30001		56.3	40.0	16.3	50.0	10.0	48.4	8.4	6.3	39%	1.6	16%		
1004	30002	6.1	30.0	19.1	10.9	25.5	6.4	24.5	5.4	4.5	41%	1.0	16%	43%	17%
1004	30002		24.5	13.5	11.0	19.6	6.1	18.5	5.0	4.9	45%	1.1	18%		
1008	30003	6.1	24.5	12.9	11.6	20.2	7.3	18.8	5.9	4.3	37%	1.4	19%	38%	18%
1008	30003		23.6	13.1	10.5	19.6	6.5	18.5	5.4	4.0	38%	1.1	17%		
1014	30004	6.0	54.7	39.8	14.9	48.5	8.7	47.2	7.4	6.2	42%	1.3	15%	40%	15%
1014	30004		55.7	36.5	19.2	48.2	11.7	46.4	9.9	7.5	39%	1.8	15%		
1020	30005	6.5	25.2	14.9	10.3	20.1	5.2	18.1	3.2	5.1	50%	2.0	38%	48%	36%
1020	30005		28.8	18.7	10.1	24.2	5.5	22.4	3.7	4.6	46%	1.8	33%		
1032	30006	6.4	27.1	14.3	12.8	20.7	6.4	18.5	4.2	6.4	50%	2.2	34%	49%	36%
1032	30006		25.9	14.4	11.5	20.3	5.9	18.1	3.7	5.6	49%	2.2	37%		
1107	40002	6.8	23.9	13.9	10.0	20.0	6.1	18.8	4.9	3.9	39%	1.2	20%	35%	17%
1107	40002		27.0	14.4	12.6	23.0	8.6	21.8	7.4	4.0	32%	1.2	14%		
1107	40003	7.0	30.8	18.8	12.0	26.2	7.4	25.0	6.2	4.6	38%	1.2	16%	39%	18%
1107	40003		30.8	19.0	11.8	26.1	7.1	24.7	5.7	4.7	40%	1.4	20%		
1109	40004	7.0	25.3	14.6	10.7	22.5	7.9	21.9	7.3	2.8	26%	0.6	8%	31%	12%
1109	40004		24.6	13.5	11.1	20.6	7.1	19.4	5.9	4.0	36%	1.2	17%		
1121	40005	7.2	28.8	14.5	14.3	23.4	8.9	21.6	7.1	5.4	38%	1.8	20%	35%	18%
1121	40005		25.8	13.7	12.1	22.0	8.3	20.7	7.0	3.8	31%	1.3	16%		

Table 7. 44-5 Parliament Street, York: some statistics for estimates of water content.

Height	Mean	SD	Min.	Max.
13.0 m OD	37%	3.8	30%	43%
<13.0 m OD	43%	5.0	31%	50%

Table 8. 44-5 Parliament Street, York: some statistics for estimates of pH.

Height	Mean	SD	Min.	Max.
13.0 m OD	6.7	0.35	6.1	7.2
<13.0 m OD	6.7	0.29	6.0	7.3

Table 9. 44-5 Parliament Street, York: some statistics for estimates of organic content.

Height	Mean	SD	Min.	Max.
13.0 m OD	18%	3.6	11%	24%
<13.0 m OD	26%	6.7	12%	40%

Table 10. 44-5 Parliament Street, York: comments on biota from selected samples from Trench 1. In each case, the subsample weight was 2 kg.

