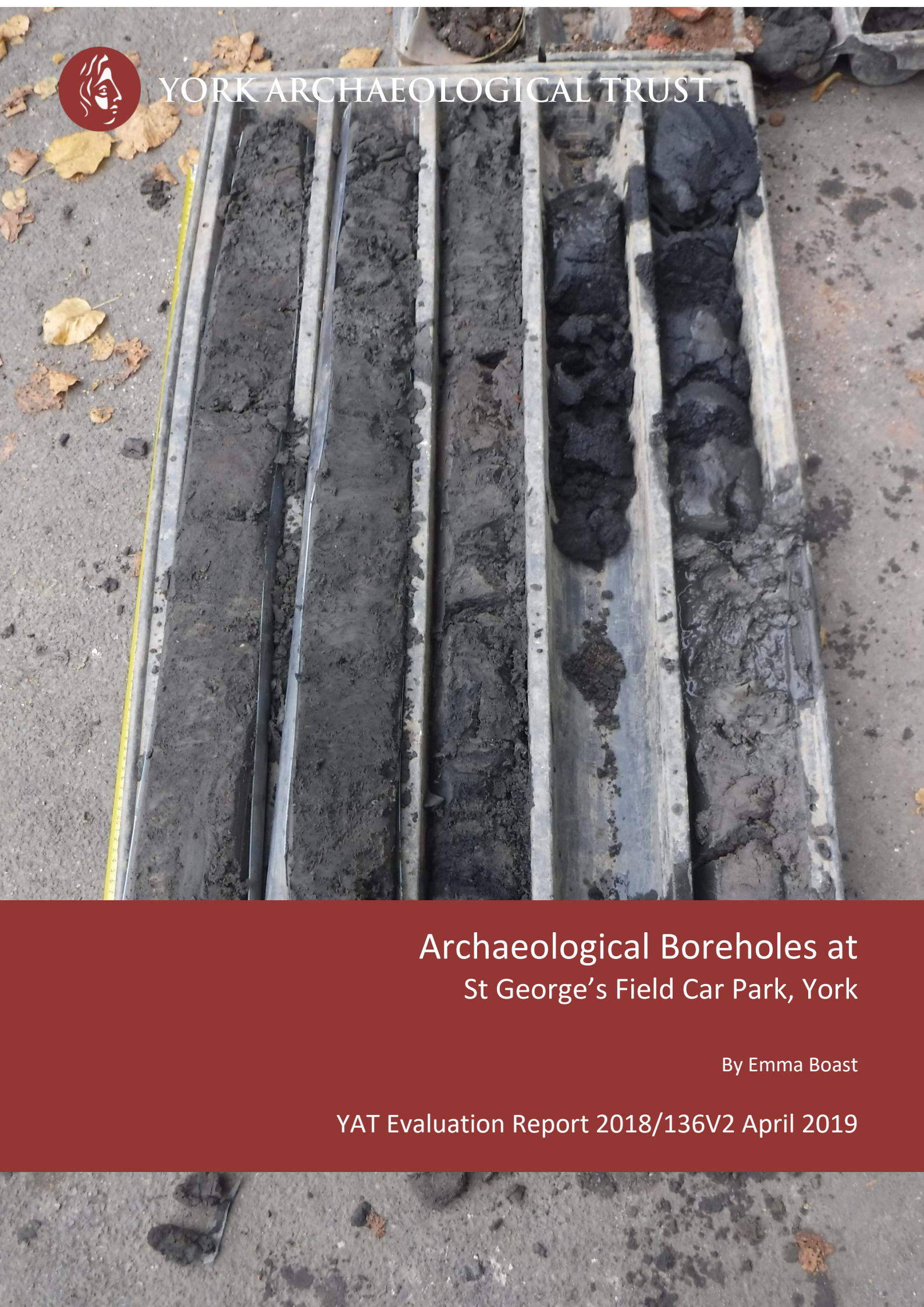

YORK ARCHAEOLOGICAL TRUST

Archaeological Boreholes at
St George's Field Car Park, York

By Emma Boast

YAT Evaluation Report 2018/136V2 April 2019

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Abbreviations

OD	Ordnance Datum
BGL	Below Ground Level (See Section 3 for information on equivalent OS heights)
BGS	British Geological Survey
CBM	Ceramic Building Material
SI	Site Investigation
YAT	York Archaeological Trust
WSI	Written Scheme of Investigation

Non-technical Summary

Between the 10th September and the 17th September 2018 York Archaeological Trust conducted a borehole evaluation and recording exercise at St George's Field Car Park, York, YO1 9WJ (SE 60478 51275).

The work was undertaken for City of York Council to support a proposal, to redevelop the area. The work was based on a written scheme of investigation (WSI) produced by YAT and involved a programme of three boreholes and the installation of three instrumented water monitoring points that will record data over a six-month period.

This report (YAT Report 2018/136V2) presents the analysis of 6 months' water monitoring between September 2018 and March 2019 as well as the results of the site investigation (SI) works and supersedes YAT Report 2018/136.

The borehole evaluation encountered a simple sequence of archaeology extending to depths close to 11m Below Ground Level (BGL) (-2.53m OD). Post-medieval activity was identified most noticeably as the accumulation of alluvial flooding, made-ground deposits and land-reclamation. Waterlogging has provided ideal conditions for the preservation of organic material. The waterlogged deposits appear largely to date to the medieval period; they include accumulations of alluvial silts and clays containing shell, animal bone and pottery which likely derive from activities such as dumping in the immediate area. A black gritty organic deposit was also present containing 'hair-like fibres' and tiny mollusca remains. The lower alluvial deposits consisted of a light, gritty sandy clay, with some organic and charcoal. Natural was not encountered in any of the boreholes investigated.

KEY PROJECT INFORMATION

Project Name	St George's Field Car park, York, YO1 9WJ
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1 INTRODUCTION

Between the 10th September and the 17th September 2018 YAT conducted a borehole evaluation and recording exercise at St George's Field Car park, York, YO1 9WJ (SE 60478 51275) (Figure 1, Site Location).

The site lies within the York Area of Archaeological Importance as defined by the Scheduled Monuments and Archaeological Areas Act 1979. It is also within York's Central Historic Core Conservation Area, as well as the New Walk/Terry Avenue Conservation Area. To the north-east of the site, within St George's Field, is the location of St George's Chapel, which is a Scheduled Monument (UID:1020407).

The borehole evaluation was undertaken for City of York Council to help inform a forthcoming planning application. The works involved drilling three windowless sleeved boreholes and installing three instrumented water monitoring points designed to house sensors measuring hydrology and water quality. This equipment will record data over a six-month period.

This work may be followed by a further phase of evaluation that may include further boreholes, water monitoring and trial trenching, all of which would contribute to deposit modelling of the site.

The aim of the borehole survey is to characterise the hydrology and soil conditions of the site and to provide a baseline model for comparison with further monitoring points should they be installed and monitored during and after the forthcoming redevelopment of the site. This will create a data set that will aid in understanding the impact of piled developments on waterlogged soil horizons.

This report details the archaeological deposition data gathered from the borehole logs

The site archive is currently stored by YAT under project code 6089.

2 METHODOLOGY

The methodology followed that as set out in the WSI (Appendix 3).

Three boreholes were drilled using a tracked windowless sample rig. The positioning of the boreholes was designed for optimal coverage across the site, taking in to consideration positions most suitable for the installation of long-term hydrology and water monitoring equipment.

Prior to drilling BHs 01–03 the tarmac car park surface was removed. Each borehole was completed with the installation of dip well covers.

Borehole 01 was drilled to a depth of 10.5m BGL, BH03 was to 11.00m BGL and BH02 to 10.00m BGL. The ground was relatively soft, there were no obstructions and the depths reached represent the maximum depth for the rig used.

The deposit cores were recovered in plastic sleeves, each measuring 1m in length and 100mm in diameter. Each plastic sleeve was opened for inspection on site, also allowing for the recovery of General Biological Analysis (GBA) samples apart from sections from which sealed REDOX samples were taken. For the recovery of REDOX samples the plastic sleeve was sawn at

the required points and the sample removed still in its plastic sleeve, sealed at both ends. After removal of the redox sample the rest of the sleeve was cut open for inspection.

Borehole cores were examined by an archaeologist suitably experienced in the deep stratigraphic nature of York's archaeological deposits. All boreholes were recorded using standardised pro forma record sheets and related to the Ordnance Datum (OD). Each context was described in full on the pro forma borehole record sheet in accordance with the accepted context record conventions. Each context was assigned a unique number. Borehole logs were supplemented by use of digital photography, including work in progress and detailed images of the recovered cores. Digital photographs were taken at a resolution of no less than 10 mega-pixels.

Where artefacts and ecofacts were recovered these were handled following the guidance set out in the CIFA guidance for archaeological materials, following which appropriate packaging was used and storage was under optimum conditions, as detailed in the RESUE/UKIC publication First Aid for Finds.

A soil sampling programme was instigated with the purpose of establishing baseline conditions regarding the preservation of organic remains, by characterising the potential of organic deposits. Three sealed REDOX samples were taken from boreholes BH01–BH03 for analysis. In addition, eight General Biological Analysis (GBA) samples were recovered from individual defined contexts across all three boreholes. All eight GBA samples have been selected for analysis.

The boreholes were located on a 1:1,250 scale map (see Figure 2).

Following a period of 22 days to allow settlement of the water levels, sensing equipment was installed within the dip wells to recover water level and water quality. Subsequent versions of this report will be issued at intervals to present the results of the water monitoring programme and assessment of the GBA and REDOX samples recovered.

3 LOCATION, GEOLOGY & TOPOGRAPHY

The proposal site covers approximately 8,500m² and is presently occupied by St. George's Field Car Park and a pumping station (Figure 1). The site is bounded to the west by the River Ouse, to the east by the River Foss, to the south by the Foss Barrier complex and to the north by Skeldergate Bridge and Tower Street. The site lies fairly flat at a consistent 8.5m AOD across the area with slight variations.

The top of BH01 at the time of drilling was at 8.47m AOD (Ordnance Datum is therefore equivalent to 8.47m BPGL in BH01), BH02 at 8.56m AOD (OD = 8.56m BPGL) and BH03 at 8.61m AOD (OD = 8.61m BPGL).

The underlying geology of the site consists of a bedrock of the Sherwood Sandstone Group. The overlying deposits consist of alluvial deposits made up of clay, silt, sand and gravel deposits reflecting the flooding and migration of the River Ouse across the landscape. http://ww.bgs.ac.uk/geologyofbritain/home.html

4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

(Taken from YAT WSI 2018/131 with amendments)

Prehistory

Knowledge of prehistoric activity from the immediate area is limited to the identification of alluvial deposits radiocarbon dated to the late Bronze Age (BC 1510–BC 900) at the St George Fields pumping station, which is to the north-east side of the site (Hunter-Mann 1994, 7). These deposits were identified between around -1.00 OD and 0.00m AOD, some 8.50 to 9.00m BGL.

Prehistoric water levels on the site would have fluctuated in tandem with those of the formerly tidal Ouse (Briden 1997, 170; Duckham 1967, 17). The resulting complex marshland ecosystem was likely a place of significance and a valuable subsistence resource to local populations (Whyman and Howard 2005, 14). There may be evidence for prehistoric activity preserved at St. George's Field; its location and the waterlogged nature of the buried deposits in the area could also hold potential for valuable information about fluvial landscape morphology and environment during this period (Savine 2016, 4; Millward 2017, 4).

Roman

The site lies approximately 700m to the south-east of the Roman fortress in an area that is likely to have been marginal land in the Roman period (Ottaway 2011, 237). Late Roman burials were recorded at York Castle in 1835 and again in 1956 (RCHMY 1, 67–8). These included three in stone sarcophagi, one in a lead coffin and two in wooden coffins (Ottaway 2011, 198). There is the possibility that the cemetery continued into St. George's Field, however as of yet there have been minimal archaeological evaluations within this central area. Further investigations at this site could help to fill in the gap of Roman archaeology within the confluences of the River Ouse and River Foss.

Anglian and Anglo-Scandinavian

Evidence for Anglian period York is generally elusive and what has been recovered to date is sparsely distributed across the city. Excavated sites and the distribution of find spots suggests that settlement at York was poly-focal with distinct nuclei spread out across the former Roman fortress and *colonia*, interspersed with cultivated or waste areas (AY 7/2, 298; Palliser 2014, 37). Anglian activity has proved to be very sparse in the immediate vicinity of St. George's Field. Antiquarian records of burials at Castle Yard may have produced 7th-century hanging bowls (Tweddle 1999, 172). Rather greater evidence for activity and settlement during this period has been found on the opposite (eastern) bank of the River Foss around Fishergate where evidence suggests the location of a 7th–9th century trading settlement or *wic* (Kemp 1996, 64).

St. George's Field Car Park is close to one of the most important Anglian period sites excavated in York - the former Redfearn National Glass works, 46–54 Fishergate (AY 7/1). Unlike the majority of the evidence for Anglian activity elsewhere in the city which may not necessarily offer convincing evidence of occupation, evidence from the 1985–6 excavation of 46–54 Fishergate provides evidence of an important production and trading centre, or *wic*. The site occupied an area of around 2,500m² sited on the lower east bank of the River Foss, directly

opposite the point of confluence with the River Ouse. This 7th–late 9th-century settlement apparently began as a well-organised, probably planned, settlement rather than one that developed organically to exploit the natural communications provided by the rivers and the east–west land route of the York Moraine (ibid.).

