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**FORMER MAGISTRATES'
COURT, NELSON
STREET, BRISTOL:
GEOARCHAEOLOGICAL
EVALUATION**

Prepared for Bristol and
Region Archaeological
Services

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SUMMARY

In November 2013 and January 2014, four geoarchaeological boreholes were drilled by Geotechnical Engineering Ltd on the site of the former Magistrates' Court, Nelson Street, Bristol, in order to establish the nature of the Holocene stratigraphy at the site. Strata in the borehole cores were described by ARCA geoarchaeologists and the resultant data incorporated within a lithological/stratigraphical database held by that organisation for the central Bristol area. This document reports on the stratigraphy of the boreholes and assesses the archaeological and palaeoenvironmental potential of the sediments encountered.

Bedrock of the Quartzitic Sandstone Formation (QSF) was encountered at the base of the Quaternary sedimentary sequence in BH1, BH2 and BH3 outcropping at between -0.59m and +0.83m OD. In BH4 and BH4A bedrock of the Mercia Mudstone Group was encountered at the base of the sequence, outcropping at +6.99m OD and +6.84m OD, respectively. The bedrock was unconformably overlain by up to c.5m of Holocene silt/clay strata of the Wentlooge Formation in BH1, BH2 and BH3. Made Ground deposits of up to 3.80m capped the alluvial/intertidal sedimentary sequence in all boreholes, unconformably overlying Wentlooge Formation strata in BH1, BH2 and BH3, and unconformably overlying MMG bedrock in BH4 and BH4A.

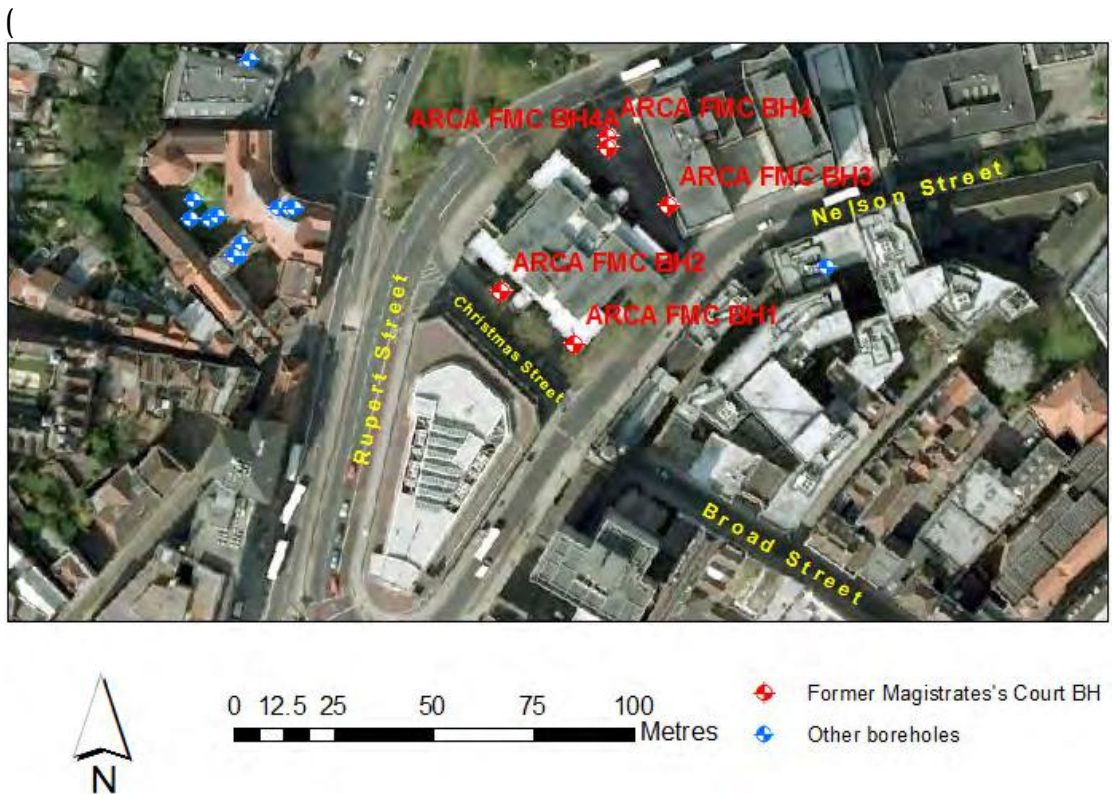
Although organic strata of high palaeoenvironmental and archaeological potential have been encountered within Wentlooge Formation sediments at other sites in central Bristol, and organic strata were noted during a previous geotechnical survey at the site, no such strata were encountered in the geoarchaeological boreholes drilled as part of the present works. The deposits on the former Magistrates' Court are assessed as having low archaeological and palaeoenvironmental potentials and therefore no further geoarchaeological works are recommended.