Context	Height (m AOD)	Sample	Type of deposit	Comments on biota
1017	13.2	10005	?surface deposit, perhaps dump rather than build-up	a few poorly preserved seeds from a small range of weed taxa, with some evidence for damp ground, perhaps trampled areas with impeded drainage; rather a large component of charcoal; traces of *Trichuris* eggs and phytoliths; quite large numbers of fly puparia (including Sphaeroceridae and Sepsidae), *?Heterodera* (nematode) cysts and mites; small beetle assemblage typical of medieval York but quite probably mainly 'background fauna'; **biota indicative of external deposition**
1101	13.4	20001	pit fill in secondary cut 1108	a low concentration of seeds showing variable preservation, most of them weeds, though with rather large numbers of toad-rush (*Juncus bufonius* L.) suggesting impeded drainage; trace of fig (*Ficus carica* L.) seeds; no parasitic nematode eggs, but abundant phytoliths; ?*Heterodera* cysts and mites abundant; some fly puparia; appreciable numbers of grain pests (*Sitophilus granarius* (L.) and *Oryzaephilus surinamensis* (L.), remaining insects of mixed origins; **nature uncertain, but perhaps including decayed stable manure**
1101	13.3	20002	ditto	a low concentration of seeds with variable preservation, though mainly poor; some matted 'grassy' debris; mainly weeds with some indicators of damp ground (*J. bufonius* again*)*, and small numbers of *Sphagnum imbricatum* Hornsch. ex Russ., a peat-bog moss; traces of fig seeds; no parasitic nematode eggs; numerous fly puparia, mites and ?*Heterodera* cysts; 'many' grain pests and *Ptinus fur* (L.), 'several' individuals of thee other house fauna taxa and smaller numbers of some others; hints of 'stable manure' decomposers; **probably at least partly stable manure**
1102	13.2	20003	ditto	a low concentration of seeds, several of them charred; mainly weeds of cultivated soils and waste places, perhaps from straw; trace of fig seeds; trace of *Trichuris* eggs; numerous mites, fly puparia and pupae, ants, and ?*Heterodera* cysts; grain pests and house fauna, traces of 'stable manure' decomposers; **probably at least partly stable manure**, with perhaps some human faeces
1104	13.1	20004	ditto	a low seed concentration; mainly weeds; some mineralised remains (oats, *Avena* sp.); trace of fig seeds; trace of *Trichuris* eggs and several diatoms; numerous puparia and mites; appreciable numbers of grain pests; remaining beetles suggest a variety of origins; traces of eggshell membrane, fish scale and fish bone; **apparently mixed waste material**, perhaps including human faeces

1105	13.0	20005	ditto	low concentration of seeds, preservation variable; mainly weeds, a few wetland/wet grassland taxa; moderate numbers of fig seeds; numerous ?*Heterodera* cysts and mites, some ants and fly puparia; appreciable numbers of grain pests and a somewhat mixed decomposer beetle fauna; traces of eggshell membrane and fish bone; **apparently mixed waste material**, perhaps including human faeces
1106	12.9	20006	ditto	moderate concentration of seeds, with variable preservation; mainly weeds, but moderate numbers of fig seeds, corncockle (*Agrostemma githago*) seed fragments and *Juncus bufonius* seeds; one charred grape (*Vitis vinifera*) seed fragment; a few *Trichuris* eggs and phytoliths; very abundant fly puparia; numerous mites; numerous grain pests and indications of house fauna; traces of eggshell membrane and fish bone; **apparently mixed waste material** including domestic debris, and perhaps including human faeces
1111	12.8	20007	fill of very large pit (cut may be 1113)	very largely faecal concretions and wood fragments (including some 'chips') with abundant seeds of goosefoot (*Chenopodium* Section *Pseudoblitum*) and moderate numbers of corncockle seed fragments and celery-leaved crowfoot; remaining taxa a mixture of weeds and wetland plants; trace of linseed (*Linum usitatissimum* L.) seed fragments; abundant fly puparia, including Sepsidae and Sphaeroceridae; mixed urban beetle assemblage, but with a substantial aquatic component (also traces of *Daphnia* ephippia); traces of eggshell and eggshell membrane, bone (some of it burnt), including fish bone and fish scale; **pit functioning as depression with temporary open water, receiving mixed waste**
1004	13.6	30001	surface deposit or uppermost extant fill of large pit 1015	a low concentration of seeds, rather poorly preserved; moderate numbers of fig, weld (*Reseda luteola*) and toad-rush seeds, the remaining taxa mainly weeds; trace of *Sphagnum imbricatum* leaves; trace of *Trichuris* eggs and abundant phytoliths; mixed beetle fauna; **interpretation uncertain**
1004	13.5	30002	ditto	a moderate concentration of seeds with variable preservation, but often quite good; moderate numbers of several taxa, including fig and several weeds (some charred cornfield weeds); trace of flax capsule fragments; abundant phytoliths and some diatoms; numerous fly puparia; very small beetle assemblage; traces of fish bone; **interpretation uncertain**
1014	12.9	30004	fill of pit 1015	moderate concentration of seeds with mostly good preservation; large numbers of fig seeds, and a single charred grape seed fragment; remaining taxa mainly weeds, but several *Sphagnum imbricatum* leaves; one *Trichuris* egg and a few diatoms and phytoliths; subjectively includes stable manure beetle fauna; **perhaps mixed organic waste**, including food waste and conceivably also stable manure
1107	13.2	40003	ditto	low seed concentration, mostly with moderate to poor preservation; moderate numbers of fig seeds, the remainder essentially weeds or wetland taxa; traces of hazel (*Corylus avellana*) nutshell; trace of *Trichuris* eggs and some phytoliths; appreciable numbers of grain pests, remaining beetles a small typically urban assemblage; traces of fish bone and eggshell membrane

