Sedimentology and archaeology at St Peter's churchyard, Little Comberton, Worcestershire.

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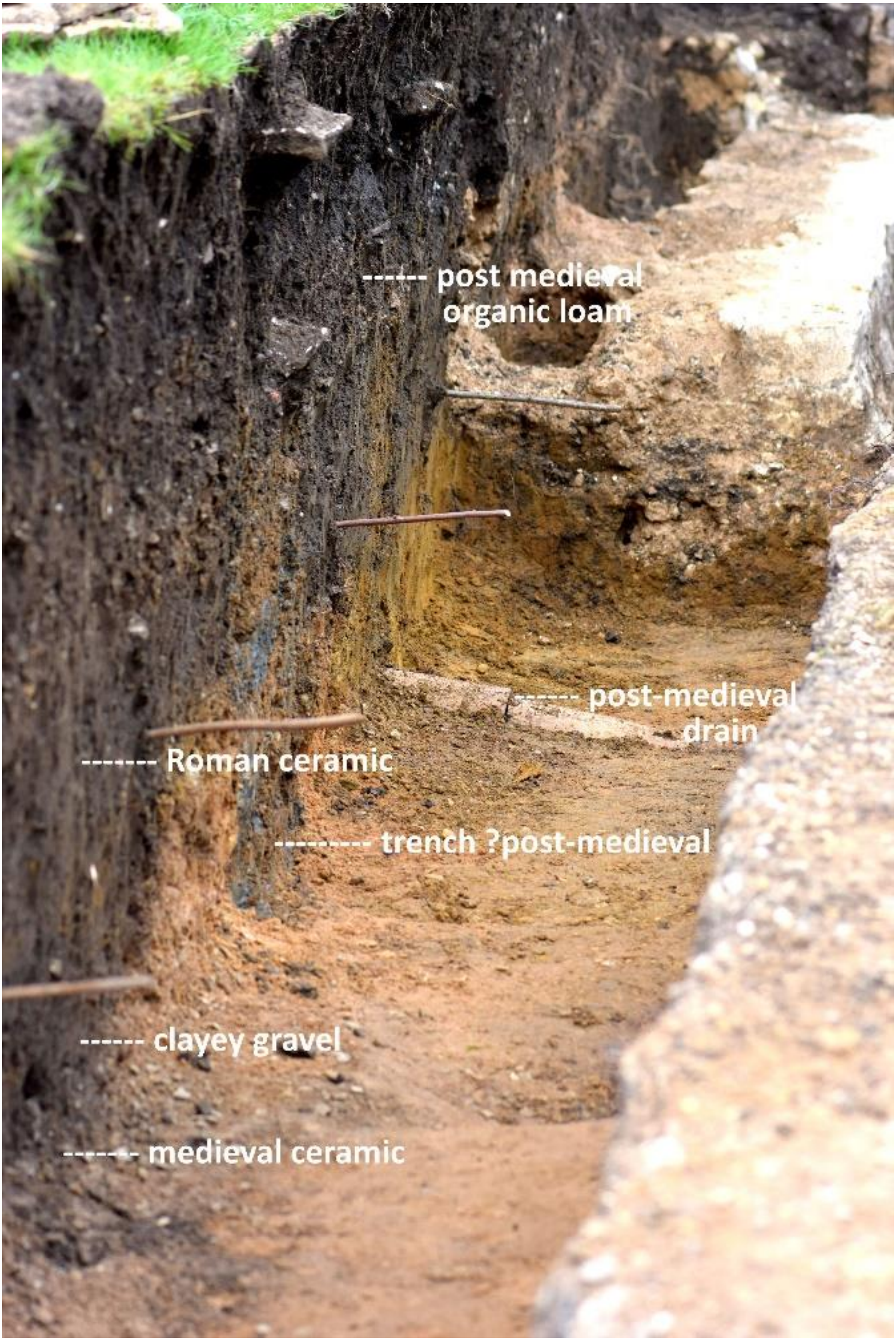
Introduction
During 2015 a drystone boundary wall at Little Comberton churchyard collapsed on the northern boundary of Manor Lane [the historic traditional name of this street is Back Lane] at SO966427. In April 2016 the wall was removed pending its reconstruction. During this process a section up to 1.52 m deep and 9 m long was exposed (01, 02). The base of the section is about the same height above the carriageway from which it is separated by an embankment.