1. INTRODUCTION

1.1 During the course of November 2013 and January 2014 five geoarchaeological boreholes were drilled at the site of the former Magistrates' Court, Nelson Street, Bristol (henceforth 'the site')¹. The works were conducted by Geotechnical Engineering Ltd., under the supervision of ARCA, and were undertaken at the request of Bristol and Region Archaeological Services (BaRAS) in advance of the development of the site. The purpose of this document is to assess the archaeological and palaeoenvironmental potential of the stratigraphy recorded in the boreholes. The report is arranged as follows: first a brief account is provided of the geographic, geological and methodological background to the geoarchaeological project; secondly the borehole stratigraphy is discussed in detail; thirdly the archaeological and palaeoenvironmental potential of the sample resource in the boreholes is assessed and recommendations on further analytical work are offered. A bibliography and appendices containing lithological descriptions of the borehole stratigraphy complete the document.

The site is located in central Bristol and is centred on NGR ST 58734 58734 73207. The site is bound by Nelson Street to the south-east, Rupert Street to the north-west and Christmas Street to the south-west

¹ As discussed below, the WSI called for drilling of four boreholes. However, one borehole (BH4) hit the bedrock at a much higher elevation than had been predicted. A second borehole (BH4A) was therefore drilled at a nearby location to confirm the finding.



1.2 Figure 1). The site lies at c.+9.5m OD and at the base of St Michael's Hill which rises towards the north-west.

1.3 The British Geological Survey (BGS) map the site as lying on rock of the Redcliffe Sandstone Member, part of the Mercia Mudstone Group (MMG), a Triassic deposit dating from 250-200 my BP (BGS 2014). However, an unconformable boundary is mapped to the immediate west and south-west of the site beyond which rock of the Carboniferous Quartzitic Sandstone Member (326-314 my BP) outcrops. The BGS map Holocene tidal flat deposits of clay and silt as overlying the bedrock, while as with most other areas in central Bristol, Made Ground seals the earlier sequence. The site is thought to occupy a former valley of the River Frome.

1.4 A geotechnical survey and concomitant archaeological watching brief at the site in 2011 encountered bedrock of the Quartzitic Sandstone Formation (QSF) overlain by grey silt/clay strata and capped with thick stratified deposits of Made Ground (Longman 2011). In one location in the north-west corner of the site, a layer of organic mud 0.50m thick was encountered. Several other geoarchaeological borehole surveys have been carried out in central Bristol area. Two surveys carried out near to the junction of the former River Frome and the River Avon at Broad Quay and Queen Square, c.500m to the south, encountered rock of the Mercia Mudstone Group (MMG) at the base of the

sequence. These strata were in turn overlain by Late Pleistocene Gravels of the Avon Formation, alluvial/intertidal sediments of the Holocene Wentlooge Formation (c.8-9m thick) and Made Ground (Stastney 2014, Wilkinson 2007). A large-scale borehole survey of the Broadmead development, c.500 to the east, encountered c.5-8m of Wentlooge Formation sediments overlying MMG bedrock, with a basal peat in some boreholes dating from the Late Mesolithic to Early Neolithic² (Wilkinson and Head 2008, Wilkinson 2013). A series of investigations in the Canon's Marsh area, c.800m to the south-west of the site, revealed widespread peat formation in the area dating to the Neolithic³ at the Cabot House, Deanery Road and Anchor Road sites (Cox *et al.* 2006, Stastney and Batchelor 2014, Wilkinson *et al.* 2002, 2009).

- 1.5 The objectives of the geoarchaeological borehole survey on the Former Magistrates' Court site, as set out in the Written Scheme of Investigation (WSI) were to (Watson 2013,1):
 - 1.6.1 Determine the Holocene sedimentary sequence on the site.
 - 1.6.2 Assess the archaeological, palaeoenvironmental and geoarchaeological potential of the Holocene sedimentary units encountered.
 - 1.6.3 Recover samples from sealed cores for AMS ¹⁴C dating.
 - 1.6.4 Recover samples from the sealed cores for palynological and diatom analysis.
 - 1.6.5 Recover cores for volume magnetic susceptibility analysis.
 - 1.6.6 Make recommendations for further investigation of high potential strata for any future project that may arise.

