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ST. GILES HOSPITAL, BROUGH ST. GILES, N. YORKSHIRE: SOIL CHARACTERISTICS AND EARLY HUMAN ACTIVITY

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Summary

The extent and nature of pre-Medieval human activities on-site were investigated using the macro/morphological and selected chemical characteristics of some buried soils. The earliest evidence for human activity on-site was found at the interface between the relatively undisturbed terrace deposits of the River Swale and the overlying clayey colluvium within which the hospital structures lie. The morphological evidence suggests human activity *in situ* including burning, possibly clearance or even occupation, though phosphorus data indicate that disturbances were either short-lived or periodic. Radiocarbon dating suggests a late Neolithic/early Bronze Age timescale, while soil characteristics suggests the presence of a stable and relatively undisturbed landscape prior to this period. The onset of colluviation suggests a radical change in local landuse, possibly involving the clearance and/or cultivation of higher ground directly south, while charcoal debris within the colluvium suggests continued activities in adjacent areas. The presence of a clearly anthropogenic soil interleaved within the colluvium indicates that at least some areas of the site were occupied during this period, though phosphorus levels indicate that activities were never prolonged or intensive. Radiocarbon dating suggests an Iron Age timescale. Comparison of pre- and post- Iron Age colluviation rates indicate a much more stable landscape during historic times.

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St. Giles Hospital, Brough St. Giles (N.Yorkshire): Soil Characteristics and Early Human Activity

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Contents

1. Introduction, objectives and methodologies

The soils associated with St. Giles Hospital were examined during the course of an excavation undertaken by North Yorkshire County Council (P. Cardwell, excavator). The Hospital is situated on a minor terrace of the River Swale (g.r. SE 209 996, c 71 m OD) and was under threat from river erosion. Drift deposits associated with the site are mapped as alluvium by the Geological Survey (Sheet 41, Geological Survey, 1970), although the terraces proper of the Swale around Catterick occur at around 30 to 60 m OD. The latter normally comprise coarse sands and gravels with subordinate clays and silts (Lovell, 1982). The site is bounded to the south by a steep escarpment which is underlain by horizontally bedded Carboniferous sedimentary strata capped by glacial drift. The latter is commonly a grey to dark brown clay containing predominantly locally derived Carboniferous cherts, limestones but also some far travelled erratics. The underlying Millstone Grit series includes grey mudstones, pale coloured feldspathic sandstones and thin coals overlying limestones and cherts (Lovell, 1982).

Fluvial deposits associated with the site and seen in river section are of two main types:-

i) Dark yellowish brown sandy silts, commonly interlayered with coarse sands and fine gravel lenses and overlying unsorted gravels. These correlate well with terrace deposits described by Lovell (1982).

ii) Undifferentiated river gravels including rounded to subrounded sandstones, cherts and limestones with subordinate greywackes, magnesian limestones and igneous Lake District erratics. The undifferentiated river gravels are of limited extent so that the stratified silt terrace deposits described above predominate on-site.

The river deposits are generally overlain unconformably by clays and clay loams within which the archaeological remains associated with St. Giles Hospital lie. These soils share textural and colour characteristics with the drift described by Lovell (1982) suggesting that they are derived from the boulder clay deposits associated with higher ground to the south and that they are therefore of colluvial origin.

The work undertaken has three separate components:-

i) To investigate early (pre-Medieval) disturbance associated with the alluvial/colluvial interface and lower colluvial deposits.

ii) Assess where possible, the mode of origin and activities associated with a possible buried soil cut by the hospital chapel wall.

iii) Determine the total phosphorus content of selected feature infill material and buried soils and thus provide some assessment of, i) enrichment associated with a burial, ii) the function of a pit, and iii) the degree of enrichment associated with the alluvial/colluvial interface (possibly pre-historic) and with the buried soil cut by the chapel wall.

Contexts and profiles sampled are detailed where appropriate in the text. Soils are described using the terminology of Hodgson (1976), soil thin sections were prepared using techniques described in Murphy (1986), modified by M. Jones[1] and are described using the terminology of Bullock et al. (1985). Plant and wood remains were tentatively identified in thin section using Jane (1956), Esau (1965), Cutler et al. (1987) and Schweingruber (1990). Total phosphorus (P) contents were determined using standard acid digestion and colorimetric procedures (Page et al., 1982), pH values were determined using standard methods (Avery and Bascomb, 1974).

2. The alluvial/colluvial interface: evidence of early activity ?

Profiles were examined from the following locations:-

i) North/south machine trench through the colluvium and terrace deposits at the west of the hospital in Area 3 including contexts 2028, 2092 and the underlying river silts (Appendix 1.1).
ii) Pit 2045 and adjacent areas (Area 3). The profile included contexts 2032, 2028 and 981 within the colluvium and underlying river deposits (Appendix 1.2).
iii) Soil profile encompassing contexts 2028, 2092 and the underlying river silts (monolith taken by the excavator, Appendix 1.3). Samples were taken from both contexts and the river silts for micromorphological examination (Appendix 1.3.2).

Context 2028 is thought to represent the surface soil at the time of hospital construction since most features associated with the hospital cut this (P. Cardwell, pers. comm.), though a distinct topsoil horizon was not observed by the author. Charcoal from within context 2092 (profile iii. Appendix 1.3) was submitted by the excavator to Dr. R.D. Scott at the Scottish Universities Research and Reactor Centre, East Kilbride, for radiocarbon dating. This context appeared to be widespread throughout the site, occurring at the interface between the river alluvium and overlying colluvial deposits. The excavator suggests that context 981, observed within the pit profile and adjacent areas, is chronologically comparable with 2092, though the precise stratigraphic relationship is uncertain. The two profile types are illustrated in sketch in Figs. 1a and 1b.

2.1 Soil macromorphology

Soil profile descriptions are detailed in Appendix 1.1 to 1.3.

In each instance undoubted river deposits are overlain by colluvial clays and clay loams. This stratigraphy was most clearly seen in the machine trench section (Appendix 1.1). Here the fluvial deposits comprise principally dark yellowish brown, sandy silt loams with occasional silt loams, overlying sand and gravels at depth. While these deposits have clearly supported plant growth (the presence of void root channels) and have been subject to normal soil processes associated with the presence of a fluctuating groundwater table (periodic anaerobism and soil reduction), there are no morphological indicators of disturbance. These

[1] Mr M. Jones, Department of Agricultural and Environmental Science, University of Newcastle Upon Tyne

soils contrast markedly with the overlying 30 cm of clays and clay loams (context 2028) since their poor structure, low porosity and weak consolidation suggest a degree of continued disturbance. The sharpness of this textural, structural and biological (the void root channel network) discontinuity suggests that the onset of colluvial processes was not gradual, and that subsequent mixing via root penetration and faunal activity has been minimal. It may be that colluvial processes were initiated by activities adjacent to the present day St. Giles farm and that the soils of the terrace were buried rapidly and at depth, although there is no clear macromorphological evidence of a distinct buried topsoil. Despite this, there are distinct accumulations of charcoal and reddened (burned) material at the colluvium/alluvium interface (context 2092). The presence of only scattered charcoal flecks within the colluvium suggests that these interface deposits are not associated with activities adjacent to St. Giles farm, but have accumulated in situ and therefore reflect early activities on-site. Conversely, the distribution of fine charcoal throughout the colluvium suggests ongoing activities in adjacent areas.