Artefacts and ecofacts comprising ceramic, glass, animal bone, molluscs and cephalopods spanning 185Ma of time were recovered. Interpreting the stratigraphy and the temporal relationship of the finds initially seemed impossible; the section was a chaotic jumble of sediment disturbed by a variety of anthropogenic features. In a sudden 'eureka-moment' it finally dawned on me that instead of short-focussing on finer details I should have been looking at the wider landscape. Only then could any semblance of clarity be brought to what was in reality a relatively small section. The interpretations provided here are tenable but not immutable; the section is unrelated to the activities of sextons.

Fig 1. Boundary wall section at St Peter's Church boundary wall, Little Comberton, 21 April 2016, developed on a knoll of gravel soliflucted from the Pliensbachian of Bredon Hill's northern escarpment. Looking north-west the sediments have been incised at the edge of Manor Lane and changes in slope and altimetry are clear.

Sedimentology followed by discussion
The churchyard section revealed two broad lithofacies (02):

1) weakly structured clay and mottled clay <1.2 m deep, gravelly below becoming loamy and humified upwards filling channels in
2) underlying sand and gravel not bottomed.



02. Sedimentology of boundary wall section, St Peter's churchyard, Little Comberton, 21 April 2016, maximum total depth 1.52 m. The foundations are those of the former village school constructed in AD1840 by Reverend William Parker and removed in AD1897 to its present site when it later became Little Comberton village hall.

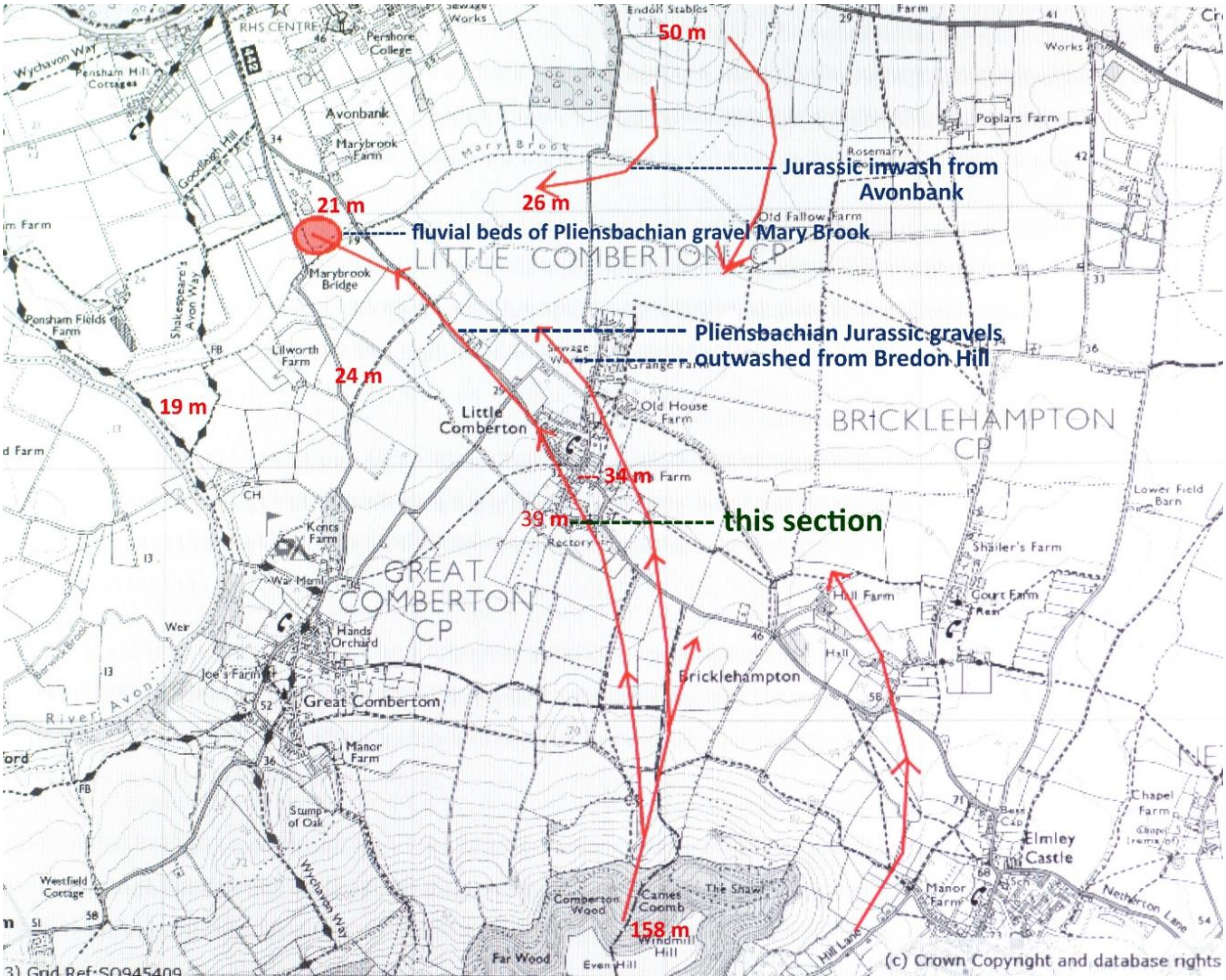
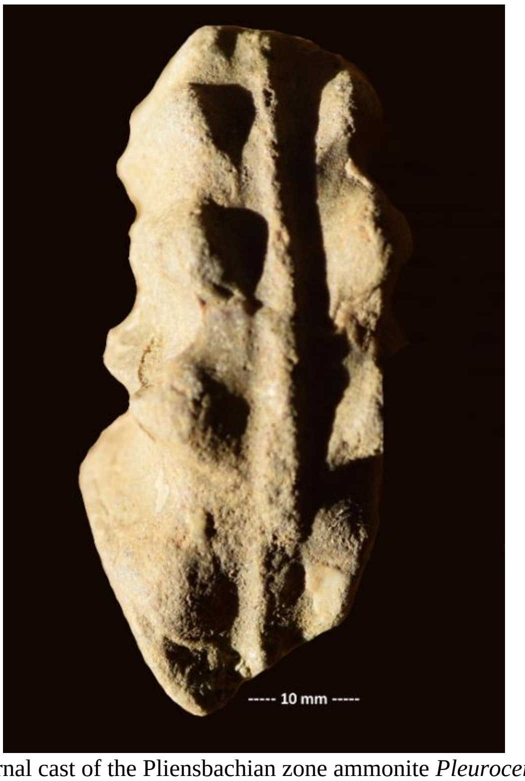


