

## **7 RIVER WALK, TONBRIDGE, KENT (NGR: TQ 58880 46420): GEOARCHAEOLOGICAL FIELDWORK REPORT**

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### **INTRODUCTION**

This report summarises the findings arising out of the geoarchaeological fieldwork and deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development at 7 River Walk, Tonbridge (National Grid Reference: TQ 58880 46420; Figure 1). Quaternary Scientific were commissioned by CgMs Consulting to undertake the geoarchaeological investigations. The site lies to the south of the historic centre of the town of Tonbridge in Kent, on the floodplain of the River Medway which at and upstream of the site occupies two channels. The western boundary of the site is the right bank of the southern channel, just upstream of the point where the two channels re-join. The floodplain surface here is at a level of ca. 21m OD. The British Geological Survey (1:50,000 Sheet 287 Sevenoaks 1971) shows the area underlain by the alluvium of the River Medway. The bedrock beneath the floodplain is the Lower Cretaceous Tunbridge Wells Sand. To the south of the river the lower valley side slopes are occupied by Brickearth, and to the north remnants of the Second and Third Terraces of the Medway are present beneath the northern and western outskirts of the town.

Six exploratory boreholes have been put down at the site (Jomas Associates Ltd., 2012; Figure 2). All but one of the boreholes recorded a surface layer of Made Ground (0.9-1.6m thick). In Borehole BH1 no Made Ground was recognised, and the near-surface horizons appeared to be a natural soil developed in the upper part of the Alluvium. In the borehole logs, the Alluvium is described as sandy, silty clay, brown or grey in colour and generally soft but with firmer upper horizons in WS3, WS5 and BH1. Scattered limestone and sandstone clasts were present in the fine-grained alluvium in all the boreholes except WS5, close to the southern boundary of the site. Peaty horizons were recorded in two of the boreholes - at 5.8-6.7m bgs in WS1, and at 3.05-3.5m bgs and 4.6-5.45m bgs in WS3. In addition, 'many peaty inclusions' were recorded in WS4 below 3.7m bgs. In four of the boreholes, the contact between the fine-grained alluvium and underlying gravel was recorded - at 6.7m bgs in WS1, 6.6m bgs in WS4, 4.95m bgs in WS5 and at 6.6m bgs in BH1. The contact between the gravel and underlying bedrock was seen in Borehole BH1 at 12.0m bgs.

The sediment sequences recorded at the 7 River Walk site are similar in general terms to

those encountered widely beneath the floodplains of rivers in south east England, with gravels of probable Late Devensian Late Glacial age occupying a buried channel and overlain by fine-grained sediments representing deposition during the Holocene. As observed elsewhere, the more organic (peaty) horizons, where they are present, are preserved in the lower part of the sequence.

The aim of the geoarchaeological investigations was to clarify the nature of the sub-surface stratigraphy across the site, and to evaluate the potential of the sedimentary sequences for reconstructing the environmental history of the site and its environs. The following objectives were proposed in order to achieve this aim:

1. To obtain two geoarchaeological boreholes from selected locations at the site (Figure 2).
2. To examine the lithostratigraphy of the new boreholes and existing geotechnical records to provide an interpretation of the major depositional units across the site.

The two new geoarchaeological borehole locations (<QBH1> and <QBH2>) were chosen in order to (1) duplicate the sequences recorded in the area of boreholes <WS1> and <WS3>, in which 'peaty clay' horizons were recorded overlying the basal sand and gravel; and (2) to confirm the expected sedimentary sequence in these areas of the site (in particular the surface of the Sand and Gravel and the presence of any significant organic horizons).

