SITE 26, CARPENTERS ROAD
Newham
E15

London Borough of Newham

An archaeological evaluation report

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PRE-CONSTRUCT ARCHAEOLOGY

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Newham
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Summary (non-technical)

This report presents the results of an archaeological evaluation carried out by the Museum of London Archaeology Service and Pre-Construct Archaeology Limited (MoLAS-PCA) on the site of the proposed EAST-2 (EDFE-2) and WEST-2 (NGT-2) shafts, a small rescue excavation around the WEST-2 shaft and 3 evaluation trenches across the site, at Warton Road, Newham, London, E15. The report was commissioned from MoLAS-PCA by the London Development Agency. The results of all of these archaeological investigations are considered and reported here as an evaluation of the whole site which has helped to refine the initial assessment of the site's archaeological potential.

The evaluation has shown that the site was situated on high and dry land, with evidence for occupation from the Mesolithic to the Early Iron Age. Firstly, by small mobile groups in the Mesolithic–early Neolithic using temporary camps, exploiting the adjacent wetland resources. Such activity is likely to have taken place within a wider occupied landscape. Subsequently Bronze Age sedentary settlement took place, possibly involving agricultural activity. The evaluation recovered no evidence for the presence of the London to Colchester Roman road, previously projected to run across the site.

The prehistoric deposits were sealed by alluvial clays of a possible post Roman date. The alluvial clays were deposited by overbank flooding; a pollen assessment from these deposits suggests the on-site landscape consisted of damp grass sedge fen, with periods of standing water. The surrounding landscape was predominately open with evidence of cereal cultivation. This environment continued into historic times.

Nineteenth century clay extraction pits truncated areas of the site, specifically in the northern and eastern parts. These correspond to the "Brick Fields" depicted by the 1867 Ordnance Survey Map for the site.

On the north-eastern part of the site the clay pits truncated a Saxon pond feature and humic clay deposit. An assessment of the pollen and diatoms from the humic clay suggested that the deposit represents a marginal marshy channel area. Due to the severe truncation of the deposit it was not possible to identify whether this developed within an isolated waterlogged hollow, or was part of a wider wetland that once existed across the entire site.

Preliminary assessment of the palaeoenvironmental remains indicated that the pond fill and the humic clay contained the highest levels of ecofact remains within the site. This report concludes that similar deposits may be encountered across this part of the site, and should be adequately sampled. However, if no such deposit sequences are encountered during further field work, it is recommended that full analysis be undertaken on the present samples. These will provide an opportunity to investigate the landscape characteristics that existed within the Lea Valley during the Saxon period; a period which, at present, is poorly understood.

Any ground remediation and other works extending below c *2m OD will encounter deposits of archaeological and archaeo-environmental significance. It is recommended that the settlement activity encountered on the site be tied into other known archaeological sites along the Lea Valley so as to understand patterns of prehistoric human settlement, migration and occupation.*

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1 Introduction

1.1 Site background

The archaeological evaluation took place on a piece of land immediately to the south of the junction of Warton Road and Carpenters Road, within Site 26 (part of Construction Zone 1) of the Olympic 2012 and Lower Lea Valley Regeneration Masterplan. The area of evaluation, hereafter called 'the site', is bounded by Warton Road to the north and west and Carpenters Road to the north and east and a railway line viaduct to the south (see Fig 1). The OS National Grid References for the centre of the shafts are EAST-2 538218 184137 and WEST-2 538160 184033 and the centre of the site is 538196 184065. The ground level across the site was level at c.4.10m OD. The site code is OL-00305.

As part of the Powerlines Undergrounding Scheme access shafts were sunk to access the cable tunnels. An *Archaeological Impact Assessment* has been prepared detailing the natural geology, archaeological and historical background of the site, and the initial interpretation of its archaeological potential (MoLAS-PCA 2005a). A *Method Statement* was subsequently prepared (MoLAS-PCA 2005b), which formed the project design for the evaluation. The evaluation comprised two trenches centred on Undergrounding shafts East-2 and West-2 (Fig 3).

Archaeological features were found around shaft West-2 and a subsequent mitigation excavation was conducted at that location in advance of the shaft construction works. In addition the opportunity was taken to excavate a further three evaluation trenches across the site prior to commencement of Undergrounding construction works. These three evaluation trenches were set out in a pattern designed to locate the presence of the Roman road believed to cross the valley in this vicinity. All archaeological works were undertaken in September and October 2005. All the archaeological investigations are considered and reported here as a single evaluation exercise for the whole site.

1.2 Planning and legislative framework

A general background to the planning and legislative framework covering all sites included in the Lower Lea Valley Olympic applications was included in the previous *Environmental Statement* (Capita Symonds 2004).

1.3 Planning background

In accordance with local and national policies, archaeological evaluation of the site in advance of its redevelopment was required as part of the planning process. Evaluation is intended to define the archaeological potential and significance of any deposits present on the site, so that the local authority can formulate responses appropriate to any identified archaeological resource.

The London Borough of Newham Powerlines Undergrounding Planning Application No. P/05/0824, Conditions 33 & 34 are:

> **33**. Prior to the commencement of the Remediation Works a programme of archaeological investigation and work shall be completed in accordance with a written scheme for investigation and work which has been submitted and approved in writing by the Local Planning Authority. Such a scheme shall comprise a methodology for recording and historic analysis, which considers building structure, architectural detail and archaeological evidence.
>
> Reason: Archaeological remains may survive on the site. The Local Planning Authority wishes to secure the provision of archaeological investigation and the subsequent recording of any remains prior to development, in accordance with the guidance and model condition set out in PPG15.
>
> **34**. Prior to the commencement of the Main Works a programme of archaeological investigation and work shall be completed in accordance with a written scheme for investigation and work which has been submitted and approved in writing by the Local Planning Authority. Such a scheme shall comprise a methodology for recording and historic analysis, which considers building structure, architectural detail and archaeological evidence.
>
> Reason: Archaeological remains may survive on the site. The Local Planning Authority wishes to secure the provision of archaeological investigation and the subsequent recording of any remains prior to development, in accordance with the guidance and model condition set out in PPG15.

1.4 Origin and scope of the report

This report was commissioned from MoLAS-PCA by the London Development Agency (LDA). The report has been prepared within the terms of the relevant Standard specified by the Institute of Field Archaeologists (IFA 2001). Field evaluation, and the *Evaluation Report* which comments on the results of that exercise, are defined in the most recent English Heritage guidelines (English Heritage, 1998) as intended to provide information about the archaeological resource in order to contribute to the:

- formulation of a strategy for the preservation or management of those remains; and/or
- formulation of an appropriate response or mitigation strategy to planning applications or other proposals which may adversely affect such archaeological remains, or enhance them; and/or
- formulation of a proposal for further archaeological investigations within a programme of research

1.5 Archaeological background

1.5.1 Modern topography

The site is located on the floodplain (valley floor) of the River Lea, *c* 3.5km to the north of its confluence with the River Thames. The modern topography and drainage of the area has been much modified by man and bears little resemblance to the landscape of the site in historic and prehistoric times. Ground raising prior to industrial development has masked the natural landsurface by several metres of ‘made ground'. Similarly, very little remains in the modern landscape of the natural course of the Lea, which today flows through a series of mostly man-made canalised and culverted channels, including the Waterworks River that is followed by the western boundary of the site.

1.5.2 Geology

(Words in Bold typeface are further explained in Appendix 1: Glossary)

The British Geological Survey Sheet 256, North London shows that the site lies on **alluvium** of Lea Valley floodplain, which represents a range of different wetland and dryland environments that existed on the floodplain from the Mesolithic period onwards. Although little archaeological work has previously been undertaken in the local area, excavation in the valley of the Thames and its tributaries suggests that archaeological remains of the prehistoric and later historic period are likely to lie within the alluvium.

Gravels, deposited following the scouring-out of the valley floor during the Palaeolithic period (the **Pleistocene**) underlie the alluvium. The base of the gravels or surface of Tertiary bedrock (which in this area is variably London Clay and Woolwich and Reading Beds) acts as the bottom line for deposits of archaeological interest.

In contrast, archaeology from later periods is likely to lie at the surface of the natural alluvial deposits, or be cut into them.

1.5.3 Buried landscape and its archaeological significance

A number of different sources of geotechnical information have provided a fairly clear picture of the buried topography that exists in this part of the Lea Valley. The evaluation carried out on Site 25 a few hundred metres to the northwest, indicates the nature and type of deposits that exist towards the northern periphery of the site (Howell *et al* 2005). The type of deposits that could be expected to occur within the site boundary was indicated from borehole data taken from the *Lea Valley Mapping Project* (Burton, *et al*, 2004), and more recently from geotechnical interventions undertaken by White Young Green (White Young Green, 2005).

This data demonstrated that the site lies on a promontory of higher ground, which extends out eastwards into the lower lying areas of the floodplain (see Fig 2). Recent work has demonstrated that this lower lying terrace extends out further towards the south. A Roman ditch feature was recorded in this area cutting through a dry soil horizon, which overlay the floodplain gravels. The ditch also contained a number of cremation vessels buried within the base of the ditch. The ditch feature was sealed by alluvial clays of a post-Roman date (Perry, *in prep*).

Towards the north of the site a tributary channel, identified during the work on Site 25, meets a confluence with the main channel of the Lea. A number of ^{14}C dates taken from the organic deposits associated with the tributary channel indicated that during the early part of the Holocene the channel flowed close to the area bound by Site 26, but from the Neolithic onwards the channel gradually migrated towards the northwest. The main deeper channel of the River Lea lies towards the west of the site.

1.5.3.1 Pleistocene

The buried topography reflects the dramatic landscape processes that took place towards the end of the Pleistocene during the cold stage known as the **Devensian** and in particular at the end of this cold stage during the **Late Glacial** period, immediately prior to the climatic warming represented by the Holocene. The climate fluctuated during the Devensian cold stage, but the most dramatic landscape processes took place in periods when the frozen Ice Age landscape thawed.

Towards the end of the Devensian, a fast flowing arctic river, charged with melt water, carved out the present floodplain of the Lea by down-cutting from its earlier, higher, level and depositing river gravels across the valley floor. These earlier higher levels of the River Lea survive to the far east of the site where the **Kempton Park** gravels form the slope of the valley side. These were deposited during the early to middle Devensian Glacial period sometime between 30 000 to 140 000 BP.

The gravels deposited across the valley floor (Lea Valley Gravels) probably represent more than one aggradational event that took place sometime between the Late Devensian and Early Holocene periods. The low terrace, over which the site is situated, extends along the eastern side of the valley from Temple Mills to the Stratford area. Fine-grained organic deposits within this low terrace have been radiocarbon dated to around 19 600 BP. This suggests that the terrace was deposited during an aggradational event sometime after the last Glacial maximum around 18,000 BP. This terrace essentially formed a dry area of land following downcutting in the Late Glacial period, over which early Holocene dry land soils began to develop. Across the site this low terrace exists at around 2m OD, and forms a fairly flat and regular surface.

To the west of the site a downcutting event lead to deeper erosion of the underlying bedrock, and the deposition of thicker gravel units. This represents the deeper channel incision that took place at the very end of the Late Glacial period between 15 000 and 10 000 BP. The gravel surface in this area occurs at around –1 to –2 m OD. Fine grained organic deposits which represented a marshy backwater environment, were found to exist within these lower lying gravels and were radiocarbon dated to 10 140 +/- 60 BP (Corcoran, 2003). These deposits occurred at –4.5m OD.

The low gravel terrace across the site may also contain such fine-grained organic deposits, which would allow for the reconstruction of the Late Palaeolithic environment that existed towards the end of the Devensian period. Such deposits are likely to occur at a considerable depth within the gravel unit.

1.5.3.2 Holocene

For the most part of the Holocene period the area would have been high and dry and provided a suitable location for occupation due to its proximity to the River Lea. Dry soil horizons would have begun to form within the older Pleistocene deposits, although very little soil formation or sediment accumulation appears to have occurred across the area. Sometime after the Roman period an increase in river levels lead to the deposition of alluvial clays above the dry soil horizons. Alluvial accumulation continued into the post-medieval period, raising the ground level and giving rise to a grass meadow environment into the modern period.

1.5.4 Prehistoric cultural activity

There are no known sites or finds of prehistoric date within the site. Evidence from a number of sites in the Lea Valley indicates however that it was well populated during the both the Bronze Age (1,800–600 BC) and Iron Age (600 BC–AD43) periods. These periods, along with the Neolithic (4000–1800BC), were characterised by forest clearance, permanent settlement and farming, with increasing population throughout each period. The gravel terrace beside the River Lea would have been attractive for early settlers, the gravels producing light, fertile and well-drained soils, with close access to the rivers for food resources and transport. The Upper Lea Valley has evidence for Bronze Age/Iron Age settlement in the form of crannogs; dwellings set on piles driven into marginal and wetlands. Although no such finds are as yet known from the vicinity of the site, the possibility of similar structures having been present within the Lower Lea Valley cannot be discounted (MoLAS-PCA 2005).

Marshland areas, prior to subsequent reclamation in the medieval period (possibly earlier) would have been exploited for varied and predictable resources such as food, from hunting and fishing, clay for pottery manufacture, reeds for basketry, along with rough grazing. Well-preserved Bronze Age and later timber structures and/or trackways such as those found elsewhere in the valley provided access across boggy areas between the areas of higher ground (MoLAS-PCA 2005).