More recent excavations at the former Mecca Bingo site and in the Blue Bridge Lane area close to Fishergate have produced further evidence of Anglian period pit groups and occupation (Spall and Toop 2011, 7). Excavation carried out at the junction of Dixon's Lane/George Street in 2006 discovered further evidence for activity possibly associated with the wic approximately 100m to the east of 46–50 Piccadilly (AYW 9; McComish 2007). Based on current archaeological evidence, the St. George's Field site lies just to the west of a significant Anglian settlement (Figure 4 in Palliser 2014, 24).

Despite the site's proximity to the extensive and well-preserved remains of 9th–11th century settlement at Coppergate (Hall 2014), Anglo-Scandinavian activity in the immediate vicinity is limited. Excavations on the site of St. George's Chapel in the north-east corner of the site highlighted the absence of alluvial deposits indicating that the area would have been dry, useable land during the medieval period, if not earlier. Consequently, the possibility of Anglo-Scandinavian activity on the site cannot be ruled out (Hunter-Mann 1990, 20).

Medieval

The landscape of the River Foss was drastically altered by the damming of the southern end of the river at Castle Mills during the Norman period to exploit its waters to feed the moat of the Norman castle at York (VCHY 1961, 509–510). The resulting body of water was called the Stagnum Regis, the King's pool. The dam of the Fishpool of the Foss probably provided a causeway across the Foss at the site of the modern Castle Mills Bridge, to the immediate north-east of the present site. The first documentary evidence for a bridge at Castle Mills is not until 1585 and the structure was destroyed during the Siege of 1644 (VCHY 1966, 519–520; Raine 1955, 196).

Medieval activity at St. George's Field is likely to have been centred on St. George's Chapel. Documentary evidence and the excavations carried out by YAT in 1990 place the chapel close to the present entrance to the car park, in the north-eastern area of the site. The chapel was established by the 12th century and was granted to the Knights Templar in 1246 where it stood on meadowland adjoining their mills (Pugh 1961, 483). Following the suppression of that order, it became a royal free chapel in 1311. By 1447 it was used by the Guild of St. George, from which the chapel and adjacent field takes its name (Hunter-Mann 1990, 14). These building also appear on John's Speed's map of 1610.

Post-medieval

Following the suppression of the Guild of St. George in 1547, the chapel passed to the York Corporation under whom it was largely demolished in 1566, with the stonework put towards the rebuilding of Ouse Bridge. From 1576 the site of the chapel was occupied by a timber building used until 1620 as a house of correction from which point it was converted into a workhouse (Hunter-Mann 1990, 14). The foundation stones of the Windmill Inn are thought to be the surviving remnant of St George's Chapel taken in a photograph from 1885, before the buildings were demolished and the area cleared for the Foss Basin.

Modern

In the 20th century the area to the north and east of St George's Field was heavily used for the transport of goods. The Castle Mill's area was used as a place to load materials ready for travelling up to the Leetham's flour mill and glassworks site further up the River Foss, it consisted of a quayside and dock for barges to unload.

Land to the south of the site of the former chapel was occupied from 1856 by public baths, these can be seen from some of the earliest aerial photographs of the city of York. St. George's Fields is thought to have been used for public recreation perhaps since early times and the site of the annual St. George's Day celebrations (Raine 1955, 198–200). In 1908 the circus arrived on St George's Field and in 1924, the Martinmas Fair was moved from Parliament Street to St. George's Field (Pugh 1961, 483). In the 1960s the site became a car park. The Foss Barrier and associated pump house were constructed in 1986 and expanded in 2016.

5 RESULTS

The three boreholes were assigned context numbers corresponding to their designation (BH01 was designated context 100 onwards, BH02 was given contexts 200 onwards, and so forth). Each context was then allocated to a phase of activity across the site (Figures 4 and 5). It must be noted however, that in the absence of clear dateable artefacts from the boreholes the phases designated are based only on the broad impression gained from experienced observation of the deposits by the attendant archaeologist.

Full descriptions of these deposits can be found in the context table (Appendix 2).

Height of present ground level is given at the beginning of each borehole summary as a height related to the Ordnance Datum (OD). A graphic representation of the recorded sequence is given in Figure 3, that of the phasing is given in Figure 4 and deposit modelling is shown in Figure 5.

5.1 Borehole BH01

Borehole BH01 (Figures 3–5, Plates 1–10) was positioned towards the north western end of the site. At the time of monitoring the ground level was recorded as being 8.47m OD (plate 1). Twenty-five contexts were identified (Contexts 100–125). The top of the water table was noted at approximately 3.5m BGL (4.97m OD). No evidence of natural deposits was encountered in BH01.

Phase 1 Lower Alluvial Deposits (Contexts 122–125)

The defining characteristic of these lowest deposits within the borehole sequence is their dark waterlogged, organic preservation and banded silt and clay layers. Within this borehole the rig was able to drill to a depth of 10.50m BGL (-2.03m OD).

The upmost deposit, Context 122 consisted of a firm gritty sandy clay which could represent a possible ground levelling event. Contexts 123–124 are represented by dark sandy silt laminates and gritty course sand with the presence of occasional flecks of charcoal. This suggests the possibility that these deposits represent the changing course of the river channel and subsequent flooding episodes next to the River Ouse. No dateable evidence was

encountered in any of these contexts, the only noticeable difference is the lowest deposit Context 125, which consisted of a firmer reddish brown clay, could be part of land build-up possibly dating to the Prehistoric or Roman period (Plate 2, BH01 shows a core from 9.70m BGL with the dark silty gritty material visible and Plate 3 shows the core at 10–10.5m BGL with the reddish brown clay, this also shows the lack of recovery from 9–9.70m BGL).

Phase 2 Medieval (Contexts 116–121)

Contexts 116–119 were homogenous silty clays with laminated bands of sand and silt, these also had small mollusca remains visible within the deposit (plate 4) possibly suggesting river inundations onto the site between 4.60–7m BGL (3.87–1.47m OD). GBA samples were taken of these deposits and are awaiting analysis.

The most likely deposit representing the medieval period was Context 120. This was a fairly irregular accumulation of friable to firm light greyish brown silty clay, containing charcoal flecks, oyster shell fragments and other small mollusca remains, as well as visible fibrous roots or 'hair-like' organic remains (plate 5). These were observed from 6.60m to 7m BGL (1.87m–1.47m OD). A GBA sample was taken from this deposit. Further GBA samples were taken from deposits above and below (Contexts 118 and 121) to help characterise the sequence.

A Redox closed tube sample was taken between 7.50–8m BGL (0.97 to -0.47m OD), as black gritty coarse sand was uncovered in Context 121 above at 7.20m BGL (1.27m OD). This deposit was soft and contained fibrous organic material which certainly warrants further identification and analysis (plate 6).

Phase 3 Post-Medieval (Contexts 105–115)

The earliest post-medieval activity belonged to a sequence of deposits comprising bands of very clean alluvial silts with no inclusions (Contexts 109, 112–113), again suggesting flooding inundations. Context 115 at the base of this sequence was more diverse, as small mollusca remains were visible; accordingly, a GBA sample was obtained to understand this interface (Plate 7). Within this sequence were also very clean light clays (Contexts 110, 111, 114), suggesting possible land build-up and levelling on this site, these were present between 2.50–4.50m BGL (5.97–3.47m OD) (Plate 8).

Contexts 105–108 all consisted of varying levels of crushed brick rubble and mortar between 1.50–2.50m BGL (6.97–5.97m OD), possibly representing a sequence of dumping and levelling or the demolition and clearance of structures once present in the vicinity (Plate 9).

Phase 5 Modern (Contexts 100–104)

Modern deposits were identified from 1m BGL to the current ground surface (7.47–8.47m OD). They included Contexts 102–104, mid brown grey clayey, silty sand containing large quantities of brick rubble, crushed mortar and pebbles, interpreted as a make-up or levelling deposits.

Above these was the current car park surface, Contexts 100 and 101, comprising compacted crushed mortar, CBM and small pebbles as well as a dark silty sandy bedding on which the tarmac surface had been lain (Plate 10).

5.2 Borehole BH02

Borehole BH02 was located approximately 70m to the southeast of the BH01 (Figures 3–5, Plates 11–14). At the time of monitoring the ground level was recorded at 8.56m OD (plate 11). Nineteen contexts were identified (Contexts 201–219). The top of the water table was noted at approximately 3.5m BGL (5.06m OD).

Natural deposition was not identified in BH02.

Phase 1 Lower Alluvial Deposits, 10m BGL (-1.44m OD)

The likely Phase 1 deposits at the lowest extent of BH02 could not be characterised. Core recovery from this depth failed due to ingress of ground water and loose deposits from higher up in the sequence falling into the sample.

Phase 2 Medieval (Contexts 211 and 219)

Deposits provisionally attributed to the medieval period comprised Contexts 211–219, which were encountered at 4.11m to 8.90m BGL (4.45m to -0.34m OD). These deposits were split into two phases, the lowest Contexts 216, 217, 218 and 219 appeared to be bands of dark coarse gritty sandy laminated silt, with very distinct deposits of black organic dumping material, between 6.82m–8.90m BGL (1.74m to -0.34m OD). The upper deposits, Contexts 211–215 were lighter sandy silt laminates, suggesting alluvial flooding and inundation (plate 12).

There was a piece of possible medieval CBM from Context 216, but it was very abraded and requires further analysis.

A GBA sample was taken of Context 212 due to the presence of charcoal within the deposit.

A REDOX closed tube sample was taken between 5.50–6m BGL (3.06–2.56m OD), as amidst the very obvious sand and silt laminates, there were more charcoal flecks within Context 213 which was directly above the sample at between 5.20–5.50m BGL (3.36–3.06m OD). This sample can potentially explain the interface between the alluvial flooding and medieval dumping sequences.

Phase 3 Post-medieval (Contexts 207–210)

These deposits were mainly alluvial in character, varying from the lowest Context 210, consisting of laminated silty clay bands between 3.20–4.0m BGL (5.36–4.56m OD) with very occasional charcoal present. Above these were bands of very fine and clean alluvial silts with the occasional deposit of clean clay, observed between 1.30–3.20m BGL (7.26–5.36m OD). These suggest more alluvial flooding and minimal levelling or building-up of the ground (plate 13).

Phase 4 Modern (Contexts 200–206)

Modern deposits (Contexts 203–206) extended from 1.30m BGL to the current ground surface to (7.26m–8.56m OD). The sequence consisted of dark grey and black mixed clayey, sandy silts containing large quantities of brick rubble, mortar and small pebbles, interpreted as a make-up or levelling deposits.

Above this was the current car park surface (Contexts 200–202) comprising compacted crushed mortar, CBM and small pebbles as well as a dark silty sandy bedding on which the tarmac surface had been formed (Plate 14).

5.3 Borehole BH03

Borehole BH03 (Figures 3–5; Plates 15–21) was located approximately 2m to the east of the BH02. At the time of monitoring the ground level was recorded at 8.61m AOD (Plate 15). Fifteen contexts were identified (Contexts 300–315). The top of the water table was noted at approximately 3.5m BGL (5.11m OD).

No evidence of natural deposits was encountered in BH03.

Phase 1 Lower Alluvial Deposits (Context 313–315)

As with the deepest deposits in BH02, recovery of Phase 1 deposits in BH3 was adversely affected by falling debris from deposits above, resulting in several voids in the borehole sequence. A few distinct deposits were observed and characterise this sequence. The lowest deposit observed (Context 315) was a very light grey sandy silt, with evidence of root activity and organic remains present between 10.80–11m BGL (-2.19m to -2.39m OD). This material probably represents an alluvial deposit, the depth indicating this may be within an ancient part of the river course (Plate 16).

Contexts 313 and 314 were both very gritty sandy silts present between 9.60–10m BGL (-0.99m to -1.39m OD). Context 314 was relatively clean with no inclusions suggesting flooding alluvium, Context 313 contained evidence of shell fragments and one very abraded piece of pottery which possibly may be Roman in date, however this requires further analysis.

Phase 2 Medieval (Contexts 312–308)

The earliest deposits within this phase (Contexts 310–312) were made up of dark and black gritty coarse sand and silt deposits, organic material, animal bone and shell present between 6.40–9m BGL (2.20 to -0.39m OD) (Plates 17–18). There were several fragments of abraded CBM and pottery that maybe Roman in date found within these contexts, however these require further analysis to differentiate between a possible Roman or Medieval dumping interface.

The upper layers (Contexts 308–309) were laminates of sandy silt with occasional charcoal and wood fragments with some visible roots. These were lighter in composition and probably related to material being brought in by alluvial processes between 4–6m BGL (2.61–4.61m OD) (Plate 19).

A Redox closed tube sample was taken between 5–5.50m BGL (3.61–3.11m OD), as there were charcoal flecks present above in Context 308 amidst the sand and silt laminates. There were also organic remains resent below in Context 309, the sample from which may explain the interface between the alluvial flooding and medieval dumping sequences.

GBA samples were taken from Contexts 309–311 to characterise the black gritty coarse material at this depth and how it relates to deposits above.