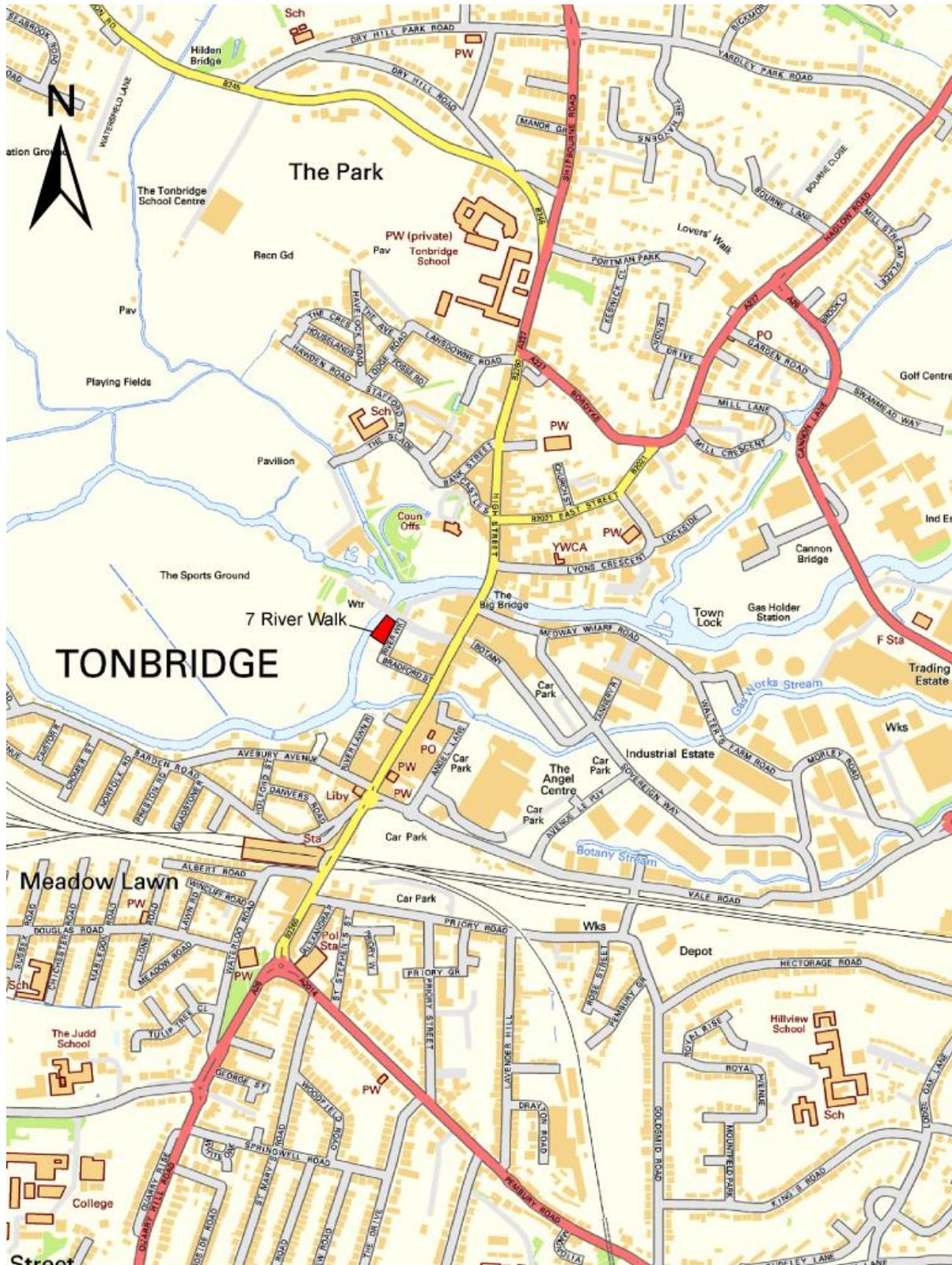


Figure 1: Location of 7 River Walk, Tonbridge, Kent. Contains Ordnance Survey data © Crown copyright and database right [2012]