Table 11. 44-5 Parliament Street, York: scores for quality of preservation of organic components recorded from residues. For preservation codes, see Figure 8; 'wood' refers to wood recorded under 'other wood' on the recording sheet.

Context	Sample	wood	bark	charcoal	concretions	free 'bran'	herbaceous detritus	nutshell	fruits/seeds	moss
1004	10001			G-M						
	10002		G-M	G-M					P	
	10003	M-V		E-M					P	
	10004	P-V		G-M	M-P			M		
1017	10005	V		G				M-P		
	10006	V		G-M						M
1020	10007	P-V		G-M					G-P	P-V
	10008	P-V		G-M						
1025	10009	G-P		G-M				G-P		
	10010	P-V		G-M						
1026	10011	V		G-M					P-V	
	10012	M-V		E-M					E-V	
	10013	V		G-M						
1032	10014	V		E-M						
1033	10015	P-V		E-M						
1101	20001									
	20002									
1102	20003	P		M					P	

1104	20004	P-V		G-M				P	P	
1105	20005	P-V		G-M						
1106	20006	P		G-M		?			G-M	
1111	20007	P-V		M					V	
	20008	P-V		M				P	P	
1114	20009	M-V		G-M					V	
	20010	M-V		M					V	
1115	20011	M-V		M-P					M-V	
	20012				M-P	P-V			P-V	
1116	20014	P-V			M-V				P-V	
1120	20015	V		E-G					M-V	
1004	30001	P-V		M				M(c)	G	
	30002			?			G-M		G-M	
1008	30003	V		G-M			G(c)			
1014	30004	P		M					G-P	
1020	30005	M-V		G-M						M
1032	30006	P-V		M				M(m)	P-V	
1107	40002	P-V		G-M						
	40003	P-V		G-P					V	
1109	40004	V		G-M						
1121	40005	P-V	M	G-M						

Table 12. 44-5 Parliament Street, York: scores for completeness and colour of Trichuris *eggs, together with semi-quantitative abundances of organic and inorganic sediment particles and other microfossils. Key—column heads: NS—no. slides examined; n—no.* Trichuris *eggs recorded; O/M—proportions of organic and mineral matter; P—phytoliths; D—diatoms; FH—fungal hyphae; FS—fungal spores;P/S—pollen/spores; N—other nematode eggs. Frequency scores—+ = present; F = few; S = several; M = many; VM = very many; ++ = predominant component; 1:1 = roughly equal proportions. Other nematodes: A =* Ascaris*; O =* ?Oxyurus equi*. Where more than one slide has been examined, the records of remains other than* Trichuris *refer to the first slide examined.*