A similar stratigraphy (including charcoal accumulations) was observed within profile iii (Appendix 1.3). The micromorphological characteristics of these deposits are discussed in section 2.2.

Colluvial deposits exposed by the excavation of pit 2045 (including context 2028 and possibly context 981, all described in Appendix 1.2) and within adjacent areas (contexts 2032 and 981) are more variable than those discussed above, probably reflecting varied depositional processes and also possibly, on-site activities. The clays and clay loams of the colluvium are overlain sporadically by a yellowish brown sand to sandy clay (context 2032) which is not alluvial and may be either colluvial or derived in situ (human activity), although its limited extent favours the latter (demolition?).

The complete stratigraphy associated with context 981 could not be observed, however it comprises a greyish brown to brown firm clay or clay loam and thus differs from colluvial deposits associated with the machine trench. Its firmness and consolidation might reflect a variability in colluvial processes, perhaps mass movement rather than the transport of particles via rain splash and overland flow. Its enhanced porosity can be attributed to earthworm burrowing although it is unclear why preferential faunal activity should be associated with this firm consolidated clay. Textural similarities with the colluvium however, suggest that context 981 does not equate with the interface horizon (context 2092) which lies directly over the undisturbed alluvium elsewhere. Fine charcoal (< 1cm) and coal fragments occur throughout suggesting either continued activity either on or adjacent to the site, or subsequent incorporation via earthworm activity (coal debris may be inherited from the parent drift).

The principal colluvial deposit (20 cm in depth), context 2028 (observed within pit 2045) is clearly disturbed, it overlies a distinct soil horizon (27 cm in depth) which might correspond with context 981 and which is underlain by undoubted alluvial silts, silt loams and sandy loams (Appendix 1.2). Context 2028 comprises a brown to dark greyish brown coarse sandy clay with gravel inclusions, the latter including locally derived sandstones, limestones and shales. It is, like the colluvium associated with the machine trench, poorly structured and weakly consolidated suggesting likewise, continued disturbance in adjacent areas. Charcoal and coal occurring throughout can be explained as above, although the presence of only rare earthworm burrows favours gradual deposition. The underlying horizon (context 981?) is texturally and morphologically comparable with context 2028, although it is dominantly dark greyish brown. It is also structurally very complex and irregular with discrete inclusions of clay and charcoal throughout. This material has clearly been massively disturbed and may represent a separate phase of activity (is it possible that it represents residual pit infill?). The anomalous occurrence of large stones of clear fluvial origin (rounded) at the base of the colluvium overlying fine stone free alluvial silts suggests deposition via non-fluvial agencies. These stones must equate chronologically with the interface horizon described above and may therefore may reflect early (pre-colluvial) activities on-site.

The underlying alluvial soil is slightly finer than those described above, though comparable in terms of colour and overall morphology. It is much more porous than the overlying colluvium with a well developed system of void root channels and common earthworm channels, both reflecting enhanced biotic activity prior to disturbance and suggesting as above, a hiatus in terms of soil processes associated with colluvial deposition.

2.2 Micromorphology of contexts 2028, 2092 and the underlying alluvial deposits (Appendix 1.3.2)

The micromorphological characteristics of the colluvium are consistent with profile macromorphology and proposed origins. The colluvium is fine textured, poorly sorted and only slightly macro-porous with a varied mineralogy reflecting the composition of the glacial drift overlying higher ground to the south. Organic components comprise primarily humified or degraded woody remains which are randomly distributed throughout. The varied orientations of the fine mineral matrix (fine silts and clays, $< 20\ \mu m$) suggest disturbance via compression, shearing or puddling, although some horizontal orientations may reflect depositional events. Common silty, organic void infillings and fine carbon rich (charcoal) and silty clay void coatings are all linked with structural instability and the translocation of particles in percolating rain water (Jongerius, 1977). They imply the presence of a non-vegetated or disturbed soil surface susceptible to rain splash or the deposition and subsequent transport of colluvial materials. Undoubted anthropogenic indicators were not observed, although organic phosphates, burnt bone or pot may be present.

The fine pore system within the underlying silts is consistent with the entrapment of water via compression (human activity?). The silts are well sorted and have a less complex mineralogy than the overlying colluvium with quartz predominant, both characteristics reflecting fluvial processes. Organic components comprise degraded and humified plant residues some of which are iron impregnated and lie within voids, ie in situ. The presence of these root replacement pseudomorphs and their absence in the overlying colluvium may reflect the sudden cessation of normal decomposition processes on burial (or during occupation) and a reduction in aeration (soil reduction and iron mobility). Other biotic components were tentatively identified as pollen grains and phytoliths. The presence of pore coatings and infillings described in Appendix 1.3.2 suggest the presence of a partially bare soil surface and structural disruption allowing translocation of particles in rain water as above. Their varied form and relative abundance suggests that these features may be linked with pre-colluvial activity, perhaps clearance and/or occupation.

The colluvium/alluvium interface is much more complex than the over- and underlying deposits. The soil shares mineralogical characteristics with both the colluvium and silts, while the varied orientations of the coarse and fine mineral components suggest physical disturbance as above. Organic debris comprises up to 20% of the soil matrix and is randomly distributed throughout, though clusters of charcoal occur, occasionally associated with fine fragments of burnt stone. Charcoal fragments have been tentatively identified as Corylus (hazel), Prunus spp. (blackthorn) and Ribes spp. (blackcurrant). Many carbonized remains are degraded and lack identifiable structures. Some limpid orange residues may be wood resins presumably released through burning.

Additional features of interest include irregular but discrete areas of fine soil matrix having a zero porosity. This material comprises non-oriented silt and clay sized minerals intimately mixed with fine plant debris, and fine to coarse charcoal and opaque (iron oxide/carbon) residues. It is impregnated laterally with iron oxides, some of these horizontal laminations appear to be compressed root replacement pseudomorphs (roots impregnated with iron), while the upper and outer surfaces the inclusion are coated with fine carbon debris. It may be that this feature has developed as a result of the infilling of a coarse void following deposition of the colluvium, however its characteristics suggest that it may be a remnant of an anthropogenic soil, perhaps an occupation layer. It must be emphasised that this suggestion is tentative, although it may also be concluded that this carbon rich deposit probably reflects human activity in situ.

3. The chapel profile

The profile cut by the chapel wall in Area 4 encompasses contexts 1547, 1552 and 1553 (described in detail in Appendix 2.1). Context 1547 is thought to be represent the surface soil at the time of chapel construction. Charred grain from the fill of a pit which cut 1552 but was sealed by 1547 was sent by the excavator to the Radiocarbon Accelerator Unit at Oxford for dating. The profile is shown in sketch in Fig. 2.

3.1 Profile macromorphology

Context 1553 at the base of this shallow profile comprises 28 cm of a typical clayey colluvium overlying river silts (silty to silty clay loams) and sandier alluvial deposits at depth (augered only). It is moderately porous with a well developed void root network and relatively common earthworm burrows. The presence of charcoal accumulations and discrete reddened, possibly burnt inclusions can probably be attributed to incorporation via earthworm activity, though might reflect human activity on or adjacent to the site.