The low terrace on which the site is situated, is likely to have been dry land in the Mesolithic, when the western part of the valley floor was probably marshy and crossed by watercourses. This would have offered contrasting resource potential to Mesolithic hunter-gather-fishers. It would subsequently have remained dry land as the lower lying western part of the valley floor became progressively waterlogged later in the prehistoric period and was probably suitable for occupation and cultivation, though perhaps with periods of seasonal flooding, until the medieval period or later (MoLAS-PCA 2005).

Later Bronze Age activity was recorded at Stratford Market Depot in the form of pottery and flint assemblages. This could be typical of the Later Bronze Age pattern. Only thin alluvium exists above the pre Holocene surface in this area. The alluvium is likely to be accretionary soil, very slowly building up as a result of seasonal overbank flooding. The location and stratigraphy suggest that relatively dry land is likely to have existed in this location until the late Prehistoric period, if not later (Corcoran 2000a; 2001). Thus the low river terrace would have provided an ideal location for occupation, with good access to the wetland area for grazing (MoLAS-PCA 2005).

Ditches and pits recorded in archaeological evaluation trenches in the eastern part of the Stratford Box (Site Code SBX00: an underground structure associated with the Channel Tunnel Rail Link scheme), to the north-east of the site suggest local dryland occupation for much of the prehistoric period. Tributary channels of the Lea are known to have drained across the low terrace and in the area of the present site where former channels of the Channelsea River are likely to have existed. Prehistoric activity associated with the channels of a tributary stream was recently found during archaeological excavation in the western part of the Stratford Box. Driven stakes and wood off-cuts were dated to both the Bronze and Middle Iron Age (Wessex Archaeology 2003). These lay on the surface of the gravel at c. 1.09m OD (MoLAS-PCA 2005).

Prehistoric occupation evidence, such as that found on excavations at the Stratford Box site, may be found in this part of the site. Both the site and SBX00 have similar landscape characteristics (MoLAS-PCA 2005).

An archaeological excavation at 40 Warton Road (Site Code WON05), south-east of the site, conducted by Sutton Archaeological Services, encountered an 'L' shaped ditch which contained a series of cremations and possibly two inhumations that were dated to the Late Iron Age. This ditch was interpreted as defining the lower marshy area of the Lea valley to the south-west and the higher and drier ground to the north-east. Other associated cut features, some of which were structural, were also found (David Divers *pers comm*.).

A sequence of alluvial deposits (lying between 1-3m OD) was found at Site 25, c. 400m north west of the site, that record the lateral migration of a tributary channel of the Lea during the prehistoric period, which has been dated by five radiocarbon samples. The deposits represent the evolving prehistoric and historic landscape and were recorded in each trench. The base of the alluvial sequence was not seen, but previous geotechnical boreholes suggest it lies between 0-0.5m OD. Butchered bone was found in a peaty land surface of Neolithic date and worked wood, dating to the Bronze Age, had been washed-up as driftwood at the margins of the later river. Isolated finds of Neolithic and Bronze Age axes have been found to the west of the site. Further axes of Bronze Age date have been found to the east of the site (MoLAS-PCA 2005).

The modern Waterworks River (the course of which probably reflects historic human activity) lies close to the western boundary of the site. However, the evidence suggests that, in this part of the Lea Valley, the ancient river flowed down the central part of the floodplain, with its main axis to the west of the present Waterworks River (MoLAS-PCA 2005).

1.5.5 Roman

There are no known sites or finds of Roman date within the site. Within a decade of their arrival in AD 43 the Romans established the town of Londinium (London) in the approximate area of the modern City of London and in the area of Southwark, with a bridge crossing just east of the modern London Bridge. During this period the site lay *c* 5km to the north-east of Londinium and probably within its *territorium*, the eastern extent of which may have been defined by the River Lea (Lakin *et al*., 2002, 2). The *territorium* would have been a distinct area controlled by the city as opposed to the economic hinterland beyond. Evidence from archaeological investigations in East London suggests that this was area was a managed agricultural landscape of scattered farmsteads and villas supplying produce to London (MoLAS-PCA 2005).

Settlement and land use in the general area would have been strongly influenced by the establishment of Londinium as a major city, port and provincial capital by the 2nd century AD. Small, nucleated settlements and an organised system of larger villa estates typically located along the major roads, acted both as markets and as producers supplying *Londinium*, particularly with agricultural produce (MoLAS 2000a, 150). The prosperity of these settlements appear to have followed the general socio-economic trends that characterise the Roman period; prosperity in the early 2nd century followed by a general decline in the late 2nd to early 3rd century and a brief revival in the 4th century (MoLAS 2000a, 151) (MoLAS-PCA 2005).

It is probable that some of the upper levels of the buried landscapes discussed above might have formed in the Roman period (MoLAS-PCA 2005).

The River Lea was probably used to transport agricultural produce to the London area and in the late period, with pottery from Much Hadham (via the River Stort). Excavations have established that a Roman settlement existed at Old Ford, *c* 400m to the south-west of the area of proposed development, in the form of domestic and industrial structures, posthole, pits, and field ditches in the area of Lefevre Walk (Site Code LEK95), with peripheral activity closer to the River Lea in the form of quarry pits and residual Roman pottery. The presence of a number of earlier Roman burials indicates an occupation of the area over a considerable period (MoLAS-PCA 2005).

The previously mentioned excavation at 40 Warton Road by Sutton Archaeological Services (Site Code WNH05) also encountered a Roman phase to the sites occupation. Roman ditches, one of which was on a similar alignment to the earlier Iron Age one, were revealed. Within one of these ditches an inhumation was found with associated samian bowl, glass vessel and small flagon grave goods. A Roman dump layer was also found, cut into which were a number of features including a baby burial, a possible horse burial, a dog burial and a cremation (David Divers *pers comm*.).

Excavations at the Goods Yard, Old Ford Road (Site Code OFD73), 413-417 Wick Lane, (Site Code OFF85) and Lefevre Walk Phase 1 (Site Code LEK95), to the south-west uncovered sections of the Roman London to Colchester road. Based on these observations, the projected line of the road crosses the site, and evidence of its construction may exist.

The uncertainty of the exact route of the road demonstrates that it was not absolutely straight, and no doubt was aligned to take advantage of the local topographic differences. However, despite this deviation it is clear that the projected road alignment passes close to the southern limit of the site (MoLAS-PCA 2005).

Not enough is yet known about the nature of the river and valley floor in the Roman period to suggest whether a river crossing in this area was feasible and what form such a crossing may have taken. However, a longitudinal transect constructed for the Lea Valley Mapping Project assessment report (Burton et al 2004, 148) provided an initial reconstruction of the downstream gradient of the Lea in the past. It suggests that in the confluence area with the Thames the valley floor was relatively flat with a gravel surface around –2.5m OD. A step up to a general gravel surface level of around 0m OD (i.e. a **knickpoint**) occurs roughly where the railway line crosses the valley, just south of Mill Meads. This is also roughly where the multiple threaded modern river in the Bow Back Rivers area converges into a single channel. It has been suggested that these back rivers represent mill leats, with the line of mills depicted on historic maps in the Mill Meads area built to exploit the drop in gradient at this point (Richard Malt pers comm.). A second knickpoint occurs at roughly the point where the Bow to Stratford railway line crosses the Northern Outfall Sewer, which coincides with a constriction in the extent of the deepest part of the valley floor. At this point the general gravel surface level steps up to around 1m OD, and from here upstream as far as Tottenham the dip of the valley floor has a steeper gradient (c. 1:1800).

These characteristics of the valley floor influenced the Holocene river regime and, as a result, may have also had a bearing on the siting of a Roman (or later) river crossing. The river gradient and its knickpoints will have influenced the upstream migration of tidal water and it is possible that the location of the tidal head had a bearing on the position of a river crossing, as it appears to have done in the City of London. In addition, the location of the river crossing could well have changed through time as the characteristics of the river between Old Ford and Stratford itself evolved (MoLAS-PCA 2005).

It is likely that many of these issues can be addressed by palaeo-environmental evidence from the alluvium of the valley floor, which will supplement more tangible archaeological evidence from excavated roads, bridge piers and jetties.

1.5.6 Saxon

There is no evidence for early medieval activity in the immediate vicinity of the site. It is probable that some of the upper levels of the buried landscapes discussed above might have formed in the Saxon period. Following the withdrawal of the army in AD410, the Roman city was apparently abandoned and the main early to mid Saxon settlement of *Lundenwic* shifted westwards to what are now Covent Garden and the Strand (MoLAS 2000, 182). The proposed development site would have been situated within a rural area within the huge manor (estate) of Stepney (*Stebenhythe*), which included most of the area of modern Tower Hamlets. It was probably part of the original foundation endowment of the Bishopric of London in AD 604 (McDonnell 1978, 17).

Old Ford is first mentioned in AD958. Hackney to the north is possibly a Saxon place-name of Saxon origin, meaning either ‘well-watered land or marsh belonging to an individual named Haca’, or possibly indicating a place of battle by the River Lea (Weinreb and Hibbert 1993, 359). Stratford means *fording place on the old street,* which probably refers to the Roman road/causeway across the marshes between Old Ford and Stratford. While the road was probably not maintained, it is likely to have continued in use throughout this period (Vince 1990, 120).

In the 9th century Londinium was reoccupied and probably fortified within the Roman walls as part of a defensive system established by Alfred against the Danes. The settlement of *Lundenburh* then formed the basis of the medieval city. Tradition has it that after Danish marauders sailed up the River Lea to Hertford, King Alfred cut a series of channels in this part of the Lea, lowering the water level and forcing the enemy to leave their vessels aground and therefore prevent their escape (Maddocks 1933). Alternatively, and perhaps more likely however, the channels may have been adapted for use as millstreams (Barber *et al* 2004).

Evidence for Saxon activity close to the site is associated with the channels of a tributary stream of the Lea, and was recently uncovered during archaeological excavation in the western part of the Stratford Box, Leyton Road (Stratford Station), Stratford New Town, E15 (SBX00), where a mid to late Saxon stone and timber bridge abutment/jetty was recorded. This had been constructed from timber piles extending out into the tributaries’ channel, which were enclosed by a masonry superstructure of flint and limestone. Two of the timber piles dated to the mid-Saxon period (AD 650-770 and AD 600-800). North of the bridge/jetty were a similarly dated bundle of wound wattle rods covering part of the channel. In addition, a wattle hurdle panel was recovered within the channel itself, downstream from the bridge/jetty (Wessex Archaeology 2003).

Otherwise, the evidence for specific Saxon period activity in the area of the site is limited, although the Lea Valley’s watercourses certainly were in use during this period (e.g. substantial driven stakes or piles with leather waste and late-Saxon pottery have been found along the Channelsea (HW-GY94: Stratford Station (Jubilee Line), Gibbin's Yard, Stratford, E15, 600m east of the site).

1.5.7 Medieval

There are no known sites or finds dated to the later medieval period within the area of proposed development. As with much of land in East London, it fell within Stepney manor and was held the bishop of London (see above) and is recorded as such in Domesday Book (AD1086). Subsequent bishops owned this extensive manor, with several tenanted sub-manors, until the Reformation in the mid 16th century (McDonnell 1978, 17).

As with earlier periods, the higher ground of the gravel terrace would have been the first choice for settlement, providing dry and fertile land with good assess to the river and marsh. The settlements of Hackney Wick, Old Ford and Bow were located on the very edge of the terrace.

Around AD1100, the principal crossing point over the valley shifted further south, from the line of the old Roman road to the existing High Street, linking the settlements at Bow and Stratford on the west and east sides of the valley (Vince 1990, 120). This entailed the construction of an arched stone bridge that was at the time a major engineering project. Old Ford Road seems to have retained its importance even after this shift (MoLAS-PCA 2005).

It is probable that some of the upper levels of buried landscapes discussed above might have formed in the medieval period (MoLAS-PCA 2005).

The major focus of medieval activity in the area was c. 1km to the south-east of the site, on the Stratford marshes where, in 1135, near modern Abbey Road, the Cistercian Abbey of Stratford Langthorne was founded. The Cistercian Order was renowned for its feats of engineering, particularly of water channels and the exploitation of waterpower, so the presence of the braided Lea tributaries was exploited from an early phase. Industry was a significant part of the Abbey's income, based on the Abbey's possession of several water mills on the rivers. The Abbot of Stratford was charged with the repair of bridges including one over the Lea at Bow Bridge (MoLAS-PCA 2005).

1.5.8 Post-medieval

Documentary sources show that the site remained as open land until the late 19th century, when industrial development, mainly associated with the perfume industry, took place (including the setting out of Carpenter's Road) – mainly in the period between the 1882 and 1899 Ordnance Survey maps. From the 1960's most of the factories went out of use and the site became derelict and took on its present post-industrial wasteland characteristics.

1.6 Aims and objectives

The following research aims and objectives were established in the *Method Statement* for the evaluation (Section 2.2) and are intended to address the research priorities established in the Museum of London's *A Research Framework for London Archaeology* (2002):

- Are there any high gravel islands, which may have been exploited in the prehistoric or early historic eras? Or do the gravels shelve gently towards the river?
- Is there any peat on the site which can inform the palaeoenvironmental understanding of the ancient landscapes?
- Is there evidence for prehistoric human exploitation of the landscape? If so is it possible to characterise the status of occupation or land use exploitation?
- Is there evidence for the London-Colchester Roman road? Does it share similar characteristics to the fragments excavated to the west at Old Ford? What is the nature of the landscape that is adjacent to the road and some distance from it?
- What evidence is there for post-Roman exploitation, in particular is there evidence for water inundation and water management? If so how are these activities characterised?
- Are there any in situ deposits of archaeological significance within the made ground or is it all of $19^{th}/20^{th}$ century dump and make-up deposits?
- Is there evidence of pre-19^{th} century industrial features?
- Has the alluvial clay been removed from the eastern part of the site?
- What is the boundary for the edge of the brickearth extraction quarry?
- Can the gravels be reached by the evaluation trench and has its surface been severely truncated?