Context	Sample	NS	n	Mean complete-ness score	Mean colour score	O/M	P	D	FH	FS	P/S	N
1004	10001	0	1			O++						
	10002	2	4	5	2	1:1	S	S				
	10003	6	5	4	2	1:1	M	S				
	10004	6	2	5	3	O++	S	F	F	F		
1017	10005	8	2	4	3	O++	S					
	10006	7	5	3	3	O++	M					
1020	10007	0	1			1:1	M					
	10008	3	5	3	2	O++	VM		S	S		O1
1025	10009	1	3	2	2	O++	S	F		F		
	10010	5	5	4	2	O++	M	S				?A1
1026	10011	4	6	5	2	O++	S	S				
	10012	6	2	3	3	O++	M	S		S		
	10013	0	1			1:1					F	
1032	10014	0	1			O++						
1033	10015	0	1			1:1	M	S		S		?A2
1101	20001	0	1			1:1	M		F	F		

	20002	0	1			O++		F	F	F	F	
1102	20003	1	3	3	1	1:1		F				
1104	20004	3	3	3	3	1:1	F	S	F	F	F	
1105	20005	3	3	2	2	1:1	M					
1106	20006	6	3	4	2	O++	S	F				
1111	20007	0	1			1:1	M	F	F	F	F	
	20008	0	1			1:1	M	M	S	S		
1114	20009	9	2	4	3	O++	M	M		M		
	20010	0	1			1:1	S	M		+		
1115	20011	6	2	3	3	O++	F	S		S		
	20012	13	1	3	2	O++	S					
1116	20014	14	1	5	2	O++	S		+	+	+	A1
1120	20013	11	1	4	2	O++	S		M	M		?A2
	20015	0	1			1:1	M	M			S	
1004	30001	4	3	5	3	1:1	M	F	S	S		?A1
	30002	0	1			O++	M	S				
1008	30003	0	1			O++	S	S			S	
1014	30004	1	3	5	3	O++	S	F	S	S		
1020	30005	6	5	4	2	1:1	M	M		M	S	
1032	30006	6	1	5	2	O++	M	F		M	S	
1107	40002	6	3	4	3	O++	S		S	S		
	40003	8	4	4	2	O++	S	F				
1109	40004	2	3	4	1	1:1	S	F				
1121	40005	2	3	5	2	1.:1	F				F	

Table 13. 44-5 Parliament Street, York: record of preservation of insect remains. Generally 'pale' seems to be a successor to 'brown' in the decay pathway. Sample 8013 showed decay which was apparently different from the remainder of the material. The fossils appeared 'dull' in an undefinable way, possibly a result of separate 'darkening' and 'paling' processes.

Context	Sample	Approx. beetle/bug MNI	Approx. no. other insects	Enough to estimate preservation?	Any completely rotted?	Erosion	Fragmentation	Colour change	Others
1004	10001	20-30	few 10s	borderline	no	3.0-4.0 continuous	3.0	brown 1-4 continuous, mode 4	some pale
	10002	20-30	few 10s	borderline	no	4.0	4.0	brown 2-3 continuous, even	hints of yellow, ?following brown
	10003	<10	few	borderline	perhaps	3.5	3.5	some yellow 4 some brown 2	
	10004	10-20	few	borderline	yes	4.5	3.0	brown 3 pale 2	?pale; many thinned
1017	10005	10-20	few	yes	no	2.0-4.0 continuous	1.5	brown 0-1 continuous	1 ?rolled *Aphodius*
	10006	<10	few	borderline	no	4.0	3.5	brown 2	1 yellowed
1020	10007	<10	few 10s	borderline	no	2.5	1.5	brown 1 all	guestimates
	10008	<10	few 10s	no	no	0	0	brown 2	cracking (trace)
1025	10009	<10	few	borderline	no	3.5-4.5 continuous	3.0	pale 0-3 continuous	
	10010	<10	few	no	no	0	0	brown 2	
1026	10011	10-20	few	borderline	perhaps	4.0	3.5	yellow 0-1 continuous, brown 0-3 continuous	pale 0-3
	10012	<10	few	borderline	no	3.5	3.0	brown 0-2 continuous	pale 0-3
	10013	<10	none	no	no	0	0	-	-
1032	10014	<10	few	borderline	yes	5	0	brown 2-3	