The overlying soil (context 1552) is a loose, incoherent dark brown humose sandy clay to sandy clay loam (@ 8 cm in depth) with abundant yellowish burnt inclusions (possibly ash or bone) and flecks or discrete accumulations of charcoal (up to 30% of the soil matrix in parts). It is incoherent, very weakly structured and is clearly disturbed despite the presence of a well developed void root network. Its boundary with the soil below is smooth and clear suggesting the gradual accumulation of an anthropogenic soil. The overlying soil (context 1547) is @ 12 cm in depth and is also weakly structured and incoherent with discrete charcoal accumulations throughout. Its higher clay content however, reflects a colluvial or pedogenetic component. The sharpness of its boundary with the disturbed soil suggests a rapid change in function.

3.2 Micromorphology

The lower colluvial soil shares many characteristics with those described in section 2. It is fine textured and poorly sorted with a varied mineralogy (though less so than context 2028) reflecting its boulder clay origins. It is though, much more porous and lacks voids, void coatings and fabric structures indicative of physical disturbance. Unidentified, degraded humified and carbonized plant and wood debris occur throughout, occasionally in association with gel-like residues thought to be resins. These inclusions combine to suggest burning and thus human activity, though the absence of structures and features indicative of disturbance other than possible relic aggregates, suggest that this debris has probably been incorporated subsequently via faunal turbation. The lower colluvium (context 1553) as a whole then does not appear to be disturbed.

Although mineralogically the overlying soil (context 1552) shares similarities with the colluvial soil below, it differs fundamentally in terms overall composition. Charcoal debris comprises up to 30% of the soil matrix, with both woody and non woody remains present. Most of the wood charcoal was too fragmented for identification, though some Betula (birch) or Corylus (hazel) may be present. Fine carbonaceous debris ($< 15\ \mu m$) also occurs throughout, often in association with orange gel-like and white amorphous residues thought to be (wood) resins and ash respectively. Unburnt plant debris is also abundant with partially degraded and humified woody and non-woody plant remains occurring throughout (Alnus or alder was tentatively identified). Pollen grains and phytoliths, fragments of burnt and unburnt bone and burnt stone or pot fragments were also observed. It seems likely that this soil has accumulated through the dumping of occupation wastes, while the presence of unburnt as well as burnt debris suggests that burning did not take place in situ. The absence of any features indicative of particle translocation within the soil below, ie. organic void coatings etc. suggests that this area may have been covered or trampled (ie. surface pores sealed) prior to dumping.

Fragmented iron impregnated root remains, which occasionally occur in situ (ie. within voids), suggest the sudden burial of a soil supporting actively respiring plants. Although they might also reflect plant growth and subsequent burial during usage (dumping), the sharpness of the upper boundary tends to favour a rapid change in function. Textural features (clay/silt coatings etc.) within the buried soil reflect this resumption of colluvial processes and subsequent disturbance, while the occurrence of these features within bio-pores also indicates plant growth perhaps prior to burial.

The overlying (sealing) soil (context 1553) shares textural and mineralogical characteristics with the colluvium as might be expected. Carbonized and humified plant remains are however common throughout reflecting continued activity on-site, while ash and resin debris and bone fragments were observed towards the boundary with 1552. The presence of common fine clay and silt void coatings, which have developed either through the disruption of an exposed soil surface (in situ disturbance) or through the percolation of loose surface soil (colluvium) in rainwater via continuous voids, may reflect either in situ disturbance and ongoing colluvial processes.

4. Total phosphorus (P) in selected soils

Total P levels were determined in the following soils:-

i) Colluvial (context 2028) and alluvial samples from profile a) of the machine trench (Appendix 1.1).
ii) Colluvial clays (context 2028) and river silts from profile iii (section 2), the interface was not sampled (Appendix 1.3).
iii) Contexts 1547, 1552 and 1553 from the chapel profile (Appendix 2).
iv) The lower infill of pit 610 (context 878)
v) The fill of a grave within the chapel.
vi) A control profile (alluvial soil from river section)

Significant differences were determined using SPSSx statistical procedures. pH and total P values are given in Table 1, phosphorus is expressed in $\mu g\ P\ g^{-1}$ oven dry soil.

There is a general enhancement of P on site with levels exceeding those in the control alluvial soil in all but the river silts of profile iii) at $p < 0.05$ levels. With the exception of the chapel soils (contexts 1552 and 1547), the grave and pit fill however, levels lie within the range encountered in non-archaeological soils (140 to 700 $\mu g\ g^{-1}$, Wild, 1988).

Table 1. Total Phosphorus and pH in selected horizons

Soil	pH water	pH $CaCl_2$	mean P $\mu g\ g^{-1}$	SE
Grave fill	7.55	6.81	6572.2	1006.3
Pit 878	7.24	6.58	6597.5	91.3
Profile a				
Colluvium	7.69	6.99	663.4	98.2
Alluvium	7.58	7.09	555.6	7.7
Profile iii				
Colluvium	7.68	6.95	579.9	19.9
Alluvium	7.73	7.08	432.6	20.0
Chapel Soil				
1547 colluvium	7.75	7.10	804.6	11.5
1552 buried soil	7.79	7.17	1017.4	54.9
1553 colluvium	7.79	7.35	584.3	11.0
Alluvial soil (control)	7.69	7.15	348.2	22.9
SE - standard error				

Total P in the chapel soil significantly exceeds levels in all other soils ($p < 0.05$) with the exception of its overlying colluvium, the pit and grave soils. Levels are comparable with those found in some midden deposits (Pettry and Bense, 1989) and are consistent with intensive occupation or garden usage (Eidt, 1977).

The pit and grave fills soils are clearly enriched in phosphorus, with levels exceeding those in all other soils at $p < 0.001$ and $p < 0.05$ levels respectively. Such enhancement within the pit soil and the occurrence of vivianite (hydrated Fe phosphate noted in the field) are consistent with the disposal of human wastes (cess). Although the grave fill soil is similarly enriched, variability is much greater. Soil P levels can be attributed to i) the presence of fine bone fragments, or ii) the dissolution of bone by percolating rainwater and subsequent retention as Ca, Fe and Al phosphates. The large standard error value suggests that the former is important.

5. Summary and Conclusions

Deposits associated with the site of St. Giles Hospital comprise two separate stratigraphical as well as chronological components comprising colluvial clays and clay loams and alluvial silts, sands and gravels. The former are derived from glacial deposits overlying higher ground directly to the south of the site and sit unconformably over the alluvial deposits of the terrace. Although a distinct buried topsoil was not observed below the colluvium, the underlying alluvial soils had clearly been subject to normal biotic and chemical processes prior to burial, having supported both plant growth and soil fauna. The general absence of a clay component suggests that colluvial processes were not important. It seems probable then that the adjacent landscape was stable and relatively undisturbed at this time.

Although the terrace soils are largely coherent and intact, the micromorphological evidence suggests superficial disturbance including the disruption of bare soil surface and compression of a wet soil, processes consistent with human activity (eg. trampling). A distinct charcoal rich horizon (including fragments hazel, blackthorn and possibly blackcurrant, burnt stone and resins) at the soil surface indicates widespread burning in situ. Dating of charcoal from this interface horizon (cal BP 4829-3829 [2σ])[2] suggests a late Neolithic/early Bronze Age timescale. It seems probable then that the terrace was cleared at this time, though the variety of tree species present in the charcoal sample (willow, elm, alder, hornbeam, hazel, blackthorn and oak, R.D. Scott, written communication) suggests that wood may also have been collected from adjacent areas. Remnants of an anomalous ferruginous and carbon rich deposit at the soil surface might also reflect late Neolithic/early Bronze Age occupation, though whatever the precise usage (sporadic burning, clearance or occupation), phosphorus levels indicate that activities were either short-lived or periodic.

