A138 Chelmer Bridge: A stratigraphic and palaeoecological evaluation of the River Chelmer floodplain and recommendations for further analyses

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by

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Summary

Deposits of palaeoecological potential were encountered during geotechnical borehole investigations on the River Chelmer floodplain. Birmingham Archaeo-Environmental was subcontracted to undertake a palaeoecological evaluation of these floodplain deposits in advance of the proposed construction of a new bridge for the A138 Chelmer Road. Sedimentary coring along the proposed bridge route indicated that organic remains within the floodplain stratigraphic sequence were limited to a single basal peat unit overlying sands and gravels. Sample cores focussing on this deposit were extracted using a windowless sampling drill rig. A suite of palaeoenvironmental assessments are recommended on the organic deposits including: pollen, plant macrofossil and beetle assessments, supported by radiocarbon dating.

KEYWORDS: A12 Chelmer Bridge, River Chelmer, Palaeoenvironment, Borehole Survey

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1. INTRODUCTION

Faber Maunsell are preparing a planning application to be submitted to Chelmsford Borough Council for the off-line replacement of the existing A138 Chelmer Viaduct and River Bridge on behalf of the Highways Agency. The current bridge spans the floodplain of the River Chelmer, whilst the proposed replacement bridge is to run immediately parallel to the east of the present route. Deposits of palaeoecological potential were encountered during ground investigations along the proposed route for the replacement bridge (centred on NGR TL719 063). Organic-rich units were recorded within geotechnical borehole logs and suggested to be present in relative abundance across the floodplain between depths of 0.50m and 3.00m. It was therefore postulated that deposits of palaeoenvironmental potential may have accumulated within the floodplain of the River Chelmer (Essex County Council, 2008). Such deposits may contain valuable environmental information relating to landscape development of the area.

Birmingham Archaeo-Environmental (BA-E) were subsequently subcontracted by Faber Maunsell to undertake a coring survey across the floodplain along the proposed bridge route. This report presents the results of these investigations (manual coring, window sampling, stratigraphic recording, sampling and palaeoenvironmental evaluation). The aim of the work was threefold:

- To identify, record, characterise and sample organic deposits associated with the floodplain of the River Chelmer;

- To assess this material for biological preservation (suitable for pollen, plant macrofossil and beetle assessments) and identify suitable samples for radiocarbon dating;

- To provide an understanding of the subsurface stratigraphy of any organic-rich deposits, which might aid in the development of archaeological prospection strategies.

2. METHODS

2.1 Borehole Survey

A site visit was undertaken by BA-E over a five-day period from 21st-25thth July 2008. At the time of fieldwork, the study area was rough pasture land. An initial site walkover was undertaken in an attempt to identify any topographic variations which might relate to palaeochannel features. Coring took place along a single transect running approximately north-south across the floodplain of the River Chelmer. Cores were extracted using a manual gauge ‘Eijkelcamp’ corer and continued to a depth of 4.0m or until bedrock or gravels were encountered. In places dense vegetation or very shallow stratigraphic sequences were encountered (see Figure 1 for approximate core locations). In addition, the presence of a buried gas main on the east side of the river prevented coring within an area c. 50m wide..

Upon completion of this initial survey, a windowless sampling cable percussive rig was subcontracted from Global Probing and Sampling Ltd to obtain suitable material for palaeoenvironmental evaluations. Samples were extracted in 1.0m lengths within enclosed core piping for storage and transport. Full details of the sampling strategy is provided in Section 3

2.2 Stratigraphic Analysis

Whilst an initial assessment of the sedimentary archive was made on-site, detailed stratigraphic recording of sample cores was undertaken at the Birmingham Archaeo-Environmental laboratory at the University of Birmingham. Each 1.0m section of sample was carefully opened ensuring the enclosed stratigraphy remained intact. Sediments were recorded using the Troels-Smith (1955) classification scheme. The scheme breaks down a sediment sample into four main components and allows the inclusion of extra components that are also present, but that are not dominant. Key physical properties of the sediment layers are also identified according to darkness (Da), stratification (St), elasticity (El), dryness of the sediment (Dr) and the sharpness of the upper sediment boundary (UB). A summary of the sedimentary and physical properties classified by Troels-Smith (1955) and the nomenclature used is provided in Table 1. A full stratigraphic description of the cores is provided in Appendix I.