Phase 3 Post-Medieval (Contexts 305 and 307)

These deposits consisted of very clean alluvial silts with very occasional charcoal present between 1.30–4m BGL (7.31–4.61m OD). These layers may represent flooding events (Plate 20).

Phase 4 Modern (Contexts 304–300)

Modern deposits were identified from 1.30m BGL to the current ground surface to (7.31–8.61m OD). Contexts 303 and 304 comprised dark greyish brown mixed clayey, sandy silt containing large quantities of brick rubble, mortar and small pebbles, and are interpreted as make-up or levelling deposits.

Above this was a sequence relating to the current car park surface comprising compacted crushed mortar, CBM and small pebbles, as well as a dark, silty-sandy bedding on which the tarmac surface had been formed (Contexts 300–302; Plate 21).

6 DISCUSSION

The results of the borehole survey largely correlate with what observations from previous evaluations in and around the site. In particular, there are close parallels with the results of the 2016 and 2017 borehole surveys located to the east of the current St George's Field site (Savine 2016; Millward 2017). The lower alluvial silts were visible in BH01 at 8.60m BGL (0.13m OD) continuing to a depth of 11m BGL (-2.39m OD) in BH03. Natural glacial clays were not identified in this investigation so it is suggested that the alluvial deposits represent an early natural flooding sequence of River Ouse (Phase 1).

Lower Alluvial Deposits

The lower deposits were overlain by extensive dumps of waste material of a possible medieval date (Phase 2). These appear to relate to deposits uncovered in Phase 2 of the 2017 borehole investigations (Millward 2017), as well as Phase 4 of the 2016 SI watching brief (Savine 2016). These deposits sugest extensive and prolonged dumping of domestic refuse, such as animal bone, marine shell and pottery and building debris, along the length of the St George's Field peninsular. The only slightly unusual deposit sequence uncovered within this phase was the very black gritty, coarse sandy silt visible in BH03 between 6.40m–9m BGL (2.21 to -0.39m OD) which contained organics, shell fragments and potentially very abraded Roman. This deposit also appeared in BH02, although it was not as thick, between 6.82–8.90m BGL (1.74 to -0.34m OD) and in BH01 at 7.20–7.90m BGL (1.27 to -0.56m OD). These varying depths suggest a consistent activity, mainly concentrated to the south and east of the site, but dissipating further northwards. Further analysis of the pottery recovered will be undertaken and the results included in a subsequent version of this report. A REDOX sample was taken of this black gritty deposit from BH1, as well as GBA samples in BH03, Contexts 309–311. Samples analysis will hopefully clarify the composition and nature of this underlying deposit sequence. Whether this is part of a Roman horizon of archaeological activity or an isolated Roman dumping event it is difficult to determine from this evaluation.

Medieval

Above the medieval dumping accumulations, a largely sterile alluvium and clay banded sequence followed between 1.30m and 4m BGL (7.31–4.61m OD) in BH02 and BH03 (Phase 2). These correlate with previous investigations in Phase 3 of the 2017 investigations and Phase 5

in the 2016 watching brief. The lack of finds from these deposits could indicate that there was little or no human activity in the vicinity of the peninsula for a period of time, or that the sequence formed rapidly during a single event or related series of events. Within BH01 there was an additional post-medieval sequence of dumping between 1–2.50m BGL (7.47–5.97m OD) that could possibly represent the demolition of a building within the immediate vicinity, possibly the 20th-century bath complex to the east, and part of levelling the ground within this area in relatively recent times.

Post-medieval to modern

The latest phase of activity (Phase 4) represents modern land reclamation, which has sealed in the lower alluvial deposits. These deposits brought the ground level up to between 7.17–8.61m OD and were sealed by the modern car park levelling and surface.

7 DEPOSIT MONIOTIRNG REPORT FOR THE SIX-MONTH PERIOD FROM SEPTEMBER 2018 TO MARCH 2019

BY IAN PANTER

April 2019

7.1 Introduction

Three standpipes were installed in the St George's public car park, York, to enable a six-month deposit monitoring program to satisfy a planning application at the request of the City of York Council.

7.2 METHODOLOGY

Three boreholes (refer to figure 1 for their locations) were drilled using a lightweight dynamic coring rig and standpipes installed to monitor fluctuations in the groundwater table as well as groundwater quality. Each standpipe consists of a plastic pipe c. 50mm diameter and perforated from circa 1.0m below ground level (BGL) to allow ingress of groundwater. The upper 1.0m of the pipe is encased in bentonite clay to prevent downward movement of surface water which would give rise to erroneous level data. The perforated section of the standpipe is encased in fine gravel which act as a filter to prevent, or at least slow down, the rate of siltation.

Borehole 1 was drilled to a depth of 10.5m BGL, borehole 2 to 10.0m and borehole 3 was terminated at 11.0m BGL. Following a period of time to allow groundwater levels to recover, two pressure transducers were installed into the standpipes at BH 1 and BH2 on the 21st September 2019, and a water quality meter was installed on the 8th October 2019 into BH3.

Water levels are logged using the Rugged TROLL™ 100 pressure transducer (from In-Situ Europe) suspended below the groundwater table. As these transducers are of the non-vented type, a BaroTROLL™ (recording barometric pressure) was deployed to enable compensation for localised changes in atmospheric pressures. This was installed in BH2 to a depth of circa 0.3m BGL hoping that it remained dry and continually above the groundwater table throughout the monitoring period.

Prior to installation each transducer was calibrated to the initial depth to the groundwater table, measured with an audible dipmeter and set to collect readings every six hours starting 30 minutes following installation.

Water quality data including optically dissolved oxygen, pH, conductivity, temperature and redox (ORP) has been collected using the Aqua Probe™ 2000 sonde connected to an Aqualogger ™ R2000 datalogger (both retailed by Bell Flow Systems Ltd) installed at a depth of circa 4.0m BGL in BH 3.

Three sealed undisturbed sediment samples were extracted during the drilling process and submitted for permeability and geochemical assessment (Geolabs Ltd, UKAS accredited facility) and additional bulk sediment samples were sent to Palaeoecology Research Services for an assessment of the preservation potential of the bioarchaeological remains.

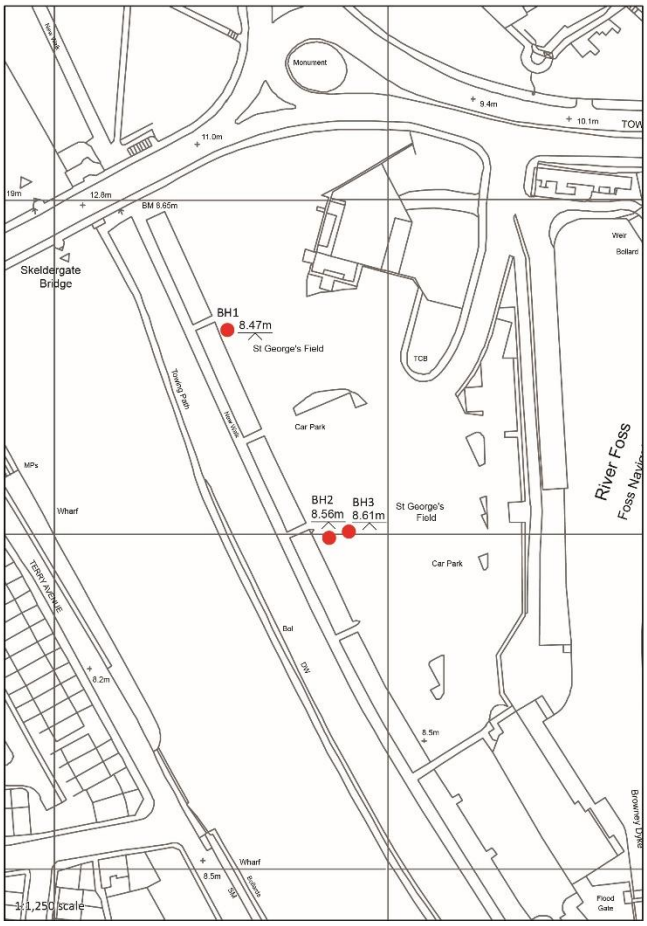

Figure 1 Standpipe locations in St George's Field car park

7.3 Results

Groundwater

The height of the groundwater in BH1 and BH2 was recorded from the 21st September until the 19th March 2019 when the carpark was submerged under flood water following a period of intense rainfall in the Ouse catchment area. The equipment was retrieved as soon as the flood waters receded and data downloaded and corrected for variations in barometric pressure using the Win-Situ Baro Merge™ software and the pressure data collected by the BaroTroll installed in BH 2. Because the BaroTroll was totally submerged by the afternoon of the 17th March, all subsequent data have been discarded.

The groundwater level has fluctuated throughout the period, falling to a maximum of 3.18m BGL (5.29m AOD) on 1/11/18 in BH1 and 3.05m BGL (5.51m AOD) in BH2 on 5/10/18, and rising in response to the River Ouse level. In fact, there is a highly positive correlation between the river and groundwater levels as seen in Figure 2 which plots the groundwater and river levels using data obtained from the Environment Agency monitoring station in central York, known as the Viking Recorder.

Furthermore, there is also positive correlation between rainfall and groundwater levels, although there appears to be a time delay before the impact of a rainstorm is observed in groundwater levels. Figure 3 includes rainfall data obtained from the Weather Underground website, from a station called York 40 (https://www.wunderground.com/weather/gb/york/IYORK40).

The results from the monitoring programme clearly indicate that the sub-surface deposits remain hydrologically connected with the river, where groundwater levels respond to the fluctuations of the Ouse.