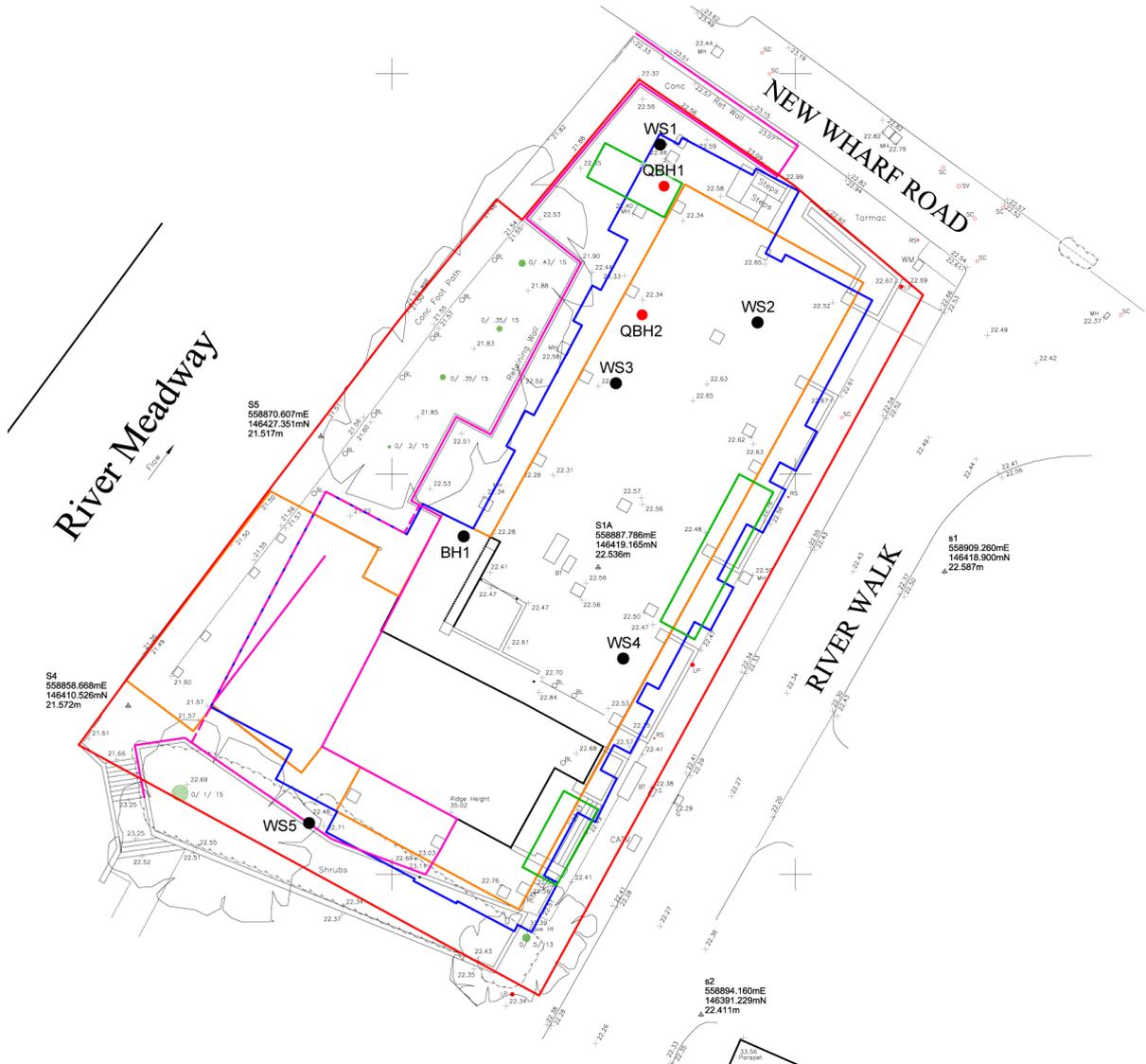


Figure 2: Detailed site map incorporating the location of the previous geotechnical boreholes and the new Quest boreholes (QBH1 and QBH2) at 7 River Walk, Tonbridge, Kent (adapted from original image provided by CgMs Consulting).

## METHODS

### *Field investigations*

Two boreholes (boreholes <QBH1> and <QBH2>) were put down at the site in November 2012 (Figure 2). Borehole core samples were recovered using an Eijkelkamp window sampler and gouge set using an Atlas Copco TT 2-stroke percussion engine. This coring technique is a suitable method for the recovery of continuous, undisturbed core samples and provides sub-samples suitable for not only sedimentary and microfossil assessment and analysis, but also macrofossil analysis. The recovered core samples were wrapped in clear plastic to prevent moisture loss, labelled with the depth (metres from ground surface) and orientation (top and base) and returned to Quaternary Scientific for storage in a purpose built facility at 2°C. This temperature prevents fungal growth on the core surface, which may lead to anomalous radiocarbon dates, and moisture loss. The spatial attributes of each borehole were recorded using a Leica DGPS (Table 1 and Figure 2).