3. PRELIMINARY RESULTS OF FIELDWORK

A total of nineteen cores were excavated during the initial phase of fieldwork. To the far northern and southern edges of the floodplain, the deposits were typified by shallow topsoils (Unit 1; c.0.50m thick) underlain by poorly sorted clay-rich sands and gravels (Unit 5). With proximity to the present channel of the River Chelmer, the sequence became much thicker, and comprised topsoil, underlain by grey-brown to orange-brown clayey silts present to a depth of *c*. 1.70m (Unit 2). Immediately adjacent to the River Chelmer, blue-grey clayey silts underlay the orange-brown clayey silts to *c*. 2.70m depth (Unit 3), which were in turn underlain by a thin layer of dark brown organic-rich silts and silty, well humified peat (Unit 4). Sands and gravels (Unit 5) were encountered below these organic-rich deposits at a maximum depth of *c*. 3.20m.

A sinuous, linear depression was identified by the walkover survey to the north of the River Chelmer (see Fig. 1). The feature was found to contain grey-brown/ dark brown organic silts to a depth of *c*. 1.70m (Core 19).

Borehole sampling was undertaken on the final day of fieldwork (Friday 25th July) and focussed on the basal organic peat unit (see below for discussion). The location of Core 9 (the thickest organic deposit identified) was revisited with the windowless cable percussive rig. Three boreholes were extracted to ensure sufficient material for palaeoenvironmental assessment was recovered. The borehole samples were returned to the Birmingham Archaeo-Environmental laboratory at the University of Birmingham for evaluation and sampling. A summary of the stratigraphy is also provided in Appendix I.

4. CONCLUSIONS

The abundance of relatively shallow poorly sorted sands and gravels at the edges of the floodplain are likely to reflect former river terraces of the River Chelmer. It should be noted that such terraces are often a focus for early human activity due to their relative elevation and the proximity to water sources The sands and gravels have since been partially buried by subsequent floodplain processes (see below).

The basal gravels were probably deposited under high energy glacio-fluvial conditions in response to climatic fluctuations during the Devensian (before c.15,000 years before present (BP)). During the Late-glacial/early Holocene (c.15,000-10,000 BP) it is likely that the River Chelmer incised a deep channel into these basal gravels. During the climatic amelioration of the Holocene (c. 10,000 BP), a lower energy fluvial regime would have developed as lowland river systems such as that of the Chelmer adjusted to rising base levels (ie. sea level) and hence shifted towards floodplain accretion As the River Chelmer stabilised within its channel, probably towards the mid-Holocene (c.10,000-5,000 BP) wetland vegetation colonised the adjacent waterlogged floodplain, resulting in the deposition of the basal peat unit. Vegetation establishment also had the effect of stabilising the floodplain which in turn, further reduced sediment supply and fluvial energy within the catchment.

Processes of alluviation eventually buried this peat unit as the river overtopped its early deep channel and meandered across its floodplain, depositing the silts and clays overlying the basal organics. Discrete palaeochannels cannot be discerned on the basis of the current data. The only exception to this is Core 19, which represents a palaeochannel feature. This is also apparent from surface expression and also its location in a drain feature apparent on Fig.1. However, the relatively low organic content of these deposits and its shallow depth means it does not have high palaeoenvironmental potential. It probably represents a relatively recent channel; it is likely that this channel re-activates during periods of flooding.

The basal organic-rich silt encountered immediately north and south of the River Chelmer (encountered in Cores 8, 9 and 13) has good potential for palaeoecological analyses. The presence of these deposits immediately overlying the basal sands and gravels, in addition to the relative thickness of overlying alluvial deposits (up to 2.70m) would suggest that the organic unit may date back to the mid-late Holocene period (c. 5- 2000yrs BP). The organics may provide valuable palaeoenvironmental information relating to past landscape development and perhaps anthropogenic activity at this location.