1033	10015	10-20	few	borderline	perhaps	4.0	4.0	brown 2 (most)	pale 2 (most)
1101	20001	10-20	few 10s	yes	perhaps some	4.5	2.0	yellow 2 brown 2	pale 1-3 continuous; continuous variation between colours
	20002	20-30	few 10s	yes	perhaps	1.0-3.5, mode 1.0	1.0-2.0	brown 0-1, mostly 1	small number darkened and some yellow 2
1102	20003	20-30	few 10s	yes	perhaps	2.5-3.5 continuous	1.5-2.0 continuous	brown 2 most	most distinctly pale
1104	20004	10-20	few 10s	yes	no	4.0	3.0	brown 2 all	most pale 0-3 continuous; 1 mineralised
1105	20005	20-30	few 10s	yes	perhaps	4.0	3.0	brown 0-3 continuous	most pale 0-3; 1 mineralised
1106	20006	10-20	few 10s	yes	no	1.5-4.5 continuous	1.0-2.0 continuous	brown 0-3	pale 0-2
1111	20007	10-20	few	yes	no	3.5	2.0-4.0 continuous	brown 1-2 continuous (most)	some pale
	20008	10-20	few 10s	yes	no	3.5	3.0	brown 1-2 continuous (most)	some pale
1114	20009	20-30	few 10s	yes	no	3.0	3.0	brown 2 (most)	some darkened
	20010	20-30	few 10s	yes	no	3.5	2.0	brown 2 (50%)	some dark 2, some yellow 2
1115	20011	20-30	several 10s	yes	no	2.0-3.5 continuous	3.0	brown 1 (50%)	some dark 1, some pale 2
	20012	<10	several 10s	yes	no	3.0	0	brown 1 (most)	some dark 2
1116	20014	10-20	few hundreds	yes	no	2.0-4.0 continuous	0	brown 2 (most)	hint of yellow in brown; some dark 1

1120	20015	10-20	few	yes	no	4.0	3.0	brown 2 (most)	hint of yellow in brown; some pale 3 (rarely zoned)
1004	30001	20-30	few 10s	yes	no	4.0	1.5	brown 3-4 continuous, mode 4	some zoned: hint of yellow in brown; some pale 1; trace local holing
	30002	30-50	several 10s	yes	no	2.5-4.0 continuous	3.0	brown 1-4 continuous	trace pale 4, zoned; trace mineralised
1008	30003	10-20	few	borderline	perhaps	3.5-4.0 continuous	4.0	brown 2	several zoned pale; trace pitting
1014	30004	30-50	few 10s	yes	no	2.0-4.0 continuous	3.0	brown 1-3	hints of yellow in brown; some pale 1, trace zoned
1020	30005	10-20	few	borderline	no	3.0	2.5	brown 2 (most)	trace pitting
1032	30006	20-30	few 10s	yes	no	2.0-4.0 continuous	0	brown 1-3 most	hints of yellow in brown; half fossils pale 3; trace pitting
1107	40002	10-20	few	borderline	yes, many	4.0	3.0-4.0 continuous	brown 2	thinning (several)
	40003	10-20	few 10s	yes	yes, many	4.5	0	brown 0-3 continuous	pale 0-3 continuous; trace cracking, few thinned
1109	40004	20-30	few	borderline	perhaps	2.5-4.0 continuous	2.5	brown 2	pale 2; trace thinning
1121	40005	<10	few 10s	yes	perhaps	3.0	0	brown 0-1 continuous	pale 0-3 continuous