The original methodology outlined in the WSI (Watson 2013, 1-3) was subsequently amended due to the nature of deposits encountered at the site (these are discussed in Section 2, below). As a result this report addresses only aims 1.6.1, 1.6.2 and 1.6.6.

2. METHODOLOGY

- 2.1 The initial methodology outlined in the WSI envisaged the drilling of four boreholes by ARCA using an Atlas Copco Cobra

² E.g. Beta 229909 (4080±50 BP) at 5.445m BGL and Beta 245642 (5430±40 BP) at 6.805m BGL in ARCA BM BH7.

³ Wood charcoal from Cabot House Wk 25622 (4100±31 BP); peat from Deanery Road Wk 10946 (4594±63 BP) and Wk 10947 (5174±61 BP); peat from Anchor Road GU 32161 (4701±29 BP) and GU 32162 (5261±29 BP).

petrol-powered hammer, Eijkelkamp gouge augers and core samplers (Watson 2013, 2). This device is capable of taking undisturbed cores 1m in length and 0.05m in diameter without significant compression, however it is not capable of penetrating thick (i.e. >0.5m) deposits of gravel or rubble. The presence of thick deposits of gravel-rich Made Ground (discussed in Section 3.4) at the site therefore necessitated the use of a Pioneer geotechnical drilling rig instead.



Figure 1. Location of boreholes on the site

2.2 Boreholes were drilled using a Pioneer combined percussion and rotary rig by technicians from Geotechnical Engineering Ltd under the supervision of an ARCA geoarchaeologist. The latter also attempted to use a Leica System 1200 RTK GPS to record the positions of the boreholes, but poor satellite reception meant that a position of $< \pm 0.5\text{m}$ could not be established. As a consequence, BaRAS archaeologists used tapes and a surveyors level to determine the Ordnance Survey National Grid Reference and Ordnance Datum of the borehole positions. The Pioneer rig provided dynamic and continuous core samples of the sedimentary sequence. However, due to poor sediment retention in cores from BH4 and contact with the bedrock at a greater elevation than had been predicted, an additional hole, labelled BH4A, was drilled c.3m from the original location. The core samples were 112mm in diameter and were retained in plastic

liners. The core samples were taken to Geotechnical Engineering Ltd Gloucester office where they were photographed and described by ARCA geoarchaeologists using standard geological criteria (Tucker 1982, Jones *et al.* 1999, Munsell Color 2000). Full stratigraphic descriptions are presented in Appendix 1.

- 2.3 Lithological descriptions and positional data from the site were combined with lithological data from previous geotechnical and geoarchaeological boreholes from central Bristol within a RockWorks database (RockWare 2012). The RockWorks software package was then used to plot lithological and stratigraphic cross sections (Figure 2, Figure 3 and Figure 4).
- 2.4 The larger size of the cores obtained from the boreholes drilled using the Pioneer drilling rig (112mm) compared with cores taken using the Atlas Copco Cobra equipment (53mm) prevented the use of the Bartington MS2C core logging sensor to obtain volume magnetic susceptibility readings from the core as was originally envisaged in the WSI. Furthermore, due to the absence of organic strata suitable for ¹⁴C dating in the cores (see discussion of borehole stratigraphy in Section 3), samples for chronometric and biostratigraphic analyses (AMS ¹⁴C, pollen and diatom analysis) were not taken as had originally been envisaged (Watson 2013, 3).
- 2.5 The geoarchaeological archive from the site consists of digital records (photographs of the cores, lithological descriptions and RockWorks database entries) retained on the University of Winchester server.