5. RECOMMENDATIONS FOR FURTHER ANALYSIS

In order to establish the potential of the palaeoecological record, it is recommended that an initial palaeoenvironmental assessment is undertaken. This will identify whether suitable proxy indicators of environmental change are preserved and present in relative abundance within the organics. The following palaeoenvironmental assessments are proposed:

- Pollen assessments should be undertaken at 0.04m intervals through the organic-rich unit in order to assess the potential of this deposit to provide information regarding environmental change on and around the sampling site (11 samples in total),

- The remaining organic deposits from the three sample cores should then be ‘bulked’ into a single sample for waterlogged plant macrofossil and coleopteran (beetle) assessments. Such assessments will complement the palynological assessments by helping elucidate the vegetation present in the immediate vicinity of the sampling site. In addition, the potential exists to identify indicators of anthropogenic activity within the flora and faunal assemblages,

- AMS radiocarbon dating should be undertaken at the top, middle and bottom of the organic unit (2.87m, 3.05m and 3.19m). This will indicate the timing of the onset and cessation of organic accumulation in addition to provide information regarding the rate of organic accumulation during this period. Bulk samples will have to be submitted for radiocarbon consideration. Due to the high level of humification within the organic unit, visible identifiable plant macrofossils are relatively sparse from the chosen unit depths. As a consequence, the potential exists for radiocarbon contamination through the influence the vertical movement of acid insoluble/alkali soluble ('humic acid') and alkali/acid insoluble ('humin') fractions within the deposit. However, such a dating framework is vital in order to provide a secure chronology to the sedimentary sequence (3 samples in total).

6. ARCHIVE

All borehole logs, site plans, sedimentary samples and associated material are stored at Birmingham Archaeo-Environmental, University of Birmingham. Sample boreholes will be temporarily stored within the BA-E laboratory and subsequently disposed of once approved by the client.

ACKNOWLEDGEMENTS

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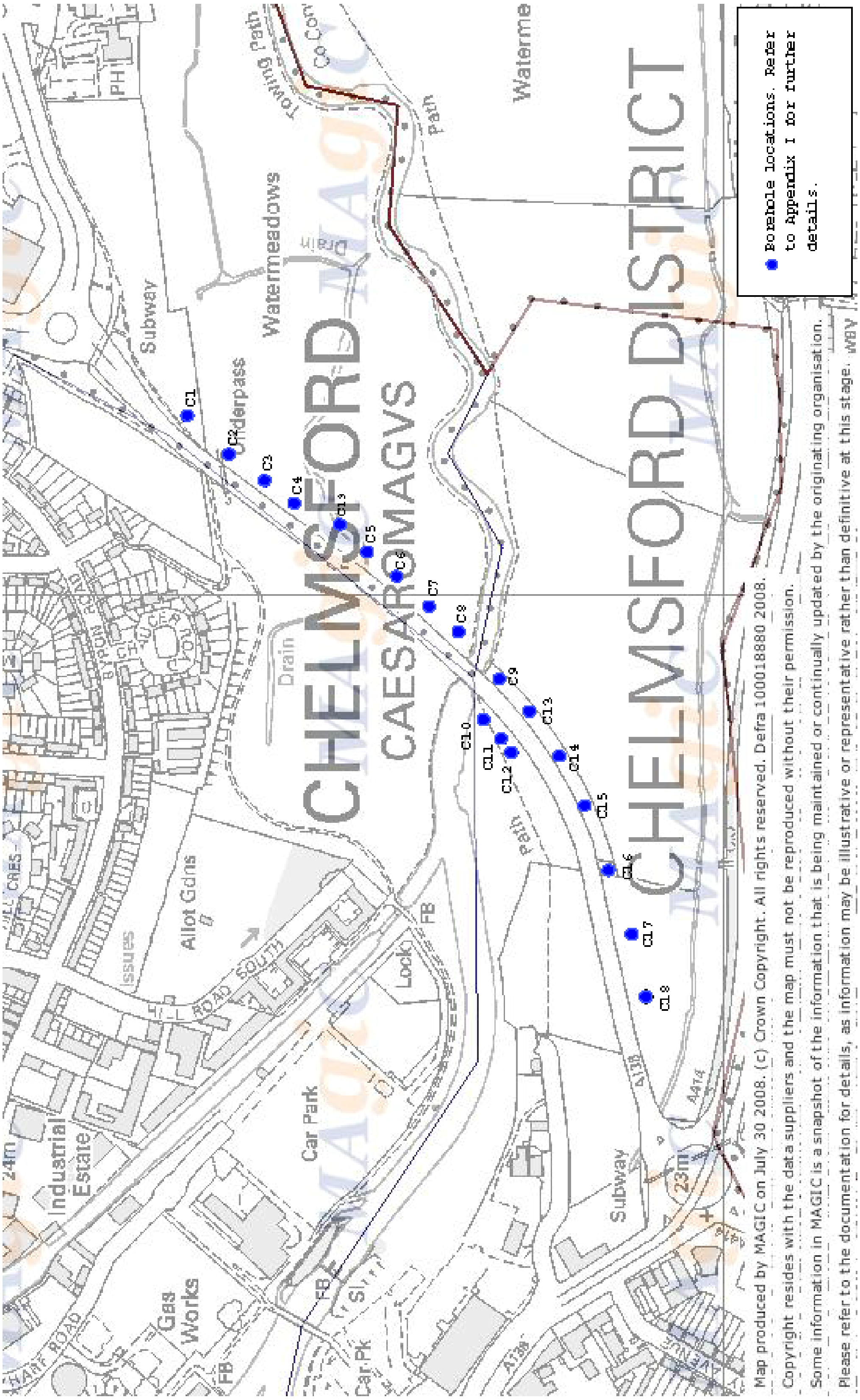

