RIVERSIDE WORKS, HERTFORD ROAD,

BARKING

LONDON BOROUGH OF BARKING AND

DAGENHAM

ARCHAEOLOGICAL EVALUATION

REVISED JUNE 2008

HET 07

An Archaeological Evaluation at Riverside Works, Hertford Road, Barking

Site Code: HET 07

Central National Grid Reference: TQ 4350 8436

Written and Researched by Alexis Haslam
Pre-Construct Archaeology Limited, Revised June 2008

Project Manager: Tim Bradley

Commissioning Client: Big Yellow Group PLC

Contractor:

Pre-Construct Archaeology Ltd
Unit 54
Brockley Cross Business Centre
96 Endwell Road
Brockley
SE4 2PD

Tel: 020 7732 3925
Fax: 020 7732 7896

Email: tbradley@pre-construct.com
Website www.pre-construct.com

CONTENTS

APPENDICES

ILLUSTRATIONS

1 ABSTRACT

1.1 This report details the results of an archaeological evaluation undertaken at the Riverside Works, Hertford Road, Barking. The evaluation was commissioned by the Big Yellow Group Plc in advance of a proposed redevelopment of the land and took place between the 14th and 23rd of March 2007. The site was located on the eastern side of Hertford Road, being bounded to the north, east and south by industrial units.

1.2 An evaluation comprising two stepped trenches measuring approximately 15m x 2m at base level was originally proposed in order to produce a profile of the alluvial formations, investigate the natural terrace gravel and provide adequate coverage of site. However, initial excavation proved problematic due to damp conditions. In attempting to open up the first trench the operating 360° 15 tonne mechanical excavator sank beyond its tracks and took both a great amount of effort and a long period of time to retrieve. At this point we were informed by the demolition team that conditions at the eastern end of the site (where the second trench was proposed) were even worse and that they themselves had sunk a 20 tonne machine beyond its tracks in this area. For this reason it was decided to excavate a single trench in a zone of the site still suitably dry and firm enough to withstand the weight of the machine. This stepped trench was square in shape, measuring 11.54m from east to west and 10.24m from north to south.

1.3 The trench was sealed by modern made ground which covered the site. A land quality statement produced by CampbellReith (2006) had identified elevated levels of arsenic and hydrocarbons within this made ground, along with marginally elevated concentrations of polycyclic aromatic hydrocarbons and inorganic compounds and elevated concentrations of ground gas (primarily carbon dioxide). Directly underlying the made ground was a stratigraphic sequence comprising of layers of alluvial and peaty clays which overlay the natural River Terrace Gravels.

1.4 The only archaeological remains encountered on the site consisted of two worked timber stakes driven into a layer of peaty clay and sealed by a later alluvial deposit. A further worked stake was also discovered within this peat horizon but was not preserved in situ. An apparent collapsed tree was also found to be overlying this peat deposit and, as with the two driven stakes, was sealed by the later alluvium.

2 INTRODUCTION

2.1 This report details the results and working methods of an archaeological evaluation undertaken by Pre-Construct Archaeology Ltd. at the Riverside Works, Hertford Road, Barking. The evaluation took place between the 14th and 23rd of March 2007.

2.2 The single, square shaped trench was located towards the centre of the site which had undergone demolition works before the evaluation. Prior to the demolition the site had been occupied by two blocks of buildings believed to have been associated with a chemical works. The site was bounded to the west by Hertford Road and to the north, south and east by industrial units.

2.3 A detailed specification for the evaluation was included within the Method Statement[1] and was prepared prior to the fieldwork.

2.4 The National Grid Reference of the site is TQ 4350 8436.

2.5 The site was given the code HET 07.

2.6 The site was monitored for the client by Mark Sheehan of the Big Yellow Group PLC and for the local planning authority by David Divers of the Greater London Archaeology Advisory Service (GLAAS). The site was project managed by Tim Bradley and supervised by the author, Alexis Haslam.

[1] Bradley, T. 2007. 'Method Statement for an Archaeological Evaluation at Riverside Works, Hertford Road, Barking'. Pre-Construct Archaeology Ltd unpublished report.

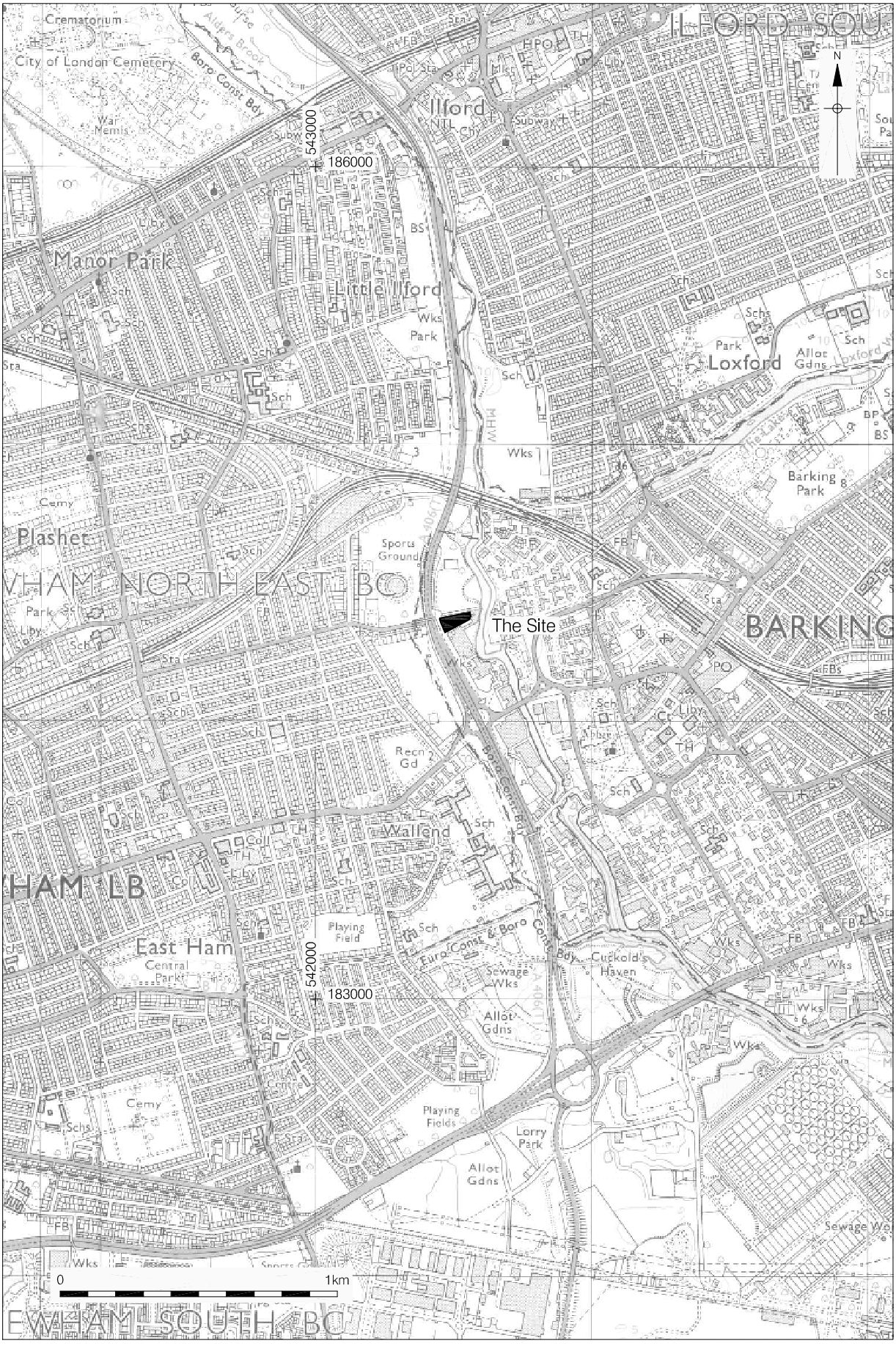


Figure 1
Site Location
1:20,000 at A4

3 PLANNING BACKGROUND

3.1 The proposed development of the site consists of the construction of a self-storage facility with a footprint of 2,186m² along with the insertion of associated services and piles. Works had been carried out prior to the evaluation and comprised of the demolition of all pre existing structures and foundations and the removal of their related services.

3.2 In 1990 the Department of the Environment issued Planning Policy Guidance note 16 (PPG16) 'Archaeology and Planning', providing guidance for planning authorities, property owners, developers and others on the preservation and investigation of archaeological remains. This document identifies the need for early consultation in the planning process in order to determine the impact of the construction schemes upon buried archaeological strata.

3.3 The London Borough of Barking and Dagenham fully recognises the importance of the buried heritage for which they are custodians. The Council's deposited draft 'Barking and Dagenham Unitary Development Plan' adopted in 1996 contains policy statements in respect of protecting the buried archaeological resource. The site lies outside the Archaeological Priority Areas as defined in the UDP.

3.4 The proposed development is subject to the Council's Design and Environment policies:

Archaeology

Development on sites of archaeological significance.

Policy DE36
When any development is proposed on sites of archaeological significance (as shown on map 9) or for any site identified by English Heritage the Council will seek to ensure that an early evaluation is carried out, and that preservation in situ is given first consideration. However, if preservation in situ is not possible and the nature of the remains does not want a planning refusal, the Council will require that adequate time, funding and resources are provided to enable archaeological investigations by an acceptable agent to take place during the process of development (see appendix 16)

Justification

36.1 The archaeology of the Borough is a community asset. Its preservation is a legitimate objective against which the needs of development must be balanced and assessed.

36.2 Where development may affect land of archaeological significance or potential, the Council will expect applicants to have properly assessed and planned for the archaeological implications of their proposals. This does not only include field work but also the analysis and preservation of results, where appropriate. A preliminary site evaluation to the specifications laid down by the Council, or an acceptable agent would be required. PPG16 states that the needs of archaeology and development can be reconciled, and potential conflict reduced if developers discuss their preliminary plans for development with the Local Planning Authority at an early stage. It is, therefore, in the interests of prospective developers to include as part of their research into the development potential of a site, an initial assessment of whether the site is known or likely to contain archaeological remains.

36.3 The developer shall ensure that an archaeological evaluation and if necessary excavation is carried out (after site clearance and before any development) on a site by an archaeological organisation to be approved by the Local Planning Authority. The specification and programming for archaeological work shall be matters for negotiation between the developer and the approved archaeological organisation, but all such work shall be carried out to the general satisfaction of the Local Planning Authority.

Policy DE37

The Council will seek to ensure that the most important archaeological remains and their settings are preserved in situ (if possible for public access and display) and that where appropriate they are given statutory protection.

Justification

37.1 This will ensure the protection of valuable archaeological heritage, and will be furthered by a commitment to encourage and develop the educational, recreational and tourist potential of archaeological sites and monuments through management and interpretation.

Co-operation between interested parties

Policy DE38

The Council will promote co-operation between landowners, developers and archaeological organisations in accordance with the British Archaeologists and

developers liaison group code of practice and the Confederation of British Industry code of practice on archaeological investigations.

Justification

38.1 The support and co-operation of all parties involved in a development is necessary for the conservation, protection and enhancement of the archaeological heritage and for its interpretation and presentation to the public.

Planning applications and archaeological sites

Policy DE39

The Council will notify English Heritage of planning applications found to correlate with sites as shown on the archaeological constraints map, as early as possible.

Justification

39.1 It would be preferable if English Heritage were informed when a significant inquiry is made into redevelopment of a site. Early notification allows more time for archaeologists to investigate the worthiness of the site, for negotiation about the site, and for the possible resultant excavation.

Protection of ancient monuments

Policy DE40

The Council will protect scheduled ancient monuments and no development will be allowed if the monument or its settings are adversely affected.

Justification

40.1 In order to safeguard the future of ancient monuments, development which has an adverse impact will be resisted.

3.5 There are no Scheduled Ancient Monuments or Listed Buildings within the development site.

4 GEOLOGY AND TOPOGRAPHY

4.1 British Geological Survey Sheet 257 (Romford – 1:50,000 series for England and Wales) shows the underlying geology of the site to comprise of London Clay overlain by alluvium. Previous borehole analysis undertaken on the site identified the top of the London Clay at levels ranging from –3.25m AOD to –2.73m AOD. River Terrace Gravels were also identified at between –0.84m AOD to –0.25m AOD whilst the alluvium was located at between +1.95m AOD to 2.07m AOD[2].