**Table 1: Borehole attributes, 7 River Walk, Tonbridge, Kent.**

<b>Borehole number</b>	<b>Easting</b>	<b>Northing</b>	<b>Elevation (m OD)</b>
<QBH1>	558890.858	146441.785	22.15
<QBH2>	558890.692	146434.633	22.30

### *Lithostratigraphic descriptions*

The lithostratigraphy of boreholes <QBH1> and <QBH2> was described in the laboratory using standard procedures for recording unconsolidated sediment and organic sediments, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter) and inclusions (e.g. artefacts) (Tröels-Smith, 1955). The procedure involved: (1) cleaning the samples with a spatula or scalpel blade and distilled water to remove surface contaminants; (2) recording the physical properties, most notably colour using a Munsell Soil Colour Chart; (3) recording the composition; gravel (*Grana glareosa*; Gg), fine sand (*Grana arenosa*; Ga), silt (*Argilla granosa*; Ag) and clay (*Argilla steatoides*); (4) recording the degree of peat humification and (5) recording the unit boundaries e.g. sharp or diffuse. The results are displayed in Figure 3 and in Tables 2 and 3.

## RESULTS, INTERPRETATION AND DISCUSSION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS

The results of the lithostratigraphic descriptions of boreholes <QBH1> and <QBH2> are displayed in Tables 2 and 3 and in Figure 3.

The basal unit at the site is a horizon of Sand and Gravel (Figure 3). These sediments are indicative of deposition in a high energy braided river system. The new geoarchaeological

boreholes indicate that the surface of the Sand and Gravel is fairly level in this part of the site at ca. 16.5m OD (recorded at 16.45m OD in borehole <QBH1> and 16.71m OD in borehole <QBH2>). Assuming an approximately level modern surface across the site, the surface of the Sand and Gravel is fairly level elsewhere, recorded at 6.7m bgs in <WS1>, 6.6m bgs in <WS4> and at 6.6m bgs in <BH1> (Jomas Associates Ltd., 2012). The Gravel surface was recorded at 4.95m bgs at the southern end of the site (borehole <WS5>), indicating either a rising gravel surface towards the south or a higher surface elevation in this part of the site. No elevation data was available for nearby BGS borehole records, and thus the recorded surface elevation of the Gravel in these boreholes is not considered here.

Succeeding the Sand and Gravel and recorded up to a level of ca. 17.6m OD was a unit of sandy silt with detrital herbaceous material and detrital wood, frequently recorded as horizontal laminations. This unit is recorded in geotechnical boreholes <WS1>, <WS3> and <WS4> as a sandy peaty clay with much silt and wood to a level of ca. 4.60m bgs. This unit most likely represents the lower part of the Holocene Alluvium, the sediments of which were deposited as the energy of flow decreased and the river channel probably became confined to a single meandering channel. The frequent laminations of detrital herbaceous material and wood are indicative of frequent overbank flood events during this period.

Above ca. 17.6m OD the Alluvium is composed of silty clay or clayey silt, indicative of a further reduction in the energy of flow in this part of the floodplain. In borehole <QBH2> decomposed organic material, frequent horizontal beds of detrital herbaceous material and detrital wood were recorded between 19.14 and 19.56m OD, again indicative of frequent overbank flood events in this area. Above ca. 20.0m OD the Alluvium is more clay-rich, generally composed of silty clay with traces of detrital herbaceous material and evidence for modern soil forming (pedogenic) processes. The Alluvium is truncated by Made Ground so that the upper surface of the Alluvium lies at 20.71m OD in borehole <QBH1> and ca. 20.87m OD in <QBH2>. The Made Ground is ca. 1.5m thick in this part of the site, and the modern surface elevation is 22.15 and 22.30m OD in boreholes <QBH1> and <QBH2> respectively.