Figure 1: Site plan of A138 Chelmer Bridge spanning the floodplain of the River Chelmer. Positions of individual core locations are highlighted. Sample boreholes taken from C9 location.

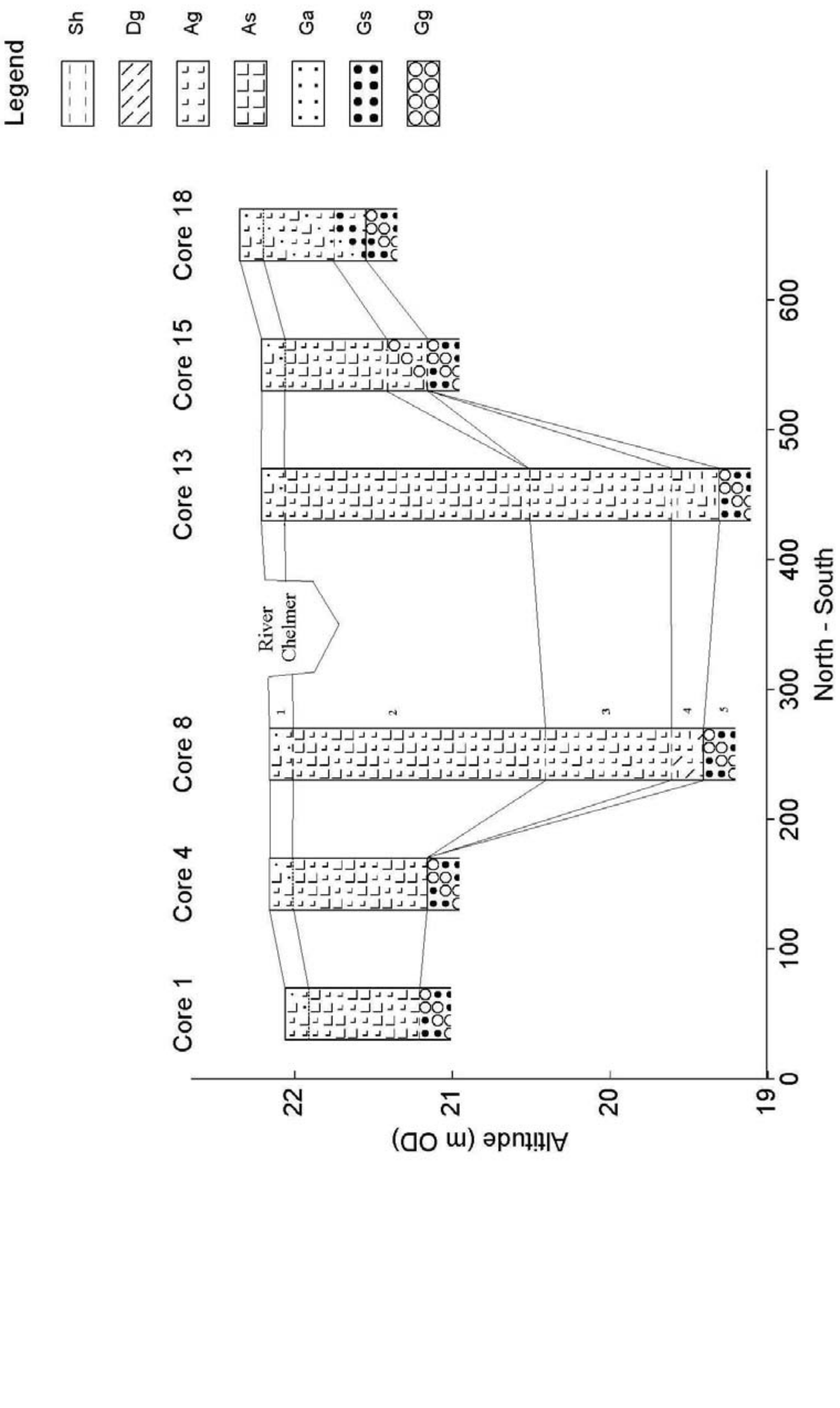

Figure 2: 2D stratigraphic model of subsurface stratigraphy encountered during coring. Selected cores have been identified for the diagram to summarise key stratigraphic units. Refer to Section 3 for stratigraphic units.