4.2 The site was fairly even topographically, existing at a highest level of between +2.7m AOD to 3m AOD. The River Roding lies to the east of the site at approximately 20m in distance from the eastern site boundary.

[2] Mailer, S. 2006. 'Riverside Works, Hertford Road, Barking, London. Land Quality Statement'. CampbellReith unpublished report.

5 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

5.1 The approximate timescales used in this report are:

Prehistoric	
Palaeolithic	450,000 – 12,000 BC
Mesolithic	12,000 – 4,000 BC
Neolithic	4,000 – 1,800 BC
Bronze Age	1,800 – 600 BC
Iron Age	600 BC – AD 43
Historic	
Roman	AD 43 – 410
Saxon / Early Medieval	AD 410 – 1066
Medieval	AD 1066 – 1485
Post-Medieval	AD 1486 – 1799
Modern	AD 1800 – Present

5.2 The Cultural Landscape of the Lower Thames

5.2.1 The River Roding rises near Dunmow and flows through Essex before forming Barking Creek as it reaches the River Thames. Recently, a significant amount of work has been conducted on environmental evidence from the Lower Thames into which the study site can be incorporated. Located on the Western Bank of the River Roding it falls roughly into the overall landscape of the Thames itself which, during the early Holocene (8-10,000 years Before Present (BP)), was dominated by a topography generated during the cold climate of the late Pleistocene.

5.2.2 Between 5-8,000 BP a diverse landscape is likely to have been produced by the river systems of the late Pleistocene and early Holocene. Sand and gravel would have formed a broad plain, with rivers and streams crossing the gravel terrace. Lakes, hollows and redundant braided channels would also have been present on the surface. These lacustrine environments would then have been filled in by minerogenic and biogenic sedimentation. The landscape on which the early Holocene vegetation developed is likely to have initially been open and dominated by herbaceous plants. This was then quickly replaced by birch and pine woodland (during the pre-Boreal and Boreal periods), followed by lime, alder and hazel, and then oak and elm. Before the end of the Boreal (*c.* 6,000 BC) drier areas would have had a temperate mixed deciduous forest dominated by oak, elm and lime with wood

fen and alder carr where it was wetter. Once this state of stable equilibrium had been reached, vegetational change in inland areas would have been limited. However, climatic changes would have had a significant impact around coasts and estuaries. Rising water levels would have submerged some land and affected the hydrology of low lying areas. It was during this period that Mesolithic and Neolithic activities occurred, with areas of closed mature deciduous woodland covering the floodplain by the late Neolithic. Species composition would have varied according to local topographic and hydrological conditions.

5.2.3 Between 4-5,000 years BP landscape evolution corresponded with a period of rising sea levels and landward inundation following the post-glacial melting of the ice sheet. The expansion of estuarine salt marsh and brackish creeks led to the widespread deposition of alluvial clay sediments and a shift in cultural activity. This activity seems to have been focussed on the higher gravel terraces or around creek head positions along the main tributaries. The forests were submerged and replaced by a more open vegetation before being completely flooded. This flooding caused widespread erosion of the surface through tidal scouring.

5.2.4 The period of 5-3,000 years BP is represented by the development of major freshwater wetland systems as a result of rising water levels. This created extensive fen carr woodlands (dominated by alder) and a decrease in woodland diversity. Peat began to grow when an area was covered by reed swamp or fen carr and was therefore drier than it had been when the clay was deposited. Sedimentation caught up with the rise in water level meaning that the growth of peat is generally associated with sea levels rising at a slower rate. The majority of the peat in East London is composed of the remains of reed swamp, alder fen and mixed deciduous woodland, although there is also widespread evidence for yew trees within these horizons. The changes in the environment during this period modified the resource base for human exploitation and are associated with the construction of wooden trackways, especially during the mid-second millennium BC whereby access to the floodplain was re-opened.

5.2.5 During the period of 3-1,000 BP the peat continued to grow until renewed episodes of flooding (associated with the expansion of tidal influence) drowned the vegetation and covered it with alluvial clay. By the late second millennium BC the wetlands became increasingly brackish as a result of the second phase of estuarine expansion. This episode of flooding corresponds with a late prehistoric settlement shift in favour of the higher terraces. The same process was later marked by successive phases of waterfront construction in Roman areas.

5.2.6 Between approximately 500BP and the present day the area of the Lower Thames has been dominated by reclamation and flood prevention measures. Reclamation of the floodplain for farmland has been recorded from the Anglo-Saxon period onwards, accelerating during the Medieval period with the investment of considerable resources by monastic houses. This process has subsequently halted alluvial deposition.

5.3 Site Specific Detail

5.3.1 An examination of all archaeological entries in the Greater London Sites and Monuments Record (GLSMR) was conducted within a 500m radius of the study site. This Information is covered extensively in the Desk Based Assessment[3]. What follows is a summary of the examination's most significant findings.

Prehistoric

Palaeolithic

5.3.2 Evidence for Palaeolithic activity in the area is represented by two handaxes and two flint flakes found to the east of the site during the 19th century. The exact provenance for these finds is unknown.

Mesolithic and Neolithic

5.3.3 Excavations to the south-east of the site on Abbey Road in 1985 produced flintwork finds of Mesolithic and Neolithic date. These came from the gravels, although they are likely to have been residual or chance finds rather than direct evidence of occupation.

Bronze Age and Iron Age

5.3.4 A crouched burial of probable Bronze Age date was revealed during the excavations on Abbey Road. A pit located to the south of this inhumation produced Iron Age pottery and loom weight fragments.

5.3.5 Excavations in advance of the construction of a supermarket on London Road to the south of the study site revealed two partial trackways within an ancient water channel. These are believed to have been of Late Bronze Age or Early Iron Age date.

[3] Holden, S. 2006. 'Riverside Works, Hertford Road, Barking: An Archaeological Desk-Based Assessment'. Pre-Construct Archaeology Ltd unpublished report.

5.3.6 Approximately 800m to the north-east of the study site, the remnants of earthworks surrounding an Iron Age hillfort were proved during excavations on Uphall Road, Ilford during the 1960's. These earthworks were roughly rectangular (enclosing approximately 48 acres) and included internal features such as roundhouses and granaries. This hillfort is believed to have been occupied sporadically during the latter part of the Iron Age.

Historic

Roman

5.3.7 Excavations in 1983 on Abbey Road revealed a number of pits filled with Roman tile. Two coins of Roman date have also been found within the Barking area. The first, a silver denarius of Vespasian was found in a garden on Church Street. The second, an unspecified coin of Antoninus, was recovered from the Quaker's meeting garden.

Saxon

5.3.8 In or around AD 666 St Erkenwald (later to become Bishop of London) founded Barking Abbey for his sister Æthelberga. This was a double foundation, housing both nuns and monks in separate quarters. The position of the original abbey is unknown, but Bede recorded that the second abbess (Hidelitha) relocated the abbey and its cemetery. The religious house was abandoned in AD 870 following attacks by the Danes and was not re-established until the early 10th century. It is believed that at this point the abbey became a purely Benedictine nunnery.

5.3.9 A possible building, comprising of five postholes aligned north-south and a line of closely packed ragstone and Roman tile was excavated in 1988 and believed to be of Saxon date. This was recorded on Abbey Road at the junction with London Road.

5.3.10 Further south along Abbey Road, excavations in 1985 recorded two timber buildings together with wells and other structures for water management. Large quantities of Middle Saxon Ipswich ware pottery and timbers from some of the structures (dated AD 675-730) provided secure dating for these features.

Medieval

5.3.11 A hamlet associated with a chapel is believed to have been established to the west-northwest of the study site in East Ham before being destroyed by the flood of AD 1236.

5.3.12 Many of the streets in the Barking area have their origins in the Medieval period during which the growth of the town began to take hold. North Street (running parallel

with the Roding to the east of the site) is mentioned as early as AD 1328, whilst Tanner Street (previously known as Loxford Street) is noted in AD 1456 and again in AD 1609.

5.3.13 Excavations on the west bank of the Roding during 1995 exposed a number of partially dressed timber oaks. These were overlain by a length of wattle work and are believed to have been redeposited following the collapse of a large waterfront structure. They may once have formed part of the former wooden footbridge recorded as crossing the Back River. This was demolished in AD 1447 in order to make way for heavier traffic. This bridge was rebuilt again in AD 1609 and appears on the AD 1777 Chapman and André map as Handtroft Bridge. In addition to the timber structures, a raft of large chalk blocks were recorded and interpreted as a slipway.

5.3.14 The most significant Medieval remains in the vicinity of the study site consist of those relating to Barking Abbey. The Abbey Church (dedicated to St, Mary) was rebuilt in the 12th century. Its remains are located in the parkland to the north of St. Margaret's Parish Church which is also of 12th century date and situated within the lands of the abbey precinct. The abbey was demolished and dismantled following the Dissolution in AD 1539.

5.3.15 At the northern end of Abbey Road, a pitched tile hearth was recorded along with an associated dish shaped hollow filled containing melted lead. It has been suggested that this lead came from window cames, implying a date shortly following the dissolution of the Monastery.

Post-Medieval

5.3.16 The study site appears to have lain unoccupied for the vast majority of the post-medieval period. Chapman and André's map of AD 1777 depicts this area as being occupied by marshland. The First Edition Ordnance Survey map of AD 1877 continues to display the site as undeveloped whilst the River Roding is shown with a wide marshy strip along its western bank. The Ordnance Survey map of 1898 continues to show no change within the boundaries of the subject site.

5.3.17 The first record likely to represent activity on the site is dated to AD 1916 and concerns the plans of an existing chemical works. This suggests that the works were established between AD 1898 and 1916. The Ordnance Survey map of 1939 shows the site as a '*Chemical Works'* with a chimney also indicated. The units to the south are annotated as *'Soap Works'* and relate to the Ajax works owned by Harry Green Ltd.

5.3.18 The 1963 Ordnance Survey map shows the layout of the site predominantly unchanged other than the addition of several new buildings. These were primarily located along the northern edge of the site and around the chimney. All of these buildings were extant until their demolition prior to the archaeological evaluation.

6 ARCHAEOLOGICAL METHODOLOGY

6.1 In accordance with the method statement, an evaluation trench was excavated in order to determine the location, form, extent, date, character, condition, significance and quality of any surviving archaeological remains liable to be threatened by the proposed development. Due to the environmental potential in the vicinity of the site, the trench was also intended to produce a profile of the alluvial formations and investigate the natural terrace gravel.

6.2 The stepped trench, roughly square in plan, was opened up with the use of a 15 tonne 360° mechanical excavator using a 1.8m wide toothless ditching bucket. All machining was monitored by the archaeologist, checking for archaeological deposits and features through the made ground and onto the natural River Terrace Gravels. All machining was preceded by scanning for live services using a CAT scanner.

6.3 The trench was hand cleaned, examined and recorded in both plan and section.

6.4 The single context system was used for recording, developed out of the Department of Urban Archaeology Site Manual, now published by the Museum of London Archaeology Service (MoLAS 1994). Plans were recorded on a scale of 1:20, and sections were recorded at a scale of 1:10.

6.5 The trench was surveyed using a total station and located to the national grid. A Temporary Bench Mark (TBM) was established on the site and was taken from a Bench Mark on the north-western corner of a Thames Water structure to the south of Hertford Road (value 2.97m AOD). The TBM had a value of 3.30m AOD.

6.6 Several health and safety issues were considered in order to undertake the evaluation safely. Due to the fact that excavation was to take place on known contaminated land, two separate areas of accommodation had to be set up along with two separate toilet facilities. Staff operating within the trench had to wear full standard Personal Protective Equipment (PPE) along with rubber suits, inner and outer gloves and face masks. No cross contamination was to occur between the two areas of accommodation. Due to the depth of the stepped trench and the possibility of toxic fumes, gas monitors were also employed throughout the evaluation. As a result of ground water entering the trench, water pumps had to be employed in order to keep the areas of excavation reasonably dry. Following the works, all contaminated tools and equipment had to be cleaned before removal from the site. PPE including boots, gloves and hi-visibility vests were disposed of in an appropriate fashion.