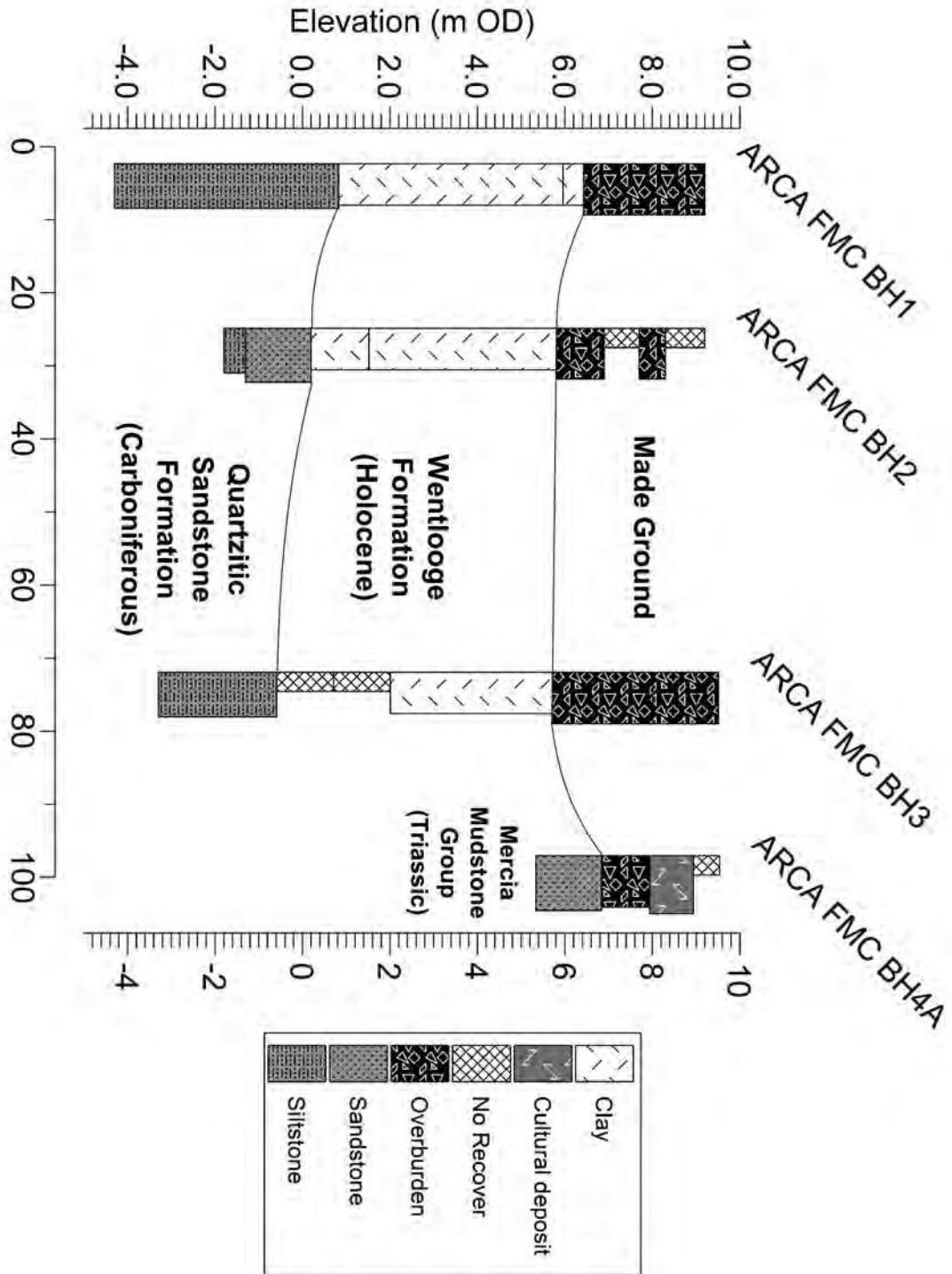


Figure 2. Lithology of boreholes at the site

3. BOREHOLE STRATIGRAPHY

3.0.1 Four major stratigraphic units present at the site were revealed in the borehole stratigraphy. These are reviewed below in chronological order.

3.0.2 The lithological data are plotted graphically in Figure 2, Figure 3 and Figure 4, while full descriptions are included as Appendix 1.