2 The evaluation

2.1 Methodology

All archaeological excavation and monitoring during the evaluation and subsequent mitigation excavation were carried out by a joint MoLAS-PCA team in accordance with the *Method Statement* (MoLAS-PCA 2005b).

Two evaluation trenches were excavated, centred over the position of the proposed observation shafts (see Fig 3) measuring 7m x 7m at the top. Because of the discovery of some prehistoric archaeological features a subsequent mitigation excavation area was opened and reduced to the level of known archaeological features, extending 20m x 15m around the area of the trench at shaft West-2. At the East-2 evaluation trench a ditch was found containing well-preserved organic remains. As a mitigation exercise the trench was widened to allow the width of the ditch to be established and recorded and a suite of environmental samples to be taken.

In addition a further three evaluation trenches were excavated so as to evaluate the rest of the site. Trench 1 measured 60m x 6m, trench 2 60m x 6m and trench 3 40m x 6m. It is extrapolated that the Roman London–Colchester road may pass through, or close to, the site on a northwest-southeast alignment. These trenches were positioned to give coverage across the whole of the site while intersecting the possible line of this road, allowing its presence or absence on this site to be determined.

A mechanical excavator with a toothless bucket was supplied by the main contractors, and was used under archaeological supervision to reduce the modern overburden and alluvial layers until the archaeological horizon was reached. All trenches were stepped for safety at c.1.00m below surface level.

The evaluation trenches and excavation area were located by a surveyor. This information was electronically collated and plotted onto the OS grid. Levels were triangulated from an Ordnance Survey benchmark on Warton Road, the value of which was 4.37m OD.

A written and drawn record of all archaeological deposits encountered was made in accordance with the principle set out in the MoLAS site-recording manual (MoLAS, 1994).

The trench sections were examined by a geoarchaeologist who provided provisional interpretations of the alluvial deposits excavated and selected representative (ie: ‘typical’) profiles, for more detailed recording and sampling. Overlapping monolith tins and an adjacent column of bulk samples, together with spot samples for radiocarbon dating were taken for off-site examination. Monoliths {4}, {5}, {13} and {14} (forming 3 profiles) were selected for further pollen and diatom analysis. Pollen samples were given the prefix ‘P’ and diatom samples the prefix ‘D’. The sampling profiles are illustrated in Fig 8, Fig 9.

The stratigraphic data from the evaluation trenches and the previous geotechnical investigation has been inputted into the Olympic Site investigation Rockworks project with the prefix ‘OL-00305’

The site has produced: 6 trench location plan; 72 context records; 10 section drawings at 1:20 and 1:10; and digital photographs of every trench, together with standard 35mm slide and black and white print shots of the site in general. In addition 2 boxes of finds, 6 monoliths (forming 4 profiles), 17 bulk samples and 4 samples for radiocarbon dating were recovered from the site. The site finds and records can be found under the site code OL-00305 in the MoL archive.

2.2 Results of the evaluation

A sequence of natural gravel overlain by the buried 'soil horizon' was recorded in most trenches. Features providing evidence of settlement activity during the Late Bronze Age/Early Iron Age were encountered within the south-western area of the site. These were sealed by alluvial deposits, recorded in every trench, associated with seasonal flooding of the wetland periphery. Nineteenth century clay extraction/quarrying took place across the site, which truncated the alluvial clay deposits often to the top of the natural gravels. These were all sealed by various deposits of mixed 20th-century made ground. Plans and sections of the trenches are illustrated in Fig 4, Fig 5, Fig 6 and Fig 7.

Note: context numbers are noted thus with square brackets [xx]; environmental sample numbers are noted thus {xx}.

2.2.1 Trench sequences

2.2.1.1 Evaluation Trench West–2 and Excavation area

Evaluation trench West–2 was excavated to a maximum depth of 2.05m below ground level (2.05m OD), where an area c.7m x 5m was exposed. The subsequent mitigation excavation, measuring 20m x 15m in area, was excavated to the level of the buried soil horizon to determine if further archaeological features survive.

Table 1: Details of depositional sequence in Evaluation Trench West-2 and Excavation area

<table>
<tr><td colspan="2">Location</td><td colspan="2">Centred over Shaft West-2</td></tr>
<tr><td colspan="2">Dimensions</td><td colspan="2">West-2: 7m x 5m in base and 2.05m deep
Exc. Area: 20m x 15m and 2.05m deep</td></tr>
<tr><td colspan="2">Modern ground level</td><td colspan="2">c.4.05m OD</td></tr>
<tr><td colspan="2">Base of modern fill</td><td colspan="2">2.76m OD</td></tr>
<tr><td colspan="2">Top of alluvium observed</td><td colspan="2">2.40m OD</td></tr>
<tr><td colspan="2">Level of base of deposits observed</td><td colspan="2">2.05m OD</td></tr>
<tr><td colspan="2">Thickness of deposits of archaeological interest (i.e soil horizon) observed</td><td colspan="2">0.40m</td></tr>
<tr><td colspan="2">Context numbers</td><td colspan="2">[1 to 9] [21 to 28]</td></tr>
<tr><td>Samples</td><td>Bulk</td><td>Sample
{6 to 12} slab samples taken adjacent to monolith {4 and 5}
{23}
{24}
{25}</td><td>Context
[6 [21] [3] [2]
[2] [3] [4]
[3] [4] [5]
[22]
[24]
[26]</td></tr>
</table>

	Monolith samples	{3 to 5}	[6] [21] [3] [2] [2] [3] [4] [3] [4] [5]

The basal flood plain gravels in cable shaft West-2 were found to occur at approximately 2m OD. The gravel surface was found to be relatively level across the exposed area. The floodplain gravels [5] consisted of a loose mid to light greyish brown, coarse to moderately coarse rounded, sub-rounded and sub-angular gravel clasts in a fine sandy clay matrix. In parts, small isolated pockets of coarse sand were visible on the gravel surface. The gravels are likely to be Pleistocene in date deposited during the last glacial maximum c. 18 000 BP in a cold climate braided river environment.

The floodplain gravels were overlain by context [4]. This deposit, which occurred at around 2.40 m OD, measuring 0.4m in thickness, consisted of a crumbly mottled light grey/brown slightly silty clay. The soil matrix contained moderate quantities of a fine sand in the lower 0.1 to 0.15m of the unit. Occasional moderate to small sized rounded, sub-rounded and sub-angular gravel clasts were noted within the deposit.

This unit appears to represent the formation of a dry weathered soil horizon above the floodplain gravels. The inclusion of the gravel clasts, which were visible throughout the entire depth of the profile, suggests that a significant amount of bioturbation has taken place disturbing the underlying gravels. This is probably as a result of root disturbance from colonising vegetation and woodland development. It is also likely that some of the silty clay component of the matrix is derived from overbank flooding associated with the early Holocene channel identified on Site 25. The general orangey brown appearance of the deposit suggests the unit has undergone a significant amount of oxidation by weathering processes. The affects of ploughing may also have been partly responsible for disturbing the underlying gravels, bringing the gravel clasts up through the profile.

Evidence for the dry soil horizon was further clarified by the presence of a number of features that appeared to cut through this horizon, sealed by the overlying alluvial clays. These included two small pits or postholes [7] and [9]. Two more post holes [25] and [27] and a curvilinear gully [23] were uncovered when the excavation area was extended. One of these features, a small pit [7], contained charcoal fragments that produced a calibrated radiocarbon date of 1380–1100 BC (Beta Analytic sample OL305 (6)-<1>). This would suggest that the area remained as a high and dry soil horizon at least until the Middle Bronze Age period. During this time the area was significantly dry enough, without any major fluvial influence from overbank flooding to allow occupation and possibly agricultural activity. The features as a whole appear to represent Late Bronze Age/Early Iron Age settlement activity that appeared to be concentrated towards the south-eastern area of the evaluation and excavation area.

The dry soil horizon was overlain by an alluvial clay [3]. This unit, which occurred at around 2.4m OD, measuring c 0.2m in thickness, consisted of a firm mid to light grey clay, with occasional manganese stained root channels; occasional calcareous flecking and occasional small gravel clasts. The unit displayed a very diffuse interface between [2] and [4], and appears to represent a transitional phase between the environments represented by both deposits.

The characteristics of context [3] suggest that conditions were generally becoming wetter with the dry soil horizon represented by context [4] becoming inundated with overbank flood deposits. This inundation is likely to have been seasonal, with ephemeral pools of shallow standing water developing during the wetter winter and autumn months. During dryer episodes the ground is likely to have remained as a dry grassland or hay meadow. The input of fine clayey flood sediments would have gradually built up this horizon forming an accretionary soil. The presence of the manganese and calcareous inclusions, points to this fluctuating dry to wet conditions, as both these inclusions require dry conditions to precipitate out from solution. The influence of overbank flooding probably made the area unsuitable for permanent occupation, although the grasslands could still have been utilised during the drier months for grazing and pasture.

Context [2], which overlies [3], consisted of a firm mid grey clay, with frequent manganese speckles and moderate quantities of small calcareous nodules. Moderate quantities of fine hair roots, molluscs, iron stained root and wormholes were also visible throughout the deposit. The deposit occurred at approximately 2.7m OD and measured up to 0.4m in thickness. This context represents the same depositional environment as [3], with an accretional soil horizon forming within overbank flood deposits.

The presence of an intermittent and possibly seasonally dry soil horizon was more evident within the deposit as indicated by the root and wormholes. On Carpenters Road the upper alluvium, which was overlain by a buried turf line, occurred at approximately 3m OD. This was interpreted as the level of the ground surface immediately prior to the industrial usage of the land, and suggests that some truncation of the original soil horizon may have taken place on Site 26.

The sequence was overlain by made ground and redeposited material [1]. The unit consisted of a mixed reddish brown/dark grey silty clay, with frequent gravel, brick/tile, oyster and clay pipe fragments. The reddish brown clay component probably represents a redeposited layer of the upper oxidised alluvial clays. A similar oxidised alluvial layer was recorded in the upper most part of the sequence at Carpenters Road. Evidence from other parts of the site suggests that the upper alluvium was quarried for brick production. The made ground is likely to represent the dumping of unwanted material and fill to reconstitute the ground level, after the clay extraction.

The natural sequence within the trench ([2]– [5]) was sampled by Monoliths {4} and {5}, with bulk slab samples taken adjacently to the monoliths {7} to {12}. The interface between the prehistoric pits fills [6] and [21] and the overlying alluvial clays [3] and [2] were sampled by monolith {3}.

2.2.1.2 Evaluation Trench East-2

Evaluation trench East-2 was excavated to a maximum depth of 2.40m below ground level (1.64m OD), where an area c. 5m x 5m was exposed.

Table 2: Details of depositional sequence in Evaluation Trench East-2 and Excavation area

Location	Centred over Shaft East-2
Dimensions	5m x 5m in base and 2.40m deep
Modern ground level	c. 4.10m OD
Base of modern fill	c. 2.5m OD

Top of alluvium observed		c. 2.3m OD	
Level of base of deposits observed		c. 1.6m OD	
Thickness of alluvium (ie: deposits of archaeological interest) observed		c. 0.6m	
Context numbers		[10 to 20] [69 to 72]	
Samples	Bulk	Sample {15} {16} {17} {18}	Context [14] [15] [11] [12]
	Radiocarbon	2 samples taken from Monolith {13} and {14}	[11] [14]
	Monolith	{13} {14}	[14] [15] [10] [11] [12] [14] [15]

The floodplain gravels within the East-2 cable shaft consisted of a mid greenish grey moderately coarse sandy clay with frequent quantities of small to moderately sized black/dark brown angular, sub-angular and sub-rounded gravel clasts [10]. The gravels occur at approximately 1.6m OD.

The height of the gravels and the characteristics differ from the gravels observed within the West-2 cable shaft. The gravels appear to be more characteristic of the Holocene gravels observed on Carpenters road Site 25. It is therefore possible that the gravels deposited within the East-2 and West-2 cable shafts may have been deposited during different aggradational events. Whereas the gravels in West-2 are likely to be Late Pleistocene in date, the gravels within East-2 could possibly date to the Late Glacial/Early Holocene period. These gravels occur at a higher depth than those recorded on Carpenters road. If the gravels observed in East-2 are of an early Holocene date, they may have been deposited in a tributary channel which ran off the higher ground into the lower lying part of the floodplain on Carpenters road. However the exposures of the gravel were too small to enable robust interpretations of their characteristics to be made. The true height of the gravels in the East-2 shaft is also uncertain, as the overlying deposits suggest that some truncation of the gravels may have occurred.

Directly over the floodplain gravels lay a soft mid brown slightly silty humic clay with frequent rooting, plant stems and reed fragments [11]. The unit occurred at c.1.95m OD, and measured 0.25m in thickness. The nature of this deposit would suggest that it was deposited in a marshy backwater environment on the margins of an active channel. The unit was sampled for radiocarbon dating (Beta Analytic sample OL26<14>1.77) which produced a calibrated date of between AD 650 to 810, placing the formation of the deposit within the Saxon period.

Context [11] was overlain by [12], a mid to light grey clay. The deposit measured c 0.3m in thickness and occurred at 2.27m OD. As with [11], the deposit would appear to be a naturally accumulating waterlain gleyed clay.