6.7 The evaluation trench measured 11.54m from east to west and up to 10.24m from north to south.

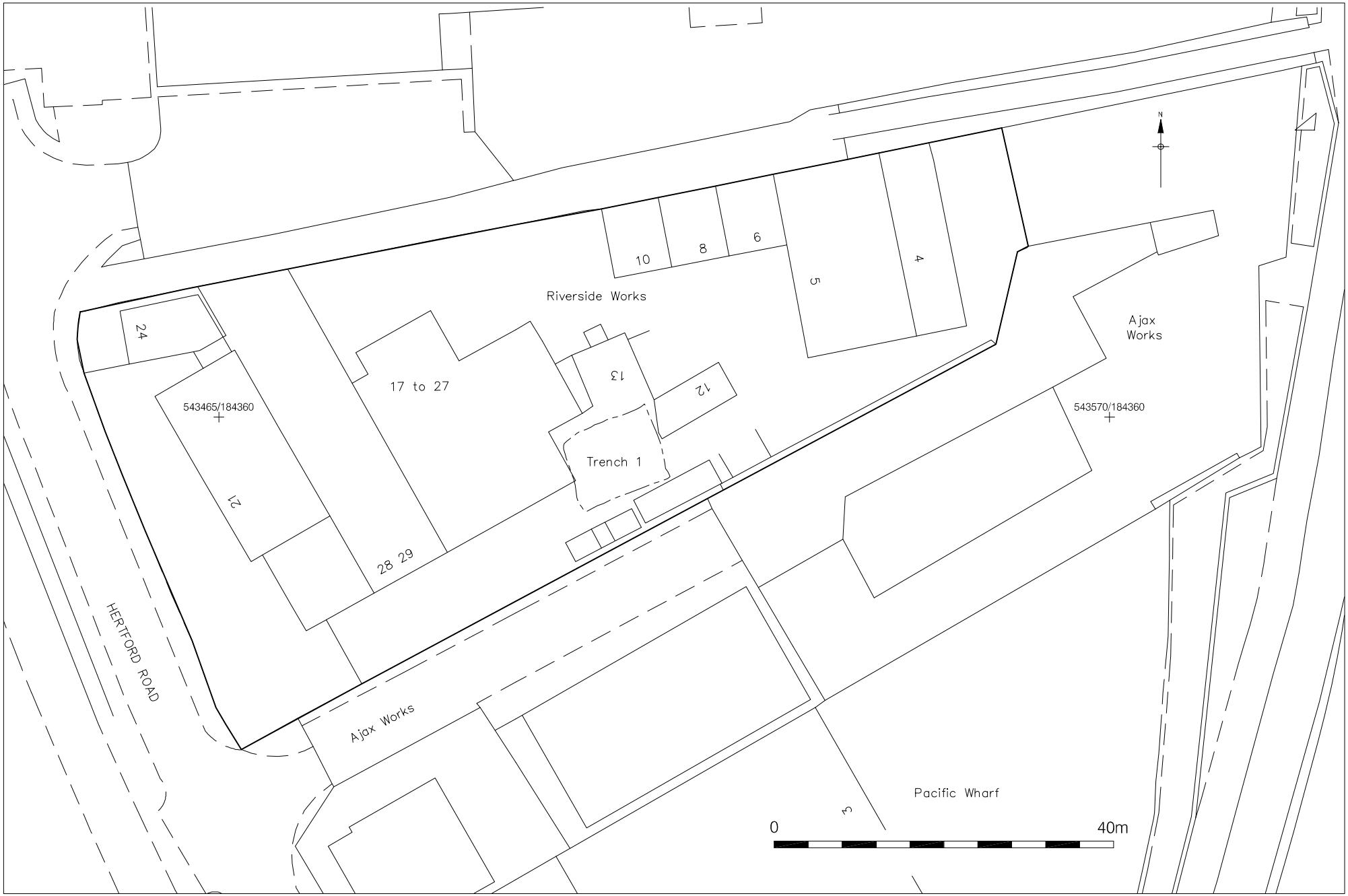


Figure 2
Trench location
1:625 at A4

7 ARCHAEOLOGICAL PHASE DISCUSSION

7.1 Background

7.1.1 In total, the stepped, square evaluation trench measured 11.54m from east to west and 10.24m from north to south. Following stepping, the area of natural River Terrace Gravels exposed at the base of the trench measured 1.74m from north to south and 2.56m from east to west. Due to the depth of the trench, four steps were required in total.

7.2 Phase 1 – Natural.

7.2.1 The earliest deposits encountered at the base of the trench consisted of the River Terrace Gravels [1]. These were recorded as loose natural sandy gravels, varied in colour and consisting of small sub angular and sub rounded pebbles. They were not fully excavated, but observed at between –1.02m AOD and –1.09m AOD.

7.3 Phase 2 – Wetland, Possible Fen Carr Environment

7.3.1 Sealing [1] was a layer of loose to coarse light blue grey clay sand [7] recorded at up to 0.68m thick at a highest level of –0.34m AOD. The precise nature of this deposit was somewhat unclear, but shingle like in appearance it possibly represented an early wetland or foreshore deposit. No material whatsoever was recovered from this horizon, but it was noted as containing a large amount of wooden material which had been eroded to such an extent that it merely existed as chippings. Environmental analysis of [7] has produced evidence of taxa including alder, oak, pine and lime, suggestive of wetland and possibly a fen carr environment.

7.3.2 Directly overlying [7] was [6], a spongy to stiff layer of dark grey brown sand peat clay found to be containing frequent twigs along with small sub rounded and sub angular gravels. This deposit was only 0.20m thick at –0.52m AOD. No cultural material whatsoever was retrieved from it.

7.4 Phase 3 – Middle Bronze Age

7.4.1 Sealing [6] was [5], a stiff to plastic mid grey brown silty clay containing occasional twigs and reeds. This was up to a maximum of 0.78m thick at +0.19m AOD. Radiocarbon dating of this deposit has placed it at between 3680-3460 BP (1730-1720 and 1690-1510 cal BC). Pollen taxa retrieved from [5] suggests a change in

vegetation from Phase 2, with a decrease in the pollen taxa of mixed deciduous woodland present in [7] and an increase in herbaceous and spore taxa.

7.5 Phase 4 – Middle to Late Bronze Age

7.5.1 Overlying [5] was a spongy, dark brown silt peat clay [4], which was up to 0.32m thick at a highest level of +0.56m AOD. Containing a frequent amount of well preserved twigs and reeds, an apparent worked stake was also recovered from this horizon. Radiocarbon dating of [4] has suggested a deposition date of between 3330-3060BP (1380-1330, 1330-1120 cal BC). As with [5], pollen retrieved from [4] consisted mostly of haerbaceous and spore taxa, suggesting little evidence of environmental change throughout the mid to late Bronze Age.

7.5.2 The upper levels of [4] were observed on the second step of the evaluation trench, and it was during the cleaning of this step that three in situ timbers were observed. To the western end of the trench, immediately adjacent to the third step was [2], a timber stake measuring 268mm in length by 36mm in diameter at +0.33m AOD. Driven at an angle of approximately 22.5°, this stake was found to have a single facetted point. At approximately 0.50m to the north-east of [2] was [3], an almost identical timber stake measuring 247mm in length and 32mm in diameter at +0.30m AOD. This also had a single facetted point and was again driven at an angle of approximately 22.5°.

7.5.3 The precise function of these two stakes remains somewhat ambiguous in that no further associated timbers were retrieved. One possible explanation may be that they once formed the foundations for a timber trackway. However, such an interpretation would at best be tentative due to the fact that no evidence of further hurdles or brushwood bundles was revealed. Being directly overlain by an organic clay it is quite possible that any potential trackway could have been washed away during a minor transgressive episode, leaving only the supportive timber stakes in situ. However, although both of the stakes were driven at an angle they actually faced away rather than towards one another. This would seem somewhat unusual in that an effective supportive cradle would not have been created. Furthermore, at only 0.50m apart any potential trackway would have been neither particularly wide nor substantial. For this reason, although the stakes were clearly worked and most probably related, their original structural purpose remains elusive and an accurate functional interpretation could not be achieved.

7.5.4 To the southern side of the trench and again located on the top of the second step was a further timber in the form of a collapsed tree trunk [12]. Recorded as overlying the peat it extended into the southern limit of excavation, measuring 1.90m in length

from north to south. Towards its northern end the trunk branched out to the west, measuring 1.56m at between +0.57 and +0.49m AOD. Due to the presence of contamination this timber was neither removed nor fully exposed.

7.6 Phase 5 – Aquatic Environment

7.6.1 Sealing [2], [3] and [12] was [10], a plastic deposit of mid yellowish grey silty clay containing frequent reeds and twigs. At up to 0.40m in depth this context was recorded at a highest level of +0.82m AOD. Environmental analysis of [10] indicated the presence of bur reed, sea aster, thrift and water mint, suggesting a change from the middle to late Bronze Age environment of herbaceous and spore taxa to a more aquatic environment.

7.6.2 Directly above [10] was a thin band of peaty clay [9], described as firm and mid brown in colour with inclusions of twigs and wood fragments. This deposit existed at up to 0.25m in thickness at a highest level of +0.97m AOD. Environmental analysis of [9] produced similar results in terms of pollen taxa as to those discovered in context [10], suggesting further evidence of a continued aquatic environment.

7.7 Phase 6 – Phase of Increased Sedimentation

7.7.1 Overlying [9] and also forming the base of the first step of the evaluation trench was [8], a plastic, dark blue silty clay with occasional dark blue mottling. No inclusions were present within this layer, which was up to a maximum of 1.41m thick at +2.20m AOD. As with the Phase 5 contexts, environmental analysis of [8] also produced evidence of an aquatic environment. However increased levels of sedimentation within [8] were more indicative of a floodplain environment, most probably formed as a direct result of the intensification of land use.

7.8 Phase 7 – Modern

7.8.1 Sealing [8] and covering the site was [11], a loose modern made ground deposit containing both cinder and brick rubble along with numerous modern materials. As seen, this context was up to 0.82m thick at a highest level of +2.59m AOD.