Fig. 3. Altimetric map of Little Comberton showing position of section and direction of Jurassic solid geology mass movement from Bredon Hill and Avonbank. Map squares are 1 km^2.

Basal sand and gravel

The sand and gravel contains exclusively late Lower Jurassic rocks and fossils attributable to the Pliensbachian stage about 185Ma on the basis of lithology and zone fossils (05, 06). These sediments outcrop beneath the well-known Marlstone Rock Bed (Hains, 1969; Whittaker & Ivimey-Cook, 1972) which is well-developed on Bredon Hill; springs emanating from these aquifers actually provided potable water for the people of the historic settlement (Richardson, 1924). Figure 4 illustrates the dominance of ironstone, micaceous siltstone and sandstone in the gravels. They have been subject to episodic weak current sorting and were soliflucted downslope from outcrops above Cames Combe (03) or close by; the direction of movement is marked in red on 03. The sand and gravel is devoid of fossil soils, humified or organic sediments and is ascribed to a cold period towards the end of the last, Devensian, ice age. A vertebra from a small ichthyosaur was located *in situ* (07) and may explain similar surface finds in Little Comberton at SO 968428 on 15 January 1971 and at SO967433 on 3 May 2003. According to McGowan & Milner (1999) Pliensbachian ichthyosaurs were undocumented in Britain until 1995. A dorso-laterally compressed belemnite phragmocone 29 mm in diameter was also recovered from the gravels.

04. Pliensbachian-derived basal sand and gravel outwashed from the northern Jurassic escarpment of Bredon Hill. Horizontal rain-washed surface, 17 April 2016.



05. Internal cast of the Pliensbachian zone ammonite *Pleuroceras spinatum* Bruguière, 1789 in situ 20 April 2016

06. Internal cast of the Pliensbachian zone ammonite *Amaltheus subnodosus* (Young & & Bird, 1828), 10 April 2016

Fig. 7. Vertebra of ichthyosaur *in situ*, Pliensbachian-derived sand and gravel, 20 April 2016

The clay beds

Down-slumped gravelly clay (08) becomes finer and more clayey upwards as freeze-thaw effects reduce and then cease. An early phase of mixed clay and gravel deposition at the south-eastern end of the section (08) contained a tibia of Red Deer *Cervus elaphus* (L., 1758) (09) which had been broken both in antiquity and during the wall reconstruction and an anciently broken mandibular ramus of a Giant Ox *Bos primigenius* Bojanus, 1827 (10) perhaps two years old. This implies a date no more recent than the Bronze Age *ca* 3500BP (Whitehead, 1979) when *B. primigenius* was passing into extinction in Britain. The bone is very densely ossified with notably large permanent third and fourth premolar teeth and cannot be from a domestic animal; its weight is 51 grams. These two herbivores indicate the nearby existence of productive swampy valley woodland (Banks, 1962; Whitehead, 2006).