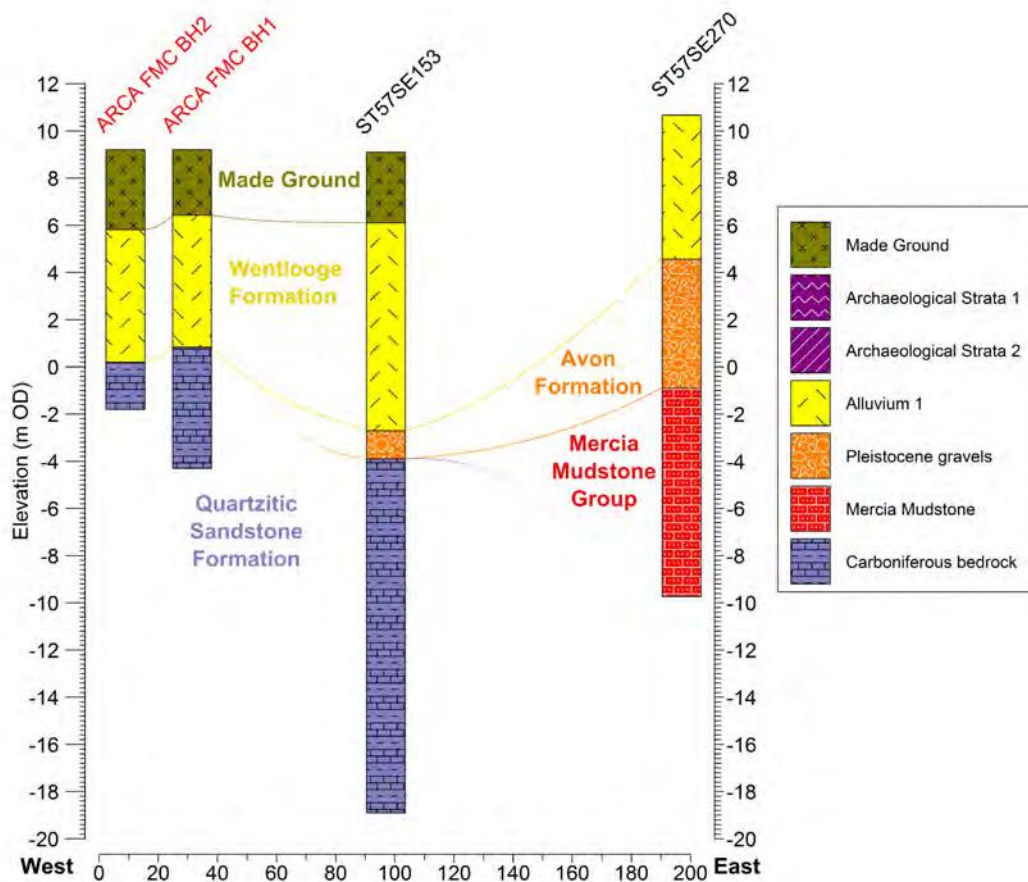


Figure 3. Stratigraphic composite cross-section running from west to east showing boreholes from the former Magistrates' Court and other nearby sites

3.1 Quartzitic Sandstone Formation

3.1.1 The Quartzitic Sandstone Formation (QSF) dates from the Pendleian to the Yeadonian Sub-ages of the Carboniferous Period (c.326-314 my BP) and comprises hard pale grey quartzitic sandstones with grey mudstones, seatearths (a layer

of sedimentary rock underlying a coal seam) and thin carbonaceous or coaly beds (Kellaway and Welch 1993).

3.1.2 The QSF is represented on the site by grey (2.5 Y 6/1) weathered mudstone outcropping below +0.83m OD in BH1; weak red (10 R 4/2) mudstone outcropping below -1.30m OD overlain by red (10 R 4/6) quartzite between -1.30 OD and +0.20m OD in BH2; and, olive grey (5 Y 4/2) friable mudstone with occasional black carbonaceous laminae outcropping below -0.61m OD in BH3. QSF was not encountered in BH4 or BH4A.

3.1.3 The variable lithology of the QSF (shown in Figure 2, Figure 3 and Figure 4) at the site indicates the considerable complexity of the bedrock geology at the site. The occurrence of QSF in the base of BH1, BH2 and BH3 suggests that the unconformable boundary between QSF and MMG bedrock runs through the site *contra* BGS (2014) mapping which show the boundary immediately to the west of the site.

3.1.4 The QSF is unconformably overlain by silt/clay strata of the Holocene Wentlooge Formation in BH1, BH2 and BH3. It is likely that had BH4 and BH4A been drilled deeper (which would have necessitated the use of a rotary attachment), the QSF would have been found beneath strata of the Mercia Mudstone Group (see Section 3.2).