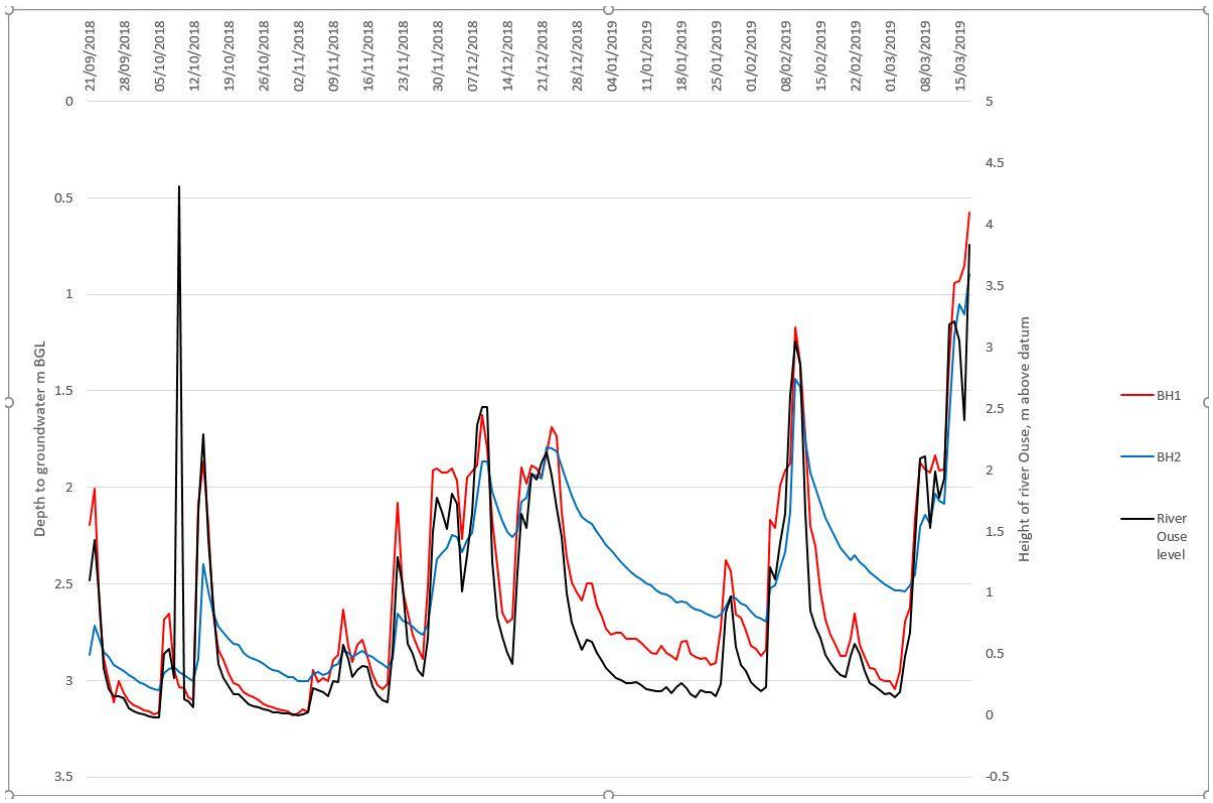

Figure 1 St George's Fields groundwater and River Ouse Levels

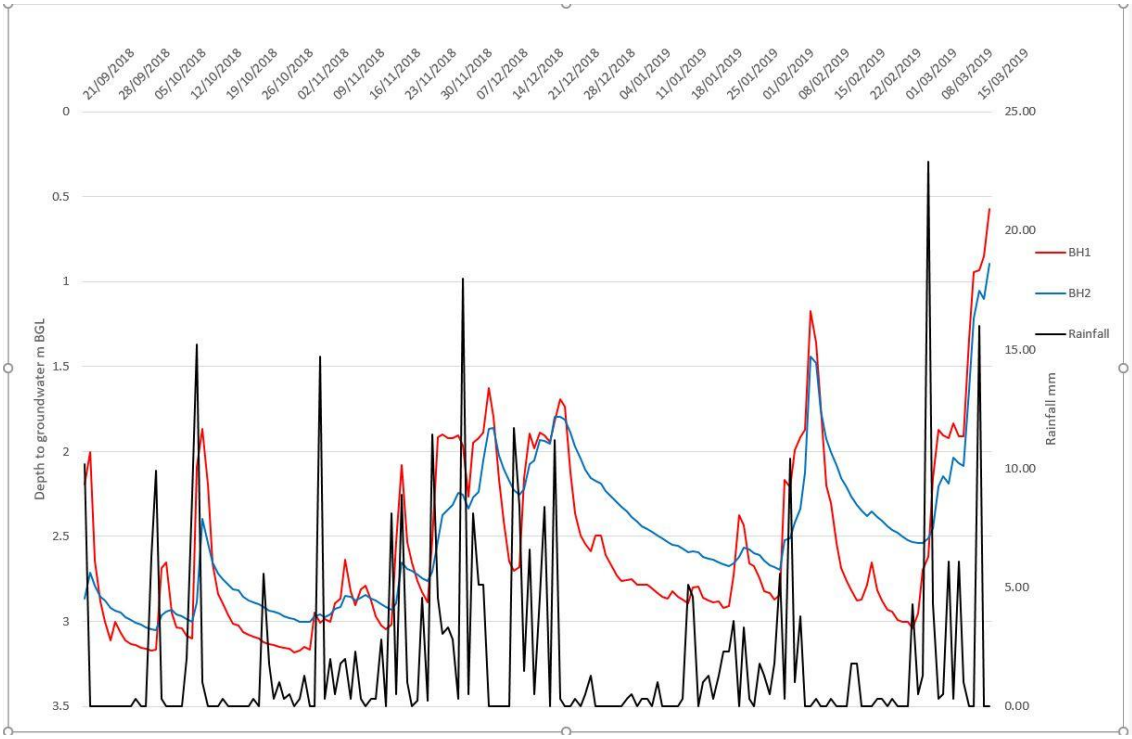

Figure 2 St. George's Fields groundwater and rainfall levels

Water Quality

Prior to installation the pH and conductivity sensors were calibrated using RapidCal™ Solution and the RapidCal™ software, and the ORP (redox) sensor was calibrated using a REDOX standard 250mV solution (at 25°C) for the Silver/Silver Chloride electrode. Further calibration of the ORP (redox) sensor was performed on a monthly basis where necessary. The dissolved oxygen sensor had been factory calibrated.

The results of the water quality monitoring are summarised in Table 1:

Parameter	Maximum	Minimum
pH	7.78	7.26
Dissolved Oxygen	0%	0%
Redox (ORP)	119.4 mV	-340.2 mV
Conductivity (EC)	1648 uS/cm	6 uS/cm
Temperature	8.8°C	13.5°C

Table 1 water quality parameters from BH3, 8th October 2018 to 19th March 2019

The key criteria that define the nature of the burial environment are the ORP(redox) potential and the dissolved oxygen concentration. Redox is shorthand for reduction/oxidation – negative readings indicate reducing conditions (good for organic preservation) and positive readings imply oxidizing conditions where decay is ongoing. Likewise, for oxygen concentration where low or no oxygen is ideal for preservation. Throughout this period there has been no oxygen detected by the sensor and redox values are all highly negative indicative of anoxic and reducing conditions, ideal for in situ preservation of organic archaeological materials. The single positive ORP measurement of 119.4mV was recorded as the sensor was inserted into the standpipe.

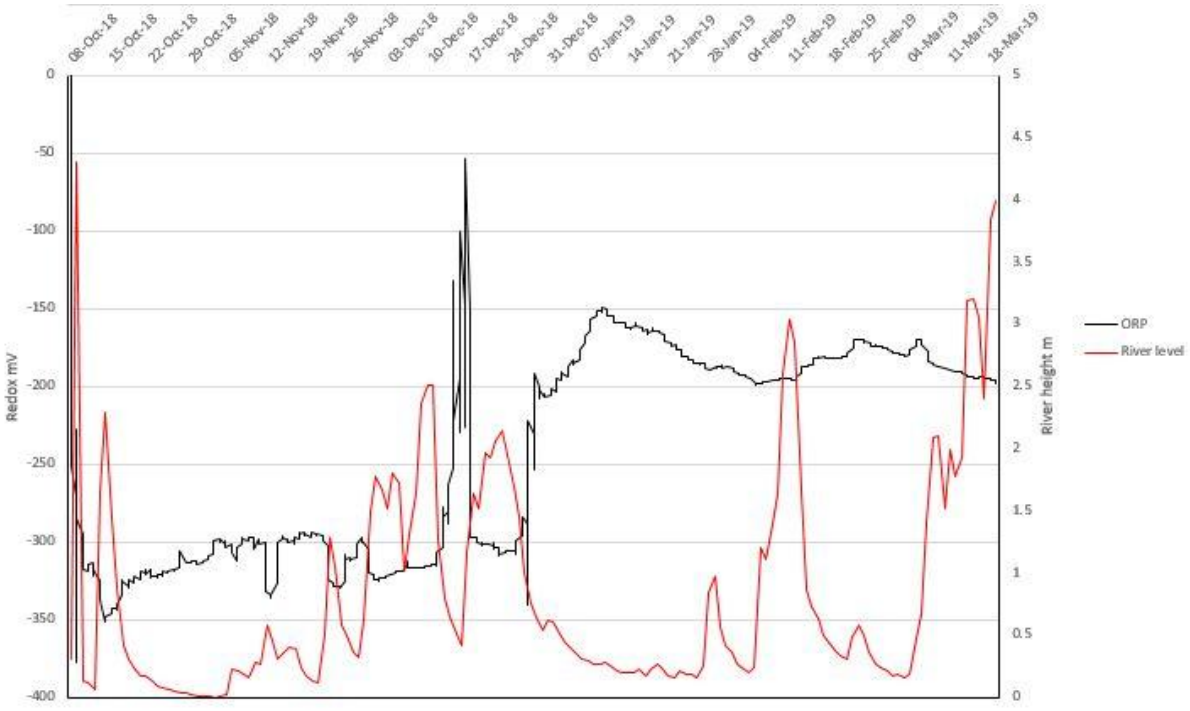

Figure 4 Redox potential measured in BH3 and river level

As to be expected the redox potential has fluctuated throughout the period although as yet it is not clear what factors are having an influence, as there is no clear correlation between river level fluctuations and ORP (redox) values (figure 3).

Temperatures have remained fairly stable ranging between 11°C and 13°C, with the lowest, 8.8°C recorded during the March 2019 flood.

The pH has remained neutral, or near neutral throughout, and the high values of the conductivity readings confirm that the deposits are saturated through contact with the river, rather than rainfall alone. The lowest conductivity value (6 uS/cm) was recorded during the March flood.

Sediment characteristics

Sediment characterization was performed on undisturbed sediment samples obtained from BH1, BH2 and BH3. Geotechnical tests include permeability, porosity and organic content to assess how fast water can flow through, or be bound, to the sediment, and a couple of chemical tests to identify the pH and the total sulphate concentration, the latter providing a coarse indicator of the reducing (or oxidizing) nature of the sediments. All tests were performed by Geolabs Ltd (a UKAS accredited facility).

Borehole	Depth m BGL	Depth mAOD	Description	pH	Organic Content	Total Sulphate content	Porosity	Coefficient of Permeability $X10^{-10}$ m/s
BH1	7.50-8.00	0.97 - 0.47	Dark brown clayey very silty sand with rare wood fragments. Sand is fine, rare medium	8.0	1.6%	0.45%	37%	7.0×10^{-9} m/s
BH2	5.50-6.00	3.06 – 2.56	Soft dark brown slightly clayey sand	7.6	2.2%	0.33%	46%	1.9×10^{-9} m/s
BH3	5.00-5.50	3.61 – 3.11	Soft dark brown clayey sand	7.6	3.5%	0.25%	43%	8.9×10^{-9} m/s

Table 2 results of the geotechnical investigation of samples from St Georges Fields, York

Low coefficient of permeability values, together with moderate organic content and porosity values indicate sediments that have the capability to retain water during fluctuations in the water table. The nature of the sediments is such that as the water level drops, a capillary zone will be established as a result of the water gradually rising due to capillary action, even if the water table drops.

All sediments are neutral or slightly alkaline (BH1), and the presence of low concentrations of sulphate suggest that reducing conditions prevail throughout the deep deposits within the water table.

7.4 Conclusions

The six-month monitoring programme has helped characterise the nature of the sub-surface deposits at St. George's Fields public car park. The groundwater level is strongly influenced by the River Ouse, and fluctuates as the river rises and falls. The lowest level for the water table has been between 5.29m AOD (BH1) and 5.51m AOD (BH2) indicating that the medieval (Phase 2) and lower alluvial silts (Phase 1) have remained fully saturated throughout this time. post-medieval deposits (Phase 3) lie within the capillary zone, immediately above the water table.

However, the nature of the sediments is such that they have the ability to retain water as the river level falls, and hence saturated reducing conditions have been maintained throughout this period, even during the recent flood event in March 2019 where it would appear that the potential impact from the sudden ingress of aerated flood water has been mitigated by the saturated deposits.

In conclusion, all available evidence indicates that conditions within the sub-surface deposits below the water table can be described as highly reducing and hence favourable to the preservation of archaeological materials, especially organics.

Any groundworks, such as contiguous sheet piling, which cuts-off the deposits from the River Ouse is likely to have a negative impact upon the water table and could give rise to oxidising conditions over time as the groundwater level falls, and sediments become less saturated.

It is recommended that monitoring can now cease, unless further groundworks are proposed that may physically isolate the sub-surface deposits from the river.

SOURCES

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The report text and illustrations were produced by Emma Boast.

APPENDIX 1 – INDEX TO ARCHIVE

Item	Number of items
Context sheets	3
Levels register	1
Photographic register	0
Sample register	12
Drawing register	0
Original drawings	0
B/W photographs (films/contact sheets)	0
Colour slides (films)	0
Digital photographs	134
Written Scheme of Investigation	1
Report	1

Table 1 Index to archive

APPENDIX 2 CONTEXT LIST

Context Number	Borehole	Depth of Deposit (BGL)	Description
100	BH1	0–0.20m	Modern car park surface 200mm thick.
101	BH1	0.30–0.40m	100mmm of mixed tarmac and fall-in.
102	BH1	0.40–0.60m	Friable, dark blueish/grey, sandy silt. Clean
103	BH1	0.60–0.80m	Soft, dark grey/brown, silty sand. Occasional small pebbles.
104	BH1	0.80–0.90m	Firm, dark grey/brown, sandy clay. Frequent small fragments of CBM and mortar flecks. Occasional small pebbles.
105	BH1	1.00–1.60m	Friable, mid brown/grey, clayey silt. Frequent brick and CBM fragments. Occasional mortar fragments.
106	BH1	1.60–1.80m	Friable, light orange/brown, clayey silt. Occasional small limestone fragments, small pebbles.
107	BH1	1.80–2.10m	Friable, light orange/red, sandy silt. Frequent brick, CBM and crushed mortar fragments, mortar patches.
108	BH1	2.10–2.50m	Friable, light greyish/whitish/brown, sandy silt. Frequent crushed mortar and small mortar fragments. Very occasional charcoal flecks.
109	BH1	2.50–2.70m	Friable, light grey, clayey, sandy, silt. Very clean.
110	BH1	2.70–3.00m	Firm, dark grey, silty clay. Very clean.
111	BH1	3.20–3.40m	Firm, dark brown/grey, silty clay. Very clean.
112	BH1	3.40–3.50m	Friable, light greyish/orangish/brown, very gritty sandy silt. Occasional charcoal flecks.
113	BH1	3.50–4.00m	Friable, mid brownish/grey, sandy silt. Very clean.
114	BH1	4.00–4.20m	Firm, dark brownish/grey, sandy clay. 200mm at base of deposit very fine sand. Very clean.
115	BH1	4.20–4.60m	Friable, mid brownish/grey, very sandy silt. Frequent small mollusca remains
116	BH1	4.60–5.00m	Firm, mid brownish/grey, silty clay. Frequent small mollusca remains visible in deposit. Occasional light yellow, fine sandy patches/bands through deposit.
117	BH1	5.30–5.70m	Firm, dark brown/grey, silty clay. Occasional yellow sand bands/laminates.
118	BH1	5.70–6.30m	Firm, dark brown silty clay. Frequent mollusca remain
119	BH1	6.30–6.60m	Firm, light orange/brown, silty, sandy, clay. Very clean
120	BH1	6.60–7.00m	Friable to firm, light greyish/ brown, silty clay with light yellow fine sand bands/laminates. Frequent large mollusca shells, organic remains present, fibres which could be roots or hair.
121	BH1	7.20–7.90m	Soft to friable, black, gritty sandy silt. Possible organic bits in. Noticeably different from any other deposits in borehole.
122	BH1	7.90–8.00m	Firm, light brown, gritty sandy, silty, clay. Very clean.
123	BH1	8.60–9.00m	Friable, light orange/brownish/grey, fine sandy silt. Frequent wood fragments.
124	BH1	9.70–10.00m	Firm, light brownish/grey, gritty sandy, clay.
125	BH1	10.00–10.50m	Firm, mid reddish/brown, sandy clay. Occasional

