Field and preliminary laboratory observations

18 London Road, Pulborough (Site Code 2006.72.1)

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Introduction

Two site visits were made by the author to the site in March and July 2006. An initial visit made on 8th March 2006 was undertaken by the author in the company of site supervisor Andy Leonard. Two trenches were observed in which a range of different sediment types were present. Because of the instability of the trench sides and the difficulties of access to the deeper parts of the site a proposal was made to undertake the drilling of auger holes in order to recover a more complete sequence of samples. This was undertaken on 11th July 2006 when 2 boreholes (BH 1 and 2, see Appendix I) were drilled. This report presents the primary borehole logs (including photographs), a summary of the likely environmental conditions associated with sequence accumulation and recommendations for further work.

Background

The site lies north of Pulborough town centre at the base of a gently sloping valley that forms a minor tributary draining towards the west that eventually enters the Arun about 1km from the site.

The site lies within the Weald area, an eroded anticline that exposes older rocks in the core of a dome flanked to the south by the younger chalk rocks of the South Downs about 5km from the site. Bedrock geology has been mapped by the British Geological Survey (1996) and their mapping indicates that the site lies close to the boundary between the Hythe Formation and the overlying Sandgate Formation (both belonging to a group known as the Lower Greensand Group). The Hythe Formation consists of glauconitic fine to coarse sandstones while the overlying Sandgate Formation consists of sandy clays and clayey sands of the local Fittleworth Member. All these deposits belong to the Cretaceous.

Overlying the bedrock geology the flanks of the valley are mantled by Head deposits that may contain a variety of grain sizes from gravel to clay. The age of the Head deposits in the area is unknown although they are likely to be polycyclic and therefore may well date to a number of different phases in the Pleistocene. At least some of the Head deposits are likely to have been emplaced during the last cold stage (the Devensian).

Valley bottom sediments are also recorded in the vicinity of the site to the west of railway but not shown to penetrate east of the railway and into the site area. These deposits are mapped as alluvium. These are likely to be fine grained clays and silts deposited during the Holocene (last 10,000 years) with a possible basal gravel dating

to the final part of the last cold stage, probably post dating the glacial maximum at 18-20ka B.P.

Survey

Two boreholes were drilled using a Terrier drill rig on the 11th July 2006 (Plate 1). The position of the boreholes were located by staff from AOC prior to commencing drilling. Survey details are held by AOC.

Drilling utilised equipment capable of recovering 1m length sealed cores. Drilling ceased when bedrock was attained (BH 2) or when drilling conditions made it impossible to drill further (BH 1).

All cores were taken by the author and cut and cleaned. Preliminary logs are presented in Appendix I along with a photographic record of the cores.

Results

In both cases sample recovery varied depending on ground conditions. Due to the nature of the made ground in BH 1 no recovery of core material was possible from the upper 2m of stratigraphy, recovery only began at a depth of 2m where the base of the made ground was encountered. Drilling of BH 1 ceased at a depth of 5.7m where the presence of dense sands and driven gravel clasts made further drilling impossible. Recovery in BH 2 was good throughout and drilling ceased when bedrock had been satisfactorily reached.

In both cases similar sequences were encountered beneath made ground. In BH 1 interbedded clay-silts/sands and organic horizons were encountered between depths of 2.3m and 4.9m (4 organic horizons present) while in BH 2 similar sediments were encountered between 1.32m and 3.35m (only 2 organic horizons were present).

In BH 1 beneath the lowermost organic horizon dark grey sands were encountered (4.90 – 5.70m). In BH 2 a thin gravel horizon (3.35 – 3.55m) sealed a thick sequence of yellow to grey sands (3.55 – 6.00m).

Discussion

The evidence obtained from the boreholes indicates that beneath the made ground sequences in both boreholes a sequence of alluvial sediments (mixed clay-silts/sands and organic silts) are present. These sediments are typical of those anticipated in alluvial situations and are likely to be similar to those associated with the tongue of alluvium mapped to the west of the railway by the BGS. On the basis of this evidence the tongue of alluvium can now be extended east of the railway.

The nature of these fine grained sediments suggest accumulation in low energy floodplain or fluvial conditions in which slow moving water (minerogenic (clay-silt/sand) parts of sequences) alternated with phases in which organic material built up

as a result of the lessening of fluvial conditions and perhaps emergence of the site above permanently inundated conditions. These sediments probably all date to the Holocene.

In BH 2 these deposits rested on a thin gravel horizon. It is difficult to ascertain from the borehole sequence whether this represents fluvial deposition or deposition by other processes such as colluviation or through solifluction processes. It is most likely these gravels represent deposition under cold climate conditions and can therefore be ascribed to the late Devensian period (?post 20ka B.P.).

It is likely that bedrock was attained beneath the gravel in BH 2 and may tentatively be ascribed to the Fittleworth Member of the Sandgate Formation. It is unclear at present whether the basal parts of BH 1 represent bedrock or whether they are parts of the Holocene alluvial sequence.