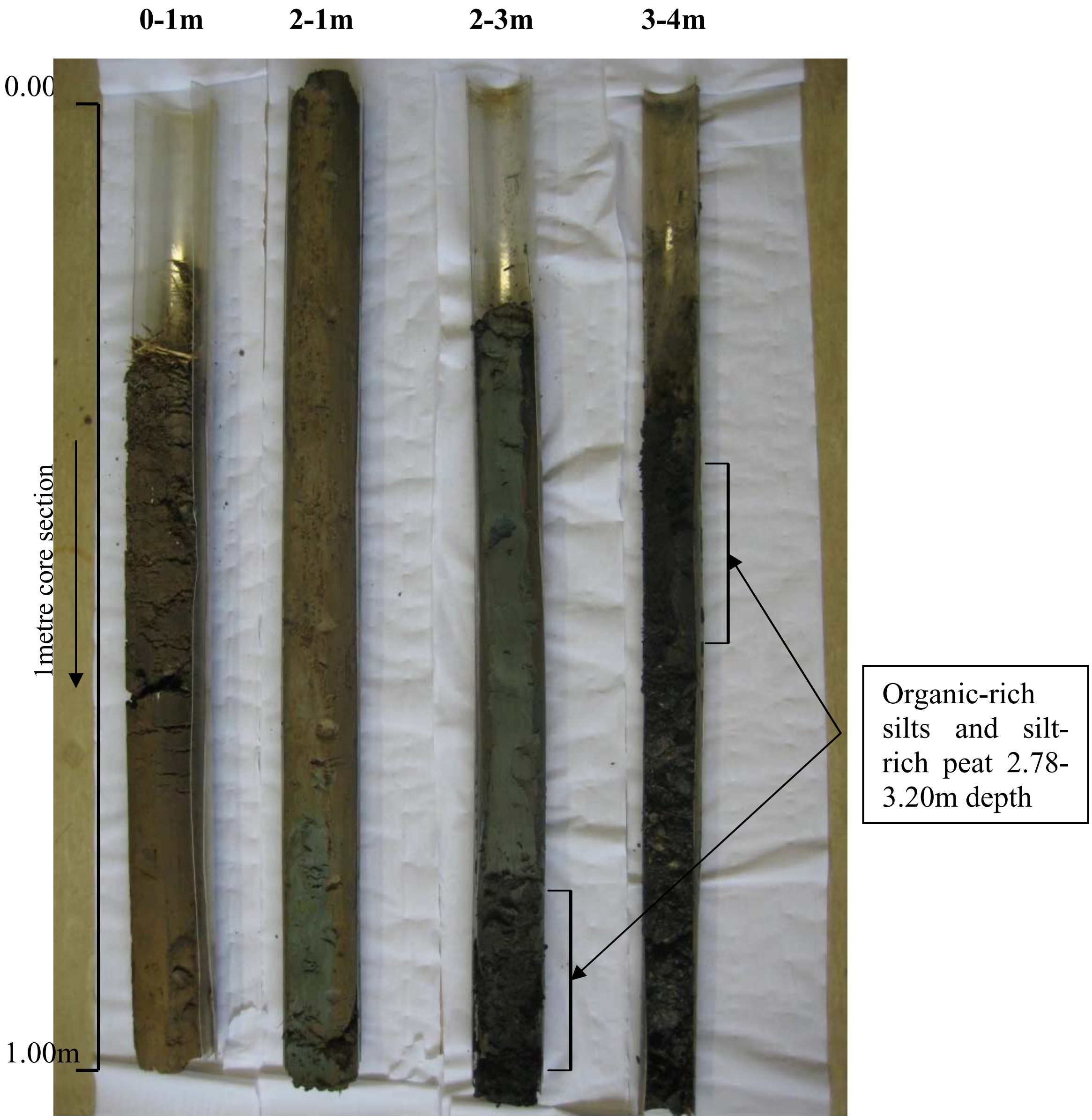

Figure 3: Photograph of windowless sample borehole WC1C. Refer to Appendix I for stratigraphic summary

Degree of Darkness	
nig.4	black
nig.3	
nig.2	
nig.1	
nig.0	white

Degree of Stratification	
strf.4	well stratified
strf.3	
strf.2	
strf.1	
strf.0	no stratification

Degree of Elasticity	
elas.4	very elastic
elas.3	
elas.2	
elas.1	
elas.0	no elasticity

Degree of Dryness	
sicc.4	very dry
sicc.3	
sicc.2	
sicc.1	
sicc.0	water

	Sharpness of Upper Boundary
lim.4	< 0.5mm
lim.3	< 1.0 & > 0.5mm
lim.2	< 2.0 & > 1.0mm
lim.1	< 10.0 & > 2.0mm
lim.0	> 10.0mm

	Sh	*Substantia humosa*	Humous substance, homogeneous microscopic structure
I Turfa	*Tb*	*T. bryophytica*	Mosses +/- humous substance
	Tl	*T. lignosa*	Stumps, roots, intertwined rootlets, of ligneous plants
	Th	*T. herbacea*	Roots, intertwined rootlets, rhizomes of herbaceous plants
II Detritus	*Dl*	*D. lignosus*	Fragments of ligneous plants >2mm
	Dh	*D. herbosus*	Fragments of herbaceous plants >2mm
	Dg	*D. granosus*	Fragments of ligneous and herbaceous plants <2mm >0.1mm
III Limus	*Lf*	*L. ferrugineus*	Rust, non-hardened. Particles <0.1mm
IV Argilla	*As*	*A.steatodes*	Particles of clay
	Ag	*A. granosa*	Particles of silt
V Grana	*Ga*	*G. arenosa*	Mineral particles 0.6 to 0.2mm
	Gs	*G. saburralia*	Mineral particles 2.0 to 0.6mm