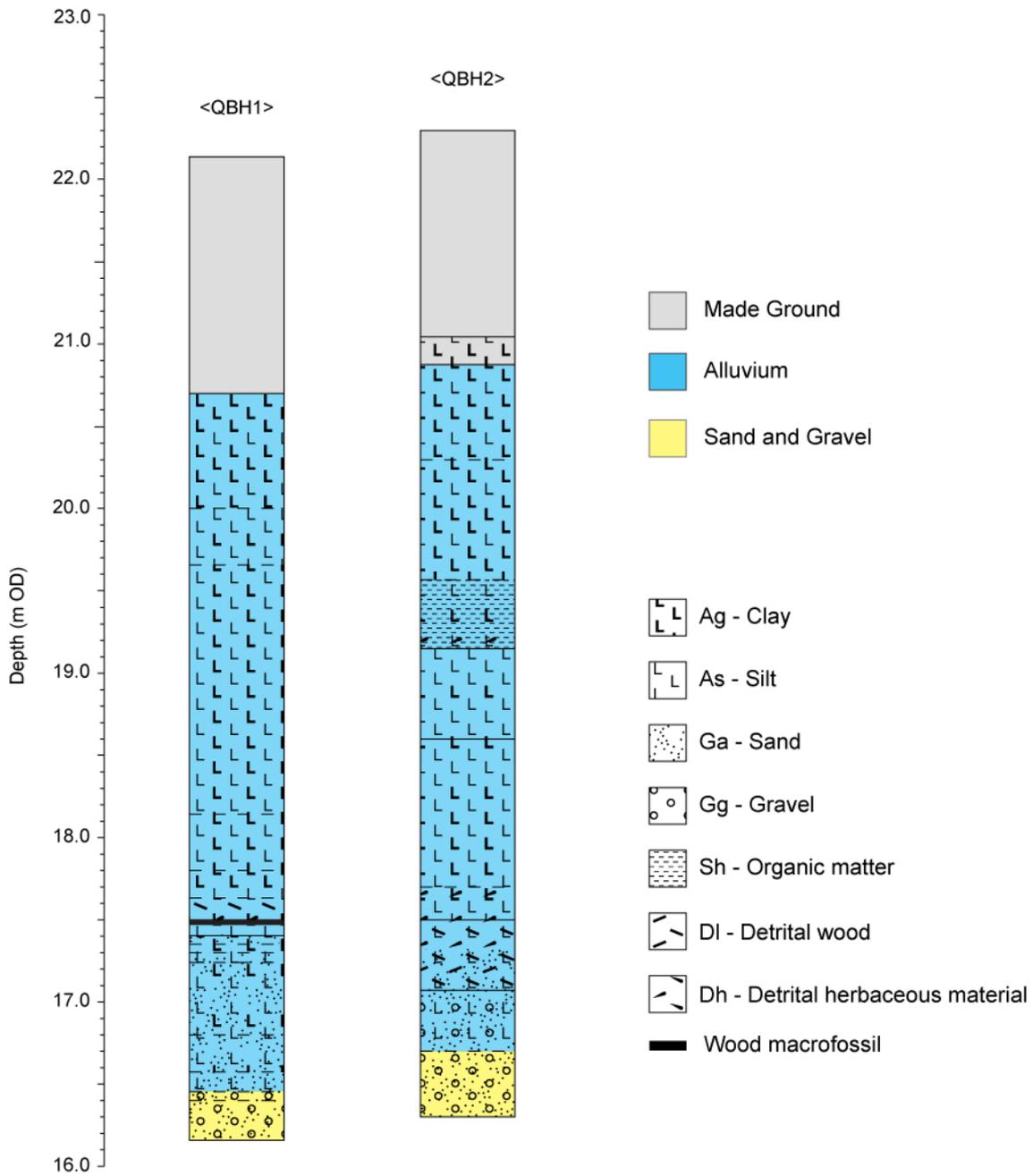


Figure 3: Lithostratigraphic description of boreholes <QBH1> and <QBH2>, 7 River Walk, Tonbridge, Kent