The results of the drilling are entirely consistent with the pattern that may be suggested from an interpretation of the BGS mapping and all sequences probably post date the last glacial maximum in age. The sequence of Holocene alluvium remains difficult to relate to any particular phase of the Holocene without supporting evidence from other sources.

Recommendations for further work

The evidence presented in this study indicates that well preserved alluvial sediments of Holocene age exist at the site. These include organic as well as inorganic units and therefore it is predicted that:

1. Pollen probably exists within the organic beds and may be present within the minerogenic units.

2. Microfossils such as ostracods may exist in the minerogenic units (fossil material (including foraminifera) may also exist within the sequences, particularly the base of BH 1, that may allow bedrock to be clearly differentiated from alluvium where it is presently difficult to do this, e.g. BH 1 base).

3. The organic horizons contain sufficient carbon for dating through AMS methods.

Because the age of the alluvium is presently unknown it is suggested that age estimates are a priority at the site prior to determining whether or not any additional investigation is merited. Dating the 4 main organic horizons in BH 1 would achieve this aim. This might usefully be linked to microfossil assessment of the minerogenic units in order to attempt to differentiate bedrock from alluvium. Depending on the results of the dating exercise it is then possible that pollen analysis in order to produce a local pollen diagram may be justified.

References

British Geological Survey 1996 **Chichester and Bognor**. England and Wales Sheet 317/332. Solid and Drift Geology. 1:50 000. British Geological Survey: Keyworth.

Appendix I.

Borehole logs BH 1 and 2 and core photographs

18 London Road, Pulborough		11/7/06	BH 1
Grid co-ordinates			
Elevation (m O.D.)			

Depth below ground level	Sediment description	Inferred environment of deposition
0.00 – 2.00	Not recorded	Made ground
	---not observed---	
2.00 – 2.30	Soft yellowish brown clay-silt.	?made ground
	---abrupt contact---	
2.30 – 2.38	Grey-brown organic silt. Soft and structureless.	Low energy fluvial?
	---graded contact---	
2.38 – 2.48	Yellow-brown fine sand and silt.	Low energy fluvial, some moving water
	---sharp contact---	
2.48 – 2.52	Brown organic silt.	Very low energy, standing very shallow water or emergent surface
	---abrupt contact---	
2.52 – 2.80	Grey clay-silt.	Low energy fluvial?
	---sharp contact---	
2.80 – 2.84	Yellow-brown silt.	Low energy fluvial?
	---abrupt contact---	
2.84 – 3.20	Dark brown organic silt.	Very low energy, standing very shallow water or emergent surface
	---abrupt contact---	
3.20 – 3.40	Grey sand becoming finer with depth.	Low energy fluvial, some moving water becoming higher energy up-profile
	---abrupt contact---	
3.50 – 3.65	Greenish-grey sand.	Low energy moving water
	---sharp contact---	
3.65 – 3.90	Yellowish-grey clay-silt.	Low energy fluvial?
	---sharp contact---	
3.90 – 4.10	Brown organic silt.	Very low energy, standing very shallow water or emergent surface
	---sharp contact---	
4.10 – 4.70	Grey clay-silt.	Low energy fluvial?
	---sharp contact---	
4.70 – 4.90	Brown organic silts.	Very low energy, standing very shallow water or emergent surface
	---abrupt contact---	
4.90 – 5.70	Very dark grey sand.	Low energy moving water
	---hole abandoned 5.70m---	

BH 1.
Cores 2-3,3-4, 4-5,
5-5.7

18 London Road, Pulborough		**11/7/06**	**BH 2**
Grid co-ordinates			
Elevation (m O.D.)			

Depth below ground level	**Sediment description**	**Inferred environment of deposition**
0.00 -1.32	Not recorded.	Made ground
	---abrupt contact---	
1.32 – 1.58	Dark grey clay-silt.	Low energy fluvial?
	---sharp contact---	
1.58 – 1.65	Black organic silt and large clasts of stone/brick.	Made ground
	---sharp contact---	
1.65 – 1.90	Yellow-brown becoming grey medium/fine sand	Low energy moving water
	---sharp contact---	
1.90 – 2.00	Brown organic silt and sand	Low energy moving water with high input of local vegetation
	---not seen---	
2.00 – 2.55	Grey fine sand. Massive and structureless.	Low energy moving water
	---abrupt contact---	
2.55 – 3.35	Grey to light grey fine sand. Structureless. Becomes yellowish grey sand with depth	Low energy moving water
	---abrupt contact---	
3.35 – 3.55	Poorly sorted sandy-gravel. Sub-angular clasts typically <5cm. Sand matrix. Loose and structurless.	? Moderate to high energy moving water or downslope movement of material (colluvial processes). Possibly late Pleistocene cold climate system either in water or as solifluction.
	---sharp contact---	
3.55 – 6.00	Yellow-brown to grey becoming grey and dark grey with depth. Medium/fine sand.	Low energy moving water. Bedrock.
	---hole abandoned 6.0m---	

BH 2.
Cores 0-1, 1-2, 2-3
3-4, 4-5, 5-6

Plate 1. Terrier drill rig of type used at Pulborough.