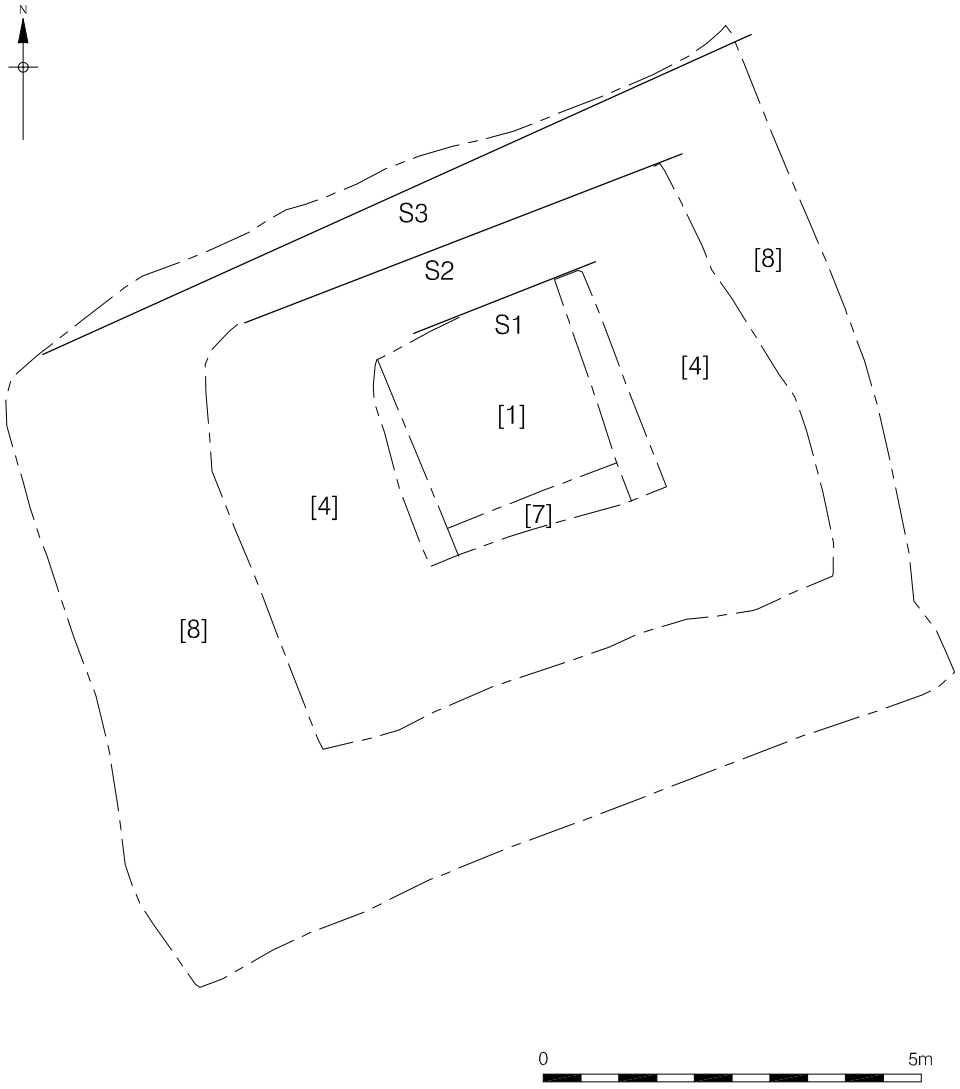


Figure 3
Plan of Trench 1
1:100

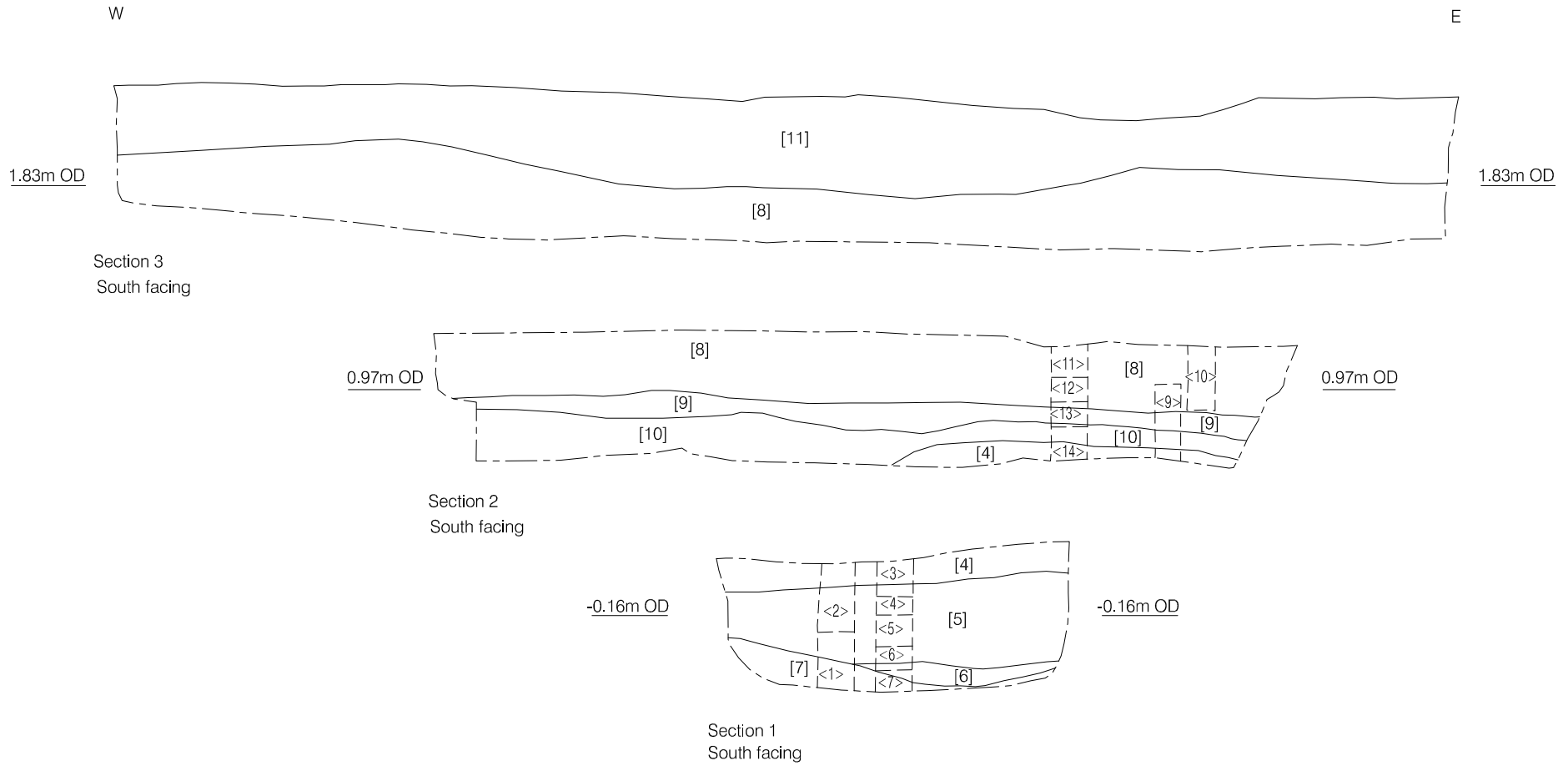


Figure 4
Sections 1, 2 and 3
1:50

8 INTERPRETATION AND CONCLUSIONS

8.1 One of the principal objectives of the archaeological evaluation was to determine the presence or absence of archaeological activity of any period. Furthermore, due to the environmental potential in the vicinity of the site it was also deemed necessary to produce a profile of the alluvial formations and investigate the natural River Terrace Gravels.

8.2 The only evidence of human activity predating the late 19th to early 20th centuries took the form of two timber stakes driven into a peat deposit and sealed by a later alluvial horizon. With no further associated woodwork present within the trench it was difficult to establish a specific structural function or form to these two stakes, and thus at present they remain ambiguous. The possibility of them representing the foundations for a trackway has been discussed in para. 7.5.3, but with so little evidence to go on this remains a tentative suggestion. A possible mid to late Bronze Age date has been attributed to these timbers as they were driven into a horizon radiocarbon dated to between 3330-3060 BP. In terms of the environmental objectives, a significant sequence was recorded and has been identified as suggestive of a quiet water depositional environment characteristic of lowland river channels and floodplains present in the south-east of England. A number of environmental samples (including both column and bulk samples) were taken in order to further quantify these horizons (see Appendix 3).

8.3 The archaeological evaluation has confirmed that a significant alluvial sequence exists on the site. To add to this, archaeological evidence for human activity was discovered in the form of two timber stakes. The precise function and date of these stakes remains ambiguous, although they are presumed to belong to the prehistoric period.

8.4 The natural on the site was discovered to be River Terrace Gravels. This was in turn sealed by a layer of clay sand, possibly representing an early foreshore or wetland deposit and may well be suggestive of a fen carr environment. Alluvial horizons indicative of a quiet water depositional environment then occupied the trench before being sealed by modern made ground.

9 ACKNOWLEDGEMENTS

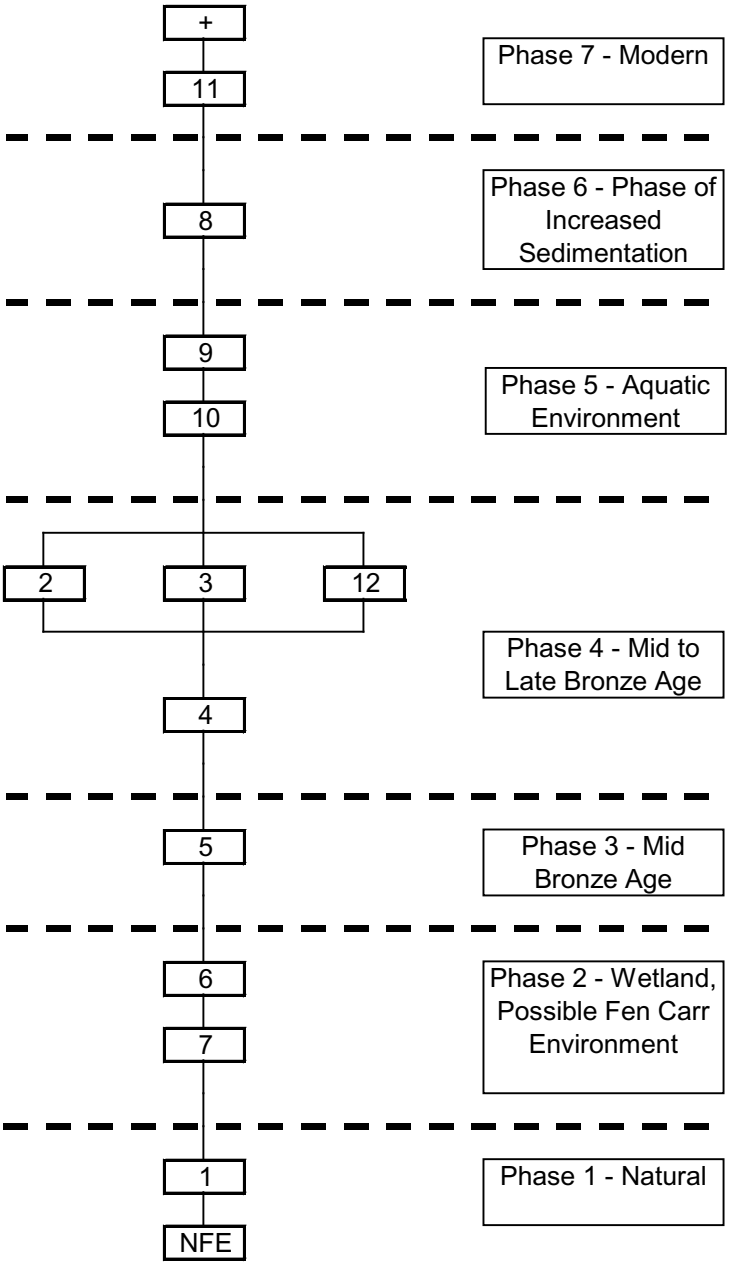
9.1 Pre-Construct Archaeology would like to thank Mark Sheehan for commissioning the work on behalf of the Big Yellow Group Plc. Thanks also to David Divers of the Greater London Archaeology Advisory Service (GLAAS) for monitoring the site on behalf of the Local Planning Authority.

9.2 The author would also like to thank Aidan Turner for all of his assistance on site; Nathalie Barrett for the surveying; Josephine Brown for the illustrations; Lisa Lonsdale and Rob Nicholson for technical and logistical support and Tim Bradley for his project management and editing.

APPENDIX 1 – CONTEXT DESCRIPTIONS

Site Code	Context No.	Plan	Section	Sample No.	Type	Description	Date	Phase	Photo no.
HET 07	1	TR 1	N/A	8	Deposit	Natural Gravels	Natural	1	N/A
HET 07	2	TR 1	N/A	N/A	Timber	Timber Stake	Bronze Age?	4	N/A
HET 07	3	TR 1	N/A	N/A	Timber	Timber Stake	Bronze Age?	4	N/A
HET 07	4	TR1	1, 2	2, 3	Deposit	Spongy, dark brown silt peat clay	Unknown	4	N/A
HET 07	5	N/A	1	1-6	Deposit	Stiff to plastic, mid grey brown silty clay	Unknown	3	N/A
HET 07	6	N/A	1	1, 6, 7	Deposit	Spongy to stiff, dark grey brown sand peat clay	Unknown	2	N/A
HET 07	7	TR 1	1	1, 7	Deposit	Loose to coarse, light blue grey sand clay	Unknown	2	N/A
HET 07	8	TR 1	2, 3	9-13	Deposit	Plastic, dark blue silty clay	Unknown	6	N/A
HET 07	9	N/A	2	9, 13	Deposit	Firm, mid brown peat clay	Unknown	5	N/A
HET 07	10	N/A	2	9, 13, 14	Deposit	Plastic, mid yellow grey silty clay	Unknown	5	N/A
HET 07	11	N/A	3	N/A	Deposit	Modern made ground	Modern	7	N/A
HET 07	12	TR 1	N/A	N/A	Timber	Collapsed Tree	Bronze Age?	4	N/A

APPENDIX 2 – SITE MATRIX



APPENDIX 3 – ENVIRONMENTAL ASSESSMENT

LAND AT RIVERSIDE WORKS, HERTFORD, BARKING (SITE CODE: HET07): ENVIRONMENTAL ARCHAEOLOGICAL ASSESSMENT

C.R. Batchelor, C.P. Green, N.P. Branch and D. Young
ArchaeoScape, Department of Geography, Royal Holloway University of London, Egham Hill, Egham, Surrey, TW20 OEX, UK

INTRODUCTION

This report summarises the findings arising out of the environmental archaeological assessment undertaken by *ArchaeoScape* in connection with the proposed development at Riverside Works, Hertford Road, Barking (Site Code:HET07; National Grid Reference: TQ 4350 8436). During recent archaeological investigations undertaken by Pre-Construct Archaeology Ltd, column and bulk samples for environmental archaeological assessment, and possible future analysis, were obtained from a deep excavation trench (Trench 1). Trench 1 was sealed by modern made ground which covered the site. Elevated levels of arsenic and hydrocarbons were present within this made ground, along with marginally elevated concentrations of hydrocarbons, inorganic compounds and elevated concentrations of ground gas (Haslam, 2007). Directly underlying the made ground was a stratigraphic sequence comprising of layers of alluvial and peaty clays, which overlay the natural River Terrace Gravels (Haslam, 2007).