Contexts [11] and [12] were truncated by cut [13] measuring approximately 2.75m in length. The cut displayed a gradual sloping edge and a relatively flat base. The feature was infilled by a soft smooth black anaerobic clay with frequent mollusc fragments [14]. The deposit measured c 0.3m in thickness and occurred at 1.77m OD. It appears as though the waterlogged hollow, which is infilled by contexts [11] and [12], may have undergone a recutting event. It is likely that the waterlogged hollow was still visible on the ground surface immediately prior to the recutting, and provided an opportunity to re-establish a body of standing water. This attempt to create a pond may have been related to agricultural activity and the need to provide a nearby source of water for grazing animals. A radiocarbon date for the black anaerobic clay (Beta Analytic sample OL26<13>1.67) produced a calibrated date of AD 780 to 1020 suggesting a close association with the fills of the waterlogged hollow and the fill of the pond feature.

Although the pond feature may have been open for sometime, an attempt was made to infill and level the ground surface. The anaerobic clay was overlain by [15], a redeposited alluvium, [15] consisting of a friable, mottled mid brown/grey slightly silty clay with occasional root stems, mollusc fragments and manganese flecking. The deposit measured c 0.6m in thickness and occurred at 2.3m OD. Deposit [15] was overlain by [16], a firm light orangey brown clay with occasional sand lenses. Frequent brick and tile fragments were also visible throughout the deposit suggesting a later phase of moderate truncation and infilling of the area had occurred.

Further evidence of the truncated nature of the ground in East-2 was visible towards the north-western part of the trench. Contexts [11], [13], [14], [15] and [16], were cut by two straight sided features [72] and [19], measuring 0.9m in depth. The cut was infilled by a series of redeposited alluvial clays [69], [70] and [71] consisting of a firm mottled orangey brown/mid grey iron stained clay.

These features extended outside the trench to the north-west and south-east and were both encountered at c.2.60m OD. Whereas the pond cut into the natural gravel these features both cut down to the top of the natural gravel suggesting they were for clay extraction for the making of bricks and tiles. Sealing these was a layer of late 20th century made ground encountered at surface level c.4.10m OD.

2.2.1.3 Evaluation Trench 1

Evaluation trench 1 was split into two separate lengths, 1a and 1b, bisected by an underground sewer. They both shared a similar stratigraphic sequence. It was excavated to a maximum depth of 2.40m below ground level (1.7m OD).

Table 3: Details of depositional sequence in Evaluation Trench 1

Location	North-east area
Dimensions	40m by 6m (at the surface) by 2.3m deep
Modern ground level	c.4.10m OD
Base of modern fill	2.6m OD
Top of alluvium observed	2.6m OD
Level of base of deposits observed	1.80m OD
Thickness of deposits of archaeological interest (ie: soil horizon) observed	*c* 0.25m
Context numbers	[49 to 54] [57 to 61]

The basal floodplain gravels within trench 1 consisted of a fine to moderately coarse greyish brown sandy clay gravel [52] and [60]. The gravel clasts were angular, sub-angular, rounded and sub rounded in shape. The surface of the gravels occurred at 1.76m OD. The gravels were exposed to a depth of 0.20m. The gravels are likely to date to the Pleistocene\ Holocene interface (c. 15 000 to 10 000 BP) and represent the riverbed of a cold climate braided river system.

The gravels were overlain by a soft mottled light tan brown\light grey slightly silty clay [51] and [59]. The deposit contained occasional fine sand within the matrix and occasional oxidised root channels. The deposit was encountered at 2.11m OD in the north-western end and sloped down to 1.90m OD at the south-eastern end; it had an average thickness of 0.25m.

The deposit probably represents the deposition of alluvial fans due to overbank flooding following the migration of the channel which deposited the underlying gravels. The presence of sand within the matrix suggests some continued fluvial influence and the close proximity of a nearby active channel. The deposit is likely to have begun to form a relatively dry soil horizon as indicated by the oxidised root channels, although during the wetter seasons pools of standing water are likely to have developed which deposited the finer clay material from suspension.

Contexts [51] and [59] were overlain by [50], [57] and [58] which were formed from two alluvial units. The lower unit which occurred at 2.07m OD, measuring 0.2m in thickness, consisted of a firm mottled mid grey/mid brown clay with occasional iron and manganese staining and occasional oxidised root channels. The upper alluvial unit which occurred at 2.57m OD, measuring c. 0.50m in thickness, displayed similar characteristics to the lower unit, although the iron and manganese staining occurred at a higher frequency.

These alluvial units represent accretional soil horizons forming within overbank flood deposits due to an increased level of flooding across the area. The increased iron and manganese staining up through the profile indicates that with continued sedimentation building up the ground surface the soil horizons became progressively drier and therefore subject to increased oxidisation and precipitation processes.

A 19th century clay extraction pit [54] cut through these alluvial clays. This feature was cut down through the alluvium to the top of the natural gravel. It was encountered at 2.60m OD and continued northwest outside the trenches limit. Clay extraction pit [19], encountered within trench East-2, also continued into the trench 1 throughout its length and past its limit to the south-east. A mixed deposit of 20th century made ground sealed the sequence.

2.2.1.4 Evaluation Trench 2

Evaluation trench 2 was split into two separate lengths, 2a and 2b, due to the presence of live underground services. They both shared a similar stratigraphic sequence. It was excavated to a maximum depth of 3.20m below ground level (1.65m OD).

Table 4: Details of depositional sequence in Evaluation Trench 2

Location	Central area
Dimensions	50m by 6m (at the surface) by 3.20m deep
Modern ground level	4.88m OD
Base of modern fill	2.80m OD
Top of alluvium observed	2.80m OD
Level of base of deposits observed	2.80 to 1.65 m OD
Thickness of deposits of archaeological	*c* 0.60m

interest (ie: soil horizon) observed			
Context numbers		[29 to 39] [62 to 68]	
Samples	Bulk	Samples {26}	Contexts [29]

The basal deposits within the trench consisted of a mid to light brown fine sandy clay [35] and [67] with frequent fine to moderately coarse rounded, sub-rounded, sub-angular and angular gravel clasts. The deposit occurred at c.2.80m OD in the north-western area of trench 2a and at 1.65m OD in the south-eastern end of trench 2b.

The gravels differ in nature to the coarser iron stained gravels found to occur towards the southern part of the site within trenches West-2 and 3, and are more similar in characteristics to brown/grey sandy clay gravels which occur within trenches East-2 and 1B towards the northern part of the site. As discussed earlier these gravels in the central and north eastern parts of the site are likely to be later than the Pleistocene gravels which occur towards the southwest, and may represent the course of a Late Glacial/Early Holocene tributary river flowing into the main channel of the Lea. A radiocarbon date was obtained from fine root hairs which rested on the gravel surface (Beta Analytic sample OL3051.96-35). This produced a calibrated date of AD 1310 to 1370. This date is far too late for Pleistocene/early Holocene gravels and suggests the root material on the gravel surface is intrusive travelling down through the profile from vegetation in the above alluvial deposits.

The basal gravels were overlain by a soft mid to light brown clay with very fine sand within the matrix [34] and [66]. The deposit displayed light grey mottling and contained frequent iron-stained root channels and worm casts. Towards the northern part of the trench the deposit contained more frequent greyish mottling, giving the deposit a grey rather than brown appearance. The deposit measured c. 0.6m in thickness and occurred at between 3.15 to 2.05m OD.

This deposit represents the formation of a buried weathered soil horizon that has formed within a fine-grained alluvial deposit of a possible Late Pleistocene/Early Holocene date. The unit is the same as context [4] encountered within trench West-2. The greyer appearance of the unit towards the northern part of the trench is a result of post-depositional waterlogging, whereby the northern part of the trench has retained more ground water leading to increased reducing conditions with the resulting gleyed appearance of the deposit. Towards the south eastern part of the trench the dry nature of the deposit was more apparent with the unit displaying heavy iron-staining along root channels and fissures.

Found lying on the top of and within this layer was a selection of struck and reworked flint and burnt flint. A series of slots were subsequently dug into the soil horizon to attempt to recover further artefacts. By far the largest concentration of this flintwork came from slot 1 in the south-eastern end of trench 2a. This concentration of struck and burnt flint may suggest the nearby presence of hearth activity around which knapping may have occurred. The flintwork was dated to the Mesolithic/early Neolithic, with the possibility of a couple of pieces dating to the Middle – Late Bronze Age, although the small size of the assemblage and lack of diagnostic pieces meant this cannot be confirmed (see Section 7). The flint bearing horizon occurred at approximately 0.1m below the top of the unit at c. 2.2m OD.

Cutting soil horizon [34] in trench 2a was a small linear gully or ditch [30]. Running approximately northeast – southwest through the trench it measured 1.15m wide and was 0.34m deep, it was encountered at 3.15m OD. This may be some form of drainage and/or boundary ditch, possibly contemporary with the settlement activity found in trench West-2

A firm, mid brown clay with frequent iron stained root channels and fissures [33] occurred above the buried soil horizon [34]. The deposit measured between c. 0.40m to 0.60m in thickness, becoming thicker towards the south-eastern part of the trench. The surface of the deposit lay at 2.4m and 2.6m OD. Towards the north-western part of the trench the deposit graded into a bluish grey clay with slight greenish grey mottling, suggesting that more permanent waterlogging of the ground surface had occurred.

This deposit was overlain by a mid to dark slightly brownish grey clay [32] with frequent manganese and iron staining present on the ped faces and along root channels, [33], [65] and [64]. The deposit measured c. 0.7m in thickness and occurred at between 2.6 to 3m OD. These upper units relate to an increase in overbank flooding across the site with the development of accretionary soils forming within alluvial clays. The deposits are characteristic of seasonally flooded grass or hay meadows. The alluvial clays sealed the dry soil horizon and the ditch feature. The upper alluvial clay contained occasional fragments of brick and tile and clinker suggesting it dates to the historic period.

Truncating the alluvium was a series of 19th century pits, [39], [37] and [63], which represent clay extraction. These were encountered at c.2.80m OD. Cuts [39] and [37] extended northwest through trench 2a and cut [63] extended northwest out of trench 2b but was not seen continuing into the south-eastern end of trench 2a. Sealing these was a mixed deposit of 20th century made ground.

2.2.1.5 Evaluation Trench 3

Evaluation trench 3 was extended southeast off of trench West-2 and the mitigation excavation area, with which it shared the same stratigraphic sequence. Approximately one third of the southern end of the trench was truncated by modern concrete intrusion. It was excavated to a maximum depth of 2.20m below ground level (1.97m OD).

Table 5: Details of depositional sequence in Evaluation Trench 3

Location	South-west area		
Dimensions	32.5m by 6m by 2.2m deep		
Modern ground level	c.4.17m OD		
Base of modern fill	2.83m OD		
Top of alluvium observed	2.83m OD		
Level of base of deposits observed	1.97m OD		
Thickness of deposits of archaeological interest (ie: soil horizon) observed	c.0.40m		
Context numbers	[42 to 48] [55 to 56]		
Samples	Bulk	Sample {28}	Context [55]

The basal deposits within the trench consisted of a mid orangey brown moderately coarse gravel in a fine sandy clay matrix [46]. The gravel clasts were angular, sub-angular and sub-rounded in shape. The sandy matrix became coarser down through the profile. The top of the gravel unit undulated across the trench but was generally found to occur at c. 2m OD. The gravels are similar in character to the gravels observed in trench West-2 and are likely to be Pleistocene in date.

The gravels were overlain by a soft friable mottled mid greyish brown/light grey slightly sandy silty clay [45]. The matrix became sandier down through the profile. Evidence of a dry soil horizon was apparent from the frequent iron stained root and worm channels visible throughout the deposit. The deposit measured c. 0.4m in thickness and occurred at c. 2.3m OD.

Cut through this buried land surface were two small pits, [48] and [56]. Cut [48] was encountered at 2.37m OD, measured 0.73m in diameter and was 0.43m deep. Cut [56] was encountered at 2.28m OD, measured 0.99m in diameter and was 0.40m deep. These features represented further occupation evidence that had already been encountered within trench West-2 and the subsequent excavation area.

The buried soil horizon was overlain by a firm mottled mid to light greyish brown/mid grey clay [44]. Occasional manganese flecks were visible throughout the deposit. The unit measured c. 0.2m in thickness and occurred at 2.45m OD.

This unit was overlain by a firm mottled mid to dark grey/brown clay [43] with frequent manganese flecking and root channels throughout the sediment. The unit measured c. 0.3m in thickness and occurred at c. 2.8m OD.

Both these upper contexts represent the accumulation of overbank flood deposits with accretionary soils forming within the deposits. These deposits represent a seasonally flooded hay or grass meadow environment. Sealing the alluvial clays was a mixed deposit of 20th century made ground.

2.2.2 Radiocarbon dating

The alluvial deposits across the site were generally found to be minerogenic with little organic material available to date the accumulation of the natural sequence across the site. However, the prehistoric features that cut through the dry soil horizon did contain charred material suitable for radiocarbon dating (within trench West-2). The dating of this material not only allows the archaeological occupation to be dated, but almost gives an indication of when the accumulation of the alluvial clays which seal this archaeology began to occur.

A difference in the gravels was noted across the site with greyish brown gravels recorded towards the central and north eastern parts of the site, and oxidised coarser gravels recorded towards the south western parts of the site. This suggested that two possible events of gravel deposition had occurred. An attempt was made to date the greyish brown gravels from some fine root fragments collected from the gravel surface (within trench 2A).