Soil morphological features and the sharpness of the alluvium/colluvium boundary suggest that the subsequent onset of colluviation was rapid, leading in places to the sudden burial of a vegetated surface. This decline in landscape stability must reflect changes in local landuse, with possibly clearance and/or cultivations on higher ground directly to the south, perhaps in areas adjacent to the present day St. Giles farm. In two of the profiles examined, the terrace soils were overlain by 30 cm of colluvium, the latter forming the ground surface at the time of hospital construction. There was little evidence within these profiles for subsequent

[2]Sample number GU-5236.

activities on-site prior to Medieval times, though the distribution of fine charcoal throughout the colluvium suggests continued activities in adjacent areas. In one instance however, the stratigraphy was more complex. Here the anomalous presence of large stones at the terrace surface suggests emplacement which may have been synchronous with early activities elsewhere. The overlying colluvium included two quite distinct deposits, the lower @ 30 cm comprising a complex and irregular soil rich in discrete clay and charcoal inclusions, the upper comprising 20 cm of colluvium comparable with that seen in the other two profiles. Although the precise origins of the lower material are uncertain, it seems at least possible that it reflects a phase of subsequent pre-Medieval activity.

The presence of an undoubted anthropogenic soil in areas adjacent to the Medieval hospital provides more substantial evidence for subsequent pre-Medieval activities on-site. This soil overlies at least 30 cm of colluvium and is sealed by @ 12 cm of a disturbed clayey colluvial soil, the surface of which formed the Medieval groundsurface. Dating of charred grain from a pit which cuts this horizon and is sealed by the overlying colluvium suggests an Iron Age timescale (cal BP 380-1 [2σ])[3]. The buried soil comprises a complex mixture of soil, plant debris, charcoal (hazel and birch), resins, burnt and unburnt bone. Micromorphological characteristics and soil P levels combine to suggest the gradual accumulation of occupation wastes (household, garden, fire), though the soil had supported plant growth at some time. The sharpness of the boundary between the soil and its overlying colluvium denotes a rapid change in function with natural processes (colluviation, soil development) gaining in importance in situ as a result perhaps of abandonment. The disturbed nature of the colluvium and a slight enrichment in phosphorus however, suggest continued activity in adjacent areas.

It is of some interest that the depth of the colluvium below the Iron Age soil corresponds almost precisely with that overlying the Neolithic/Bronze Age horizon described above. In may be that in some areas, colluviation virtually ceased with a stable groundsurface persisting through historic times, though some soil removal during hospital construction must remain a possibility. Despite this, the presence of only @ 12 cm of colluvium overlying the Iron Age soil adjacent to the chapel suggests a much slower rate of colluviation, and thus by implication the presence of a much more stable landscape than during the late Neolithic/early Bronze Age period.

In general, phosphorus levels suggest that prior to the Medieval period, and with the exception of late Iron Age times, the site was never intensively utilized. Levels within the lower fill of a pit and a grave fill suggest the disposal of human wastes and the presence of fine bone fragments respectively.

[3]Sample number OxA 3653

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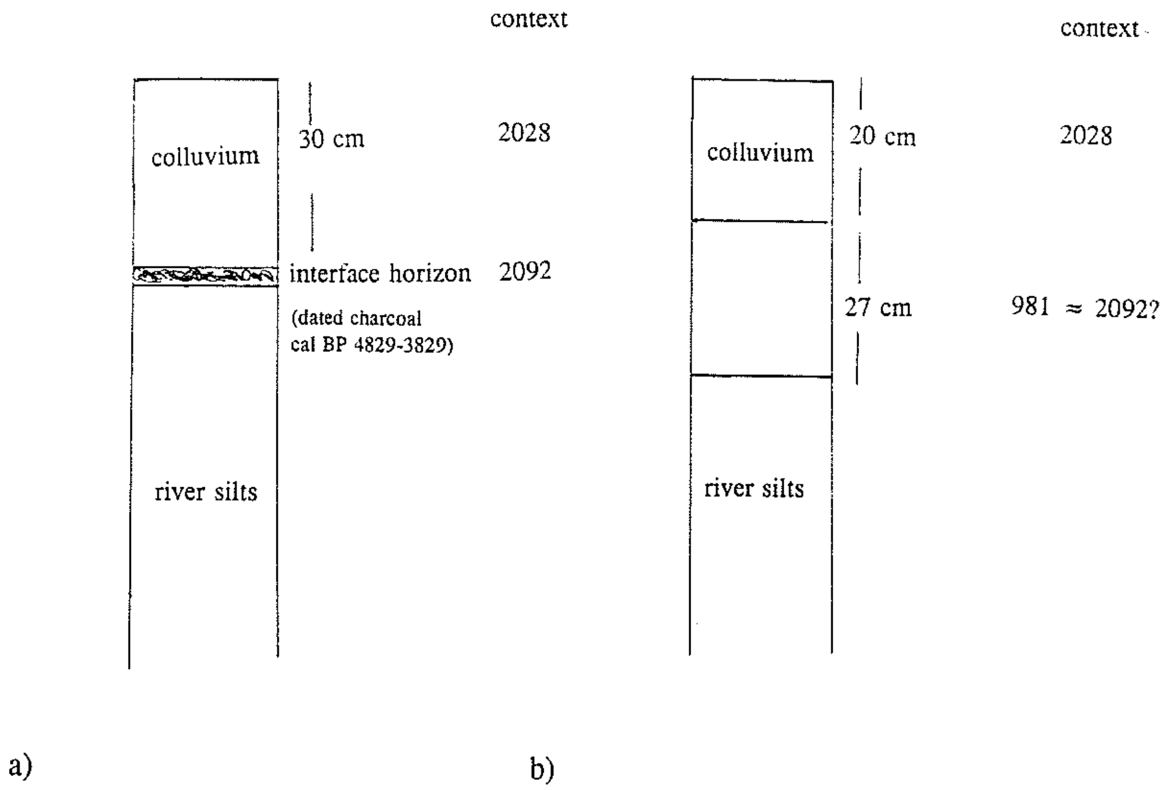