BH2 0.68-1.6m	2002	10-20	few 10s	yes	no	2.5-3.5 continuous	2.5	brown 1 (about one-fifth)	pale 2 (about one-fifth); trace with zonal paling
BH2 2.50-2.55m	2007	10-20	few 10s	yes	no	3.0-4.0 continuous	3.0-4.0 continuous	brown 2-3 continuous	some pale 1
BH8 1.95-2.15m	8001	<10	few	borderline	no	3.5	4.5	brown 1 (most)	?chlorophyll extracted into alcohol
BH8 2.15-2.28m	8002	<10	none	no	perhaps	0	0	-	-
BH8 2.45-2.70m	8004	10-20	few 10s	yes	no	3.0	2.0	brown 1 (most)	1 rolled/folded *Aphodius*
BH8 3.22-3.48m	8005	10-20	few 10s	yes	no	1.5-3.0 continuous, evenly distributed	1.5	brown 1 (about half)	some dark 1; trace fresh, 'oily'
BH8 3.50-3.59m	8006	20-30	several 10s	yes	no	4.0	3.0	brown 2 (general)	trace dark 1
BH8 3.95-4.50m	8007	20-30	few 10s	yes	no	2.5-4.0 ?bimodal at extremes	4.0	brown 1 (most)	
BH8 4.75-4.95m	8008	<10	few	no	-	0	0	-	-
BH8 4.95-5.35m	8009	<10	few	borderline	no	?3.0	0	-	-
BH8 5.35-5.50m	8010	<10	few	borderline	no	?3.0	0	-	-
BH8 6.45-6.70m	8013	20-30	few 10s	yes	no	2.0	2.0-3.0 continuous	pale 2 (?most)	trace dark 1

Appendix: Results of evaluation of sediment samples

This material has been reproduced verbatim from the evaluation report (Carrott *et al.* 1995)

The sediment samples

The results of the investigations are presented in context number order, with information provided by the excavator in brackets. Those plant and invertebrate remains preserved by anoxic waterlogging generally appeared to be undergoing active decay; the evidence for, and significance of, this is discussed below.

Context 1006 [mid 11th century to mid 13th century - fill]
Sample 1

Moist, mid grey-brown, crumbly (working plastic), silty clay to clay silt. Mortar/plaster, brick/tile, charcoal and very rotted wood were present.

Most of the small residue consisted of sand with moderate amounts of brick/tile (to 20 mm) and charcoal (to 15 mm); there were traces of mortar, stones and bone (including fish bone), and decayed wood was present in all fractions in small amounts. Identifiable plant remains were sparse and poorly to moderately well preserved; most were seeds or fruits from weed taxa but there were some very slight hints that food remains, perhaps from faecal material, might formerly have been present. A few food taxa (fig, *Ficus carica* L., and perhaps also opium poppy, *Papaver somniferum* L.) were also recorded in the small flot. The presence of leaves of the peat-bog moss *Sphagnum imbricatum* Hornsch. ex Russ. is noteworthy.

About 30 beetle taxa were noted in the flot, together with a few other invertebrates. Some quite delicate remains had been preserved, but the fossils had a characteristic yellow or yellow-brown coloration, and appeared to be in the early stages of aerobic decay (resembling remains in some modern death assemblages seen by HK). There were numerous individuals of the grain pests *Oryzaephilus surinamensis* (L.) and *Sitophilus granarius* (L.). The abundance of the latter, which is normally the least numerous of the grain pests in archaeological assemblages, perhaps indicates that the remains originated in faeces, having been eaten with spoiled grain (*S. granarius* develops inside whole grains and is thus particularly likely to be ingested). A few water beetles were noted; these may have invaded an open pit but the rarity of other 'outdoor' forms may suggest that they were brought in water.

The material seen in the 'squash' was mostly inorganic with a large amount of organic detritus, some fungal hyphae (perhaps modern), a few diatoms and five *Trichuris* sp. (whipworm) eggs (one with both polar plugs).

This deposit appears to have contained some very poorly preserved human faecal material.

Context 1007 [mid 11th century to mid 13th century - fill]
Sample 2

Moist, mid grey-brown, crumbly (working slightly plastic), slightly sandy clay silt. Very small stones (2 to 6 mm), brick/tile, charcoal, wood and fragments of bone were present in the sample.