	Gg(min)	*G. glareosa minora*	Mineral particles 6.0 to 2.0mm
	Gg(maj)	*G. glareosa majora*	Mineral particles 20.0 to 6.0mm
	Ptm	*Particulae testae molloscorum*	Fragments of calcareous shells

Table 1 Physical and sedimentary properties of deposits according to Troels-Smith (1955)

Appendix I

Core Stratigraphy

Core 1 (TL72133 BNG06448, 21.65m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-0.85m	Da	St	El	Dr	UB
	2	0	0	2+	1
	As2, Ag2, Ga+, Ggmin+, Lf+				
	Orange-grey iron mottled silty clay with occasional gravel				

>0.85m Gravels encountered

Core 2 (TL72122 BNG06424, 21.73m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-0.50m	Da	St	El	Dr	UB
	2	0	0	4	1
	As3, Ag1, Lf+, Th+, Ggmin+				
	Orange-grey iron mottled stiff clay with occasional gravel				
0.50-1.30m	Da	St	El	Dr	UB
	2	0	0	2	1
	Ga2, Ag2, As+, Ggmin+, Ggmaj+, Lf+				
	Light grey sandy silt with abundant gravel				

>1.30m Gravels encountered

Core 3 (TL72101 BNG06404, 21.69m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-0.50m	Da	St	El	Dr	UB
	2+	0	0	3	1
	Ag2, As2, Ga+, Lf+, Th+				
	Light grey stiff silty clay				
0.50-1.20m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ag2, As2, Lf+				
	Light grey stiff silty clay				

>1.20m Gravels encountered

Core 4 (TL72077 BNG06377, 21.75m OD)