Fig 1. The alluvium/colluvium profiles

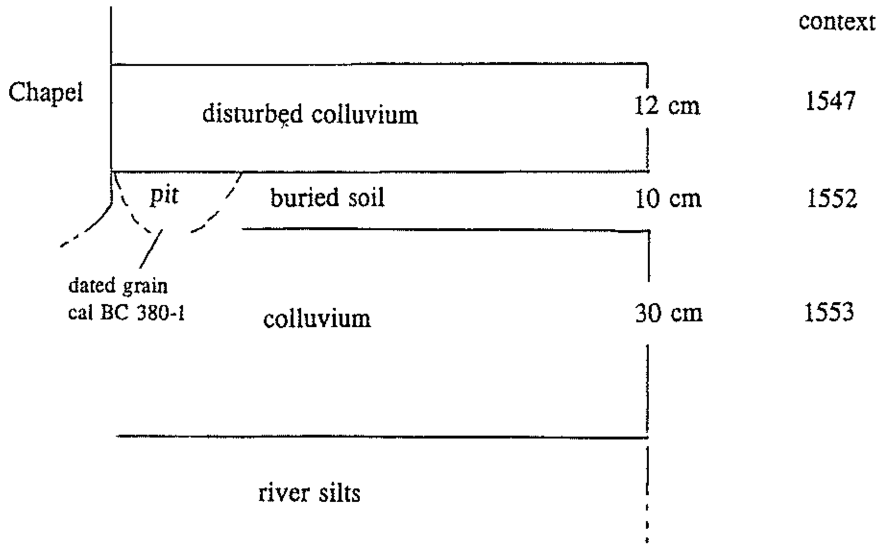

Fig 2. The Chapel Profile

Appendix 1: soils of the colluvium and river deposits

1.1 Machine trench

Profile a

0-33 cm (Context 2028) Brown to dark brown to dark grey clay loam (10 YR 4/3 to 4/1); very weakly developed medium angular blocky structure to massive; moderately porous; abundant fine to medium root channels, few coarse earthworm burrows; fine strong brown mottles (7.5 YR 4/6) associated with fine root channels; few fine to medium angular (non-fluvial) stones; boundary distinct and wavy, occupied in places by a distinct charcoal layer with reddish inclusions (5 YR 4/6), possibly ash (Context 2092).

33-85 cm Dark yellowish brown medium sandy silt loam (10 YR 4/4 to 4/6); weak angular blocky structure; moderately porous; few medium root channels, some very faintly mottled dark greyish brown (10 YR 4/2); few strong brown ferruginous accumulations (7.5 YR 4/6); becoming sandy and gravelly with depth; gravels comprise small rounded stones; boundary smooth and sharp.

85-99 cm Sandy gravel comprising coarse sand and rounded to subrounded gravel sized stones.

>99 cm Yellowish brown to dark yellowish brown fine silty sand (10 YR 5/4 to 4/4).

Profile b

0-25 cm (Context 2028) Brown to dark brown to dark grey clay loam (10 YR 4/3 to 4/1); very weak prismatic structure to massive; moderately porous; abundant fine root channels, a few mottled (Fe) strong brown (7.5 YR 4/6); a few coarse earthworm channels; boundary distinct and wavy.

25-80 cm Dark yellowish brown sandy silt to fine sandy silt loam (10 YR 4/4); weak angular blocky structure; moderately porous; common fine root channels, some infilled with fine sand; few faint dark greyish brown mottles with depth (10 YR 4/2); boundary smooth and distinct.

80-91 cm Coarse yellow sand (10 YR 7/6) with gravels comprising fine to medium subrounded stones.

91-100 cm River gravels comprising coarse to medium subrounded stones.

Profile c

0-30 cm (Context 2028) Brown to dark brown to dark grey clay to clay loam (10 YR 4/3 to 4/1) with sand lenses; massive to unconsolidated; slightly porous; few fine root channels, a few mottled (Fe) strong brown (7.5 YR 4/6); boundary irregular and clear.

30-49 cm (Context 2092?) Brown to dark brown to dark greyish brown clay loam (10 YR 4/3 to 4/2); massive; slightly porous; few medium root channels infilled with fine sand; boundary smooth and distinct.

49-76 cm Dark yellowish brown sandy silt loam (10 YR 4/4); weak angular blocky structure; moderately porous; common earthworm channels, some clay coated; rare greyish brown mottles associated with medium root channels (10 YR 5/2); boundary smooth and sharp.

76-90 cm Dark yellowish brown coarse sand and gravel (10 YR 4/4), the latter comprising fine to medium subrounded stones; boundary smooth and sharp.

90-112 cm Dark yellowish brown sandy silt to fine sandy silt loam (10 YR 4/4); moderately porous; common fine root channels some infilled with fine sand; few faint dark greyish brown mottles with depth (10 YR 4/2); boundary smooth and distinct.

>112 cm River gravels comprising fine to medium subrounded stones.

1.2 Miscellaneous contexts from colluvial/alluvial sequence

The following sequence of horizons occurs sporadically throughout the western end of the site in the following sequence.

context

2032 yellow mottled sand
2028 sandy gravelly clay
981 grey clay (corresponds with 2092?)
riverine silts/sands

Context 2032 (observed in horizontal section only)

Brown to yellowish brown medium sand to sandy clay loam (10 YR 5/3 to 5/4); common dark grey clay inclusions (10 YR 4/1); few fine subangular white quartzitic stones, few small slate stones; very weak angular blocky structure to massive; common fine root channels.

The following profile was exposed during the excavation of **pit 2045**. Datum is the upper limit of context 2032.

0-20 cm (Context 2028) Dark brown to dark greyish brown coarse to medium sandy clay with gravel inclusions (10 YR 3/3 to 4/2); abundant (up to 20%) dark grey mottles (10 YR 4/1); weak angular blocky structure becoming massive with depth; slightly porous, mainly fine to medium void root channels; rare earth worm burrows; common fine, few medium roots; few subrounded sandstones and limestones, some weathered micaceous sandstones and sandy shales; common charcoal and few coal inclusions; more gleyed (mottled) with depth with common inclusions of brownish yellow weathering sandstones (10 YR 6/8); boundary smooth and clear.

20-47 cm (Context 981?) as above though dominantly dark greyish brown (10 YR 4/2) sandy clay to clay; texturally complex with discrete inclusions of clay; abundant iron and manganese accumulations, segregations and clay coatings associated with voids; clay coatings are predominantly dark grey (10 YR 4/1); abundant fine charcoal smears and discrete inclusions (< 1 cm) throughout; structurally complex, very weak medium prismatic, angular blocky to platy structures; sandier with depth (sandy clay loam); large to very large subrounded fine sandstones/impure limestones towards lower boundary (river derived); boundary smooth and distinct.

47-90 cm Dark yellowish brown silty clay to fine silty loam (alluvium, 10 YR 4/4); moderately porous, abundant fine to medium void root channels and common earthworm channels; moderately developed fine prismatic to medium angular blocky structure; strong brown and dark reddish brown (7.5 YR 4/6 and 5 YR 3/3) ferruginous coatings and concentrations associated with voids and structural faces; dark brown to dark grey clay coatings associated with coarse earthworm channels; rare charcoal smears; root channels coarser and more abundant with depth (ie preserved); boundary smooth and distinct.

>90 cm Stone free, brown to dark yellowish brown silty to fine sandy loam (10 YR 4/4); massive; common to very fine root channels; common iron and manganese root channel coatings and greyish brown areas of iron depletion (10 YR 5/2) but less gleyed than above.

Context 981 (equivalent to context 2028)

Greyish brown to brown firm clay to clay loam (10 YR 5/2 to 5/3); common coal and charcoal fragments;

abundant faint iron and manganese mottles associated with structural faces and root channels (7.5 YR 3/2, 2/0); some greyish brown areas of iron depletion (10 YR 5/2); moderately porous; few coarse earthworm burrows; weak fine prismatic structures; moderately stony, common fine subangular to angular grit stones and quartzites.

1.3 Profile encompassing contexts 2082 and 2092)

1.3.1 Soil description

Context 2028

Brown to dark brown to dark grey clay to clay loam (10 YR 4/3 to 4/1), very weakly developed medium angular blocky structure to massive: moderately porous; common fine to medium root channels, few earthworm channels; fine strong brown mottles (7.5 YR 4/6) associated with root channels and structural faces; charcoal inclusions becoming abundant towards the lower boundary smooth and clear defined in parts by charcoal layer **(context 2092).**

Dark yellowish brown to brown sandy silt loam (alluvium, 10 YR 4/4 to 5/3); weak medium angular blocky structure; moderately porous, mostly void root channels with some earthworm burrows; very faintly mottled dark greyish brown (10 YR 4/2); some Fe mottling (7.5 YR 4/6); abundant charcoal towards upper boundary.