Context Number	Borehole	Depth of Deposit (BGL)	Description
			medium sized pebbles.
200	BH2	0–0.10m	Modern carpark surface
201	BH2	0.10–0.20m	Tarmac rubble under hard standing tarmac.
202	BH2	0.20–0.42m	Tarmac mixture, clinker, modern rubble.
203	BH2	0.42–0.62m	Modern levelling for carpark.
204	BH2	0.62–0.80m	Friable to firm, dark greyish/black, sandy, clayey, silt. Frequent crushed white mortar flecks.
205	BH2	0.80–0.98m	Friable, dark orange/brown, sandy silt. Frequent small CBM fragments.
206	BH2	1.00–1.30m	Friable, mid orange/brown, very sandy silt. Occasional small pebbles.
207	BH2	1.30–2.30m	Friable, light orangey/brown, very fine sandy silt. Very clean.
208	BH2	2.30–2.80m	Friable, light yellow/orangey/brown, very sandy silt. Laminates of sand.
209	BH2	2.80–3.20m	Firm, light brown, silty, sandy clay. Very clean.
210	BH2	3.20–4.00m	Firm, mid grey, silty clay. Occasional charcoal flecks. Bands of sandy laminates within.
211	BH2	4.20–4.60m	Friable, light orange/brown, very sandy silt. With light grey laminates of fine silty sand.
212	BH2	4.60–5.00m	Friable, dark grey/brown, coarse sandy/silt. Occasional small CBM fragments, charcoal flecks.
213	BH2	5.20–5.50m	Friable, dark brown/grey, very sandy silt. Occasional charcoal flecks. Yellow sand laminates
214	BH2	6.00–6.70m	Friable, mid greyish/brown, very coarse sand, silt. With light yellow/grey silt bands/laminates.
215	BH2	6.70–6.82m	Firm, dark blackish/grey, silty clay. Occasional charcoal flecks.
216	BH2	6.82–7.00m	Friable, black, gritty sandy, silt. Frequent small CBM fragments, shell fragments.
217	BH2	7.70–8.00m	Friable, dark brown/grey, very sandy silt.
218	BH2	8.20–8.40m	Friable, dark brown, very gritty sandy, silt. Frequent small CBM fragments. Occasional charcoal flecks.
219	BH2	8.40–8.90m	Friable, black, gritty sandy, silt. Frequent small CBM fragments and small shell fragments.
300	BH3	0–0.30m	Carpark road surface, 300mm thick.
301	BH3	0.30–0.50m	Crushed tarmac and rubble make-up.
302	BH3	0.50–0.60m	Dark orange fine sandy bedding. Modern carpark make-up.
303	BH3	0.60–0.80m	Firm, dark brownish/grey, silty clay. Occasional brick small fragments and small pebbles.
304	BH3	1.20–1.30m	Friable, mid orangey/brown, sandy silt. Occasional small pebbles.
305	BH3	1.30–2.00m	Friable, mid brownish/yellowy/orange, very fine sandy silt. Very clean.
306	BH3	2.20–3.10m	Friable, light brownish/yellow/orange, fine sandy, clayey, silt. Very Clean.
307	BH3	3.10–4.00m	Soft, mid greyish/brown, very sandy, clayey silt. Very

Context Number	Borehole	Depth of Deposit (BGL)	Description
			occasional charcoal flecks.
308	BH3	4.00–5.00m	Soft, mid grey, very sandy, clayey silt. Laminates of sand and silt. Occasional charcoal flecks.
309	BH3	5.00–6.40m	Soft, dark brownish/ grey, very sandy, clayey silt (more clayey). Occasional wood fragments and organics.
310	BH3	6.40–6.80m	Soft, black, silt (no sand). Moderate oyster shell and mollusca remains visible. Occasional small CBM fragments and organic fibres (roots or hair?)
311	BH3	7.30–8.00m	Friable, black, very gritty sandy, silt. Bands/laminates brown/orange sand. Moderate oyster shell, small CBM fragments, animal bone. Occasional charcoal flecks, organics, pebbles.
312	BH3	8.70–9.00m	Friable, mid blackish/ brownish/ grey, very gritty sandy, silt. Moderate animal bone fragments, small CBM fragments and shell fragments.
313	BH3	9.60–9.80m	Friable, mid greyish/brown, very gritty sandy, silt. (not allot of silt). Occasional small shell fragments found.
314	BH3	9.80–10.00m	Friable, mid brown, very gritty sandy, silt (very sandy). Very Clean. Occasional roots.
315	BH3	10.80–11.00m	Friable, light greyish/brown, fine sandy silt. Occasional roots and organics.

Table 2 Context list

APPENDIX 3 – WRITTEN SCHEME OF INVESTIGATION

ARCHAEOLOGICAL TRUST

WRITTEN SCHEME OF INVESTIGATION FOR

ARCHAEOLOGICAL INVESTGATIONS AT ST. GEORGE'S FIELD CAR PARK, YORK

Site Location: **St. George's Field Car Park, York**

NGR: **SE 60478 51275**

Proposal: **Ground investigation works and water monitoring**

Planning ref: **N/A**

Prepared for: **City of York Council**

Document Number: **2018/131**

Version	Produced by		Edited by		Approved by	
	Initials	Date	Initials	Date	Initials	Date
1	AJ	05/09/18	BR	06/09/18	BR	06/09/18

1 SUMMARY

1.1 City of York Council have appointed York Archaeological Trust to carry out a borehole and water monitoring survey at St. George's Field Car Park, York (SE 60478 51275). The scheme will include a programme of three boreholes and the installation of two instrumented water monitoring points and one instrumented water quality sensor that will be observed over an initial period of six months; this may be extended at the discretion of City of York Council (CYC) Principal Archaeologist, John Oxley.

1.2 This Written Scheme of Investigation (WSI) has been prepared in response to a Brief supplied by the client. The work will be carried out in accordance with the Brief and this WSI, and according to the principles of the Institute for Archaeology (CIfA) Code of Conduct and all relevant standards and guidance.

2 SITE LOCATION & DESCRIPTION

2.1 The proposal site covers approximately 8,500m² and is presently occupied by St. George's Field Car Park, York and a pumping station (Figure 1). The site is bounded to the west by the River Ouse, to the east by the River Foss, to the south by the Foss Barrier complex and to the north by Tower Street.

2.2 The underlying geology of the site is sandstone of the Sherwood Sandstone Group with superficial deposits of alluvial silt, clay, sand and gravel (http://mapapps.bgs.ac.uk/geologyofbritain/home.html). The present ground level ranges from around 11m to 8m AOD, sloping gently southwards towards the confluence of the Ouse and the Foss.

3 DESIGNATIONS & CONSTRAINTS

3.1 The site is located within York's Central Historic Core Conservation Area and the city centre Area of Archaeological Importance (AAI) as defined by the Scheduled Monuments and Archaeological Areas Act 1979. There are no listed buildings within the proposed development area, although the site is immediately without the City Walls and close to Clifford's Tower and numerous other significant sites.

4 ARCHAEOLOGICAL INTEREST

4.1 Prehistory

4.2 Knowledge of prehistoric activity from the immediate area is limited to the identification of alluvial deposits radiocarbon dated to the late Bronze Age (BC 1510–BC 900) at the St George Fields pumping station (Hunter-Mann 1994, 7). These deposits were identified between around -1.00 OD and 0.00m OD, some 8.50 to 9.00m below the current ground level. Prehistoric remains from York as a whole are scarce, amounting to a small number of casual finds since the 19th century, mainly from the south-west of the River Ouse

and a small number of undated but possibly pre-Roman features (Wellbeloved 1861, 61–3; Radley 1974, 10–4; Hall 1996, 25). However, evidence is increasingly being found for Bronze Age and Iron Age activity focused on the York Moraine, particularly to the east of the city. Closest of these discoveries, at 25 Lawrence Street, was a Bronze Age cremation urn discovered in 2007 (Reeves forthcoming) and an assemblage of Neolithic flint tools consistent with occupation recovered from recent excavations at Hungate (Kendall 2009, 175). Both of these sites are within the lower Foss area.

4.3 Prehistoric water levels on the site would have fluctuated in tandem with those of the formerly tidal Ouse (Briden 1997, 170; Duckham 1967, 17). The resulting complex marshland ecosystem was likely a place of significance and a valuable subsistence resource to local populations (Whyman and Howard 2005, 14). There may be evidence for prehistoric activity preserved at St. George's Field; its location and the waterlogged nature of the buried deposits in the area could also hold potential for valuable information about fluvial landscape morphology and environment during this period (Savine 2016, 4).

4.4 Roman

4.5 The site lies approximately 700m to the south-east to the Roman fortress in an area that is likely to have been marginal land in the Roman period (Ottaway 2011, 237). Late Roman burials were recorded at York Castle in 1835 and again in 1956 (RCHMY 1, 67–8). These included three in stone sarcophagi, one in a lead coffin and two in wooden coffins (Ottaway 2011, 198). There is the possibility that the cemetery continued into St. George's Field. If this were the case, parallels might be drawn with the setting of the Roman cemeteries at both 16–22 Coppergate and at Hungate. These share a similar position in the landscape close to the bank of the River Foss and on marginal land (Kendall, forthcoming).

4.6 Anglian

4.7 Evidence for Anglian period York is generally elusive and what has been recovered to date is sparsely distributed across the city. Excavated sites and the distribution of find spots suggests that settlement at York was poly-focal with distinct nuclei spread out across the former Roman fortress and colonia, interspersed with cultivated or waste areas (AY 7/2, 298; Palliser 2014, 37). Anglian activity has proved to be very sparse in the immediate vicinity of St. George's Field. Antiquarian records of burials at Castle Yard may have produced 7th century hanging bowls (Tweddle 1999, 172). Rather greater evidence for activity and settlement during this period has been found on the opposite (eastern) bank of the River Foss around Fishergate where evidence suggests the location of a 7th–9th century trading settlement or wic (Kemp 1996, 64).

4.8 St. George's Field Car Park is close to one of the most important Anglian period sites excavated in York - the former Redfearn National Glass works, 46–54 Fishergate (AY 7/1). Unlike the majority of the evidence for Anglian activity elsewhere in the city which may not necessarily offer convincing evidence of occupation, evidence from the 1985–6 excavation of 46–54 Fishergate provides evidence of an important production and trading centre, or wic. The site occupied an area of around 2,500m² sited on the lower east bank of the River Foss, directly opposite the point of confluence with the River Ouse. This 7th–late 9th century settlement apparently began as a well-organised, probably planned, settlement rather than

one that developed organically to exploit the natural communications provided by the rivers and the east–west land route of the York Moraine (ibid.).

4.9 More recent excavations at the former Mecca Bingo site and in the Blue Bridge Lane area close to Fishergate have produced further evidence of Anglian period pit groups and occupation (Spall and Toop 2011, 7). Excavation carried out at the junction of Dixon's Lane/George Street in 2006 discovered further evidence for activity possibly associated with the wic approximately 100m to the east of 46–50 Piccadilly (AYW 9; McComish 2007). Based on current archaeological evidence, the St. George's Field site lies just to the west of a significant Anglian settlement (Figure 4 in Palliser 2014, 24).

4.10 Anglo-Scandinavian

4.11 Despite the site's proximity to the extensive and well-preserved remains of 9th-11th century settlement at Coppergate (Hall 2014), Anglo-Scandinavian activity in the immediate vicinity is limited. Excavations on the site of St. George's Chapel in the north-east corner of the site highlighted the absence of alluvial deposits indicating that the area would have been dry, useable land during the medieval period, if not earlier. Consequently, the possibility of Anglo-Scandinavian activity on the site cannot be ruled out (Hunter-Mann 1990, 20).

4.12 Medieval

4.13 The landscape of the River Foss was drastically altered by the damming of the southern end of the river at Castle Mills during the Norman period to exploit its waters to feed the moat of the Norman castle at York (VCHY 1961, 509–510). The resulting body of water was called the *Stagnum Regis*, the King's pool. The dam of the Fishpool of the Foss probably provided a causeway across the Foss at the site of the modern Castle Mills Bridge, to the immediate north-east of the present site. The first documentary evidence for a bridge at Castle Mills is not until 1585 and the structure was destroyed during the Siege of 1644 (VCHY 1966, 519–520; Raine 1955, 196).

4.14 Medieval activity at St. George's Field is likely to have been centred on St. George's Chapel. Documentary evidence and the excavations carried out by YAT in 1990 place the chapel close to the present entrance to the car park, in the north-eastern area of the site. The chapel was established by the 12th century and was granted to the Knights Templar in 1246 where it stood on meadowland adjoining their mills (Pugh 1961, 483). Following the suppression of that order, it became a royal free chapel in 1311. By 1447 it was used by the Guild of St. George, from which the chapel and adjacent field takes its name (Hunter-Mann 1990, 14).