	Da	St	El	Dr	UB
0.00-0.15m	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

	Da	St	El	Dr	UB
0.15-1.00m					

Ag2, As2, Lf+, Ggmin+
Light grey stiff clayey silt with occasional gravels

>1.00m Gravels encountered

Core 5 (TL 72058 BNG06357, 21.81m OD)

	Da	St	El	Dr	UB
0.00-0.20m	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

>0.20m Gravels encountered

Core 6 (TL72022 BNG06304, 21.74m OD)

	Da	St	El	Dr	UB
0.00-0.15m	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

	Da	St	El	Dr	UB
0.15-1.30m	2	0	0	3	1

A2, Ag1, Ga1, Lf+, Sh+
Light grey silty clay with occasional thin sand laminations

	Da	St	El	Dr	UB
1.30-2.40m	2	0	0	2	1

Ag3, As1, Dh+, Th+, Sh+
Blue grey clayey silt with occasional organic detritus

Core 7 (TL71982 BNG06261, 21.81m OD)

	Da	St	El	Dr	UB
0.00-0.15m	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

	Da	St	El	Dr	UB
0.15-1.20m	2	0	0	3	1

Ag2, As2, Lf+, Ga+, Sh+
Orange-grey stiff silty clay with iron mottling

	Da	St	El	Dr	UB
1.20-2.75m	2	0	0	2	1

Blue-grey silt with occasional organic detritus

> 2.75m Gravels encountered

Core 8 (TL71971 BNG06244, 21.78m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-1.75m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ag2, As2, Lf+, Ga+, Sh+				
	Orange-grey iron mottled silty clay				
1.75-2.55m	Da	St	El	Dr	UB
	2	0	0	2	1
	Ag3, As1, Sh+, Dh+				
	Blue-grey clayey silt				
2.55-2.70m	Da	St	El	Dr	UB
	3	0	2	1	2
	Ag2, Sh1, Dg1, As+, Dh+				
	Dark grey-brown organic-rich silt				

> 2.70m Gravels encountered

Core 9 (TL1932 BNG6181, 21.81m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-0.30m	Da	St	El	Dr	UB
	2	0	0	4	1
	Ggmin2, Ag1, As1, Ga+				
	Grey-brown silty gravel (Made Ground?)				
0.30-1.50m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ag2, As2, Ga+, Lf+				
	Grey-brown iron-mottled clayey silt				
1.50-2.80m	Da	St	El	Dr	UB
	2	0	0	2	1
	Ag3, as1, Sh+				
	Blue-grey clayey silt				
2.80-3.20m	Da	St	El	Dr	UB
	3	0	1	2	2
	Ag2, Sh2, As+, Ga+				
	Dark grey-brown organic rich silt				

> 3.20m Gravels encountered

Core 10 (TL71904 BNG06225, 21.87m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

0.15-1.70m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As2, lf+, Ga+
Light brown iron mottled silty clay

1.70-2.70m	Da	St	El	Dr	UB
	2	0	0	2	1

Ag3, As1, Sh+, Ga+
Blue-grey clayey silt

> 2.70m Gravels encountered

Core 11 (TL71884 BNG06202, 21.85m OD)

0.00-0.50m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Ggmin++
Grey-brown silt-rich topsoil

> 0.50m Gravels encountered
Possible Made Ground resulting from original bridge construction

Core 12 (TL71872 BNG06166, 21.86m OD)

0.00-0.50m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Ggmin++
Grey-brown silt-rich topsoil

> 0.50m Gravels encountered
Possible Made Ground resulting from original bridge construction

Core 13 (TL71887 BNG06166, 21.80m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

0.15-1.70m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As2, Ga+, Lf+
Grey-brown iron mottled silty clay

1.70-2.60m	Da	St	El	Dr	UB
	2	0	0	2	1

Ag3, As1, Sh+
Blue-grey clayey silt

2.60-2.90m	Da	St	El	Dr	UB
	3	0	2	2	2

Sh2, Ag1, As1, Dg+, Th+, Dl+
Dark grey-brown silt-rich peat with occasional wood fragments

> 2.90m Gravels encountered

Core 14 (TL71680 BNG06148, 21.77m OD)

	Da	St	El	Dr	UB
0.00-0.25m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

0.25-1.30m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As2, Lf+, Th+
Grey-brown iron mottled silty clay