1.3.2 Soil thin section description of, i) colluvial clay (context 2028), ii) the underlying silt and iii) the colluvium/silt boundary (2092).

i) Colluvial clay (context 2028)

<u>Microstructure</u>

Porosity variable ranging from 10% within the soil matrix to 20 to 30% overall. Voids mainly smooth walled (some coats), partially accommodating interconnected channels and chambers, no discrete aggregates at this scale. Major systems of coarse voids (chambers up to 5 mm, channels @ 2 mm) are vertically oriented. Excluding the latter, overall random though with some horizontal orientation, the latter are probably earthworm burrows).

<u>Basic mineral components</u>

c/f limit at 20 μm of 50:50, 30:70 to 20:80, 60% of the coarse component >60 μm. Very poorly sorted, with 10 % (overall) small subrounded to subangular sandstones (2 mm to 1 cm, mainly quartz from 60 to 200 μm, some opaques), some weathering with Fe coats, some inclusions of sand sized clastic detritus, comprising quartz and pale yellow unidentified (anisotropic) mineral, some weathering fine grained mudstones. Mostly porphyric to gefuric.

Coarse:- 80% rounded, subangular to angular quartz (30 to 2 mm, 80% < 250 μm), subsidiary (5%) chalcedony; 10% opaques (Fe oxides, sedimentary carbon); 2 to 5% fine (mainly < 40 μm) lath like muscovite micas, rare biotite; 2% plagioclase feldspar, some very finely twinned; 2% pyroxenes, rutile, garnet, tourmaline and zircon, epidote all seen, often rounded (more varied mineralogy reflects boulder clay origins).

Fine:- reddish brown clay minerals, varied Fe content, fine weathered and abraded quartz, micas, pyroxenes, opaques, carbon debris (charcoal/coal) and microcontrasted punctuations.

<u>Basic organic components</u>

Coarse:- Common dark reddish brown degraded and humified plant/woody debris, structures mostly not visible.
Fine:- isotropic component of the groundmass, cell residues, microcontrasted punctuations and void coatings.

Groundmass

Coarse:- variable, random to clustered, clusters may be randomly or vertically oriented the latter are probably infilled earthworm channels, other subrounded inclusions may be sandstone detritus in situ (see also pedofeatures)
Fine:- very variable, ranging from stipple speckled to reticulate, porostriated, granostriated to unistrial (the latter often with high isotropic organic or Fe rich component, some weathering mudstones in situ), some horizontal orientation.

Pedofeatures

i) Few rounded to elongated clusters (@ 600 μm) of silt sized angular to subangular quartz, mostly chitonic to gefuric, fine matrix is isotropic and Fe rich, some include pale yellow mineral (ppl), yellow to grey interference colours (phosphatic/organic), others are associated with fine plant or microbial cell debris (coprolite?),
ii) Some inclusions (100 μm to 1 mm) have a c/f limit of 30 μm at 50:50 to 20:80, these may be weathered earthworm residues (finer), relic aggregates or weathered coprolites.
iii) Dark reddish brown, irregular subrounded inclusions, mostly isotropic matrix, may be degraded, humified plant or woody debris.
iv) Some voids partially infilled by silty/organic debris, some voids have dusty organic/carbon (charcoal) coats (@ 6 μm thick).
v) Common, poorly oriented (stipple speckled) silty clay coats or hypocoatings, orientations probably originate in situ rather than as a result of clay translocation.
vi) Some burnt bone or pot, isotropic semi-circular.

Comments

Poorly sorted clay rich colluvium with diverse mineralogy reflecting boulder clay origins. Varied orientations of the fabric suggest depositional events or disturbance rather than gradual colluvial processes. This soil has supported plant growth and soil biota, though fresh plant and faunal debris was not observed. Silty clay and dusty carbonized void coatings reflect subsequent activity associated with St. Giles.

ii) River silts (alluvium)

Microstructure

Slightly to moderately porous (5 to 10%). No aggregates at this scale, mostly channels, chambers (up to 3mm, possible recent, rough walled earthworm or root channels) and vesicles (channel or chamber structure). Voids have a random distribution, some channels are vertically oriented (earthworm or root channels), but many voids, including vesicles, are laterally oriented. (vesicles are thought to form as water is trapped within the soil under pressure, they may therefore reflect rapid burial by the overlying colluvium or trampling. Most voids are smooth walled, some are coated or partially infilled by fine groundmass (see below).

Basic mineral composition

c/f limit of 13 μm generally at 50:50, but varies between 60:40 where there is some clustering of the coarse component (infilling of coarse channels with silt and fine sand-sized detritus), to 20:80 where areas of fine groundmass coalesce (illuvial clay, organic detritus or earthworm faecal residues). Gefuric to porphyric, random distribution, moderately to well sorted.

Coarse:- 80 to 85% angular to subangular quartz, mostly 13 to 60 μm (silt sized), rare inclusions up to 200 μm, subsidiary chalcedony; 10% subangular opaques (< 100 μm), possibly Fe oxides or coal (carbon rich silt stone) fragments (or humified or carbonized pant residues); < 5% micas feldspars, < 2% pyroxenes (< 60 μm); rare inclusions of greenish limestone ((@100 μm).

Fine:- Yellowish brown to dark reddish brown clay minerals and Fe oxides; 10% fine micas, 20% fine opaques and/or humified plant or cell residues; microcontrasted punctuations (< 5μm and unresolvable).

Basic organic components

Coarse:- common dark reddish brown subrounded, subangular elongated, degraded and humified organic residues (< 100 μm, most randomly distributed within the soil matrix, some are in situ and lie within infilled root channels, most of these are Fe impregnated (Fe oxide pseudomorphs); rare reddened, distorted non woody tissue residues within root channels (@ 250 μm); rare fine charcoal and carbonized residues (too degraded for identification); rare rounded cell residues (with isotropic interior (opal?), phytoliths, pollen grains or microbial residues (@ 60 μm). Fresh organic remains not seen.

Fine:- cell residues, microcontrasted punctuations, isotropic component of the fine groundmass.

Groundmass

Coarse:- random to clustered distribution (within coarse channels).
Fine:- stipple speckled to mosaic speckled b-fabric, some reddish limpid areas (< 60 μm) organic matter residues.

Pedofeatures

i) Common dark reddish brown, weathered, iron rich rounded to subrounded aggregates < 200 μm (c/f 20 μm at 50:50, coarse:- predominantly quartz, fine:-
dark reddish brown isotropic Fe/organic matter). These occur within the matrix and may be either weathered earthworm residues or relic aggregates.
ii) Common dark reddish brown, subrounded inclusions,possibly iron impregnation (gley) features or degrading or humified plant material in situ.
iii) Areas of Fe impregnated groundmass (fine infillings) often associated with humified plant remains.
iii) Common to very common silty (organic plus mineral) clay void coatings and hypocoatings, these include; common stipple speckled silty or impure clay coatings, some with fine outer coating of unresolvable organic or carbonized material (plant roots decomposing in situ); rare to common silty clay cross laminated uni-strial clay coatings with organic punctuations, some areas Fe impregnated; some root crescentic infillings comprise yellowish stipple speckled clay and isotropic organic matter, some are associated with distorted root remains in situ. Coated voids are randomly distributed, some similar fabrics occur within the matrix, possibly infilled voids.