4.15 Post-medieval

4.16 Following the suppression of the Guild of St. George in 1547, the chapel passed to the York Corporation under whom it was largely demolished in 1566, with the stonework put towards the rebuilding of Ouse Bridge. From 1576 the site of the chapel was occupied by a timber building used until 1620 as a house of correction from which point it was converted into a workhouse (Hunter-Mann 1990, 14).

4.17 Modern

4.18 Land to the south of the site of the former chapel was occupied from 1856 by public baths. St. George's Fields is thought to have been used for public recreation perhaps since early times and the site of the annual St. Georges Day celebrations (Raine 1955, 198–200). In 1924, the Martinmas Fair was moved from Parliament Street to St. George's Field (Pugh 1961, 483). In the 1960s the site became a car park. The Foss Barrier and associated pump house were constructed in 1986 and expanded in 2016.

5 AIMS

5.1 The aim of the borehole survey is to characterise the hydrology and soil conditions of the site and to provide an ambient baseline model for comparison with data collected during and after the forthcoming redevelopment of the site. This will create a data set that will aid in understanding the impact of piled developments on waterlogged soil horizons.

6 BOREHOLE SURVEY METHODOLGY

6.1 A series of three boreholes will be drilled within the proposal area with a compact tracked rig. Two of the boreholes will be located within two metres of the northern side of the forthcoming building, while the third will be sited within two metres of the southern limit of the building (Figure 2).

6.2 The borehole locations will be accurately plotted by GPS working at an accuracy of no less than 100mm. All of the boreholes will have dipwells installed with well heads and lockable caps. Two remote sensors (a TROLL/BARO TROLL unit) will be required to monitor the water levels and barometric pressure, giving a north-west/south-east transect across the site at either end of the proposed building.

6.3 One of the two boreholes on the north side of the forthcoming building will be installed with a water quality sensor. This will measure four variables: Conductivity, Redox, PH level and Dissolved Oxygen level. These measures provide an accurate assessment of what the current organic conditions are, how they change and why they vary over time. This will allow an impact assessment to be made, in accordance with CYC policy as informed by Historic England guidelines. The sensors can potentially be re-used if monitoring is required elsewhere on the site at a later date.

6.4 A soil sampling programme will be undertaken for the recovery and identification of charred and waterlogged remains where suitable deposits are identified. Up to eight General Biological Analysis (GBA) samples and up to three sealed REDOX samples will be taken. The purpose of these samples is to establish baseline conditions regarding preservation of organic remains, by characterising the potential organic deposits via the recovery of charcoal, burnt seeds, bone, artefacts, macrofossils and microscopic remains such as pollen and insects and by assessing their condition via chemical analysis.

7 HYDROLOGICAL AND WATER QUALITY MONITORING

7.1 Recently published Historic England guidance on Preserving Archaeological Remains (Historic England 2016) has informed the City of York to evaluate potential deeply buried, water-logged and organic deposits by borehole.

7.2 A six-month programme of water monitoring work will be undertaken to understand the site hydrology and potential impact of the development. The monitoring and assessment will encompass both hydrology and water quality over the course of the stipulated time frame.

7.3 Water levels will be automatically logged using in situ sensors. The data will be assessed with reference to the levels measured by the Viking Recorder on the River Ouse (the closest Environment Agency monitoring station), along with weekly rainfall levels recorded at the University of York's Heslington Campus and hosted by the Electronics Department.

7.4 The dip wells will be monitored on a monthly basis for 6 months, with an interim report being compiled after the third month. Upon completion of the six-month monitoring, the process will be reviewed and the possibility of further monitoring will be discussed in consultation with the client and CYC Principal Archaeologist John Oxley.

8 RECORDING METHODOLGY

8.1 All boreholes will be recorded using standardised pro forma record sheets and related to Ordnance Datum. Borehole cores will be examined in the field by an archaeologist suitably experienced in the deep stratigraphic nature of York's archaeological deposits.

8.2 Each context will be described in full on the pro forma borehole record sheet in accordance with the accepted context record conventions. Each context will be given a unique number. These field records will be checked and indexes compiled.

8.3 Photographs of work in progress and recovered cores will be taken. The photographic record will comprise of digital photographs of not less than 10 mega-pixels. All site photography will adhere to accepted photographic record guidelines.

8.4 All finds will be collected and handled following the guidance set out in the CIfA guidance for archaeological materials. Finds of particular interest or fragility will be retrieved as Small Finds. Other finds will be collected as Bulk Finds and bagged by material type.

8.5 All artefacts and ecofacts will be appropriately packaged and stored under optimum conditions, as detailed in the RESCUE/UKIC publication First Aid for Finds, and recording systems must be compatible with the recipient museum. All finds that fall within the purview of the Treasure Act (1996) will be reported to HM Coroner according to the procedures outlined in the Act, after discussion with the client and the local authority.

8.6 The collection and processing of environmental samples will be undertaken in accordance with Historic England guidelines (Campbell, Moffatt and Straker 2011).

8.7 General Biological Analysis (GBA) samples from the potential waterlogged organic deposits will be processed and assessed by specialist staff at Palaeoecology Research Services (PRS).

8.8 Sealed REDOX samples from potential waterlogged organic deposits will be processed and assessed by GEOLABS Ltd.

8.9 If suitable material is identified within the GBA samples then it will be assessed and submitted for AMS dating. This will be conducted by SUERC and will aim to date samples from the top and bottom of the sequence of potential waterlogged organic deposits, with at least one intermediate point, to contribute to the understanding of the archaeology.

9 SPECIALIST ASSESSMENT

9.1 The stratigraphic information, artefacts, soil samples, and residues will be assessed as to their potential and significance for further analysis and study. The material will be quantified (counted and weighted). Specialists will undertake a rapid scan of all excavated material. Ceramic spot dates will be given. Appropriately detailed specialist reports will be included in the report.

9.2 Materials considered vulnerable should be selected for stabilisation after specialist recording. Where intervention is necessary, consideration must be given to possible investigative procedures (e.g. glass composition studies, residues on or in pottery, and mineral-preserved organic material). Allowance will be made for preliminary conservation and stabilization of all objects and a written assessment of long-term conservation and storage needs will be produced. Once assessed, all material will be packed and stored in optimum conditions, in accordance with Watkinson and Neal (1998), CIfA (2014) and Museums and Galleries (1992).

9.3 All finds will be cleaned, marked and labelled as appropriate, prior to assessment. For ceramic assemblages, any recognised local pottery reference collections and relevant fabric Codes will be used.

9.4 Allowance will be made for the recovery of material suitable for scientific dating and contingency sums will be made available to undertake such dating, if necessary. This will be decided in consultation with CYC Principal Archaeologist, John Oxley.

10 REPORT & ARCHIVE PREPARATION

10.1 An interim assessment report will be compiled after three months of monitoring has been completed.

10.2 Upon completion of the six-month monitoring period, a report will be prepared to include the following:

a) A non-technical summary of the results of the work.

b) An introduction which will include the planning reference number, grid reference and dates when the fieldwork took place.

c) An account of the methodology and detailed results of the operation, describing structural data, archaeological features, associated finds and environmental data, and a conclusion and discussion.

d) A selection of photographs and drawings, including a detailed plan of the site accurately identifying the areas monitored, borehole locations and selected artefacts where appropriate.

e) Specialist artefact and environmental reports where undertaken, and a context list/index.

f) Details of archive location and destination (with accession number, where known), together with a context list and catalogue of what is contained in that archive.

g) A copy of the key OASIS form details

h) Copies of the Brief and WSI

i) Additional photographic images may be supplied on a CDROM appended to the report.

10.3 A bound and digital copy of the report will be submitted direct to CYC for planning purposes, and subsequently for inclusion into the HER.

10.4 A field archive will be compiled consisting of all primary written documents, plans, sections and photographs. Catalogues of contexts, finds, soil samples, drawings and photographs will be produced. York Archaeological Trust will liaise with the Yorkshire Museum prior to the commencement of fieldwork to establish the detailed curatorial requirements of the museum and discuss archive transfer and to complete the relevant museum forms. The relevant museum curator would be afforded access to visit the site and discuss the project results.

10.5 The owner of the Intellectual Property Rights (IPR) in the information and documentation arising from the work, would grant a licence to the Local Authority and the museum accepting the archive to use such documentation for their statutory functions and provide copies to third parties as an incidental to such functions. Under the Environmental Information Regulations (EIR), such documentation is required to be made available to enquirers if it meets the test of public interest. Any information disclosure issues would be resolved between the client and the archaeological contractor before completion of the work. EIR requirements do not affect IPR.

10.6 Upon completion of the project an OASIS form will be completed at http://ads.ahds.ac.uk/project/oasis/.

HEALTH AND SAFETY

Health and safety issues will take priority over archaeological matters and all archaeologists will comply with relevant Health and Safety Legislation.

A Risk Assessment will be prepared prior to the start of site works.

PRE-START REQUIREMENTS

12.1 The client will be responsible for ensuring site access has been secured prior to the commencement of site works, and that the perimeter of the site is secure.

12.2 The client will provide York Archaeological Trust with up to date service plans and will be responsible for ensuring services have been disconnected, where appropriate.

12.3 The client will be responsible for ensuring that any existing reports (e.g. ground investigation, borehole logs, contamination reports) are made available to York Archaeological Trust prior to the commencement of work on site.

11 TIMETABLE & STAFFING

13.1 The borehole survey is scheduled to begin on September 10th 2018 and is expected to take one day.

13.2 Specialist staff available for this work are as follows:

Human Remains – Malin Holst

Palaeoenvironmental remains – PRS Ltd.

Redox sample analysis: GEOLABS Ltd

Head of Curatorial Services - Christine McDonnell

Finds Researcher - Nicky Rogers

Pottery Researcher - Anne Jenner

Finds Officers – Nienke Van Doorn

Archaeometallurgy & Industrial Residues – Rachel Cubitt and Dr Rod Mackenzie

Conservation - Ian Panter

12 MONITORING OF ARCHAEOLOGICAL FIELDWORK

14.1 As a minimum requirement, John Oxley will be given a minimum of one week's notice of work commencing on site, and will be afforded the opportunity to visit the site during and prior to completion of the on-site works so that the general stratigraphy of the site can be assessed and to discuss the requirement any further phases of archaeological work. York Archaeological Trust will notify John Oxley of any discoveries of archaeological significance so that site visits can be made, as necessary. Any changes to this agreed WSI will only be made in consultation with John Oxley.

13 COPYRIGHT

15.1 York Archaeological Trust retain the copyright on this document. It has been prepared expressly for City of York Council, and may not be passed to third parties for use or for the purpose of gathering quotations.

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For the latest Historic England guidance documents see:

https://historicengland.org.uk/advice/latest-guidance/

PLATES

Plate 1 Location of BH01 to the north of St George's Field, looking south (8.47m OD)

Plate 2 Context 124 at 9.70m BGL (-1.23m OD)

Plate 3 Context 125 at 10m BGL (-1.53m OD)

Plate 4 Context 116, with small white mollusca remains visible

Plate 5 Contexts 118–120, showing darker deposit C120 to the right, possible medieval deposits between 6–7m BGL (2.47–1.47m OD)

Plate 6 Black, coarse gritty, sandysilt with organics at 7.20–7.50m BGL

(1.27 to -0.97m OD)

Plate 7 Contexts 114–116 with small mollusca remains present at 4.50m BGL (3.97m OD)

Plate 8 Contexts between 4–5m BGL (3.97–3.47 OD) the alluvial silt and clay banding

Plate 9 Interface between post-medieval levelling and alluvial deposits at 2.50m BGL (5.97m OD)

Plate 10 Borehole 1, ground level to 1m BGL (8.47–7.47m OD)

Plate 11 Location of BH02 to the south of St George's Field, looking north (8.56m OD)

Plate 12 Deposit 219 (black material) at the bottom of BH02 at 8–9m BGL (-0.56 to -0.44m OD)

Plate 13 Alluvial silts and laminates visible in between 1.30–4m BGL (7.26–4.56m OD)

Plate 14 Borehole 2, ground level to 1m BGL (8.56–7.56m OD)

Plate 15 Location of BH03 to the north of St George's Field, looking east (8.61m OD)

Plate 16 Alluvial silts present (200mm to the right), rest of deposit fall-in from above deposits. 10–11m BGL (-1.39 to -2.39m OD)

Plate 17 Black gritty coarse sandy silt between 8.70–9m BGL (-0.09 to -0.39m OD)

Plate 18 Possible medieval dumping deposit, Context 311 at 7.30–8m BGL (1.31 to -0.61m OD)

Plate 19 Alluvial silts between 4–5m BGL (4.61–3.61m OD)

Plate 20 Post-medieval alluvial silts between 2–3m BGL (6.61–5.61m OD)

Plate 21 Borehole 3, ground level to 1m BGL (8.61–7.61m OD)