Cinder (to 30 mm) and charcoal (to 20 mm) made up a large proportion of the small residue, with sand the largest component of the finer fractions. Traces of bone and some small stones were present, with very decayed wood in all fractions. The concentration of identifiable plant remains was low and preservation was poor. The taxa present were mostly weeds, but toad-rush (*Juncus bufonius* L.), recorded in moderate numbers, suggests low-growing vegetation in damp or wet places, perhaps trampled paths with impeded drainage, whilst *Sphagnum imbricatum* leaves were again recorded, this time more frequently.

Arthropod remains were present in rather small numbers, with fly puparia the most abundant. The limited group of beetles consisted of species typical of urban deposits, but (subjectively) may have included a significant component of invaders of foul matter—with weak indications of material with the consistency of stable manure. The preservational condition of the insect remains was unusual.

The 'squash' yielded no parasite eggs; there was about 50% each of organic detritus and mineral sediment, with a few diatoms.

The balance of evidence suggests the presence of some rather foul organic matter in or near to the pit. The plant remains (including urban weeds) and low concentration of invertebrates may indicate that this deposit consisted of material taken from a ground surface and used to backfill the feature.

Context 1008 [mid 11th century to mid 13th century - fill]
Sample 3

The sample consisted mostly of concretions ranging in colour from yellow to orange-brown to dark brown to black with a matrix of moist, mid grey-brown, crumbly amorphous organic matter and silt. Pot, wood and fruitstones (embedded in the concretions) were also present.

The small residue included moderate amounts of faecal concretions (to 65 mm) and charcoal (to 15 mm); sand made up most of the finer fractions. There were also traces of pottery and mammal and fish bone and a little brick/tile (to 5 mm). Plant remains were sparse and preservation was moderately good to poor. Consistent with the presence of faecal concretions, the only moderately abundant identifiable plant remains were seed fragments of corncockle (*Agrostemma githago* L.), likely to have been an unavoidable contaminant of flour-based foods. The other taxa were mainly weeds of cultivated land or waste places and are of no interpretative significance.

Arthropod remains were rare and mostly rather decayed, being red-brown in colour.

The 'squash' showed mostly mineral grains with a large amount of organic detritus, a few fungal spores, diatoms and modern soil nematodes and three *Trichuris* sp. eggs.

There is no doubt that this deposit consisted largely of (human) faecal material preserved in a mineral matrix which formed around the remains *in situ*.

Context 1014 [11th to 12th century - fill]
Sample 8

Moist, mid grey-brown, plastic to sticky, silty clay with patches of very rotted organic matter. Brick/tile, rotted ?mortar/plaster, charcoal and wood were present.

The small residue contained moderate amounts of brick/tile (to 30 mm) and sand, with traces of charcoal, decayed wood, rotted mortar and bark. There were moderate numbers of identifiable plant remains whose state of preservation ranged from good to poor. Most notable were abundant fig seeds (whose generally good state of preservation reflects their resistance to decay); there were no other convincing 'foodplants' apart from some wheat/rye 'bran' fragments and an opium poppy seed, the other taxa mostly being weeds, particularly seed fragments of corncockle. *Sphagnum imbricatum* leaves were again present.

The flot contained a rather small group of rather poorly preserved insects, mostly synanthropic species typical of post-Conquest material seen by HK. This being so, and in view of the evidence from plant remains for faeces, the specimens of *Sitophilus granarius* may well have originated in ingested food, in the way discussed for sample 1.

The 'squash' was mostly inorganic with some organic detritus, many fungal spores and three *Trichuris* sp. eggs.

It is likely that some faecal material was present in this deposit.

Context 1027 [fill]
Sample 14

Moist, mid to dark orange-brown, crumbly, amorphous organic sediment or very humic silt with abundant faecal concretions and some bird bone present.