1.30-1.50m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As1, Ggmin1, Lf+
Grey-brown gravelly clayey silt

>1.50m Gravels encountered

Core 15 (TL71840 BNG06134, 21.80m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

0.15-0.80m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As2, Lf+, Ga+
Orange-brown iron mottled silty clay

0.80-1.05m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As1, Ggmin1, Ga+, Lf+
Orange-brown iron mottled gravelly clayey silt

> 1.05m Gravels encountered

Core 16 (71815 BNG06123, 21.88m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-

Ag2, As1, Ga1, Th+, Dh+, Sh+
Grey-brown silt-rich topsoil

0.15-0.80m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As2, Lf+, Ga+
Orange-brown iron mottled silty clay

0.80-0.95m	Da	St	El	Dr	UB
	2	0	0	3	1

Ag2, As1, Ggmin1, Ga+, Lf+
Orange-brown iron mottled gravelly clayey silt

> 0.95m Gravels encountered

Core 17 (TL71758 BNG06099, 21.90m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-1.05m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ag2, As2, Ga+, Lf+				
	Orange-brown iron mottled silty clay				
1.05-1.25m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ag2, As1m, Ggmin1, Lf+				
	Orange-brown iron mottled gravelly silty clay				

> 1.25m Gravels encountered

Core 18 (TL71689 BNG06081, 21.94m OD)

0.00-0.15m	Da	St	El	Dr	UB
	2+	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Grey-brown silt-rich topsoil				
0.15-0.60m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ag2, as1, Ggmin1, Ga+, Lf+				
	Orange-brown iron mottled gravelly clayey silt				
0.60-0.75m	Da	St	El	Dr	UB
	2	0	0	3	1
	Ga2, Ag1, Ga1, As+, Lf+				
	Orange-brown sands and gravels				

> 0.75m Gravels encountered

Core 19 (TL72069 BNG06364, 21.54m OD)

0.00-0.35m	Da	St	El	Dr	UB
	3	0	0	3	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+				
	Dark grey-brown sandy silt				
0.35-0.65m	Da	St	El	Dr	UB
	3	0	1	2	1
	Ag2, As1, Sh1, Dh+				
	Grey-brown organic-rich silt				
0.65-1.75m	Da	St	El	Dr	UB
	3+	0	1	2	1
	Ag2, Sh2, As+, Ga+				
	Dark grey-brown organic rich silts				

> 1.75m Gravels encountered

Sample Borehole Stratigraphy

All three sample boreholes contained the same stratigraphic sequence. Consequently, a single stratigraphic summary is provided. The influence of compaction resulting from the drilling process has been accounted for when describing sedimentary content and the location of unit boundaries (refer to Figure 3 for photograph of borehole and Table 1 for stratigraphic classification scheme)

(TL1932 BNG6181, 21.81m OD)

0.00-0.19m	Da	St	El	Dr	UB
	2	0	0	4	-
	Ag2, As1, Ga1, Th+, Dh+, Sh+, Dg+				
	Light grey-brown silt-rich topsoil				
0.19-0.45m	Da	St	El	Dr	UB
	2+	0	0	4	1
	Ag2, As2, Th+, Ga+, Lf+				
	Orange-brown iron-mottled silty clay				
0.45-1.75m	Da	St	El	Dr	UB
	2+	0	0	3	0
	Ag2, As2, Lf+				
	Orange-brown iron mottled silty clay				
	Becoming grey-brown towards base of unit				
1.75-2.77m	Da	St	El	Dr	UB
	2	0	0	2+	1
	Ag3, As1, Th+, Sh+				
	Blue-grey clayey silt with organic mottling				
2.77-2.88m	Da	St	El	Dr	UB
	3+	0	2	2	2
	Sh2, Ag2, As+, Th+, Dg+, Dh+				
	Dark grey-brown organic-rich silt				
2.88-3.20m	Da	St	El	Dr	UB
	3+	0	2	2	1
	Sh2, Ag1, Dg1, Dh+				
	Dark brown silt-rich herbaceous peat				
3.20-4.00m	Da	St	El	Dr	UB
	3+	0	0	1+	2
	Ggmin1, Ggmaj1, Ga1, Gs1, Sh+, Dh+, Dg+				
	Dark brown sands and gravels with organic detritus				