FIGURES

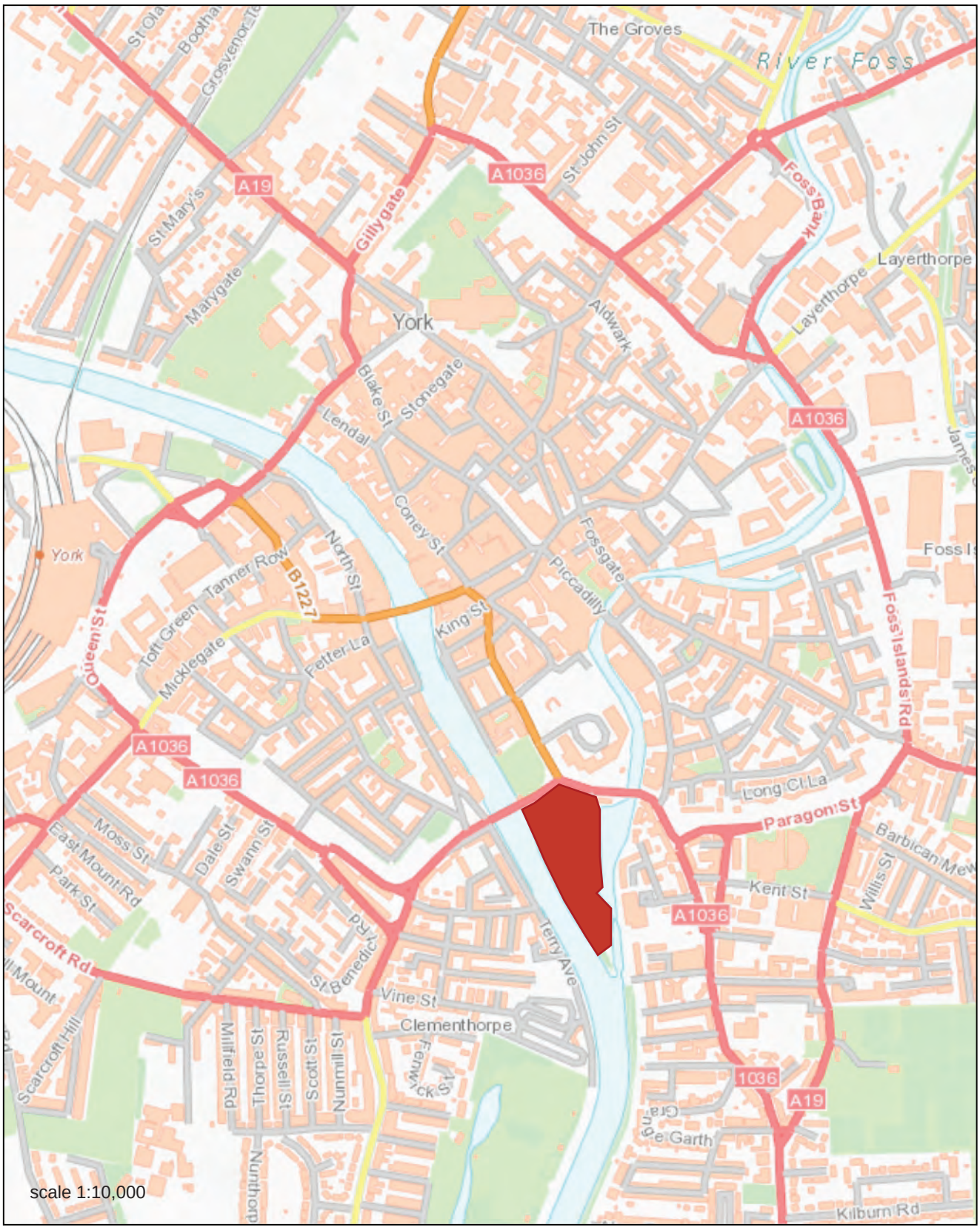

Figure 1. Site Location

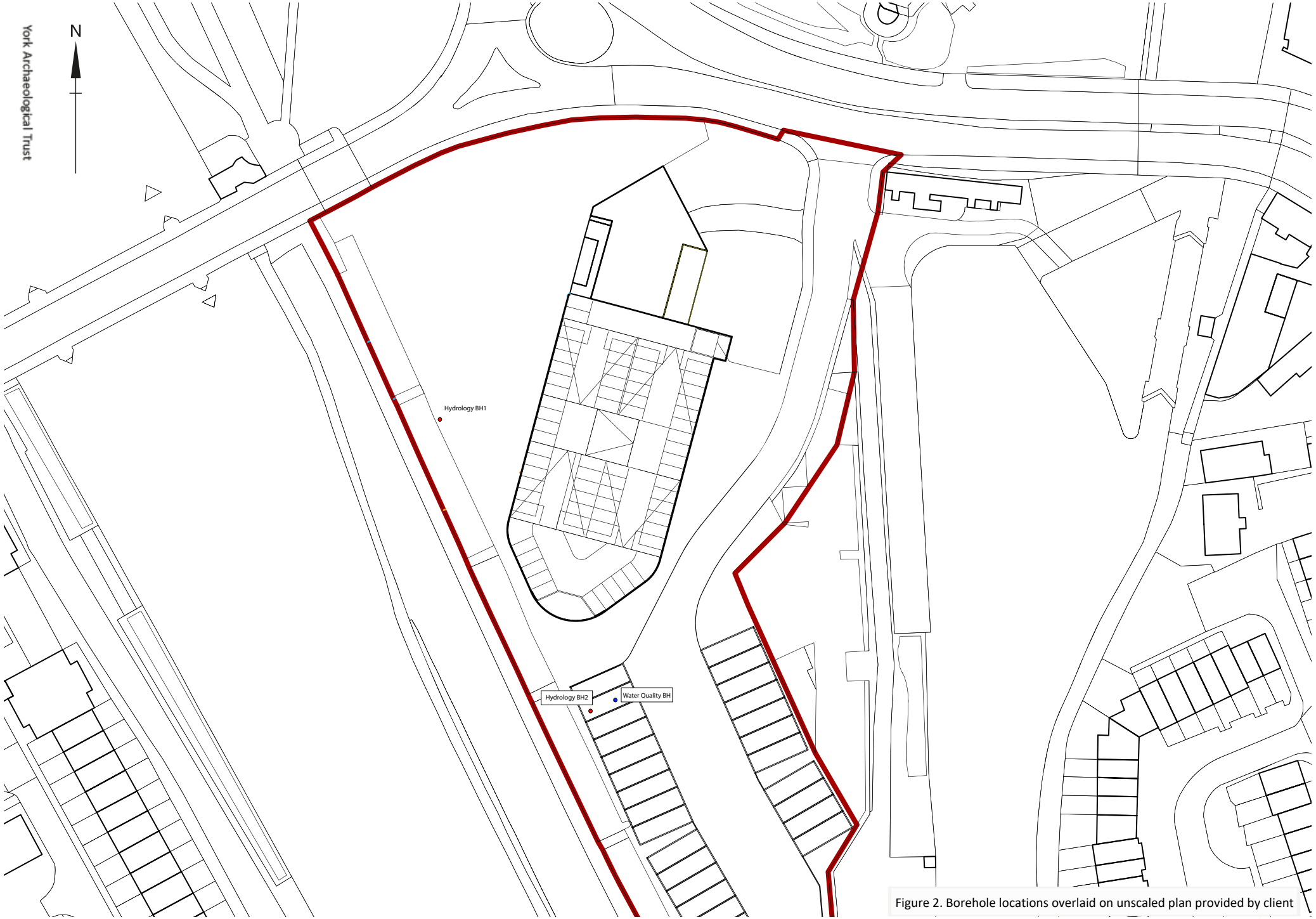

Figure 2. Borehole locations overlaid on unscaled plan provided by client

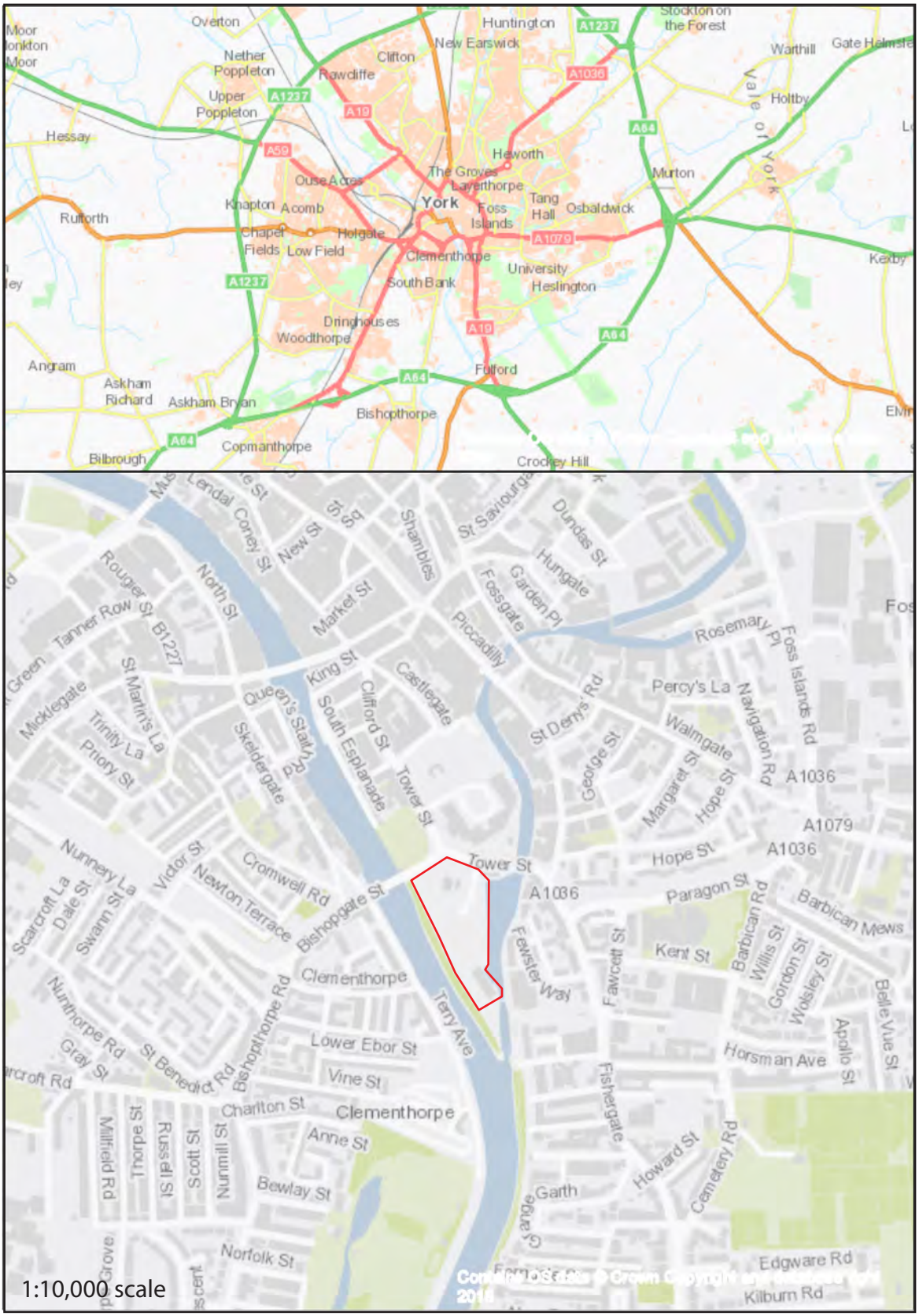

Fig. 1 Site Location

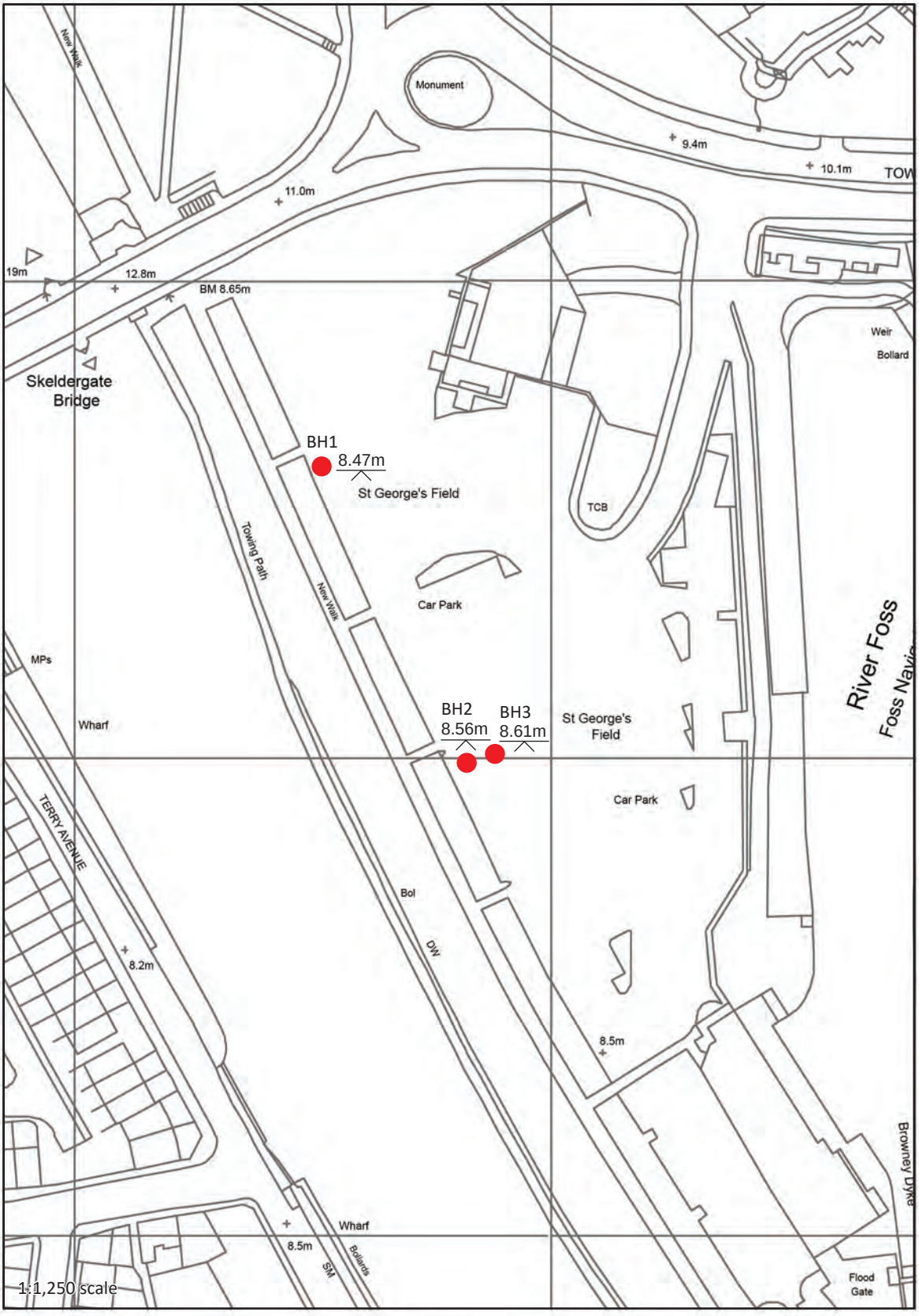