The overarching aim of the environmental archaeological assessment was to evaluate the potential of the sedimentary sequence for reconstructing the environmental history of the site and its environs. In particular, the assessment focussed on evaluating the potential for quantifying the impact of human activities on the environment, and the response of humans to natural environmental change. The assessment consisted of the following:

1. Recording the lithostratigraphy (all column samples) and quantifying the organic matter content (column samples <1>, <2>, <9> and <10>) to provide a preliminary reconstruction of the sedimentary history
2. Assessment of the preservation and concentration of pollen grains and spores (column samples <1>, <2>, <9> and <10>) to provide a preliminary reconstruction of the vegetation history, and to detect evidence for human activities e.g. woodland clearance and cultivation
3. Assessment of the preservation and concentration of macroscopic plant (seeds, wood) remains from selected bulk samples (<3>, <5>, <7>, <11>, <12> and <13>) to provide a preliminary reconstruction of the vegetation history and general environmental context of the site
4. Radiocarbon dating to provide a provisional geochronological framework for the stratigraphic sequence (column samples <1> and <9>).

GEOLOGICAL CONTEXT

The site is on the valley floor of the River Roding, a left-bank tributary of the River Thames, and about 3.5km upstream from the confluence with the Thames. The site lies to the west of the Roding, between the river and the A406 road and on its eastern boundary is only about 20m from the modern river channel. The ground surface is at levels between 2.5m and 3.0m OD. The British Geological Survey (1:50,000 Sheet 257 Romford 1996) shows the site to be underlain by Alluvium resting on bedrock London Clay.

The alluvial sediments were recorded in the archaeological evaluation trench (Haslam, 2007) and comprised at the base of the section a sandy gravel with an upper surface at -1.09m OD overlain by just over 2.0m of more or less organic mainly fine-grained river channel and floodplain deposits. These deposits were slightly pebbly in the basal 0.5m and included three mineral-rich peaty horizons. The upper surface of this sequence was recorded at 0.97m OD and was overlain by up to 1.41m of inorganic dark blue silty clay, recorded at levels up to 2.20m OD. Up to a metre of made ground was present above the natural alluvial deposits.

The alluvial sequence described by Haslam (2007) resembles quite closely alluvial sequences recorded in the valley of the River Lea (Chambers *et al.,* 1996; Green *et al.,* 2006). In the Lea valley gravelly organic sediments at the base of the alluvial sequence have produced Early Holocene radiocarbon dates and it seems possible that the similar deposits at Hertford Road may be of the same age and that the overlying sediments represent identifiable phases of Holocene landscape development in the Roding valley.

METHODS

Field investigations

Four column samples (<1> and <2> <9> and <10>) and nine bulk samples, each between 15cm and 20cm in thickness, were recovered from Trench 1 (Table 1) by Pre-Construct Archaeology Ltd.

TABLE 1: DETAILS OF SAMPLES TAKEN AT RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Sample type	Sample number	OD Height at top (m)	OD Height at base (m)
Column	1	-0.29	-0.79
Column	2	0.25	-0.25
Column	9	1.01	0.51
Column	10	1.32	0.82
Bulk	7	-0.59	-0.76
Bulk	6	-0.41	-0.59
Bulk	5	-0.16	-0.41
Bulk	4	-0.01	-0.16
Bulk	3	0.25	-0.01
Bulk	14	0.67	0.51
Bulk	13	0.87	0.67

Bulk	12	1.07	0.87
Bulk	11	1.32	1.07

Lithostratigraphic descriptions

The lithostratigraphy of all column samples was described in the laboratory using standard procedures for recording unconsolidated sediment and peat, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter), unit boundaries and inclusions (e.g. artefacts) (Tables 2, and 4 to 6 and Figure 1).

Organic matter determinations

Seven sub-samples were taken from each column sample (<1>, <2>, <9> and <10>) for determination of the organic matter content (Table 3 and Figures 2 to 5). These records were important for two reasons: (1) they identified lithostratigraphic units with a higher organic matter content that may be suitable for radiocarbon dating, and (2) they identified increases in organic matter possibly associated with more terrestrial conditions. The organic matter content was determined by standard procedures involving: (1) drying the sub-sample at 110^0C for 12 hours to remove excess moisture; (2) placing the sub-sample in a muffle furnace at 550°C for 2 hours to remove organic matter (thermal oxidation), and (2) re-weighing the sub-sample obtain the 'loss-on-ignition' value (see Bengtsson and Enell, 1986).

Radiocarbon dating

A sub-sample was taken from column sample <1> from the organic clay (unit 4; context 5; -0.45 to -0.46 m OD) and from column sample <9> (unit 1; context 4; 0.52 to 0.53m OD) from the organic clay. These were submitted for radiocarbon dating to Beta Analytic Inc, Florida (Table 7). The results have been calibrated using OxCal v4.0.1 Bronk Ramsey (1995, 2001 and 2007) and IntCal04 atmospheric curve (Reimer *et al.,* 2004).

Pollen assessment

Seven sub-samples were taken from each column sample (<1>, <2>, <9> and <10>) for assessment of the pollen content. The pollen was extracted as follows: (1) sampling a standard volume of sediment (1ml); (2) deflocculation of the sample in 1% Sodium pyrophosphate; (3) sieving of the sample to remove coarse mineral and organic fractions (>125µ); (4) acetolysis; (5) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm^3), and (6) mounting of the sample in glycerol jelly. Each stage of the procedure was preceded and followed by thorough sample cleaning in filtered distilled water. Quality control is maintained by periodic checking of residues, and assembling sample batches from various depths to test for systematic laboratory effects. Pollen grains and spores were identified using the Royal Holloway (University of London) pollen type collection and the following sources of keys and photographs: Moore *et al* (1991); Reille (1992). Plant nomenclature follows the Flora Europaea as summarised in Stace (1997). The assessment procedure consisted of scanning the prepared slides at 2mm intervals along the whole length of the coverslip and recording

the concentration and state of preservation of pollen grains and spores, and the principal pollen taxa (Tables 8 to 11).

PLANT MACROFOSSIL ASSESSMENT

Sub-samples from six selected bulk samples (<3>, <5>, <7>, <11>, <12> and <13>) recovered from the site were processed for the plant macrofossil assessment. The samples were wet-sieved using 300 micron and 1mm mesh sizes. The residues were scanned using a low power zoom-stereo microscope. Identifications were made with reference to the modern seed collection at Royal Holloway University London, and Berggren (1981) and Anderberg (1994). Plant nomenclature follows Stace (1997).

RESULTS AND INTERPRETATION OF THE LITHOLOGICAL ASSESSMENT

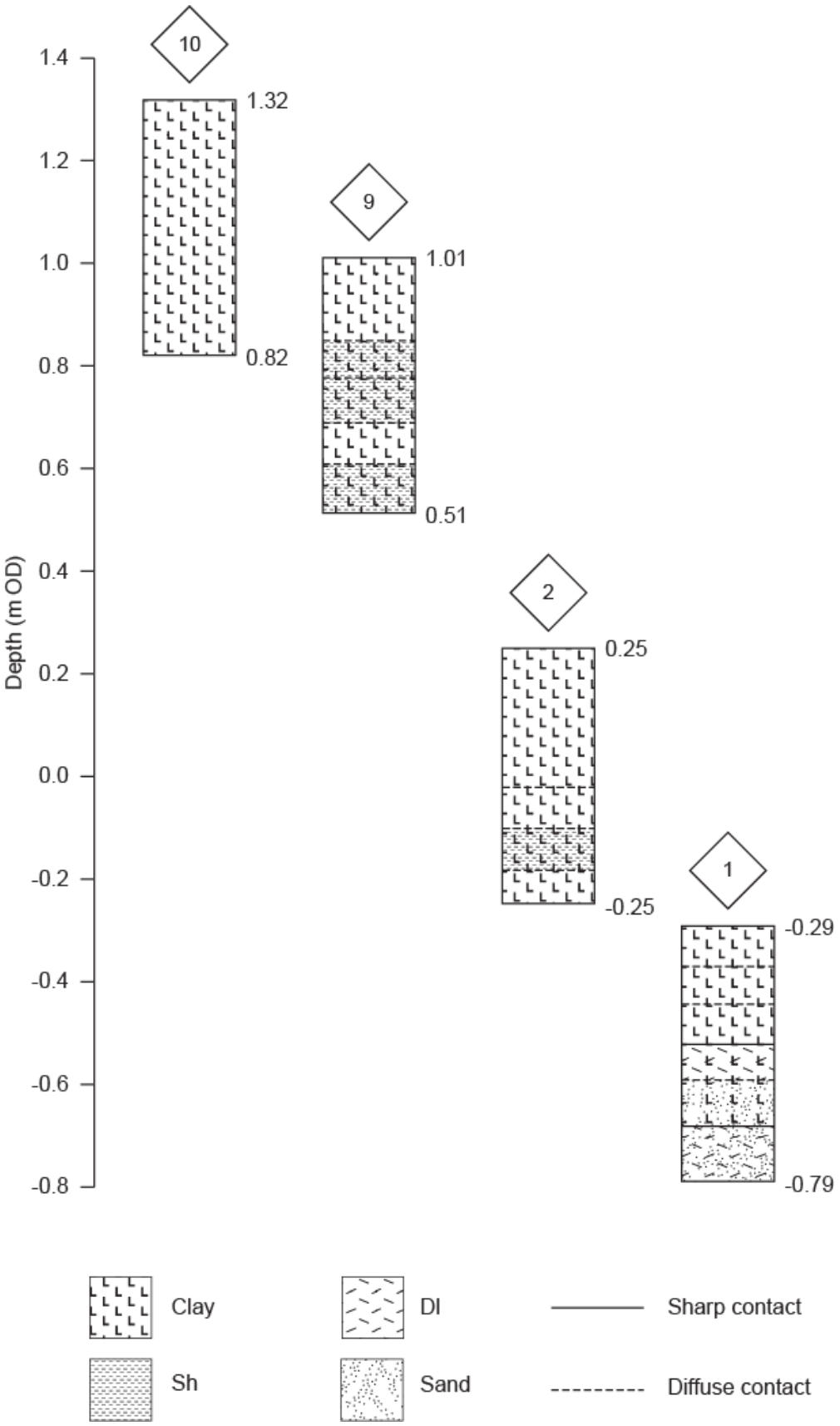
Four column samples were taken at levels between -0.79m and 1.32m OD. They probably represent sediments equivalent to most or all of the organic sequence recorded in the archaeological evaluation trench (Haslam, 2007). At the base of the sequence are three units comprising context (7), *ca.* 0.25m in thickness and consisting of sandy gravel passing up into gravelly clay (Figures 1 and 2; Tables 2 and 3). Wood fragments are present throughout context (7) but overall organic content of the sediment is generally low (4-6%). Context (7) is overlain by a sequence of organic clays comprising successively contexts (5), (4), (10) and (9) (Figures 1, 2, 3 and 4; Tables 2, 3, 4 and 5). Although some 10 separate units are recorded in this sequence, they are distinguished only by relatively minor variations of colour and texture. Probably the most significant source of variation is in terms of the organic content of the sediment. In particular, organic matter rises from background values between 10% and 18% to values between 26% and 34% at the base and near the top of context (5), in the upper part of context (4) and in context (9). In the upper part of context (5) and in context (9) these increased values are accompanied by visible inclusions of, respectively, wood peat and herbaceous peat. Wood fragments are present throughout this sequence and stems and leaves are present in the upper part of context (4) and the immediately overlying context (10). As a whole these sediments are consistent with accumulation in the various quiet water depositional environments characteristic of lowland river channels and floodplains in south-east England. Overlying this organic sequence is a mainly dark greyish brown slightly gravelly inorganic clay comprising context (8) in which organic matter values decrease upward from 13% to 7% (Figures 1, 4 and 5; Tables 2, 5 and 6).

It seems likely that the sedimentological variations in the alluvial sequence represent a number of different local environments on the floodplain of the prehistoric Roding, probably reflecting changes in the position of the river channel, or channels, on the floodplain.