The pond features and marsh deposits recorded within trench East-2 were also submitted for dating to ascertain the palaeoenvironmental potential of the deposits. No finds were available to date these deposits, and given the severe amount of modern truncation within this trench, it was possible the features could date to the post-medieval or modern period.

The sample locations and elevations are set out in the table below. All of the samples were analysed by the radiometric dating technique. The ^{14}C age estimates, made by Beta Analytic[1] are presented in the table below.

Table 6: The radiocarbon samples

Trench	context	m OD	Material	MoLAS ref.
West-2	6	2.12	Charred material	OL305(6)-<1>
2A	35	1.67	Plant material	OL3051.96-35
East-2	11	1.77	Humic clay	OL26<14>1.77
East-2	14	1.61	Organic clay	OL26<13>1.61

Table 7: Results of radiocarbon dating

context	sample	Lab no.	13C/12C Ratio	Uncalibrated date	calibrated date*
6	OL305(6)-<1>	Beta-210488	-24.7	2990+/- 40 BP	1380 to 1100 BC
35	OL3051.96-35	Beta-210489	-27.0	580+/- 40 BP	AD 1310 to 1370
11	OL26<14>1.77	Beta-213550	-29.4	1370+/-50 BP	AD 650 to 810 and 840 to 860
14	OL26<13>1.61	Beta-213551	-28.7	1170+/-60 BP	AD 780 to 1020

2.3 General discussion of archaeological stratigraphy

This section discusses the archaeological sequence on the site. The natural sequence present on the site is discussed within the geoarchaeological deposit model (see section 8)

2.3.1 Prehistoric settlement activity

Evidence of prehistoric occupation, from the Mesolithic to the Iron Age, was encountered across the site. This occupation was directly related to the dry land, 'buried soil horizon'. A moderate amount of burnt flint (weighing 1283g) and a small scatter of worked flint were recovered from the soil horizon. This flint assemblage dated to the Mesolithic – early Neolithic, although a couple of the pieces may be of Bronze Age provenance. The presence of such an assemblage, although relatively small, suggests occupation on the site and exploitation of the local environment. The presence of burnt flint implies nearby hearth activity, possibly flint-lined, around which knapping and possibly other industrial activities would have taken place. This may represent a temporary, seasonal camp, utilised by small mobile groups which would have had many such camps within in a much wider landscape of inhabitation.

Settlement activity comprising postholes, pits and a ring gully was recorded in the south-western portion of the site, and dates to the Late Bronze Age/Early Iron Age. This reflects a change from the previous migratory occupation of the site to a sedentary settlement characterised by the construction of permanent structures, against a background of agricultural activity and animal husbandry.

[1] Calibration was provided by Beta Analytic, using the calibration data published in Stuiver, M. *et al* (1998) *Radiocarbon Vol.40 No.3* and is quoted to 98% confidence levels.

2.3.2 The Roman road

No evidence for the London to Colchester Roman road was uncovered during the evaluation. Furthermore, no Roman features were found, including those typically associated with Roman roads, such as roadside ditches.

The uppermost deposits on the site are predominantly cohesive clays, often containing fragments of clay pipe and other post-medieval inclusions. These deposits accumulated by clay settling out of standing water during periods of seasonal overbank flooding and represent wet meadowland – a deposit likely to have accumulated during the historic period across most of the site. If the Roman road had traversed the site it would have been sealed by this meadow/clay deposit which accumulated during the post-Roman period.

2.3.3 Post-Roman land use

A Saxon-period pond was recorded in trench East-2. The pond contained anaerobic deposits, including plants, grasses and reeds, formed in still, standing water. The exact extent of this feature was not revealed but it may have been used to provide a source of water for nearby grazing animals. The pond truncated an organic clay deposit characteristic of a marginal marshy environment. Very little of this deposit survived due to later clay extraction pits, but it is possible that other areas on this part of the site may yield similar deposits.

2.3.4 Post-Medieval land use

A series of 19^{th} century clay extraction pits truncated the alluvium across the site. These pits quarried the clay down to the surface of natural gravel, which was subsequently used in the construction of bricks and tiles. This clay extraction can be seen on the Ordnance Survey Map of 1867 where the eastern two thirds of the site are located in the southern half of an extensive "Brick Field". The quarrying encountered on site did not seem to be as systematic as the map suggests but instead appeared to be more sporadic across the northern part, where clay was extracted as and when required.

2.4 Assessment of the evaluation

GLAAS guidelines (English Heritage, 1998) require an assessment of the success of the evaluation 'in order to illustrate what level of confidence can be placed on the information which will provide the basis of the mitigation strategy'.

The evaluation revealed important evidence for scattered late prehistoric human activity in the central and southern areas of the site. A mitigation excavation area was subsequently opened on the guidance of GLAAS around the area of the archaeologically sensitive deposits. This encountered further evidence for small-scale settlement activity represented by postholes, pits and a possible ring gully. Late Bronze Age/Early Iron Age pottery was recovered from these features adding evidence for activity taking place on the dry land periphery, south of the wetland environment identified on Site 25 (OL-00105).

A small flint assemblage recovered from the central area of the site dated to the Mesolithic/early Neolithic, which implied seasonal occupation by small, mobile groups that would have had many such camps within a much wider landscape of inhabitation.

No Roman features were identified within the site, despite lying within the conjectured route of the London to Colchester Roman road. A heavily truncated Saxon pond was present within the site and contained a rich resource of environmental and botanical residues. The pond may have functioned as a watering hole for animals pastured on the marsh.

The post-medieval features and deposits encountered in trench East-2 appear to represent 19th century clay extraction for brick and tile making. This was previously identified on the Ordnance Survey Map of 1867, indicating the eastern two thirds of the site as 'Brick Field'. This may mean that the buried prehistoric soil horizon may have been extracted from these areas of the site, potentially removing any archaeologically significant deposits.

3 Botanical Assessment

By Kate Roberts

3.1 Quantification and assessment

3.1.1 Site archive: finds and environmental, quantification and description

Table 8: Environmental general archive summary

Bulk soil samples	Flots and fauna; 1 box

3.1.2 The botanical samples

3.1.2.1 Introduction/methodology

Seventeen bulk soil samples of ten to twenty litres were taken from ditches, pits and layers for flotation and subsequent environmental analysis. The dates of the samples range from the Holocene and late glacial, up until the Iron Age. 10 litres of soil from each sample were processed by flotation by staff at PCA, using a flotation machine and meshes of 1mm and 300µm to catch the residue and flot respectively. The resultant flots and residues were dried and the residue sorted and flots submitted to the author for assessment. The flots were briefly scanned using a low-powered binocular microscope and the abundance, diversity and general nature of plant macrofossils and any faunal remains were recorded onto the MoLAS ORACLE database. Table 9, Table 10, Table 11 and Table 12 summarise these results and are located at the end of the report.

3.1.2.2 Charred remains

Charred plant remains were very rare in these samples. Occasional flecks of charcoal were present in ten of the samples and half an indeterminate cereal grain (Cerealia indet.) and an indeterminate pinks family seed (Caryophyllaceae indet.) were found separately in two of these. This material can provide no further information.

3.1.2.3 Waterlogged remains

Waterlogged preservation was the main form of preservation in these samples. Eleven samples produced waterlogged seeds and of these {15}, layer [14], {16}, fill [15], {17}, layer [11], {18}, layer [12] and {26}, fill [29] contained moderate to large amounts of material. It is possible that had these samples not been dried, there would have been a wider variety of material present in these samples. The plant remains found in these samples represented a variety of environments. Water plants such as pond weed (*Potamogeton* spp.) and water plantain (*Alisma plantago-aquatica*) were common, as were plants that are found on damp ground such as gipsy-wort (*Lycopus-europaeus*). Also present were plants that grow on nitrogen rich soil, including stinging nettles (*Urtica dioica*). It is likely that these samples should enable a richer interpretation of the local environment and should show environmental changes both across the site and through time.

3.1.3 The invertebrates

3.1.3.1 Molluscs

A large quantity of molluscs were found in sample {15}, fill [14] and occasional molluscs were present in {10}, layer [3] and {16}, fill [15]. These were passed onto the relevant specialist for assessment.

3.1.3.2 Insects

Beetle remains were possibly present in {11}, layer [2], fill {15}, pond fill [14], {16}, layer [15] and {26}, fill [29]. Of these, only {11} and {26} have soil retained. Should this fit with research aims and stratigraphy, then it is recommended that these two soil samples should be sent to an insect specialist for assessment.

3.2 Analysis of potential

3.2.1 Botanical samples

Samples from this site varied in terms of the quantities and variety of plant remains present. Where there were large or at least moderate quantities of plant remains present, the habitats represented appear to vary between damp and nitrogen-rich, and wet contexts. Further work should allow a consideration of the changing environment in this early landscape.

3.3 Significance of the data

This material is of local significance only.

3.4 Botanical Tables

Abundance 1 = 1–10 items, 2= 11–50, 3 = 50+ items

Diversity 1 = 1–3 items, 2 = 4–7 items, 3 = 7+ items

Table 9: Processing summary

Context	Sample	BI	Dating	Bulk Vol	Wet Sv Mesh Size	Flot	Flot Vol	Any un-processed	Subsample?
2	11	Alluvial clay		10		Y	5	Y	20 litres
	12	Alluvial clay		10	1	Y	5	N	
3	10	Alluvial clay	HOLOCENE	10	1	Y	5	N	
4	7	Soil horizon	HOLOCENE	10	1	Y	2	N	
	8	Soil horizon	HOLOCENE	10	1	Y	2	N	
	9	Soil horizon	HOLOCENE	10	1	Y	2	N	

Context	Sample	BI	Dating	Bulk Vol	Wet Sv Mesh Size	Flot	Flot Vol	Any un-processed	Subsample?
5	6	Floodplain gravels	LATE GLACIAL	10	1	Y	2	N	
8	2	Pit fill		10	1	Y	1	N	
11	17	Humic clay		10	1	Y	10	N	
12	18	Alluvial clay		10	1	Y	10	N	
14	15	Pond/ditch/channel		10		Y	20	N	
15	16	Redeposited alluvium		10	1	Y	20	N	
22	23	Fill of pit/post hole	PREHISTORIC	10	1	Y	2	N	
24	24	Fill of gully	PREHISTORIC	10	1	Y	5	Y	10 litres
26	25	Fill of pit/post hole	PREHISTORIC	10	1	Y	2	N	
29	26	Fill of ditch	?PREHISTORIC	10	1	Y	5	Y	10 litres
55	28	Fill of pit	BRONZE/IRON AGE	10	1	Y	2	Y	10 litres

Table 10: Finds present in flots and residues

Context	Sample	BI	Dating	Constituent	Proportion
2	11	Alluvial clay		FLINT	M
	12	Alluvial clay		CBM	O
	12	Alluvial clay		FLINT	M
11	17	Humic clay		FLINT	M
12	18	Alluvial clay		FLINT	M
15	16	Redeposited alluvium		FLINT	A
22	23	Fill of pit/post hole	PREHISTORIC	FLINT	M
24	24	Fill of gully	PREHISTORIC	FLINT	A
26	25	Fill of pit/post hole	PREHISTORIC	FLINT	A
29	26	Fill of ditch	?PREHISTORIC	FLINT	A
55	28	Fill of pit	BRONZE/IRON AGE	FLINT	A

Table 11: Sample contents

						CHD Grain	CHD Seeds	CHD Wood	WLG Seed	WLG Misc	WLG Wood	
Con	Samp No	BI	Dating	Flot Vol.	Proc	A D	A D	A D	A D	A D	A D	Comments
2	11	Alluvial clay		5	F			2 1				
	12	Alluvial clay		5	F	1 1		3 1	1 1			NEED A WET SAMPLE, N2/WETLAND SEEDS
3	10	Alluvial clay	holocene	5	F			2 1	1 1			
4	7	Soil horizon	holocene	2	F				1 1		1 1	SHOULDN'T HAVE BEEN DRIED, SEEDS RARE
	8	Soil horizon	holocene	2	F				1 1			
	9	Soil horizon	holocene	2	F			2 1				
5	6	Floodplain gravels	late glacial	2	F			1 1			1 1	
8	2	Pit fill		1	F			2 1	1 1		1 1	
11	17	Humic clay		10	F				2 3			NEED A WET SAMPLE - WATER
12	18	Alluvial clay		10	F				2 2	1 1	1 1	NEED A WET FLOT - WATER/SCRUB
14	15	Pond/ditch/channel		20	F				2 2			NEED A WET SAMPLE - WATER/N2
15	16	Redeposited alluvium		20	F			2 1	3 3	1 1	2 1	NEED A WET FLOT - DAMP/N2/SCRUB
22	23	Fill of pit/post hole	prehistoric	2	F				1 1			DULL
24	24	Fill of gully	prehistoric	5	F			2 1				STERILE
26	25	Fill of pit/post hole	prehistoric	2	F		1 1	2 1				DULL
		Fill of pit/post hole			W			2 1				
29	26	Fill of ditch	?prehistoric	5	F				2 3			NEED A WET FLOT - WATER/N2
55	28	Fill of pit	bronze/iron age	2	F			2 1				INTRUSIVE MODERN INSECTS