Fig. 8. Pliensbachian-derived basal sand and gravel diffusing upwards into clayey gravel inwashed from the northern escarpment of Bredon Hill. 17 April 2016.

09. Distal end of anciently broken tibia of Red Deer *Cervus elaphus*, lower clayey gravel.

10. Mandibular ramus of immature Giant Ox *Bos primigenius*, lower clayey gravel.

Further episodic inwash of clay occurred until a morass was formed that may have persisted for *ca* 2000 years until well after the church was built. Artefacts including Iron Age, Roman and medieval pottery were incorporated in these sediments either naturally or directly through human activity; a Roman occupation site lies immediately to the south-west and the church knoll was also subject to Roman activity (Whitehead, 2000). A medieval plain floor tile (11) recovered *in situ* was bedded into the surface of the underlying gravel and represents various *rejectamenta* (12) thrown into the mire which moved downwards through its subaqueous sediments which were about a metre deep. Little Comberton had several mires, or sumps, including a gigmire (at SO96724333), into which domestic items were habitually tipped. This morass evidently caused the inhabitants of Little Comberton some concern, for it was subject to concerted drainage operations for at least 220 years (02, 13); vertical trenches may mark earlier drainage attempts.

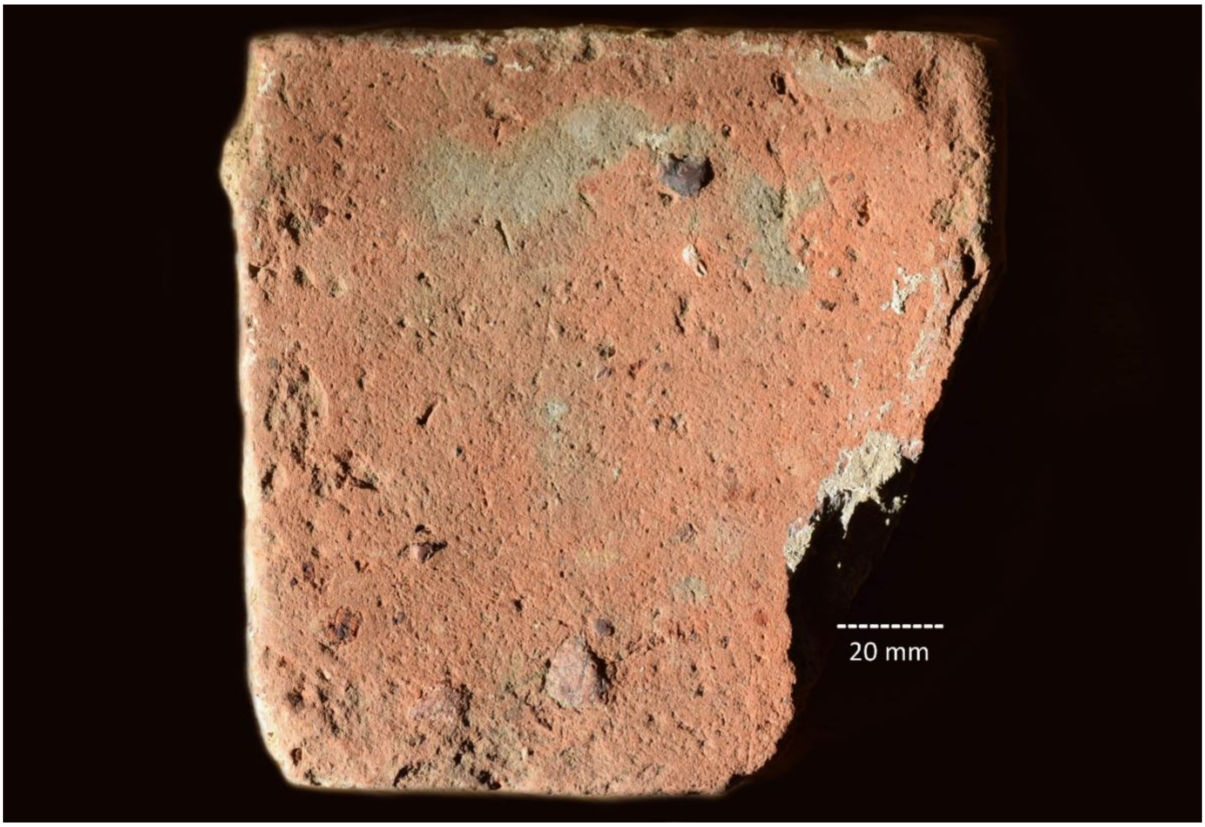
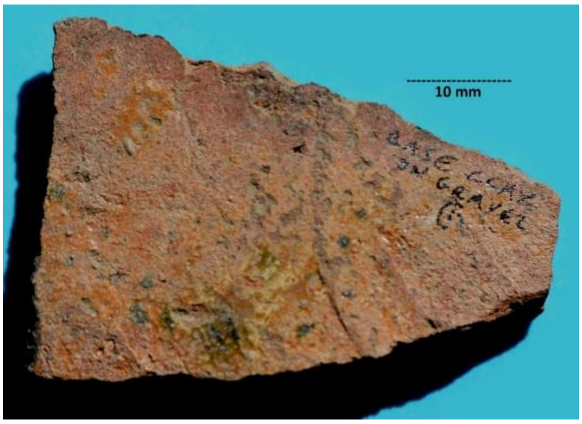