The organic lower part of the alluvial sequence, recorded by Haslam (2007) and described from the column samples, comprising successively contexts (7), (5), (4), (10) and (9), resembles to some extent organic alluvial sequences recorded in the nearby valley of the River Lea (Chambers *et al.,* 1996; Green *et al.,* 2006) and elsewhere in the valley of the Thames itself (e.g. Preece and Robinson, 1982).

Where such organic sediments have been dated they are generally found to represent Early to Middle Holocene deposition prior to landscape changes associated with Neolithic or Bronze Age occupation. The overlying much less organic sediments comprising context (8) at Hertford Road resemble later Holocene, mineral-rich floodplain sediments elsewhere in lowland England, which are thought to reflect Neolithic or post-Neolithic intensification of land-use leading to soil erosion and increased sediment supply.

1.



2.

FIGURE 1: LITHOSTRATIGRAPHY OF COLUMN SAMPLES <1>, <2>, <9> AND <10> OBTAINED FROM RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

TABLE 2: LITHOSTRATIGRAPHIC SEQUENCE FROM COLUMN SAMPLE <1>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Depth (m from top of column)	Depth (m OD)	Unit number	Context number	Description
0.00 to 0.08	-0.29 to -0.37	6	(5)	10YR 4/2 and 10YR 4/1; As4, Sh+, Dl+; Mottled dark greyish brown and dark grey clay with organic and detrital wood inclusions
0.08 to 0.15	-0.37 to -0.44	5	(5)	10YR 4/1; As4, Sh+, Dl+; Dark grey clay with organic and detrital wood inclusions; diffuse contact with upper unit
0.15 to 0.23	-0.44 to -0.52	4	(5)	10YR 3/1; As4, Sh+, Dl+; Very dark grey clay with organic and detrital wood inclusions; diffuse contact with upper unit **14C Date**
0.23 to 0.30	-0.52 to -0.59	3	(7)	Gley 1 6/1; As3, Dl1, Ga+, Gg+; Greenish grey clay and detrital wood with gravel and sand inclusions; sharp contact with upper unit
0.30 to 0.39	-0.59 to -0.68	2	(7)	Gley 1 5/1; As3, Ga1, Dl+; Greenish grey sandy clay with detrital wood inclusions; diffuse contact with upper unit
0.39 to 0.50	-0.68 to -0.79	1	(7)	10YR 4/2; Ga3, Dl1, Gg+; Dark greyish brown sand and detrital wood with gravel inclusions; sharp contact with upper unit

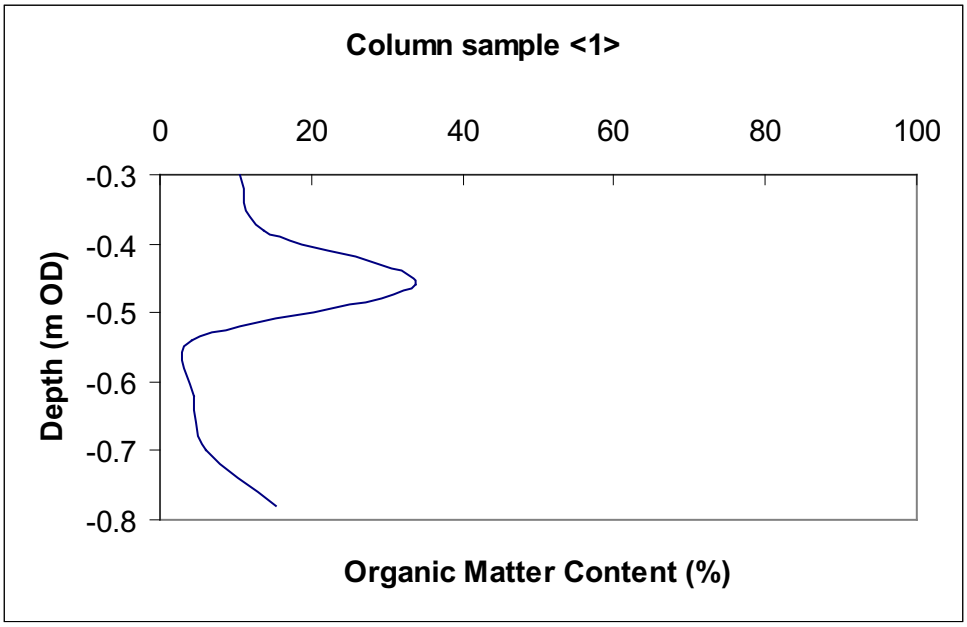


Figure 2: Organic matter content of column sample <1>

Table 3: Organic matter content of column samples <1>, <2>, <9> and <10>

Column sample number	Depth (m OD)		Organic matter (%)
	From	To	
1	-0.77	-0.78	15.28
1	-0.69	-0.7	6.00
1	-0.61	-0.62	4.45
1	-0.53	-0.54	4.33
1	-0.45	-0.46	33.86
1	-0.37	-0.38	13.85
1	-0.29	-0.3	10.42
2	-0.23	-0.24	25.89
2	-0.15	-0.16	29.40
2	-0.07	-0.08	17.70
2	0.01	0.00	12.60
2	0.09	0.08	13.85
2	0.17	0.16	13.96
2	0.25	0.24	12.55
9	0.53	0.52	27.57
9	0.61	0.60	15.85
9	0.69	0.68	14.63
9	0.77	0.76	27.86
9	0.85	0.84	12.74
9	0.93	0.92	9.85
9	1.01	1.00	8.40
10	0.84	0.83	8.85
10	0.92	0.91	7.98
10	1.00	0.99	8.50
10	1.08	1.07	9.46
10	1.16	1.15	8.69
10	1.24	1.23	7.15
10	1.32	1.31	7.06

TABLE 4: LITHOSTRATIGRAPHIC SEQUENCE FROM COLUMN SAMPLE <2>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Depth (m from top of column)	Depth (m OD)	Unit number	Context number	Description
0.00 to 0.27	0.25 to -0.02	4	(4)	10YR 4/1 and 2.5/1; As4, Sh+, Dl+; Slightly mottled very dark grey and black clay with organic and detrital wood inclusions
0.27 to 0.35	-0.02 to -0.10	3	(5)	10YR 4/1 and 2.5/1; As4, Sh+, Dl+; Mottled very dark grey and black clay with organic and detrital wood inclusions; diffuse contact with upper unit
0.35 to 0.43	-0.10 to -0.18	2	(5)	10YR 3/1; As3, Sh1, Tl+; Very dark grey organic clay with wood peat inclusions; diffuse contact with upper unit
0.43 to 0.50	-0.18 to -0.25	1	(5)	10YR 4/2 and 10YR 4/1; As4, Sh+, Dl+; Mottled very dark greyish brown and very dark grey clay with organic and detrital wood inclusions; diffuse contact with upper unit

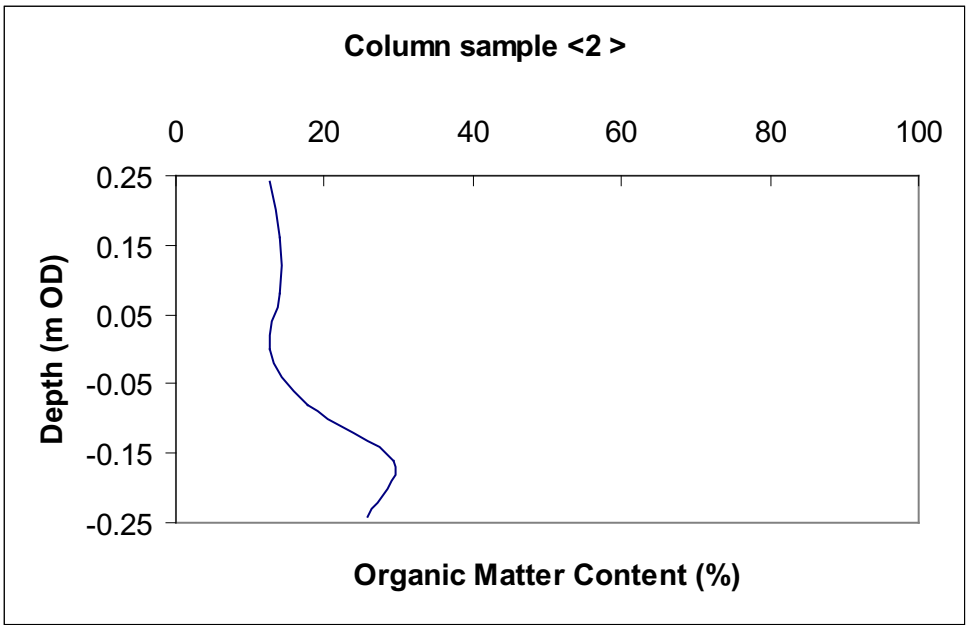


Figure 3: Organic matter content of column sample <2>

Table 5: Lithostratigraphic sequence from column sample <9>, Riverside Works, Hertford Road, Barking (HET07)

Depth (m from top of column)	Depth (m OD)	Unit number	Context number	Description
0.00 to 0.16	1.01 to 0.85	5	(8)	10YR 4/2 to 10YR3/2; As4, Sh+; Dark greyish brown to very dark greyish brown clay with organic inclusions; diffuse contact into
0.16 to 0.23	0.85 to 0.78	4	(8)	10YR 3/2; As3, Sh1; Very dark grey organic clay; diffuse contact with upper unit
0.23 to 0.32	0.78 to 0.69	3	(9)	2.5Y 3/2 and 10YR 4/2; As3, Sh1, Th+; Mottled very dark greyish brown and dark greyish brown organic clay with herbaceous peat inclusions; diffuse contact with upper unit
0.32 to 0.40	0.69 to 0.61	2	(10)	2.5Y 4/2; As4, Dl+, Dh+; Dark greyish brown clay with detrital wood and plant inclusions, diffuse contact with upper unit
0.40 to 0.50	0.61 to 0.51	1	(4)	10YR 3/2; As2, Sh1, Dl1, Dh+; Very dark grey organic clay and detrital wood with detrital plant inclusions; diffuse contact with upper unit **14C date**

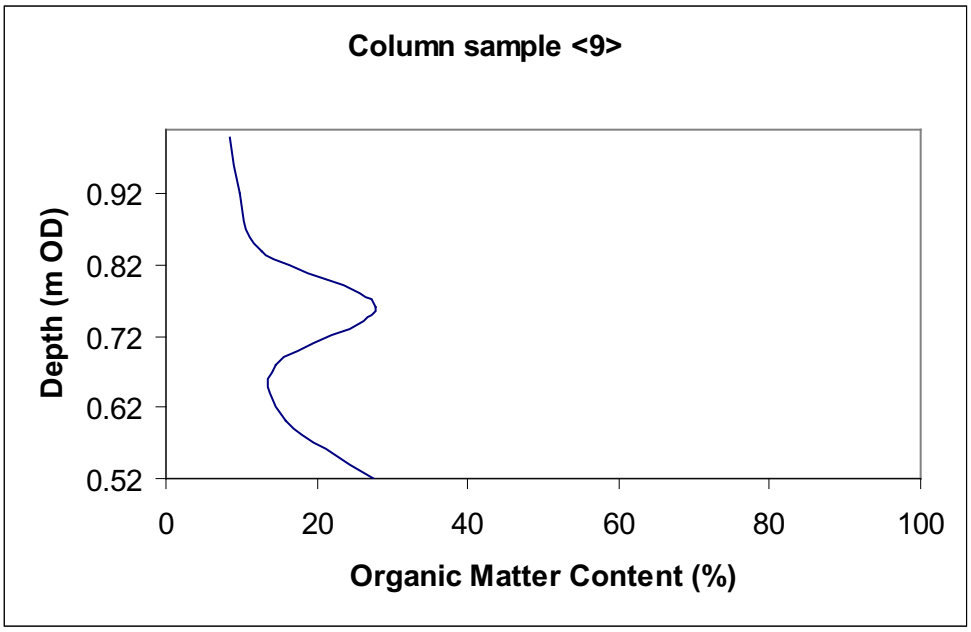


FIGURE 4: ORGANIC MATTER CONTENT OF COLUMN SAMPLE <9>

TABLE 6: LITHOSTRATIGRAPHIC SEQUENCE FROM COLUMN SAMPLE <10>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Depth (m from top of column)	Depth (m OD)	Unit number	Context number	Description
0.00 to 0.50	1.32 to 0.82	1	(8)	2.5Y 4/2; As4, Gg+; Dark greyish brown clay with gravel inclusions