**Table 2: Lithostratigraphic description of Borehole <QBH1>, 7 River Walk, Tonbridge, Kent**

Depth (m OD)	Depth (m bgs)	Composition
22.15 to 20.71	0.00 to 1.44	Made ground containing gravel, charcoal, brick fragments, sand and clay. Sharp contact in to:
20.71 to 19.98	1.44 to 2.17	Gley 1 4/10GY; As3 Ag1 Dh+; dark greenish grey silty clay with traces of detrital herbaceous material. Diffuse contact in to:
19.98 to 19.68	2.17 to 2.47	Gley 1 5/5GY; Ag3 As1; greenish grey clayey silt with occasional iron nodules. Diffuse contact in to:
19.68 to 18.15	2.47 to 4.00	10YR 4/4; As2 Ag2; dark yellowish brown silt and clay with frequent iron nodules.
18.15 to 17.83	4.00 to 4.32	Gley 1 5/5GY; As2 Ag2; greenish grey silt and clay with occasional iron nodules. Diffuse contact in to:
17.83 to 17.66	4.32 to 4.49	Gley 1 4/10GY; As3 Ag1; dark greenish grey silty clay. Diffuse contact in to:
17.66 to 17.49	4.49 to 4.66	10YR 2/1; As1 Ag1 Dh1 DI1; black silt and clay with frequent horizontal beds of detrital herbaceous material and detrital wood. Sharp contact in to:
17.49 to 17.47	4.66 to 4.68	Wood macrofossil
17.47 to 17.40	4.68 to 4.75	10YR 3/1; As2 Ag2 DI+; very dark grey silt and clay with traces of detrital wood. Sharp contact in to:
17.40 to 17.37	4.75 to 4.78	5Y 4/2; Ag2 As1 Ga1; olive grey sandy clayey silt. Diffuse contact in to:
17.37 to 17.29	4.78 to 4.86	10YR 3/1; As2 Ag2 DI+; very dark grey silt and clay with traces of detrital wood. Diffuse contact in to:
17.29 to 17.26	4.86 to 4.89	5Y 4/2; Ag2 As1 Ga1; olive grey clayey sandy silt. Diffuse contact in to:
17.26 to 16.81	4.89 to 5.34	10YR 4/2; Ga1 Gg1 Ag1 As1 Gg+; dark greyish brown silty clayey sand with gravel clasts. Diffuse contact in to:
16.81 to 16.58	5.34 to 5.57	10YR 2/1; Gg1 Ag1 Ga1 As1 DI+; black silty clayey sand with gravel clasts and traces of detrital wood. Diffuse contact in to:
16.58 to 16.45	5.57 to 5.70	10YR 3/1; Ga3 Ag1; very dark grey silty sand. Diffuse contact in to:
16.45 to 16.39	5.70 to 5.76	10YR 4/2; Gg2 Ga1 Ag1; dark greyish brown silty sandy gravel. Diffuse contact in to:
16.39 to 16.15	5.76 to 6.00	10YR 4/6; Gg2 Ga2; dark yellowish brown sand and gravel.

**Table 3: Lithostratigraphic description of Borehole <QBH2>, 7 River Walk, Tonbridge, Kent**

Depth (m OD)	Depth (m BGS)	Composition
22.30 to 21.05	0.00 to 1.25	Made ground containing gravel, slag, brick fragments, sand and clay. Sharp contact in to:
21.05 to 20.87	1.25 to 1.43	10YR 5/4; As3 Ag1 Gg+; greyish brown silty clay with occasional gravel clasts, brick fragments and iron nodules. Sharp contact in to:
20.87 to 20.30	1.43 to 2.00	Gley 1 4/10Y; As3 Ag1 Dh+; dark greenish grey silty clay with traces of detrital herbaceous material.
20.30 to 19.56	2.00 to 2.74	Gley 1 5/N; As3 Ag1; grey silty clay. Diffuse contact in to:

19.56 to 19.22	2.74 to 3.08	7.5YR 4/1; As2 Ag1 Sh1 Dh+ Dl+; dark grey organic silty clay with horizontal beds of detrital herbaceous material and detrital wood.
19.22 to 19.14	3.08 to 3.16	7.5YR 4/1; As1 Ag1 Sh1 Dh1; dark grey organic silt and clay with frequent horizontal beds of detrital herbaceous material. Sharp contact in to:
19.14 to 18.60	3.16 to 3.70	Gley 1 6/5GY; As2 Ag2; greenish grey silt and clay. Sharp contact in to:
18.60 to 18.30	3.70 to 4.00	7.5YR 4/3; Ag3 As1; brown clayey silt with frequent iron nodules. Brown mottling.
18.30 to 17.71	4.00 to 4.59	Gley 1 4/10Y; As2 Ag2 Dh+; dark greenish grey silt and clay with traces of detrital herbaceous material. Diffuse contact in to:
17.71 to 17.50	4.59 to 4.80	5YR 4/1; Ag2 As1 Dh1; dark grey clayey silt with frequent horizontal beds of detrital herbaceous material. Sharp contact in to:
17.50 to 17.30	4.80 to 5.00	5YR 3/1; Ag2 Dl1 Dh1; very dark grey silt with frequent horizontal beds of detrital herbaceous material and detrital wood.
17.30 to 17.09	5.00 to 5.21	Gley 1 4/10Y; Ag2 Dl1 Ga1; dark greenish grey; sandy silt with detrital wood. Sharp contact in to:
17.09 to 16.71	5.21 to 5.59	Gley 1 4/10Y; Ag2 Gg1 Ga1 Dl+; sandy silt with gravel and occasional horizontal beds of detrital wood. Diffuse contact in to:
16.71 to 16.30	5.59 to 6.00	10YR 4/6; Gg3 Ga1; dark yellowish brown sandy gravel.

## CONCLUSIONS AND RECOMMENDATIONS

The aim of the geoarchaeological investigations was to clarify the nature of the sub-surface stratigraphy across the site, and to evaluate the potential of the sedimentary sequences for reconstructing the environmental history of the site and its environs. In particular, the two new geoarchaeological borehole locations (<QBH1> and <QBH2>) were chosen in order to duplicate the sequences recorded in the area of boreholes <WS1> and <WS3>, in which 'peaty clay' horizons were recorded overlying the basal sand and gravel.

The sedimentary sequences in boreholes <QBH1> and <QBH2> overlying the Sand and Gravel at 7 River Walk are broadly consistent with the Holocene alluvial sediments that are found across the middle and lower reaches of rivers draining in to the English Channel, usually comprising a lower unit of sandy alluvium which often contains visible organic remains, which may include wood, other plant remains, and Mollusca; this horizon is evident at 7 River Walk below ca. 17.6m OD. In many places this sandy alluvium is overlain by a peat bed, representing the development of a more stable terrestrial surface across the floor of the valley. At the 7 River Walk site sediment deposits indicative of more stable terrestrial surfaces (i.e. peat) are absent however, indicating either that a) this part of the floodplain has not experienced a lowering of the water level suitable for such sedimentation, or b) such

deposits have subsequently been eroded. Notably, the 'peaty' horizons recorded in boreholes <WS1> and <WS3> were not recorded in the new geoarchaeological boreholes. Given the proximity of the new sequences to those collected previously (within ca. 2m), it is considered likely that this difference is due to the different descriptive terms (and differing technical constraints in terms of recorded detail) used by the geotechnical drilling team, and that the new geoarchaeological boreholes represent a more accurate record of the sedimentary sequences at the site.

The uppermost unit almost everywhere and evident at the 7 River Walk site above ca. 17.6m OD is a silty alluvium in which visible organic remains are uncommon; often, this horizon represents evidence of the effects of an increase in sediment supply produced by soil erosion associated with the intensification of land-use from the Neolithic period onward.

## REFERENCES

Jomas Associates Ltd. (2012) *River Walk, Tonbridge Site Investigation Results*. Unpublished exploratory hole records.

Trøels-Smith, J. (1955) Karakterisering af løse jordarter (Characterisation of unconsolidated sediments), *Danm. Geol. Unders.*, **Ser IV 3**, 73.