The moderately large residue was dominated by fragments of faecal concretion (to 80 mm) with some fish bones; the finer fractions were mostly sand with a little wheat/rye 'bran'. Other plant remains were sparse and preservation ranged from poor to good. Only corncockle seed fragments were present in more than very small amounts. The taxa represented were mostly weeds with a few probable foodplants (including apple 'core' and seeds, a linseed (*Linum usitatissimum* L.) fragment, blackberry (*Rubus fruticosus* agg.) and hazel nutshell (*Corylus avellana* L.)).

The flot contained quite large numbers of insects, showing unusual preservation (indicated by the yellowish to dirty orange colour). Fly puparia were predominant, and it was estimated that in excess of 100 ?Sphaeroceridae were present. The beetles were a heterogeneous group including species associated with foul matter, human habitation and (in very small numbers) open-air habitats. Most of the beetles probably entered the pit accidentally or in search of breeding places, although unlike the flies none appear to have established breeding populations.

The 'squash' gave 14 *Trichuris* eggs, two of which retained one polar plug, the remainder none; preservation was poor. Otherwise, there was organic detritus with many mineral grains, and a few fungal hyphae (perhaps modern) were noted.

This was another deposit rich in human faecal material, though with generally poor preservation of plant and invertebrate macrofossils.

Context 1028 [11th to 12th century - fill]
Sample 15

Gingery-brown to dark brown (to black internally), brittle concretions.

There was a large residue from this subsample, most of it consisting of faecal concretions larger than 4 mm, and reaching a maximum of 40 mm. The finer fractions (especially the <0.3 mm), not surprisingly, were rich in wheat/rye ‘bran’ and there was some leek/onion (*Allium* sp.) leaf epidermis. Other components were restricted to a little fish bone and charcoal. Corncockle seed fragments were abundant (and there was some bird eggshell membrane representing another food component), but the few other plant remains were mainly from weed taxa.

Only a fraction of the large flot was examined for insect remains. Fly puparia were abundant but few beetles were seen. It seems likely that this deposit was either too foul for colonisation by beetles (some fly species being able in the immature stages to tolerate extremely vile conditions), or that burial was rapid.

The ‘squash’ was mostly organic detritus with many mineral grains, some plant tissue and fungal hyphae (perhaps modern) and twenty-three *Trichuris* sp. eggs.

There is no doubt that the bulk of this sample was faecal material.

Context 1030 [11th to 12th century - fill]
Sample 16

Moist, mid orange-grey-brown, crumbly, slightly silty amorphous organic sediment. Very small and small stones (2 to 20 mm), brick/tile, twigs, eggshell and fly puparia were present and faecal concretions were common in the sample.

The small to moderately large residue consisted predominantly of what appeared to be very rotted mortar or granular lime. The largest fragments were 20 mm but it was frequent or abundant in all fractions. There were moderate amounts of charcoal, too, the largest being 15 mm, with traces of pottery, bone and wood, and a single small (20 mm) fragment of faecal concretion. The small to moderate concentration of identifiable plant remains (which were in a poor to moderately good state of preservation) included some weed seeds and corncockle seed fragments and a few taxa which might represent wetland habitats. The single poorly preserved seed of opium poppy might have originated from a plant which was a weed or a foodplant. Two snails were also recorded (one *Vallonia pulchella* (Müller), one *Vallonia* sp.), of no interpretative significance.

Insects were numerous in the flot. The most abundant were fly puparia, but there was a group of beetles characteristic of rather foul decaying matter, together with some indicators of herbaceous vegetation. Two specimens of the bark beetle *Leperisinus varius* (Fabricius) were noted; this common species is generally found in ash (*Fraxinus*) and frequently imported in firewood. The most abundant beetle, however, was *Sitophilus granarius*, and this seems likely to have originated in faeces.

The ‘squash’ was mostly organic detritus with many mineral grains, a few fungal spores and hyphae (perhaps modern), thirteen *Trichuris* sp. eggs and one ?*Ascaris* sp. egg

This appears to have been another faecal deposit. There were weak hints of an insect assemblage associated with stable manure (decomposers and plant-feeders which might have been brought with hay) but on balance the insects seem most likely to have been a mixture of invaders of human faeces with species originating on urban weeds.