Fig. 11. Medieval plain floor tile from a Great Malvern kiln containing pegmatitic inclusions up to 15 mm diameter. Fabric described by Vince (1977), probably *ca*AD1450. The late Alan Vince described tiles of similar provenance from excavations at Tewkesbury Abbey Meadow (Hoyle, 1992).



12. Body sherd of late-medieval wheel-thrown light patchy copper and green-flecked glaze, base of clay

13. Fragment of ceramic land drain *ca* AD1800 Malvernian ware with recovered from vertical trench cut into the sediments. Stamped for exclusion from a 1784 tax on bricks act

At a depth of 55 cms post-medieval black-glazed ware and blue and white ware (*ca* AD1750-AD1900) are associated with the terrestrial molluscs *Discus rotundatus* (Müller, 1774), *Trochulus striolatus* (Pfeiffer, 1828) and *Aegopinella nitidula* (Draparnaud, 1805) indicating a somewhat stabilised land surface with shade cast by trees. Cattle bones are geometrically sawn. These more recent sediments may have been subject to limited anthropogenic activity; final sedimentary accretion was limited this and to slow downhill creep that raised the land surface above the base of the original drystone wall.

Summary and conclusion

Large quantities of sand and gravel of Jurassic Pliensbachian lithology were transported downslope from Bredon Hill by freeze-thaw processes during the closing phases of the last ice age and subsequently entered the River Avon *via* what is now the Mary Brook catchment. Beds of the same Pliensbachian-rich sand and gravel at least 3 m thick floor the valley side of Mary Brook at Wick (03); Richardson (1904) recorded similar sediments nearby and I have observed comparable sediments on the western embankment of the traditional orchard at Well Furlong (SO96754279). As lobe after lobe of semi-frozen gravel descended the hillside a combination of periglacial, gravitational and hydrological processes fuelled its mass movement. The ease with which melting permafrost transports sediment is well-understood. At times this movement may have taken the form of large-scale surges possibly on catastrophic scales. The process continued with inwash of finer Jurassic sediments, probably associated with woodland clearance during the Bronze Age until a morass developed against the church knoll which may have been sporadically inundated for some 2000 years. Used as a waste tip it was not until about AD1750 that serious thought was given to draining it.

A key point is that the wider modern land surface to the north-west between the church and Mary Brook is now everywhere lower (03). It is therefore argued that the churchyard section marks the edge of a more extensive area of down-slumped sediment which has subsequently been greatly modified largely by fluvial processes. This explains how a small vertical section may represent 12000 years of time. Eventually the land surface reached its present height and the sediments achieved the somewhat uncertain dynamic equilibrium that now pertains. During a major flood event in 2007 a hitherto unrecorded palaeochannel was detected (Fig. 14) draining the land surface of Bredon Hill directly on to Manor Lane which for long had been an open drain passing water to a topographical low at the crossroads. This palaeochannel is taken to be the most recent obscured evidence of the processes described above that pertained for at least 10000 years and left the church knoll isolated as a geomorphic feature and perhaps a place of significance for meetings of people. Although the sediments underneath the church are undocumented, when the rectory pond or sump below the south-eastern embankment of the churchyard (SO96734277) was dredged during August 1981 only the blue clay of Charmouth Mudstone was encountered.

Fig. 14. Manor Lane, or Back Lane, Little Comberton, looking towards St Peter's Church during flood event of 20 July 2007. Floodwater emanating from a meandering palaeochannel draining Bredon Hill directly into the road, replicating processes that created the churchyard section.

Acknowledgments
I am grateful to Mr David Poloni for assistance during the wall rebuilding work at St Peter's churchyard. Mr Matthew Davis kindly confirmed that my camera had not disappeared into the morass!

Repository
Material finds from St Peter's churchyard will be accessioned at Evesham Almonry Museum which has full Museums Association accreditation.

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