3.2 Mercia Mudstone Group

3.2.1 The Mercia Mudstone Group (MMG) dates from the Middle Triassic (c.230 my BP) and formed in a series of alluvial fans emanating from the Mendips and Bristol coalfields (Green 1992, 78). The MMG therefore comprises sand and conglomerate facies, but as the name suggests is primarily made up of silts and clays.

3.2.2 The MMG is represented on the site by light olive brown (2.5 Y 5/3) silt/clay with irregular lenses of granular to pebble-sized sandstones outcropping below +6.99m OD and overlying dark reddish grey (2.5 YR 4/1) to white (2.5 YR 8/1) indurated mudstone at +5.74m OD in BH4, with the same outcropping below +6.84m OD in BH4A.

3.2.3 Where found in BH4 and BH4A, the MMG is unconformably overlain by Made Ground. The elevation of the outcrop of the MMG in BH4 and BH4A indicates that these boreholes are situated on a bedrock bluff in the eastern part of the site.

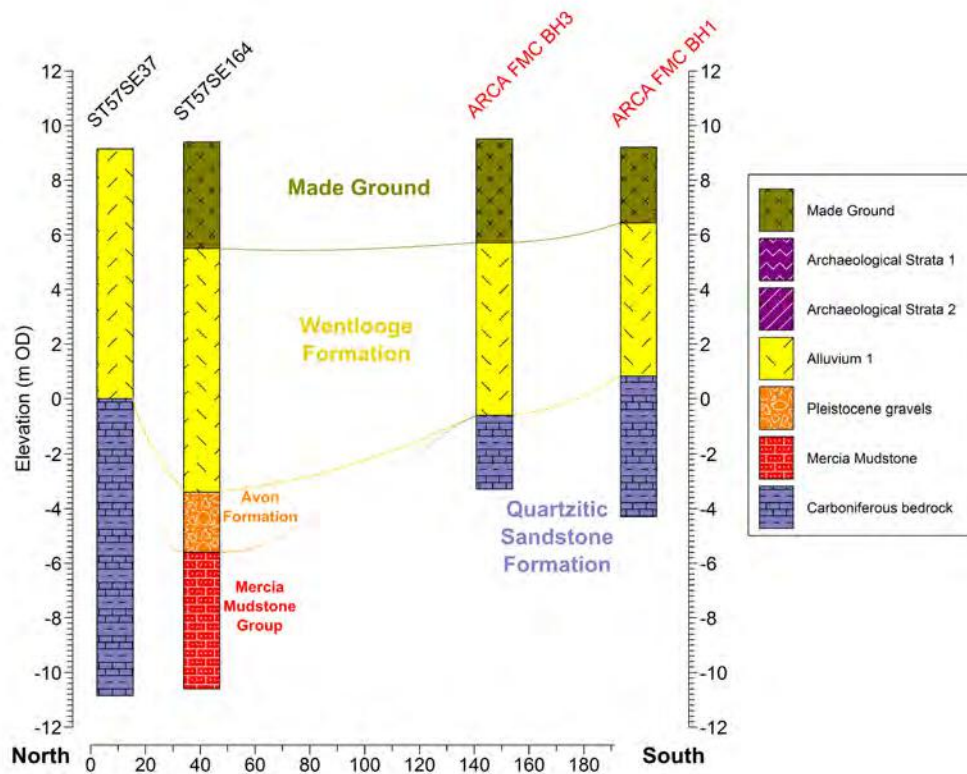


Figure 4. Stratigraphic composite cross-section running from north to south showing boreholes from the former Magistrates' Court and other nearby sites.

3.3 Wentlooge Formation

3.3.1 The Wentlooge Formation is comprised of mineral silts, clays and occasional organic muds and peats deposited in intertidal/alluvial conditions. It dates to the prehistoric period (from the Mesolithic to the Iron Age) (Allen and Rae 1987). Since other Holocene intertidal formations defined by Allen and Rae (1987) only outcrop close to the historic sea defences along the line of the River Severn, all the Holocene intertidal/alluvial sediments encountered at the site are most likely referred to the Wentlooge Formation. Strata of the Wentlooge Formation at the site conform to 'Alluvium 1' as defined in a recent investigation aimed at modelling Holocene deposits in central Bristol, and is defined by Wilkinson *et al.* (2013) as alluvial/intertidal strata of the Wentlooge Formation that immediately underlie Made Ground.