Table 12: Organic contents in flot

Context	Sample	BI	Dating	Process	Constituent	Abundance	Diversity	Comment
2	11	Alluvial clay		F	CHD WOOD	2	1	
	11	Alluvial clay		F	INV BEETLES	2	1	
	11	Alluvial clay		F	WLG ROOTS	2	1	
	12	Alluvial clay		F	CHD GRAIN	1	1	INDET (1)
	12	Alluvial clay		F	CHD WOOD	3	1	
	12	Alluvial clay		F	WLG ROOTS	2	1	
	12	Alluvial clay		F	WLG SEEDS	1	1	POLAV,RANABR, URTDI,RANSC
3	10	Alluvial clay	holocene	F	CHD WOOD	2	1	
	10	Alluvial clay		F	MOLSCTR	2	1	
	10	Alluvial clay		F	WLG SEEDS	1	1	CAR,ALIPLAQ
4	7	Soil horizon	holocene	F	WLG SEEDS	1	1	INDET AS DRIED - SIL?
	7	Soil horizon		F	WLG WOOD	1	1	
	8	Soil horizon	holocene	F	WLG ROOTS	2	1	
	8	Soil horizon		F	WLG SEEDS	1	1	POLY,RANABR
	9	Soil horizon	holocene	F	CHD WOOD	2	1	
5	6	Floodplain gravels	late glacial	F	CHD WOOD	1	1	
	6	Floodplain gravels		F	WLG WOOD	1	1	
8	2	Pit fill		F	CHD WOOD	2	1	
	2	Pit fill		F	WLG SEEDS	1	1	RANSC
	2	Pit fill		F	WLG WOOD	1	1	
11	17	Humic clay		F	WLG ROOTS	3	1	
	17	Humic clay		F	WLG SEEDS	2	3	PTM,RANABR,LYCEU,RANS,JUN,RANBA,CAR,ERI,INDET
12	18	Alluvial clay		F	WLG MISC	1	1	THORN
	18	Alluvial clay		F	WLG ROOTS	3	1	
	18	Alluvial clay		F	WLG SEEDS	2	2	UMBE,RANBA,PTM,RUBFRID,RANFL,CAR,ELE

Context	Sample	BI	Dating	Process	Constituent	Abundance	Diversity	Comment
	18	Alluvial clay		F	WLG WOOD	1	1	
14	15	pond/ ditch/ channel		F	INV BEETLES	2	1	
	15	pond/ ditch/ channel		F	INV EPHIPPIA	1	1	
	15	pond/ ditch/ channel		F	INV OSTRACOD	3	1	
	15	pond/ ditch/ channel		F	MOLSCFW	3	2	
	15	pond/ ditch/ channel		F	WLG ROOTS	3	1	
	15	pond/ ditch/ channel		F	WLG SEEDS	2	2	ALIPLAQ,POLAV,PTM,RUMTEPALS,RUM,RANBA
	15	pond/ ditch/ channel		W	MOLSCTR	2	1	
15	16	Redeposited alluvium		F	CHD WOOD	2	1	
	16	Redeposited alluvium		F	INV BEETLES	2	1	
	16	Redeposited alluvium		F	MOLSCTR	1	1	
	16	Redeposited alluvium		F	WLG MISC	1	1	THORN
	16	Redeposited alluvium		F	WLG SEEDS	3	3	RUBID,SAMNI,CAR,RUM,CARCIR,SOLNI,STE,POLAV,RANABR,RANFL,BRAS
	16	Redeposited alluvium		F	WLG STEMS	2	1	STRAW
	16	Redeposited alluvium		F	WLG WOOD	2	1	
22	23	Fill of pit/post hole	prehistoric	F	WLG ROOTS	1	1	
	23	Fill of pit/post hole		F	WLG SEEDS	1	1	CAR,RANABR
24	24	Fill of gully	prehistoric	F	CHD WOOD	2	1	
26	25	Fill of pit/post hole	prehistoric	F	CHD SEEDS	1	1	CARY
	25	Fill of pit/post hole		F	CHD WOOD	2	1	

Context	Sample	BI	Dating	Process	Constituent	Abundance	Diversity	Comment
	25	Fill of pit/post hole		F	INV EPHIPPIA	1	1	
	25	Fill of pit/post hole		W	CHD WOOD	2	1	
29	26	Fill of ditch	?prehistoric	F	INV BEETLES	2	1	
	26	Fill of ditch		F	INV EPHIPPIA	2	1	
	26	Fill of ditch		F	WLG ROOTS	3	1	
	26	Fill of ditch		F	WLG SEEDS	2	3	MON,SONAS,HYP,JUN,CAR,CARCIR,URTDI,RANSC,RANBA,LYCEU,ALIPLAQ,RUM,RANABR,CAR
55	28	Fill of pit	bronze/iron age	F	CHD WOOD	2	1	
	28	Fill of pit		F	INV BEETLES	1	1	INTRUSIVE INSECTS

4 Invertebrate Assessment

By Alan Pipe

4.1 Quantification and assessment

4.1.1 Site archive: finds and environmental, quantification and description

Table 13: Finds and environmental archive general summary

Mollusc shell and ostracod valves	Five small plastic bags in one archive quality 'shoebox'

4.1.2 The invertebrates

Table 14: Summary of mollusc and ostracod remains

PERIOD	FEATURE	CONTEXT	SAMPLE	TERRESTRIAL	FRESHWATER	OSTRACOD	NOS.	WT (kg)
	layer	3	10	unid. taxon 1		nil	{5	{0.001
	layer	3	10		unid. taxon 1	nil	{5	{0.001
TOTAL							**{10**	**{0.001**
		12	18		unid. taxon 2		2	{0.001
TOTAL							**2**	**{0.001**
	pond fill	14	15			FW taxon 1	{50	{0.001
	pond fill	14	15		unid. taxon 3		{50	
	pond fill	14	15		unid. taxon 4		{50	
	pond fill	14	15		unid. taxon 5		{50	
TOTAL							**{150**	**{0.010**
	Fill	15	16	unid. taxon 1			{5	{0.001
	Fill	15	16		unid. taxon 1		{5	{0.001
TOTAL							**{10**	**{0.001**

4.1.2.1 Introduction/methodology

This report quantifies, describes and interprets the invertebrate fauna recovered from layer [3] {10}, [12] {18}, pond fill [14] {15} and fill [15] {16}. It then considers the potential of the assemblage for further study, and quantifies the resources required to carry out such work. Each sample was scanned using a low-powered binocular microscope, and the estimated abundance and taxonomic diversity of the molluscan and ostracod fauna recorded. No attempt was made to identify any taxon to specific level, or to produce a detailed shell or valve count. Identifications were made with reference to the MoLSS Environmental Archaeology Section reference collection, and following Cameron & Redfern 1976; Henderson 1990; and Macan 1977. Ecological interpretation followed Henderson 1990; and Kerney 1999.

4.1.2.2 Marine molluscs

There were no marine molluscs.

4.1.2.3 Terrestrial molluscs

Small numbers, in each case fewer than five, of a single unidentified snail taxon were recovered from [3] {10} and [15] {16}.

4.1.2.4 Freshwater molluscs

Well-preserved freshwater mollusc shells provided the majority of the assemblage, more than 90% of the mollusc sample. They were recovered from context/sample groups [3] {10}, [12] {18}, [14] {15} and [15] {16}. The fauna derived from at least five snail taxa probably including valve snail *Valvata sp*., pond snail *Lymnaea sp*., and ram's-horn snail, Planorbidae. Abundance of snails varied from two shells in [12] {18}, to up to 150 shells from [14] {15}. Pond fill [14] {15} produced the most abundant and diverse sample including at least three unidentified snail taxa, each represented by up to 50 shells. Each of these taxa occur in suitable habitats throughout lowland southern England, although there is considerable inter-specific variation in terms of habitat requirement.

4.1.2.5 Freshwater ostracods

A substantial group, up to 50 examples, of well-preserved ostracod valves was recovered from the flot fraction of pond fill [14] {15}. These probably all derived from one family, the Candonidae, perhaps all from the same species. This family is predominantly bottom-living and non-swimming (Henderson 1990, 63) and contains many species widely distributed throughout lowland southern England. There is considerable inter-specific variation in terms of habitat requirement.

4.1.2.6 Assessment work outstanding

Nil.

4.2 Analysis of potential

The terrestrial molluscs from [3] {10} and [15] {16}; and the freshwater molluscs from contexts [3] {10}, [12] {18}, [14] {15}, and [15] {16} have definite potential for further study. Identification of all shells to specific level will allow interpretation of freshwater habitats in terms of water chemistry, drainage and flow, vegetation and substrate.

The freshwater ostracods from pond fill [14] {15} have definite potential for further study. Identification of all valves to specific level will allow interpretation of the pond in terms of water chemistry, drainage and flow, vegetation and substrate.

4.3 Significance of the data

The terrestrial and freshwater molluscs, and freshwater ostracods are of local significance for interpretation of local habitats in terms of vegetation, soil, and the physical and chemical characteristics of local freshwater habitats.

There is no regional or wider significance.

5 Pollen Assessment

By Rob Scaife

5.1 Introduction

Three profiles, consisting of four Monolith columns of differing sedimentological characteristics and ages were taken from the Warton Road Site. These include {4} and {5} of possible Pleistocene age taken from trench West-2, and Monolith {14} and {13} of a Saxon age taken from trench East-2. These sediment sequences have been examined with the following objectives in mind

i.) An initial determination of the presence or absence of pollen in the sediments.

ii.) If sub-fossil pollen is present, to provide preliminary pollen data on the depositional habitat and the surrounding vegetation environment of the site.

iii.) To indicate any potential for a fuller analysis and for comparing this site/sequences with other pollen data from the Lea Valley and North London.

The location of the pollen samples, identified with the prefix 'P', is illustrated in Fig 8 and Fig 9.

5.2 Pollen Method

Samples of 2ml volume were processed using standard techniques for the extraction of the sub-fossil pollen and spores (Moore and Webb 1978; Moore *et al.* 1992). Micromesh sieving (10u) was also used to aid with removal of the clay fraction in the mineral sediments. The sub-fossil pollen and spores were identified and counted using an Olympus biological research microscope fitted with Leitz optics. A pollen sum of up to 200 grains was counted for each level where possible. Additionally, all extant fern spores and miscellaneous pre-Quaternary palynomorphs were also counted for each of the samples analysed. Preliminary pollen diagrams have been plotted using Tilia and Tilia Graph (Fig 10, Fig 11, Fig 12). Percentages have been calculated in a standard way as follows:

Sum = % total dry land pollen (tdlp).
Marsh = % tdlp + sum of marsh/aquatics
Spores = % tdlp + sum of spores.
Misc. = % tdlp + sum of misc. taxa.

Taxonomy, in general, follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1992) for plant descriptions. These procedures were carried out in the Palaeoecology Laboratory of the Department of Geography, University of Southampton.

5.3 Results of analysis

Three profiles have been analysed. These include Monoliths {4}, {5} {13} and {14} the palynological characteristics of which are described below.

5.3.1 Monoliths 4 and 5; 2.31mOD to 2.59mOD.

These two Monoliths are a complete sequence of a soil into which Bronze Age features were cut (1300-100BC). This is overlain by Holocene alluvial sediments. It is suggested (C. Halsey, *pers comm*) that this soil may be of part of a former terrace of the River Lea and of Pleistocene date. Pollen was present between 2.31mOD and 2.59m*OD (*samples P3 to P6*)* but, however, was absent at and below 2.16m*OD.* (Monolith 5, samples P1 and P2).

Overall, the pollen preservation was variable with a range of heavy walled and degraded taxa present (Lactucoideae) as well as thin walled, easily destructible forms (e.g. Cyperaceae and Poaceae). With the exception of the sample at 2.51mOD (P5), the pollen assemblages are dominated by herbs. Poaceae (grasses; to 47%) and Lactucoideae (dandelion types; to 30% at the top of the profile) are the dominant dry-land types. There is a small range of other taxa of which Brassicaceae (*Sinapis* type) is most important. Of particular note are grains described as cereal type as well as 'large Poaceae', the latter being grains from certain grass species (e.g. *Glyceria fluitans*) which have bigger than average types (i.e. ca. }45u). Marsh herbs are well represented by Cyperaceae which are important in the upper part of the profile (to 36%) with smaller numbers of *Typha angustifolia/Sparganium* type (greater reed mace and bur reed). Spores include *Pteridium aquilinum* (bracken; 30%), monolete (*Dryopteris* type) forms and *Polypodium vulgare* (common polypody fern).

Trees and shrubs are skewed by a substantial peak/maximum of *Pinus* (pine; 48%) at 2.51mOD (P5) along with a smaller peak of *Betula* (birch; 5%) at this level. There are also small numbers of *Quercus* (oak), *Alnus* (alder) *Corylus avellana* type (hazel and/or sweet gale).

5.3.2 Discussion

Overall this sequence is dominated by herbaceous pollen types with the exception of an anomalous sample at 28cm (2.51mOD, P5) which has a significant peak of Pine. It has been suggested that these sediments may be of Pleistocene age. The dominance of herbs does suggest an open environment, which along with the herbs present, may indicate a cold stage, perhaps Devensian environment. This would be commensurate with the presence of pine and birch and less probably the small numbers of extra-local oak alder and hazel. However, cereal pollen type is recorded in the basal level (2.31mOD, P3) along with what are regarded as 'natural' grasses which also have large diameter but without the thick pollen wall (exine) and columellate structure found in the pollen of cultivated cereals. Such pollen types do, however, occur in Devensian sediments and although here defined as cereal type **does not suggest cereal cultivation during the last glacial** (Upper Palaeolithic) period.

The substantial quantities of Lactucoideae (dandelion type) and Poaceae (grasses) indicate a grassland habitat on surrounding whilst the on-site community was a grass-sedge fen with reed with some evidence of standing water (pond weed) although this may have been derived from overbank flooding.