Comment

This soil comprises well sorted, undisturbed river silts which have clearly been biotically active at some time. Void coatings and the presence of many horizontally oriented vesicles suggest disturbance (erosion) and compression of the soil when wet, respectively.

iii) Colluvium/ silt (alluvium) boundary (Context 2092)

Microstructure

Less porous than both of the above, ranging from 5 to 15 %, predominantly vertically oriented channels and chambers (earthworm and root channels), though some horizontal orientations present, mostly smooth walls, many silty clay and organic coatings (see pedofeatures) and infillings. Some channels are partially infilled by soil, while rare loose walled vughs and vesicles occur in some areas.

Basic mineral components

c/f limit at 25 μm of 30:70 (varies between 50:50 in clusters to 10:90 in fine infill fabrics). Very poorly sorted with common inclusions (up to 3 mm) of fine (< 200 μm) unweathered quartzitic sandstone and weathering mudstone (2 to 3 mm). Rare weathering limestones seen, these have diffuse boundaries and may be associated with areas having a stipple speckled b-fabric. Mostly single spaced porphyric to gefuric.

Coarse:- 80 to 90% quartz ranging from rounded to angular, mostly between 50 and 300 μm, subsidiary chalcedony, some calcareous; common laths (up to 5%) of muscovite mica (up to 270 μm), many weathering, rare weathering biotites; rare siliceous limestone fragments (@ 30 μm); rare (< 2%) weathering plagioclase feldspars; rare (< 1 %, less frequent than colluvium) amphiboles, pyroxenes, garnet, zircons and epidote (ie. influence of overlying boulder clay).
Fine:- yellow to reddish brown clay minerals (depending on Fe content) (and unresolvable organic matter), opaques (10%), micas (5%), quartz, cell residues, fine minerals as above, all weathering.

Basic organic components

Organic debris (including charcoal) comprises 10 to 20 % of the soil as a whole, it is randomly distributed throughout, though clusters of fragmented humified debris and charcoal (particularly the coarse component) occur.

Coarse:- Abundant charcoal or (brown to dark brown) humified wood debris, some with up to 15 scalariform perforation plates, opposite/alternate elongated pits (possibly Corylus, Ribes spp., others lacking plates may be Prunus, many lack structures and are degraded and fragmented; abundant (@ 10 % of total organic matter) dark reddish to orange brown inclusions of humified and or degraded plant/woody debris, mostly structureless, though some structures and distorted tissue remains are visible, some orange brown limpid fibrous examples may be wood resins (amber?).

Fine:- unresolvable isotropic component of the ground mass; fine isotropic, probably carbonized debris; reddish cell residues (mostly silt sized); finely divided dusty black (carbonized) thin void coatings.

Groundmass

Coarse:- random, clustered, laminated and bow-like distributions are all common, some clusters are vertically oriented and may represent infilled voids. Some coarse particles within clusters have a parallel orientation, this may reflect rolling during deposition, others are random.
Fine:- very variable, ranging from mosaic speckled, grano-, poro-, parallel to reticulate striated.

Pedofeatures

i) Pale yellow brown burnt limestone.
ii) Abundant charcoal, many fragments have scalariform perforation plates and oblong opposite/alternate vessel pits (not firmly identified)
iii) Amber/glass/resin inclusions.
iv) Dark reddish brown iron concentrations/impregnation features, up to 6 mm (c/f limit at 20 μm of 50:50, coarse mineral component predominantly quartz, <60 μm), often with irregular diffuse boundaries, often associated with accumulations of charcoal and burnt stone (fire), some fine (<2mm), rounded inclusions with sharp boundaries may be either weathered earthworm residues or relic aggregates (these are not impregnation features but have been incorporated within the soil matrix).
v) Possible remnant of occupation layer, fine brown material, c/f at 20 μm of 5:95, upper limit of coarse mineral component, predominantly quartz, is 80 μm. b-fabric comprises stipple speckled clay minerals, amorphous organic matter, fine plant debris and abundant opaques (Fe oxides and/or organic matter and/or carbonized material. Massive with zero porosity. Iron enriched to varying degrees, amorphous and dark reddish brown, some Fe root channel pseudomorphs in situ. Common charcoal (unidentified) and coarse carbonized debris, upper or outer surfaces are associated with fine carbonized debris. Some layering associated with differential Fe enrichment (compressed Fe pseudomorphs). These areas comprise stipple speckled clay minerals, organic matter, Fe oxides and opaques (Fe oxides, charcoal and humified plant debris).
vi) Common detrital inclusions ie. quartz clusters (fragmenting sandstone)

vii) Abundant void coatings and infillings, iron enriched to varying degrees; abundant brown, non-laminated silty clay coats (degree of orientation varies), these also form stipple speckled void infillings and fabrics within the matrix; silty clay with high amorphous organic component (infilling pores mainly); silty clay with high particulate organic matter component, often forming a fine outer void coating. Grain coatings and cappings also occur.

Comment

Undoubted anthropogenic influences, soil shares mineralogical characteristics with colluvium soils, pore system is biotic and related to soil processes within the colluvium, ie. subsequent. Abundance of carbonized debris suggests burning, the preservation of humified debris suggests rapid burial.

2. The chapel soils

2.1 Profile macromorphology

Soils within the chapel encompassing contexts 1547, 1552 and 1553

Datum is upper limit of context 1547.

0-11.5 cm Dark brown to very dark greyish brown (10 YR 3/3 to 3/2) silty clay loam; moderately developed, medium granular to angular blocky structure; moderately porous; abundant fine to medium pores, mostly void; few coarse earthworm channels; rare fine quartzitic stones; few coarse (0.5 cm) discrete charcoal inclusions; unconsolidated and possibly disturbed (combination of in situ soil, chapel floor and/or colluvial deposits); boundary sharp and wavy.

11.5-21 cm Dark brown humose sandy clay to sandy silt loam (10 YR 3/3); abundant yellowish brown distinct discrete inclusions (10 YR 5/4 to 5/6) most abundant within upper horizon (burnt perhaps); abundant flecks and inclusions of charcoal (up to 0.5 cm); flecks of micaceous sand clearly visible, some micaceous sandy areas are brown to yellowish brown (10 YR 5/3 to 5/4) (analogous with context 2028); very weak angular blocky to platy structure, weak incoherent, friable; rare fine to medium subrounded local stones; moderately porous; abundant void root channels; incoherent, weak; boundary smooth and clear.

21-49 Brown to dark brown firm clay to clay loam (10 YR 4/3 to 3/3), very dark greyish brown areas associated with structural faces (10 YR 3/2); moderately porous; abundant very fine void root channels, medium infilled earthworm channels; weak coarse to medium prismatic structure; slightly porous with depth; dark grey areas of Fe depletion associated with many root channels (10 YR 4/1); rare yellowish red inclusions (5 YR 4/6), < 1 cm, discrete and irregular (burnt areas possibly and mixing by earthworms); abundant charcoal (@ 20 % in places). Thought to be relatively undisturbed colluvium, overlies river silts at 72 cm (sandy silt loams to silty clay loam) and sandier river deposits at 1.3 m.