Fig. 2 Works Location

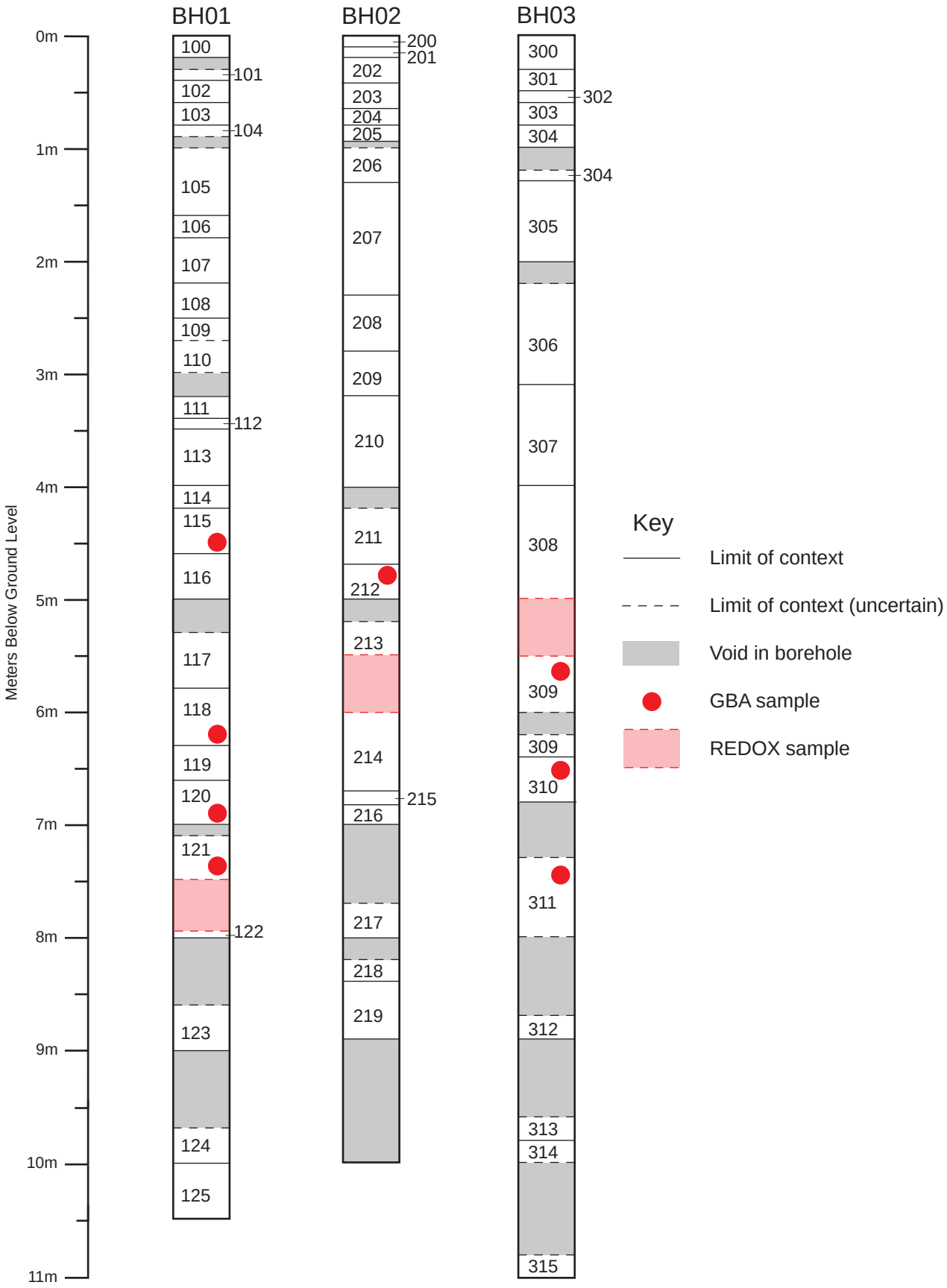

Fig. 3 Borehole profiles

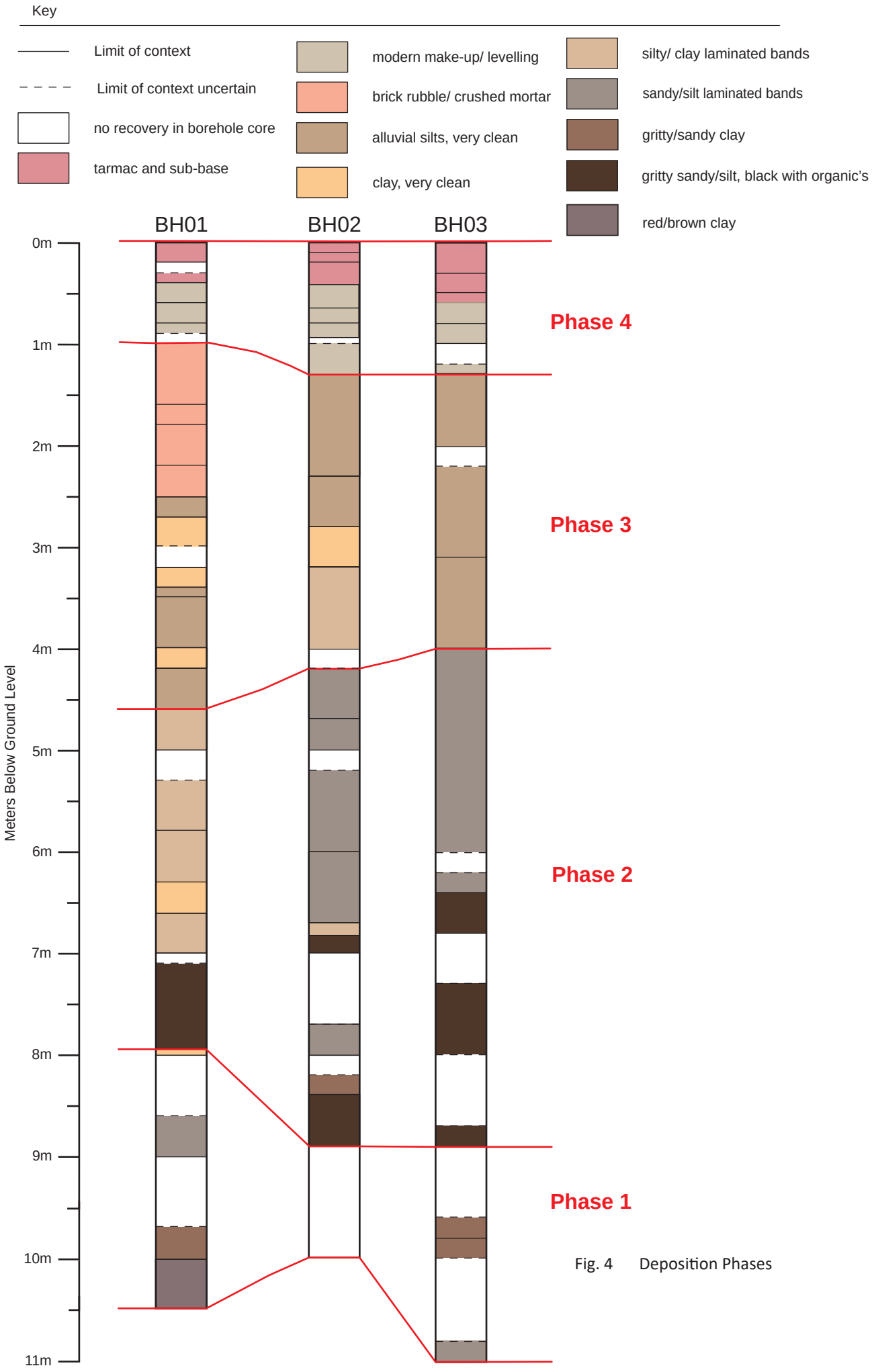

Fig. 4 Deposition Phases

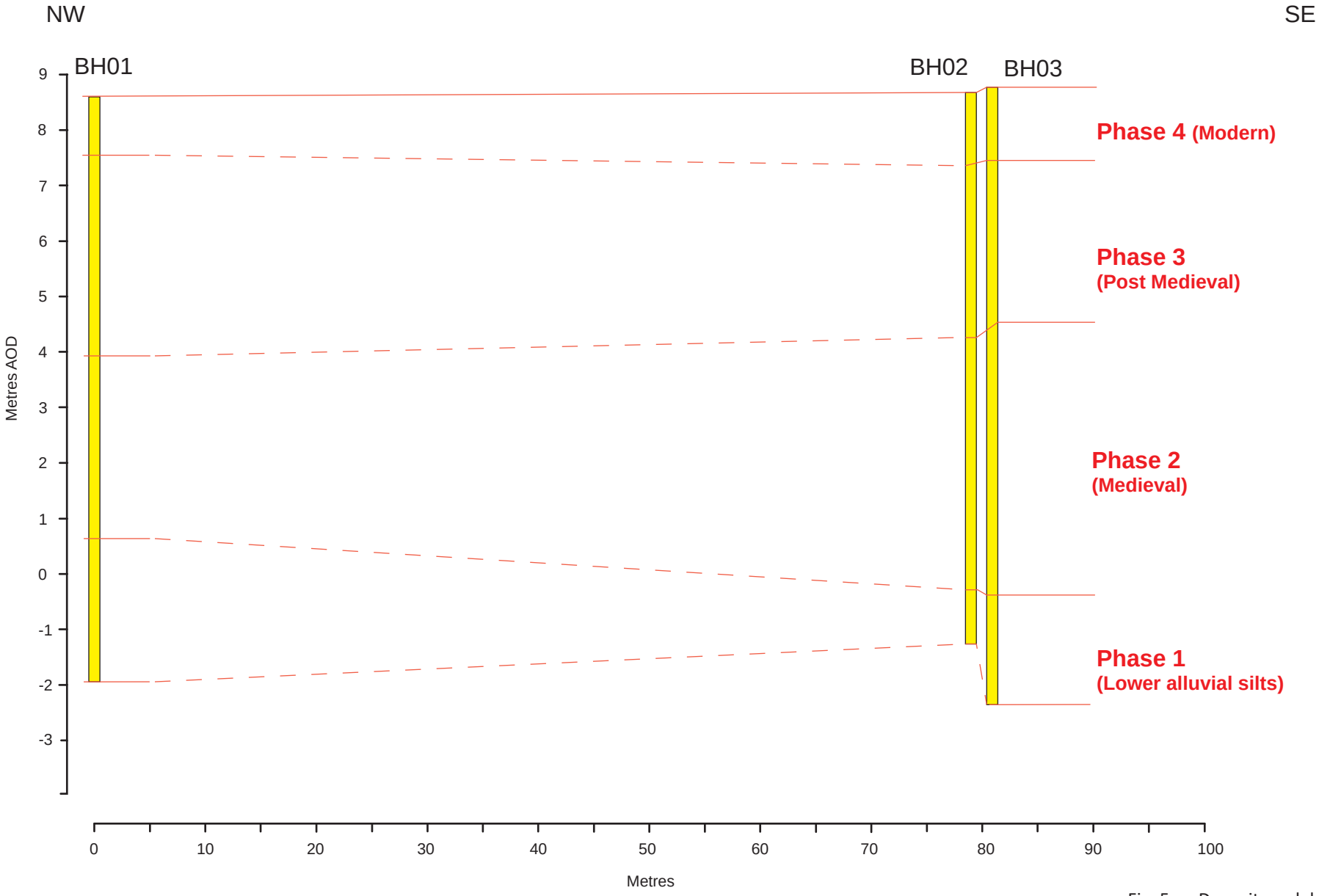

Fig. 5 Deposit model

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