Whilst Pleistocene age (and cold stage as indicated by pollen) has been suggested for these sediments, it should also be considered that the pollen assemblages are also similar to open agricultural environments today. As such, it is possible that pollen may be contaminant from Holocene, late prehistoric or historic land use with pollen travelling down rootlet tubes. It is also possible that there may be an admixture of pollen types dating to both periods also accounting for the high pine pollen values at 2.51mOD (P5).

5.3.3 Monolith 14; 1.78mOD to 1.97mOD.

Three pollen samples were examined from this profile. This sequence comprises a humic clay which directly overlies floodplain gravels of the Lea Valley.

The pollen assemblages are dominated by herbs with few trees and shrubs. The latter comprise *Quercus* (oak; to 13%), *Alnus glutinosa* (alder; to 19% at 1.86m*OD,* P2) and *Betula* (birch; to 5% at 1.86m*OD*). There are also small numbers of *Ulmus* (elm) and *Corylus avellana* type (hazel). Herbs are dominant (80% to 100% of total pollen at 1.97mOD the top of the profile, P1). These are dominated throughout by Poaceae (grasses; 56% at base and declining). Lactucoideae (dandelion types) attain high values in the upper-most sample (45%). Overall, the herb diversity is greater in the lowest levels. Taxa include cereal type and a range of weeds including Caryophyllaceae (pinks), *Spergula* (spurrey), Chenopodiaceae (goosefoots and oraches), *Rumex* (docks), Asteraceae types (daisy family) and *Plantago lanceolata* (ribwort plantain). In the upper levels, Lactucoideae become important with *Sinapis* type (charlocks) and some *Plantago lanceolata* (ribwort plantain). Spores of ferns comprise largely *Pteridium aquilinum* which attain highest values in the upper level (19% sum+spores).

Marsh/fen and aquatic taxa are present and include *Myriophyllum spicatum* (water millfoil), *Potamogeton* type (pond weed), *Sagittaria sagittifolia* (arrow weed) and *Typha latifolia* (greater reed mace) and *Sparganium* type (lesser reed mace and bur reed). Cyperaceae (sedges) are dominant (20-30%).

5.3.4 Discussion

This sediment was deposited in a freshwater grass-sedge fen. There is evidence of some standing water with pond weed and water millfoil with sedges, greater reed-mace (*Typha latifolia*), lesser reed mace and/or bur-reed (*Typha angustifolia/Sparganium*) and arrow head (*Sagittaria sagittifolia*). The dry-land environment was largely open as indicated by the moderately diverse herb pollen assemblages. Cereal pollen is present and with some weeds of waste and disturbed ground (Brassicaceae, Chenopodiaceae, greater plantain etc.) suggests some local arable activity. However, quantities of grasses and other pasture herbs (Lactucoideae) suggest that locally grassland may have been more important. The little alder pollen came from wetland situations but, however, as a very substantial pollen producer, and being anemophilous, cannot be regarded as significant here.

It would appear that woodland clearance had taken place and both arable and pastoral agriculture was being practiced. A record of *Cannabis sativa* type (hop and hemp/cannabis) was recovered at 1.78m (P3). It is possible this comes from hemp cultivation or processing rather than from wild hop which is usually associated with fen carr woodland (not present here).

5.3.5 Monolith 13; 1.57mOD to 1.80mOD.

Three samples come from an organic clay (context 14) which appears to be the fills of a pond feature of a Saxon date. The pollen spectra are dominated by herbs with only few trees and shrubs. However, the diversity is low with only Poaceae (80-85%) of any substantial importance. Other taxa include *Ranunculus* type (buttercups; 10% at the base of the profile; 1.57mOD, P3). There are small numbers of *Plantago lanceolata*, Lactucoideae and Cereal type. Trees include sporadic occurrences of *Pinus, Ulmus, Quercus* and *Alnus glutinosa.*

Fen and aquatic taxa are present including Cyperaceae (to17%) with *Typha latifolia* and *Typha angustifolia* type (16% at the base). Potamogeton type (pond weed; 5%) is present at 1.68m*OD* (P2).

5.3.6 Discussion

The pollen from this profile clearly shows an open herb dominated environment with no local trees and shrubs growing. Where the latter occur, these are sporadic and come from extra-local/regional sources. The range of taxa indicate a predominantly grass environment (probably pasture). Small numbers of cereal type pollen also attest to cultivation and use of cereals although this is not a dominant or even important element in the spectra. The assemblages are typical of a late Historic age.

The on-site plant community was partially aquatic as evidenced by pond weed (Potamogeton type) but with grass-sedge-reed fen. Whilst dominance of grasses has been noted implying grassland and probably pasture, it is also likely that a proportion of the grass pollen may also derive from this on-site habitat.

5.4 Conclusion

Three profiles of different ages and sedimentological characteristic's have been examined from this site. Pollen was recovered from these sites but was absent in the lower levels of Monolith {5}. Although only an assessment study, some useful data has been obtained. It is clear, however, that these sediments/profiles require radiocarbon dating to establish the temporal framework for the palaeo-vegetation characteristics established by pollen analysis. The following summary points can be made.

* Pollen is present in all or parts of the sediment profiles analysed. Although pollen preservation is variable, pollen counts and preliminary pollen diagrams have been plotted.

* Monoliths {4/5} were thought to be of Pleistocene age. Pollen does not wholly confirm this as there is a possibility of contamination by modern pollen down rootlet hollows. However, herbs of open ground, a substantial peak of pine with some birch suggests that a Pleistocene element is present. That is, an open habitat with some trees.

* Monolith {14} of a Saxon age demonstrates an open agricultural habitat of grassland with evidence of some cereal cropping. The site was a grass-sedge-reed fen probably with some open water.

* Monolith {13} from a Saxon pond feature shows absence of trees and shrubs and dominance of pasture with some evidence of arable activity. Aquatic plant taxa confirm that the site was probably a pond with surrounding marginal aquatics.

* Only Monoliths {13}, {14} have been securely dated so far. This pollen data will provide useful information on the vegetation of the Lea Valley spanning periods not covered in earlier analyses which have tended to be of early Holocene age (i.e. early Mesolithic).

* These data have only been analysed to assessment level. If further work is required this should be at a closer sampling interval and with greater numbers of pollen identified and counted where preservation makes this possible.

6 Diatom Assessment

By Nigel Cameron

6.1 Introduction

A diatom assessment has been carried out on twelve sediment sub-samples from the Warton Road (OL - 00305) site in the Lea Valley. The location of the diatom samples, identified with the prefix 'D' is illustrated in Fig 8, Fig 9.

The diatom samples are from three separate sequences (C Halsey, *pers. comm.*). Monolith {13} sampled an organic clay (context [14]) which appears to in-fill a cut pond feature, radiocarbon dated to the Saxon period. This pond feature truncates an organic humic clay (context [11]) (C Halsey, *pers. comm.*). Monolith {14} was taken from trench East-2 and cuts the humic clay (context [11]) which overlies floodplain gravels. This deposit was radiocarbon dated to the Saxon period, and may represent a marginal channel at the edge of a ridge of higher, drier ground. Monoliths {4} and {5} cover a complete sequence taken from trench West-2. Context [4] seems to represent a dry soil horizon through which Bronze Age features were cut (charcoal from a pit has a radiocarbon age of 1300 to 1100 BC). The origins of the dry soil horizon may be Pleistocene and represent the former terrace of the Lea prior to down-cutting in the Holocene that has resulted in the present floodplain level. Over or within this deposit the dry land surface formed. The deposit generally consists of heavily oxidised, fine sandy clay with occasional gravel. Above this is alluvial clay, probably deposited through gentle over-bank flooding (C Halsey *pers. comm.*).

The aims of the diatom assessment are to determine if diatoms are present and the potential for percentage analysis of the diatom assemblages. Comments are made about a number of sample characteristics including: diatom valve concentrations, the quality of diatom preservation, the diversity of taxa, the types of diatom assemblage and their habitat preferences. Of particular interest in the context of the evolution of the tidal Thames and the Lea are the salinity preferences of the diatoms present.

6.2 Methods

Diatom preparation followed standard techniques: the oxidation of organic sediment, removal of carbonate and clay, concentration of diatom valves and washing with distilled water. Two coverslips, each of a different concentration of the cleaned solution, were prepared from each sample and fixed in a mounting medium of a suitable refractive index for diatom microscopy (Naphrax). Slides were scanned at magnifications of x400 and x1000 under phase contrast illumination.

Diatom floras and taxonomic publications were consulted to assist with diatom identification, including Hendey (1964), Hartley *et al.* (1996) and Krammer & Lange-Bertalot (1986-1991). Diatom species' salinity preferences are discussed using the classification data in Denys (1992) and the halobian groups of Hustedt (1953, 1957: 199), these salinity groups are summarised as follows:

1. Polyhalobian: }30 g l^{-1}

2. Mesohalobian: 0.2-30 g l^{-1}

3. Oligohalobian - Halophilous: optimum in slightly brackish water

4. Oligohalobian - Indifferent: optimum in freshwater but tolerant of slightly brackish water

5. Halophobous: exclusively freshwater

6. Unknown: taxa of unknown salinity preference.

6.3 Results & Discussion

The locations of the samples are listed in Table 15 and the results of the diatom assessment are summarised in Table 16 and Table 17.

6.3.1 Trench East-2: Saxon pond feature (Monolith {13}, D1-D3)

Diatoms are present in high concentrations (samples D2 and D3) or moderately high concentrations (sample D1) in all three samples from the pond feature. In the two lower samples (D3, D2) the quality of diatom valve preservation is good and species diversity is high. There is therefore excellent potential to make percentage diatom counts. For the uppermost sample, D1, the quality of preservation of individual valves varies from good to poor and diversity is moderately high. There is also good potential to make percentage diatom counts for D1.

The dominant components of all three diatom assemblages from the pond feature are non-planktonic shallow water diatoms. These diatoms grow attached to submerged surfaces including aquatic macrophytes and in benthic, mud-surface habitats. The dominance of this group and the relative rarity of planktonic diatoms reflect a shallow water environment. For example the freshwater taxon *Cocconeis placentula* common in all three samples often grows as an epiphyte on submerged macrophytes. Similarly the *Gomphonema* and *Epithemia* taxa present are epiphytic. Whilst the *Navicula, Caloneis, Stauroneis, Nitzschia* and *Gyrosigma* taxa present would mostly grow in the benthic habitat.

Many of the diatoms present are halophilous or mesohalobous diatoms that are from freshwaters of high conductivity (e.g. *Synedra pulchella, Rhoicosphaenia curvata, Navicula menisculus, Melosira varians*). However, particularly in samples D2 and D3 there are allochthonous marine diatoms (*Cymatosira belgica, Rhaphoneis amphiceros, Rhaphoneis minutissima*) and estuarine species (*Cyclotella striata, Navicula pygmaea* in OL21). The presence of these diatoms reflects either the incursion of water from the tidal Thames or deposition of marine/estuarine material (waste) in the pond/ditch feature. Although diatom counting has not been carried out it appears that the allochthonous marine diatom component is more numerous than the estuarine component. For example *Cyclotella striata* has been the dominant planktonic estuarine species in the tidal Thames in historic times but is relatively uncommon here. If the introduction of the less abundant groups of mesohalobous and polyhalobous diatoms to the pond is the result of tidal transport this would have been an infrequent (flood) event. A number of obligate freshwater diatoms that are also found here such as Achnanthes minutissima, Eunotia spp. and Cocconeis pediculus will not grow in water of high conductivity. The anaerobic nature of the mud and presence of standing water is commented upon in the notes on the relevant section drawing. The presence of *Achnanthes hungarica* a species growing in waters with high nutrient levels and epiphyte of *Lemna* (duckweed) would support this observation. However, without carrying out percentage counting and quantitative nutrient reconstruction for these samples the degree of nutrient enrichment is unclear.

6.3.2 Trench East-2: Natural Humic Clay overlying floodplain gravels (Monolith {14}, D1-D3)

Poorly preserved diatoms are present in low concentrations and the assemblages are of low species diversity in the three samples from Monolith {14}, context (11). Those diatoms that are identifiable to the species level are non-planktonic diatoms that represent shallow freshwater environments (*Gomphonema angustatum, Synedra ulna*). In addition the aerophilous diatoms (*Ellerbeckia arenaria*, large *Pinnularia* sp.) and chrysophyte stomatocysts that are present are tolerant of desiccation.

These poorly preserved assemblages of aerophilous types are consistent with an ephemeral aquatic environment such as a marginal channel, as is described in the comments on this site, that was prone to periods of drying out. The inwash of aerophilous soil diatoms from the ridge of higher ground may also have contributed to the assemblage. There is no further potential to analyse diatoms from this group of samples.

6.3.3 Trench West-2: Soil Horizon and overlying alluvial clays (Monoliths {4 and 5} D1-D6)

Diatom remains are absent from four samples (samples D1 to D5) and a low concentration of poorly preserved valves is present in two samples (samples D2, and D6). As a result of breakage and silica dissolution those diatoms that are present are not identifiable to the species level. The remains consist of very few undifferentiated Naviculaceae and a fragment of a *Nitzschia* sp. and a central area fragment of an undifferentiated centric diatom. A chrysophyte cyst was identified in D5. It is not possible to comment on the possibility of over-bank flooding from these partial diatom assemblages. However, they are consistent with a dry soil horizon where aerophilous diatoms could live but valves would be poorly preserved. There is no further potential for diatom analysis of these samples.

Table 15: Samples assessed for diatoms.