2.2 Profile micromorphology

i) Context 1547/1552

Complex mixture of colluvium and carbon rich buried soil occurring within the upper half of the section. Most of the finer textured colluvium infills a coarse vertically oriented channel @ 1 cm wide within the humose soil (possible archaeological feature or coarse earthworm channel). The following description refers to this infill unless otherwise stated.

Microstructure

Moderately to very porous, voids comprising 10 to 20 %; predominantly channels, chambers and irregular often loose walled vughs, often forming continuous systems; mostly vertically oriented, though horizontal orientations occur; randomly distributed, some form continuous systems; coatings are generally absent (possibly modern pore system).

Basic mineral components

c/f limit of 26 μm at 30(20):70(80), poorly sorted, mostly gefuric to porphyric.

Coarse:- 80% subangular to angular quartz (26 to 200 μm), much abraded and clay coated, subsidiary chalcedony; 10 to 20% fine rounded to subangular opaques (< 50 μm), may include Fe oxides, carbonized material including coal or charcoal or lignified/degraded wood; subsidiary (< 5%) micas, plagioclase feldspar, amphiboles, epidote, limestone fragments, zircon, garnet.

Fine:- yellow brown clay minerals, fine micas, opaques and abraded mineral fragments as above.

Basic organic components

Coarse:- Mostly dark reddish brown to orange brown degraded/lignified woody residues, no structured remains seen, unidentifiable carbonized residues as above.
Fine:- Isotropic component of the groundmass, fine cell residues, microcontrasted punctuations.

Groundmass

Coarse:- Overall random distribution.
Fine:- Dark reddish fine silt and clay minerals, brown stipple and mosaic speckled b-fabric.

Pedofeatures

i) Rare mosaic speckled, silty clay void hypocoatings with very fine outer clay coats occur within the colluvium. Voids directly within the humose soil have well developed silty clay coatings (mosaic speckled), no organic coatings were seen.

Comments

There are large inclusions (7 mm) of fresh bone and abundant carbonized and opaque material towards the base of the slide. Opaques and carbonized material comprise up to 40% of the total soil and include wood, coal, charcoal and iron oxides. There are also abundant inclusions of weathering calcareous material not seen elsewhere, possibly ash or pot remnants.

Buried soil, context 1552.

Microstructure

Predominantly channel structure, coarse, non-coated, probably modern channels comprise 10 to 15% total soil area. Within the soil matrix, channels, chambers and irregular vesicles predominate. Some contain humified or Fe rich root remains, others are loose walled, most are non-coated. This soil has supported plant growth. Overall matrix porosity @ 10 to 15%.

Basic mineral components

c/f limit of 15 μm at 20(30):80(70). Very poorly sorted with inclusions of calcareous chert, pot residues or ash. There are abundant inclusions of biogenic opal including phytoliths and diatoms. Mainly porphyritic, some chitonic.

Coarse:- 85% subangular to angular quartz (15 to 400 μm), subsidiary chalcedony, some calcareous; 5%

biogenic opal (see pedofeatures below); 5% fine (40 μm) muscovite laths; < 2% fine weathering biotite, pyroxene, amphiboles.
Fine:- dark reddish brown clay minerals, calcite, biogenic opal and opaques, probably Fe oxides and organic and ash debris.

Basic organic components

Coarse:- abundant charcoal debris, in some areas comprising 30 to 50 % of the soil matrix overall, 50:50 woody (possibly some Betula) and non woody remains. Fragmentation precludes identification of most woody debris. Abundant unidentified reddened and distorted tissue and cell residues, occasional fragmented root remains in situ; some pollen grains.
Fine:- isotropic component of the groundmass, limpid yellow orange diffuse accumulations of amorphous organic matter; abundant fine cell residues, humified and carbonized debris, some fragments having scalariform perforation plates, microcontrasted punctuations.

Groundmass

Coarse:- mostly random distribution and orientation, some randomly oriented clusters. Parallel distributions occur within textural pedofeatures.
Fine:- variable, ranging from undifferentiated (organic matter, Fe oxides and biogenic opal), crystallitic (limestone, organic matter and Fe oxides) to stipple or mosaic speckled where clay contents increase (ie. mostly within soil inclusions and relic pedofeatures).

Pedofeatures

i) Rare inclusions of burnt (up to 1 mm) and unburnt (250 μm) bone.
ii) Abundant phytoliths and diatoms, some associated with limestone (inherited diatoms?) or ash, see below.
iii) Common relic textural pedofeatures and soil inclusions comprise 30% of the soil overall. These comprise rounded discrete and irregular diffuse inclusions and of fine textured clay rich soil, mosaic speckled to parallel concentric striations, rolled? (c/f limit of 20 μm at 30:70, coarse component predominantly quartz up to 170 μm, subsidiary chalcedony, micas and pyroxenes, some garnet and zircon, ie. like colluvium)
iv) Abundant quartzitic calcareous opal-like inclusions, is this local limestone or chert or degrading pot residues. Not seen in the colluvium/silt profile.
v) Fe rich accumulations and inclusions, latter may be weathered earthworm residues or relic aggregates.

Lower boundary:- 1552/1553

The following additional features were also observed within 1552
i) Coarse (2-3 mm) humified fragments of Alnus.
ii) Large inclusions of barely weathered bone towards boundary (7.5 mm).

Comment

Anthropogenic soil, very irregular matrix, a complex mixture of organic debris, mineral and/or detrital soil. Includes calcareous chert-like inclusions which do not occur within colluvial soils and which may be ash or degrading pottery?.

Buried soil/colluvium boundary, contexts 1552/1553

Microstructure

Moderately porous, pore space comprises 20 to 30% total soil, predominantly channels, chambers and loose walled vughs, coatings not seen.

Basic mineral components

c/f at 30 μm of 40(20):60(80), poorly to moderately sorted, mostly porphyritic to chitonic. Includes 5% clastic sandstones (mostly quartz) and pure limestones.

Coarse:- 80% angular to subangular quartz (30 to 350 μm), subsidiary chalcedony; 10 to 15% subangular opaques (Fe oxides, carbonized or organic material); 2% fine (< 63 μm) micas, plagioclase feldspars, zircon, garnets, amphiboles, epidote, calcareous limestone fragments (less varied than colluvium proper).
Fine:- clay minerals, amorphous organic matter, fine calcareous, quartzitic and micaceous fragments, fine opaques (composition as above), microcontrasted punctuations, probably organic.

Basic organic components

Coarse:- Common carbonized or humified woody fragments and tissue residues mainly, not identified though similar to those within the buried soil, comprises up to 20% of the soil as a whole; common dark brown degraded humified structureless woody debris; common orange brown gel-like organic debris, may form discrete and rounded inclusions or occur as diffuse accumulations within the matrix - resins?.
Fine:- Fine fragments of the above (<30 μm), isotropic component of the groundmass

Groundmass

Coarse:- Random overall.
Fine:- Brown to dark brown stipple to mosaic speckled b-fabric, 30 to 40% isotropic, ie. organic.

Pedofeatures

i) Common areas of Fe impregnation
ii) Rare to common dark reddish brown weathered earthworm residues or relic aggregates.
iii) Common pale brown areas of impure limestone or chert, pottery residues or ash (crystallitic to undifferentiated b-fabric)

Merging into 1552 towards upper boundary, abundant fairly fresh bone fragments (barely weathered, up to 5 mm).