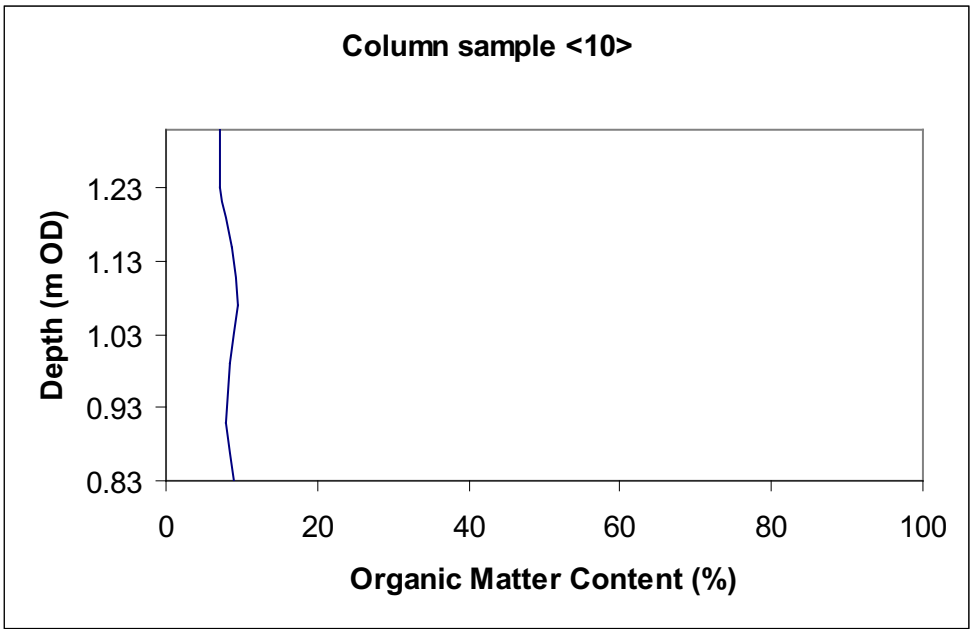


Figure 5: Organic matter content of column sample <10

RESULTS AND INTERPRETATION OF THE RADIOCARBON DATING

The organic clay (unit 4; context (5)) at -0.45 to -0.46m OD has been radiocarbon dated to 3680-3460 cal yr BP, and the organic clay (unit 1; context (4)) at 0.52 to 0.53m OD has been dated to 3330 to 3060 cal yr BP. The δ13C (‰) values are consistent with that expected for organic sediment, and there is no evidence for mineral or biogenic carbonate contamination. These dates may be equated with the Middle Bronze Age (Beta-231734) and Middle to Late Bronze Age (Beta-231735) cultural periods.

TABLE 7: RESULTS OF THE RADIOCARBON DATING OF COLUMN SAMPLE <1> AND COLUMN SAMPLE <9>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Laboratory Code / Method	Material	Context no.	Column sample	Depth (m from top of column)	Depth (m OD)	Un-calibrated Radiocarbon Years Before Present (yrs BP)	Calibrated age BC / AD (BP) (2-sigma, 95.4% probability)	δ13C (‰)
BETA-231734 AMS	Organic clay	(5)	<1>	0.16 to 0.17	-0.45 to -0.46	3330 ± 40	1730-1720 and 1690-1510 cal BC (3680-3660 and 3640-3460 cal BP)	-27.2
BETA-231735 AMS	Organic clay	(4)	<9>	0.48 to 0.49	0.53 to 0.52	2990 ± 40	1380-1330 and 1330-1120 cal BC (3330-3280 and 3280-3060 cal BP)	-27.8

RESULTS AND INTERPRETATION OF THE POLLEN ASSESSMENT

The results of the pollen-stratigraphical assessment of column samples <1>, <2>, <9> and <10> indicate variable concentration and preservation through the sequence at Hertford Road (Tables 8 to 11). The main taxa identified in context (7), between -0.79 and -0.52m OD, are generally of moderate to high concentration and preservation, and consist of *Alnus* (alder), *Quercus* (oak), *and Pinus* (pine) and *Tilia* (lime). These taxa indicate the presence of a wetland plant community comprising alder woodland, forming possible fen carr, most likely with an understorey of herbs and ferns, such as Cyperaceae (sedges). On the dryland, oak and lime woodland dominated the vegetation cover, with the presence of *Polypodium* (polypody) and *Dryopteris* (buckler fern) possibly indicating the presence of woodland glades. Between contexts (5) and (4) (-0.52 to 0.61m OD), the preservation and concentration of pollen and spores is generally very low. Despite this, the pollen taxa appears to indicate a change in vegetation communities, with a decline in the frequency of pollen taxa of mixed deciduous woodland (for example lime, oak and alder), and increase in herbaceous and spore taxa such as dandelion (Lactuceae), polypody and ferns. However, this change in pollen stratigraphy may also be due to the greater susceptibility of other grains to degradation, and the differential preservation of pollen grains and spores having higher sporopollenin content.

Above 0.61m OD (contexts (10), (9) and (8)), pollen concentration and preservation is moderate to high. These contexts record the presence of *Sparganium* (bur reed), *Typha latifolia* (common reedmace), *Chenopodium* type (common orache), *Aster* type (e.g. sea aster), *Armeria maritima* (thrift) and *Mentha* type (e.g. water mint) indicating a change to vegetation communities representative of aquatic conditions locally to the site. The remaining pollen assemblage is dominated by herbaceous taxa indicative of rough grassland / meadowland and disturbed ground e.g. grasses (Poaceae), *Cirsium* type (e.g. spear thistle), *Centaurea cyanus* (cornflower) and *Ranunculus* type (e.g. creeping buttercup). Together with the presence of cereal pollen, the assemblage indicates an environment modified by human activities, which involved woodland clearance, cultivation and grass formation. Supporting this interpretation is the presence of a range of other light demanding taxa, including ash (*Fraxinus*) and pollen grains often originating from greater distance, thus representing more open environments (e.g. *Pinus*).

TABLE 8: POLLEN-STRATIGRAPHIC ASSESSMENT OF COLUMN SAMPLE <1>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Lithostratigraphic unit	**Depth (m OD)**	**Context number**	**Main pollen taxa**	**Common Name**	**Concentration 0 (none) to 4 (high)**	**Preservation 0 (none) to 4 (high)**	**Carbonaceous particles**
6	-0.29 to -0.30	(5)	cf Dryopteris *Polypodium*	cf Fern Polypody	1	1	1
5	-0.37 to -0.38	(5)	Dryopteris *Quercus*	Fern Oak	1	3	1
4	-0.45 to -0.46	(5)	*Corylus* type Dryopteris	e.g. Hazel Fern	1	1	1
3	-0.53 to -0.54	(7)	*Polypodium*	Polypody	1	2	2
2	-0.61 to -0.62	(7)	*Alnus* cf Cyperaceae cf *Quercus* *Pinus* *Tilia*	Alder cf Sedge family cf Oak Pine Lime	2	1/2	1
1	-0.69 to -0.70	(7)	*Alnus* Dryopteris *Pinus* *Quercus* *Tilia*	Alder Fern Pine Oak Lime	2	2/3	1
1	-0.77 to -0.78	(7)	*Alnus* *Corylus* type Dryopteris *Polypodium* *Quercus* *Tilia*	Alder e.g. Hazel Fern Polypody Oak Lime	4	3	0

TABLE 9: POLLEN-STRATIGRAPHIC ASSESSMENT OF COLUMN SAMPLE <2>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Lithostratigraphic unit	**Depth (m OD)**	**Context number**	**Main pollen taxa**	**Common Name**	**Concentration 0 (none) to 4 (high)**	**Preservation 0 (none) to 4 (high)**	**Carbonaceous Particles**
4	0.25 to 0.24	(4)	cf *Corylus* type Dryopteris	cf e.g. Hazel Fern	0/1	0/1	2
4	0.17 to 0.16	(4)	Dryopteris *Polypodium* Sphagnum *Tilia*	Fern Polypody Moss Lime	1	1	2
4	0.09 to 0.08	(4)	*Alnus* Dryopteris Lactuceae *Quercus* *Tilia*	Alder Fern Daisy family Oak Lime	1/2	1/2	2
4	0.01 to 0	(4)	Dryopteris Lactuceae *Quercus* cf *Rumex* undiff	Fern Daisy family Oak Dock family	1	1/2	2
3	-0.07 to -0.08	(5)	*Quercus*	Oak	1	2	2
2	-0.15 to -0.16	(5)	*Alnus* *Artemisia* Dryopteris Poaceae *Pteridium aquilinum* Quercus	Alder Mugwort Fern Grass Bracken Oak	2/3	2/3	2
1	-0.23 to -0.24	(5)	Lactuceae Polypodium cf *Quercus*	Daisy family Polypody cf oak	2	2	2

3. TABLE 10: POLLEN-STRATIGRAPHIC ASSESSMENT OF COLUMN SAMPLE <9>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Lithostratigraphic unit	**Depth (m OD)**	**Context number**	**Main pollen taxa**	**Common name**	**Concentration 0 (none) to 4 (high)**	**Preservation 0 (none) to 4 (high)**	**Carbonaceous Particles**
5	1.01 to 1.00	(8)	*Alnus* cf *Armeria maritima* cf *Corylus* type *Chenopodium* type Cyperaceae Dryopteris type Lactuceae Poaceae *Quercus* *Ranunculus* type *Sparganium* type *Sphagnum* *Typha latifolia*	Alder cf Thrift cf e.g. Hazel e.g. Fat hen Sedge family Fern Daisy family Grass Oak Buttercup Bur-reed Moss Common Reedmace	4	2/3	2/3
5	0.93 to 0.92	(8)	*Alnus* *Aster* type cf *Apiaceae* cf *Corylus type* *Chenopodium* type *Dryopteris* type Lactuceae *Pinus* Poaceae *Pteridium aquilinum* *Quercus* *Salix* *Typha latifolia* *Ulmus*	Alder e.g. Sea Aster cf Carrot family cf e.g. Hazel e.g. Fat hen Fern Daisy family Pine Grass Bracken Oak Willow Common Reedmace Elm	4	2/3	1

4	0.85 to 0.84	(8)	*Alnus* Apiaceae cf *Fraxinus* *Cirsium* type *Corylus* type Cyperaceae *Dryopteris* type Lactuceae Poaceae *Pteridium aquilinum* *Quercus* *Salix* *Sparganium*	Alder Carrot family cf Ash e.g. Spear thistle e.g. Hazel Sedge family Fern Daisy family Grass Bracken Oak Willow Bur-reed	4	2	1
3	0.77 to 0.76	(9)	*Alnus* *Chenopodium* type *Cirsium* type *Corylus* type Cyperaceae *Dryopteris* type Poaceae Poaceae cf *Cereale* type *Quercus* *Salix* *Sparganium* type *Typha latifolia*	Alder e.g. Fat hen e.g. Spear thistle e.g. Hazel Sedge family Fern Grass Grass cf Cereal Oak Willow Bur-reed Common Reedmace	3/4	2/3	1
2	0.69 to 0.68	(10)	*Alnus* *Aster* type cf *Sparganium* type *Cirsium* type *Dryopteris* type *Fraxinus* *Pinus* Poaceae	Alder e.g. Sea Aster cf Bur-reed e.g. Spear thistle Fern Ash Pine Grass	2/3	2/3	1
1	0.61 to 0.60	(4)	*Corylus* type *Dryopteris* type *Quercus*	e.g. Hazel Fern Oak	1	2/3	1

1	0.53 to 0.52	(4)	-	-	0	0	0/1

TABLE 11: POLLEN-STRATIGRAPHIC ASSESSMENT OF COLUMN SAMPLE <10>, RIVERSIDE WORKS, HERTFORD ROAD, BARKING (HET07)

Lithostratigraphic unit	**Depth (m OD)**	**Context number**	**Main pollen taxa**	**Common Name**	**Concentration 0 (none) to 4 (high)**	**Preservation 0 (none) to 4 (high)**	**Carbonaceous Particles**
1	1.32 to 1.31	(8)	Apiaceae *Aster* type *Centaurea cyanus* *Cereale* type *Chenopodium* type *Corylus* type Cyperaceae *Dryopteris* type Lactuceae *Mentha* type Poaceae *Quercus* *Salix*	Carrot family e.g. Sea aster Cornflower Cereal e.g. Fat hen e.g. Hazel Sedge family Fern Daisy family e.g. Water Mint Grass Oak Willow	4	2/3	4
1	1.24 to 1.23	(8)	Apiaceae *Aster* type *Centaurea cyanus* *Corylus* type Cyperaceae Lactuceae Poaceae *Quercus*	Carrot family e.g. Aster type Cornflower e.g. Hazel Sedge family Daisy family Grass Oak	3/4	2	3
1	1.16 to 1.15	(8)	*Corylus* type Cyperaceae cf *Fraxinus* Lactuceae Poaceae *Quercus*	e.g. Hazel Sedge family cf Ash Daisy family Grass Oak	2/3	2	1/2
1	1.08 to 1.07	(8)	*Alnus* *Dryopteris* type *Quercus* *Sinapis* type	Alder Fern oak e.g. Charlock	2	2	2/3
1	1.00 to 0.99	(8)	*Alnus* *Chenopodium* type Dryopteris	Alder e.g.Fat hen Fern	2	2	2

1	0.92 to 0.91	(8)	*Alnus* Poaceae *Quercus*	Alder Grass Oak	1	1	1
1	0.84 to 0.83	(8)	*Alnus* *Corylus* type Lactuceae Poaceae *Quercus* *Typha latifolia*	Alder e.g. Hazel Daisy family Grass Oak Common Reedmace	2	2	1

RESULTS AND INTERPRETATION OF THE PLANT MACROFOSSIL ASSESSMENT

The results of the plant macrofossil assessment of bulk samples <7>, <5>, <3>, <13>, <12> and <11> indicate variable concentration and preservation of waterlogged seeds and wood, and charcoal, throughout the sequence at Hertford Road (Table 12). No charred seeds, Mollusca or bone were present within the samples assessed.