3.4.2 Wentlooge Formation strata are present only in BH1, BH2 and BH3. These strata outcrop between +0.83m OD and +6.43m OD

in BH1, between +0.20m OD and +5.81m OD in BH2 and between -0.59m OD and +5.71m OD in BH3. The deposits generally consist of very dark to dark grey (5 Y 3/1 to 5 Y 4/1) silts and clays with rare organic 'stains' and were deposited on either or both an alluvial floodplain or intertidal mud flats.

3.4.3 The dark yellowish brown (10 YR 4/4) colour of strata above +5.96m OD in BH1 and the occasional greyish brown (2.5 Y 5/2) patches of strata in BH3 may be indicative of oxidation of the upper part of the Wentlooge Formation at the site due to subsequent lowering of the water table.

3.4.4 The Wentlooge Formation is unconformably overlain by deposits of Made Ground in all three boreholes in which these strata were encountered.

3.4 Made ground

3.4.1 'Made Ground' is a term used by the British Geological Survey to encompass deposits formed as a product of human action (BGS 2014). Made Ground at the site was the focus of archaeological investigations carried out by BaRAS and is therefore not discussed in detail here.

3.4.2 Made Ground strata occur at the top of all five boreholes at the site and were between 2.55m and 3.80m in thickness across the site. Made Ground outcrops above +6.43m OD in BH1, +5.81m OD in BH2, +5.71m OD in BH3, +6.99m OD in BH4 and +6.84m OD in BH4A. The Made Ground deposits sampled at the site were variable in character, but generally consisted of grey or brownish diamicts containing a variety of granular to cobble-sized clasts of various lithologies including sandstone, limestone, ceramic building material and charcoal.

4. ASSESSMENT

4.1 Archaeological significance

4.1.1 The QSF and MMG deposits have NO archaeological potential given their Carboniferous and Triassic ages.

4.1.2 The silt/clays of the Wentlooge Formation are assessed as having a LOW archaeological potential since these were deposited in an alluvial and/or intertidal setting, and there are no specific indicators of human activity.

4.1.3 The archaeological potential of the Made Ground has been tested by archaeological investigations carried out by BaRAS.

4.2 Palaeoenvironmental significance

4.2.1 The QSF and MMG have NO palaeoenvironmental potential.

4.2.2 The Wentlooge Formation strata have a LOW palaeoenvironmental potential. Previous investigations of comparable mineral deposits at Deanery Road and Harbourside with a similar genesis to those at the Former Magistrates' Court suggest that pollen is variably preserved (Wilkinson *et al.* 2002, Wilkinson and Tinsley 2005). Indeed preservation of microbiological remains in the apparently oxidised strata above +5.96m OD in BH1 and in BH2 is likely to be poor. Even were pollen preserved in the lower strata, its source would be difficult to determine given the wide derivation of mineral particles found in floodplain/mud flat settings. The lack of chronological control due the absence of organic strata suitable for ¹⁴C dating further restricts the potential of these deposits.

4.2.3 The Made Ground has LOW palaeoenvironmental potential since it is composed of mixed deposits of unknown source and the water table lies below the Made Ground, meaning that biological remains are likely to have undergone oxidation

5. RECOMMENDATIONS

5.1 As discussed in Section 6, all strata encountered in the borehole cores are considered to be of low archaeological and palaeoenvironmental potential. No further geoarchaeological work is recommended either on the existing core samples or in the field.

6. ACKNOWLEDGEMENTS

6.1 ARCA would like to thank John Bryant, Ian Greig and Tim Longman (BaRAS) for help during the course of the project.

6.2 Nick Watson and Dr Keith Wilkinson monitored the drilling of boreholes and the cores were described by Nick Watson and Phil Stastney. The project was managed for ARCA by Keith Wilkinson and the report was written by Phil Stastney.

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APPENDIX 1: BOREHOLE LOCATIONS AND LITHOLOGICAL DESCRIPTIONS

Borehole	Easting	Northing	Elevation (m OD)
ARCA FMC BH1	358737.31	173180.86	9.20
ARCA FMC BH2	358719.00	173194.00	9.20
ARCA FMC BH3	358745.65	173232.85	9.51
ARCA FMC BH4	358760.72	173215.72	9.54
ARCA FMC BH4A	358760.72	173212.72	9.54

Position and elevation of boreholes at the site.