At the base of the sequence, sample <7> (-0.76 to -0.59m OD; context (7)) contained a low concentration (1-25 specimens) of charcoal and unidentifiable waterlogged seeds of which the preservation was very poor. Sample <7> also contained a high concentration of waterlogged wood (101+ specimens).

Sample <5>, (-0.41 to -0.16m OD; context (5)), contained a moderate concentration of waterlogged seeds (51-75 specimens) and a high concentration of waterlogged wood (101+ specimens). The main taxa present in the waterlogged seed assemblage were identified as *Corylus avellana* (hazel), *Ranunculus* sp (e.g. creeping buttercup) and Apiaceae (carrot family). Charcoal was present in low concentrations in this sample (1-25 specimens).

Sample <3>, (-0.01 to 0.25m OD; context (4)), contained high concentrations of both waterlogged seeds and waterlogged wood (both 101+ specimens). The main taxa present in the waterlogged seed assemblage were identified as *Rubus fruticosus* (common blackberry), *Prunus* sp. (blackthorn) and cf. *Potentilla* (cf. tormentil).

Between 0.67m OD and 1.07m OD (sample <13>; contexts (9) and (8); sample <12>; context (8)) low concentrations of both charcoal and waterlogged wood (1-25 specimens) were present. Above 1.07m OD, no charred or waterlogged plant macrofossils were present (sample <11>; context (8)).

Table 12: Plant macrofossil assessment, Riverside Works, Hertford Road, Barking (HET07)

Depth (m OD)	Context number	Sample number	Charred		Waterlogged		Molluscs	Monocots	Bone	Minerogenic	Main taxa
			Wood	Seeds	Seeds	Wood					
1.32 to 1.07	(8)	<11>	-	-	-	-	-	-	-	2	
1.07 to 0.87	(8)	<12>	1	-	-	1	-	-	-	-	
0.87 to 0.67	(8) and (9)	<13>	-	-	-	1	-	4	-	-	
0.25 to -0.01	(4)	<3>	-	-	5	5	-	5	-	-	*Rubus fruticosus* (Common blackberry) *Prunus* sp. (Plums) cf. *Potentilla* (Tormentil)
-0.16 to -0.41	(5)	<5>	1	-	3	5	-	4	-	-	*Corylus* type (e.g. Hazel) *Ranunculus* type (e.g. Creeping buttercup) Apiaceae (Carrot family)
-0.56 to -0.76	(7)	<7>	1	-	-	5	-	4	-	5	Unknown

Key	Specimens
1 =	1 to 25
2 =	26 to 50
3 =	51 to 75
4 =	76 to 100
5 =	101+

CONCLUSIONS AND RECOMMENDATIONS

The overarching aim of the environmental archaeological assessment was to evaluate the potential of the sedimentary sequence for reconstructing the environmental history of the site and its environs. In particular, the assessment focussed on evaluating the potential for quantifying the impact of human activities on the environment, and the response of humans to natural environmental change. The results indicate that sedimentation commenced sometime before 1730-1720 cal BC and 1690-1510 cal BC (3680-3660 and 3640-3460 cal BP), during the Middle Bronze Age, and continued after 1380-1330 and 1330-1120 cal BC (3330-3280 and 3280-3060 cal BP). The lower sediments as a whole are consistent with accumulation in the various quiet water depositional environments characteristic of lowland river channels and floodplains in southeast England. The bulk of the organic alluvial sequence, dated between 1730 cal BC and 1120 cal BC proves to be later than the sequence described by Chambers *et al* (1996) from Enfield in the Lea Valley and to be equivalent to part only of the longer sequence described by Green *et al* (2006) from Edmonton, also in the Lea valley. The Hertford Road organic sequence does however overlap in age with several of the Middle Holocene organic sequences recorded by Sidell *et al* (2000) at sites in the valley of the Thames between Westminster and Canning Town. The overlying much less organic sediments resemble later Holocene, mineral-rich floodplain deposits widely recorded in the river valleys of lowland Britain. They reflect increased sediment yields and at Hertford Road contain evidence of proximity to estuarine depositional environments.

The pollen and plant macrofossil data support this interpretation, with evidence in the lower part of the alluvial sequence for standing water and a rich wetland plant community comprising alder woodland, forming possible fen carr, with an understorey of sedges and grasses. On nearby dryland, oak, elm and lime woodland dominated the vegetation cover. In the upper part of the alluvial sequence, the pollen record shows an overall increase in non-arboreal taxa, indicating a transition towards aquatic and possibly estuarine conditions, and an environment significantly modified by Bronze Age and later human activities, which involved woodland clearance, cultivation and grassland formation, rather than the consequences of natural environmental change.

It is recommended that no further work is carried out at Hertford Road for the following reasons:

1. The alluvial sequence at Hertford Road, spanning the Middle to Late Bronze Age period, is a relatively short sequence when compared to other sites in the Lower Thames and Lea Valleys (dating in some cases from the Mesolithic/Early Neolithic)
2. The preservation and concentration of pollen and plant macrofossils is variable indicating that an incomplete vegetation history may be gained for the site
3. The pollen assessment indicates a vegetation history analogous to other sites in the Lower Thames Valley during this time

4. The site at Hertford Road contains no archaeological evidence with which the environmental data can be directly correlated.

REFERENCES

Anderberg, A. L. (1994) *Atlas of Seeds: Part 4*, Swedish Museum of Natural History, Risbergs Trycheri AB. Sweden: Uddevalla.

Bengtsson, L. and Enell, M. (1986) Chemical analysis, In (B.E. Berglund ed.) *Handbook of Holocene Palaeoecology and Palaeohydrology,* 423-454. Chichester: Wiley

Berggren, G. (1981) *Atlas of Seeds: Part 3,* Swedish Museum of Natural History. Sweden: Berlings, Arlöv.

The British Geological Survey (1996) 1:50,000 Sheet 257 Romford.

Bronk Ramsey, C. (1995) Radiocarbon calibration and analysis of stratigraphy: The Oxcal program. *Radiocarbon* **37 (2)**, 425-430.

Bronk Ramsey, C. (2001) Development of the Radiocarbon Program Oxcal, *Radiocarbon* **43 (2a)**, 355-363.

Bronk Ramsey, C. (2007) Deposition models for chronological records. *Quaternary Science Reviews* (INTIMATE special issue; http://c14.arch.ox.ac.uk/oxcal/ref.html#Ramsey:2007), in press.

Chambers, F.M., Mighall, T.M. and Keen, D.H. (1996) Early Holocene pollen and molluscan records from Enfield lock, Middlesex. *Proceedings of the Geologists' Association*, **107**, 1-14.

Green, C.P., Branch, N., Swindle, G.E. and Preece, R. (2006) *Advent Way, Edmonton, (Site Code: AWE06) London Borough of Enfield: Environmental Archaeological Assessment*. Unpublished ArchaeoScape Report.

Haslam, A (2007) *An Archaeological Evaluation at Riverside Works, Hertford Road, Barking (Site Code: HET07)*. Pre-Construct Archaeology Unpublished Report.

Moore, P.D., Webb, J.A. and Collinson, M.E. (1991) *Pollen Analysis* (2nd Ed.). Oxford: Blackwell.

Preece, R.C. and Robinson, J.E. (1982) Mollusc, Ostracod and plant remains from early postglacial deposits near Staines. *London Naturalist*, **61**, 6-15.

Reille, M. (1992) *Pollen et Spores d'Europe et d'Afrique du Nord*, Laboratoire de Botanique Historique et Palynologie: Marseille.

Sidell, J., Wilkinson, K., Scaife, R. and Cameron, N. (2000) *The Holocene evolution of the London Thames*. Museum of London Archaeology Service, Monograph 5.

Stace, C. (1997) *New Flora of the British Isles* (2nd ed.). Cambridge: Cambridge University Press.

Reimer, P.J., Baille, M.G.L., Bard, E., Bayliss, A., Beck, J.W., Bertrand, Blackwell, P.G., Buck, C.E., Burr, G.S., Cutler, K.B., Damon, P.E., Edwards, R.L., Fairbanks, R.G., Friedrich, M., Guilderson, T.P., Hogg, A.G., Hughen, K.A., Kromer, B., McCormac, G., Manning, S., Bronk Ramsey, C., Reimer, R.W., Remmele, S., Southon, J.R., Stuiver, M., Talamo, S., Taylor, F.W., van der Plicht, J. and Weyhenmeyer, C.E. (2004) IntCal04 terrestrial radiocarbon age calibration, 0-26 ca

APPENDIX 4 – OASIS FORM

3.1. OASIS ID: preconst1-25602

Project details

Project name	Riverside Works, Hertford Road, Barking
Short description of the project	An archaeological evaluation was undertaken at the Riverside Works, Hertford Road, Barking between the 14th and 23rd of March 2007. This evaluation, consisting of one stepped trench, revealed an alluvial sequence suggestive of a quiet water depositional environment believed to have been associated with the River Roding. The natural on the site consisted of River Terrace Gravels. Two worked wooden stakes were discovered to have been driven into a peaty horizon. A collapsed tree was also recorded as overlying the peat and sealed by alluvium.
Project dates	Start: 14-03-2007 End: 23-03-2007
Previous/future work	No / Not known
Any associated project reference codes	HET 07 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Vacant Land 1 - Vacant land previously developed
Significant Finds	STAKES Bronze Age

Project location

Country	England
Site location	GREATER LONDON BARKING AND DAGENHAM BARKING Riverside Works, Hertford Road, Barking
Postcode	IG11
Study area	3000.00 Square metres
Site coordinates	TQ 4350 8436 51.5393729246 0.06942902038730 51 32 21 N 000 04 09 E Point

Height OD	Min: -1.09m Max: -1.02m

Project creators

Name of Organisation	Pre-Construct Archaeology Ltd
Project brief originator	Pre-Construct Archaeology
Project design originator	Tim Bradley
Project director/manager	Tim Bradley
Project supervisor	Alexis Haslam
Name of sponsor/funding body	Big Yellow Group PLC

Project archives

Physical Archive recipient	LAARC
Physical Contents	'Environmental','Wood'
Digital Archive recipient	LAARC
Digital Contents	'Environmental','Stratigraphic','Survey','Wood'
Digital Media available	'Spreadsheets','Survey','Text'
Paper Archive recipient	LAARC
Paper Contents	'Environmental','Wood'
Paper Media available	'Context sheet','Correspondence','Diary','Drawing','Matrices','Plan','Report','Section','Survey

','Unpublished Text'

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	An Archaeological Evaluation at the Riverside Works, Hertford Road, Barking
Author(s)/Editor(s)	Haslam, A.
Date	2007
Issuer or publisher	Pre-Construct Archaeology Ltd
Place of issue or publication	Brockley

Entered by	A. Haslam (ahaslam@pre-construct.com)
Entered on	9 June 2008