Bore	Top	Base	Lithology	Comments
ARCA FMC BH1	0.00	2.77	Overburden	10 YR 5/4 Yellowish brown. Loose, angular limestone pebbles with rare silt/clay. Occasional clasts of concrete, wood and brick. Sharp boundary to:
	2.77	3.24	Clay	10 YR 4/4 Dark yellowish brown silt/clay. Rare fine sand-sized mineral grains and black organic spots. Sharp boundary to:
	3.24	8.37	Clay	5 Y 4/1 Dark grey silt/clay with rare black organic spots. Sharp boundary to:
	8.37	13.50	Siltstone	2.5 Y 6/1 Grey weathered mudstone (Quartzitic Sandstone Formation)
ARCA FMC BH2	0.00	0.90	No Recover	Void
	0.90	1.50	Overburden	10 YR 5/3 Greyish brown angular limestone pebbles, rare concrete clast. Loose.
	1.50	2.30	No Recover	Void

	2.30	3.39	Overburden	10 YR 5/3 Greyish brown angular limestone pebbles with rare concrete clasts. Loose. Sharp boundary to:
	3.39	7.68	Clay	5 Y 4/1 Dark grey silt/clay. Occasional black organic spots. Diffuse boundary to:
	7.68	9.00	Clay	5 Y 4/1 Dark grey silt/clay. Rare sand-sized shell fragments. Sharp boundary to:
	9.00	10.50	Sandstone	10 R 4/6 Red quartzite
	10.50	11.00	Siltstone	10 R 4/2 Weak red mudstone.
ARCA FMC BH3	0.00	0.50	Overburden	10 YR 4/2 Dark greyish brown, compact silt/clay with occasional granular-sized CBM, charcoal and rock fragments. Rare angular cobble-sized grey sandstone. (Made Ground). Sharp boundary to:
	0.50	1.50	Overburden	10 YR 6/3 Pale brown clast-supported gravel of granular to pebble-sized angular grey limestone clasts in fine sandy clay matrix. (Made Ground).
	1.50	3.80	Overburden	7.5 YR 3/3 Dark brown poorly sorted, matrix supported silt/clay with frequent granular to pebble-sized clasts of various lithologies (green sandstone, CBM, limestone, charcoal) and frequent coarse sand-sized mineral grains (Made Ground). Sharp boundary to:
	3.80	7.50	Clay	5 Y 3/1 Very dark grey silt/clay with occasional granular-sized organic black humic inclusions. Structureless, compact. Compressed. Oxidises to 2.5 Y 5/2 greyish brown.
	7.50	8.80	No Recover	
	8.80	10.10	No Recover	Void with cobble-sized red quartzitic sandstone fragment.
	10.10	12.80	Siltstone	5 Y 4/2 Olive grey friable mudstone horizontally laminated, occasional black laminae. (Quartzitic Sandstone Formation)

ARCA FMC BH4A	0.00	0.60	No Recover	
	0.60	1.60	Cultural deposit	2.5 Y 3/3 Dark olive brown poorly sorted matrix-supported gravel of angular granular to cobble-sized clasts of sandstone and CBM in a coarse sandy silt/clay matrix. Sharp boundary to:
	1.60	2.70	Overburden	5 YR 4/3 Reddish brown diamict with angular granular to cobble-sized quartzite clasts in silt clay matrix. Cobble-sized lens of 5 YR 3/3 dark reddish brown silt/clay at 2.50 (cultural deposit).
	2.70	4.20	Sandstone	Mercia Mudstone Group
ARCA FMC BH4	0.00	0.90	No Recover	
	0.90	1.85	Overburden	2.5 Y 5/2 Greyish brown poorly-sorted gravel of coarse sand to cobble-sized angular clasts of sandstone. Sharp boundary to:
	1.85	2.55	Overburden	2.5 YR 4/3 Reddish brown diamict of granular to cobble-sized angular sandstone clasts in coarse sandy clay matrix. Sharp boundary to:
	2.55	4.00	Sandstone	2.5 Y 5/3 Light olive brown compact silt/clay, multi-coloured with 10 YR 5/6 yellowish brown and 2.5 YR 4/3 reddish brown patches. Irregular lenses of granular to pebble-sized angular sandstone in a red clay matrix. Angled contact with increasingly indurated 2.5 YR 4/1 Dark reddish grey mixed with 2.5 YR 8/1 white mudstone at base (Weathered top of bedrock/ made ground? Bedrock at 3.80m?).