MoLAS Diatom Sample	Monolith Sample	OD Height (m)	Context	Notes
D1	13	1.80	15	Tr. East. 2 Saxon pond
D2	13	1.68	14	Tr. East. 2 Saxon pond
D3	13	1.57	14	Tr. East. 2 Saxon pond
D1	14	1.97	11	Tr. East. 2 Humic clay
D2	14	1.86	11	Tr. East. 2 Humic clay

D3	14	1.78	11	Tr. East. 2 Humic clay
D1	5	2.01	4	Tr. West. 2 soil horizon & alluvial clay
D2	5	2.16	4	Tr. West. 2 soil horizon & alluvial clay
D3	5	2.31	4	Tr. West. 2 soil horizon & alluvial clay
D4	4	2.36	3	Tr. West. 2 soil horizon & alluvial clay
D5	4	2.51	2	Tr. West. 2 soil horizon & alluvial clay
D6	4	2.59	2	Tr. West. 2 soil horizon & alluvial clay

Table 16: Assessment of diatom species abundance.

+ species present; ++ species common; +++ species abundant.

Diatom Sample Number **Diatom Species**	**{13} D1**	**{13} D2**	**{13} D3**	**{14} D1**	**{14} D2**	**{14} D3**	**Salinity Group**
Cymatosira belgica			+				polyhalobous
Rhaphoneis amphiceros			+				polyhalobous
Rhaphoneis minutissima		++	+				polyhalobous
Cyclotella striata		+					mesohalobous
Navicula pygmaea	+						mesohalobous
Surirella ovalis		+	+				mesohalobous
Synedra pulchella	++	++	++				mesohalobous
Synedra tabulata		+	+				mesohalobous
cf. Actinocyclus normanii		+					halophilous
Cyclotella meneghiniana		+	+				halophilous
Gomphonema olivaceum		+					halophilous
Melosira varians		+	++				halophilous
Navicula menisculus	+	++					halophilous
Navicula slesvicensis		+	+				halophilous
Nitzschia levidensis		+					halophilous
Rhoicosphaenia curvata	++	++	+++				halophilous
Hantzschia amphioxys			+				oligohalobous indif. (aerophile)
Achnanthes hungarica	+	+	+				oligohalobous indifferent
Achnanthes minutissima	+	++	++				oligohalobous indifferent
Amphora libyca		+	+				oligohalobous indifferent
Amphora pediculus		+	+				oligohalobous indifferent
Amphora veneta	++	+					oligohalobous indifferent
Caloneis silicula		+					oligohalobous indifferent
Cocconeis placentula & var. euglypta	+++	+++	++				oligohalobous indifferent
Cymbella affinis		+	+				oligohalobous indifferent
Diatoma vulgare		+					oligohalobous indifferent
Ellerbeckia arenaria				+			oligohalobous indifferent
Epithemia adnata	+						oligohalobous indifferent
Eunotia bilunaris		+	+				oligohalobous indifferent
Fragilaria pinnata	+	+	+				oligohalobous indifferent
Gomphonema acuminatum & var. coronatum			+				oligohalobous indifferent
Gomphonema angustatum & var. productum			+			+	oligohalobous indifferent
Gomphonema parvulum	+	+					oligohalobous indifferent
Gomphonema truncatum		+	+				oligohalobous indifferent
Gyrosigma acuminatum		++	+				oligohalobous indifferent
Navicula capitata	++	+					oligohalobous indifferent
Navicula pupula		+					oligohalobous indifferent
Navicula radiosa			++				oligohalobous indifferent
Navicula tripunctata		+					oligohalobous indifferent
Neidium affine var. longiceps			+				oligohalobous indifferent
Nitzschia amphibia	+	+					oligohalobous indifferent
Pinnularia subcapitata	+		+				oligohalobous indifferent
Pinnularia viridis	+						oligohalobous indifferent
Pinnularia sp.	+				+		oligohalobous indifferent

Diatom Sample Number Diatom Species	{13} D1	{13} D2	{13} D3	{14} D1	{14} D2	{14} D3	Salinity Group
Stauroneis smithii			+				oligohalobous indifferent
Synedra ulna			+		++	+	oligohalobous indifferent
Cocconeis pediculus		++	++				oligohalobous indif. to halophob
Eunotia flexuosa			+				halophobe
Nitzschia sp.	+	+	+				unknown salinity group
Gomphonema sp.	+				+		unknown salinity preference
Gyrosigma sp.		+			+		unknown salinity preference
Navicula sp.	+	+	+				unknown salinity preference
Thalassiosira sp.	+	+					unknown salinity preference
Chrysophyte Cysts				++	++	+	unknown salinity preference
Unknown Naviculaceae	+				+	+	unknown salinity preference
Indeterminate pennate fragments				+	++	+	unknown salinity preference
Indeterminate centric						+	unknown salinity preference

Table 17: Summary of diatom assessment

Diatom Sample Number	Diatom valve concentration	**Quality of preservation**	**Diversity**	**Assemblage type**	**Potential for percentage counting**
{13}D1	moderate	good to poor	moderately high	shallow freshwater with brackish	good
{13}D2	high	good	high	shallow freshwater with brackish and marine	excellent
{13}D3	high	good	high	shallow freshwater with brackish and marine	excellent
{14}D1	very low	very poor	very low	aerophile	none
{14}D2	low	very poor	low	shallow freshwater & aerophile	none
{14}D3	low	poor	low	shallow freshwater	none
{5}D1	none	-	-	-	none
{5}D2	very low	very poor	single fragment	-	none
{5}D3	none	-	-	-	none
{4}D4	none	-	-	-	none
{4}D5	none	-	-	one chryso. cyst	none
{4}D6	very low	very poor	very low		none

6.4 Conclusions

1. Diatoms are present in eight of the twelve samples assessed for diatoms. However, well-preserved and diverse diatom assemblages are present in only the three samples from the pond feature sampled in Monolith {13}.
2. Aerophilous diatom types and chrysophyte cysts that are found in ephemeral aquatic habitats and in soils dominate the poorly preserved freshwater diatom assemblages in Monoliths {14}, {5} and {4}.
3. Some shallow, freshwater diatoms were present in the two lowermost samples from Monolith {14}.

4. Non-planktonic freshwater and halophilous diatoms dominate the diatom assemblages of the pond feature. These reflect a shallow-water habitat with diatoms colonising mud and macrophyte surfaces. Freshwater planktonic diatoms are rare. There is some evidence for nutrient enrichment of standing water.
5. Mesohalobous and allochthonous polyhalobous diatom species that are typical of the tidal Thames are present in significant numbers in two samples from the pond (samples D2 and D3) and mesohalobous species are also present in sample D1. However, it is interesting to note that in this component of saline diatoms some species common in the tidal Thames in historic times are rare (such as the estuarine species *Cyclotella striata*) or absent (such as the allochthonous marine diatom *Paralia sulcata*).
6. The relatively high quality of the diatom assemblages in the three samples from the pond feature means that there is good potential to carry out percentage diatom counting for these samples. Diatom-based habitat, nutrient and salinity histories for this feature would be valuable in interpreting the feature's environmental history. Percentage diatom analysis, quantitative nutrient reconstruction and qualitative salinity reconstruction would be appropriate and useful to carry out here.

7 Lithics Assessment

By Barry Bishop

7.1 Introduction

Excavations at the above site recovered 18 struck flints and just under 1.3kg of burnt flint fragments. This report quantifies the material by context according to a basic technological/typological scheme (see Table 1), includes some general, preliminary impressions and interpretations of the material, and recommends any further work required. The majority of the material was recovered from a buried soil layer of prehistoric date.

7.2 Quantification

Context		Cortical Flake	Broad Flake	Trimming Flake	Blade	Core	Context Total	Burnt Flint (No.)	Burnt Flint (wt:g)
04	Palaeosol		1				1	5	91
34 Slot 1	Palaeosol	3	3	3	3	1	13	92	940
34 Slot 3	Palaeosol						0	1	28
34 Slot 5	Palaeosol					1	1	4	23
34 Slot 6	Palaeosol		1				1	1	16
35	Top of gravel					1	1		
44					1		1		
47							0	2	11
50							0	7	84
55							0	3	90

Table 18: Quantification of Lithic Material by Context

7.3 Burnt Flint

A total of 115 pieces of otherwise unmodified burnt flint weighing 1283g was recovered from eight separate contexts. Where identifiable it consisted of smooth worn/chattermarked alluvial flint cobbles. The degree of burning was variable, with some pieces retaining their original colour or become reddened, but it mostly had been burnt to the extent that they had shattered and changed to a grey-white colour, as would be consistent with having been placed in or close to a hearth.

The bulk of the burnt flint was recovered from buried soil horizon [34] and was particularly concentrated in slot 1. This concentration may indicate the presence of a hearth or the dumped waste from a hearth. The quantities present in this concentration would appear to suggest the flint was deliberately placed in the hearth, either as a structural component or in order to deliberately heat it, such as for the purposes of cooking or for industrial/craft uses. The remainder of the burnt flint was found in small quantities in a number of features and probably represented incidental background waste deriving from hearth use in their vicinity.

7.4 Struck Flint

7.4.1 Raw Materials

The struck material was manufactured predominantly from small sub-angular to rounded alluvial cobbles of semi-translucent black or brown flint, with a few pieces of Greensand chert also present. Due to the size of the raw materials and particularly by its often-extensive thermal flawing, its knapping potential would have been limited, but nevertheless a number of flakes and blades were successfully produced. Its quality may have been compensated for by its easy availability in the vicinity of the site.

7.4.2 Condition

The struck material was mostly in a good condition with slight chipping and abrasion visible, although there was some evidence of silica polishing and dorsal ridge rounding, consistent with minor taphonomic movement such as 'settling' of the artefacts within the burial matrix. None of the struck surfaces had recorticated.

7.4.3 Technology, Typology and Dating

No retouched implements or other typologically diagnostic pieces were present and the small size of the assemblage limited the inferences that could be made from its technological characteristics.

Three cores were recovered. The example from the surface of gravels [35] was made from a sub-rounded cobble of greensand chert weighing 92g. It had a series of flakes removed from different directions using cortical surfaces as striking platforms. The scar of one of these was then used to make an edge trimmed striking platform from which a series of small narrow flakes were detached. These mostly only succeeded in removing original cortex and further attempts at flake removal, as evidence by a number of incipient Hertzian cones, remained unsuccessful.

The core from the buried soil horizon [34 slot 5] consisted of a small sub-angular pebble weighing 19g. It had at least two flakes removed and an incipient Hertzian cone indicated further attempts were made to remove flakes. It had then shattered along thermal flaws which presumably prompted its abandonment. A small split pebble weighing 25g from context [34 slot 1] also had two flakes removed prior to the core shattering along thermal faults.

The flakes and blades varied in size and shape considerably. Most consisted of debitage including primary or decortication flakes and small platform trimming flakes. All of the flakes and blades were small, measuring less than 50mm maximum dimension and commensurate with the size of the raw materials. Four blades, all relatively short and wide, were recovered, three from context [34 slot 1]. All showed some evidence of having been possibly used as cutting implements although the possibility that these traces were caused by incidental post-deposition damage cannot be excluded. The remainder of the struck assemblage consisted of relatively broad, thick and expediently produced flakes.

The only confidentially dateable pieces comprised the four blades. These were all relatively wide but had all been systematically produced, displaying parallel dorsal scars and carefully edge trimmed striking platforms. They would be consistent with Mesolithic or Early Neolithic industries and were unlikely to have been manufactured much after c.3000BC. With these may be added the core from [34 slot 5], which, although unsuccessful, had been used to attempt to produce blades or narrow flakes. The various other pieces from [34 slot 1] revealed few dateable technological traits although none of the pieces would be out of place within Mesolithic / Early Neolithic assemblages. However, the broad thick flakes and the other cores present would equally not be out of place within Middle Bronze Age or later industries, and these could potentially be contemporary with the settlement evidence revealed in the structural record.

7.5 Discussion

The assemblage of struck flint was small but at least some of the pieces demonstrated activity at the site broadly dateable to the Mesolithic or Early Neolithic. There was a notable concentration of both burnt and struck flint within a small area in context [34]. This may indicate the presence of a flint-lined hearth around which knapping may have occurred, although no refittable pieces were present and the assemblage as recovered could only represent a fraction of the original waste produced. This assemblage would be typical of the evidence for occupation during the Mesolithic and Early Neolithic in the Lea Valley, which mostly consists of small scatters of lithic material found throughout the valley and suggestive of short-term residency by small mobile groups and representing only a single point of activity within a much wider landscape of inhabitation (eg Bishop in press).

A few of the struck flakes were squat and crudely produced (cf Herne 1991; Young and Humphrey 1999) and could possibly be contemporary with the Middle – Late Bronze Age activity identified in the structural record, although due to the size of the assemblage and the lack of diagnostic pieces this cannot be confirmed.

7.6 Recommendations

Due to the small size of the struck flint assemblage, the paucity of typologically diagnostic pieces and its probable chronological mixing, this report is all that is required for the archive and no further metrical or technological analyses are proposed.

However, the assemblage is of significance in that it indicates prehistoric activity that significantly pre-dates the main period of occupation at the site and which may contribute to the further understanding of Mesolithic and Early Neolithic activity in the Lea Valley. No structural features were identified from these periods and the lithics provide the principal means of understanding the activity at the site during this period.

There is also some limited evidence of flintworking associated with the Late Bronze Age occupation that may help understanding the range of activities represented there, as well as understanding the role of flintworking within a Late Bronze Age settlement context, close to the end of structured flintworking within Britain.

It is therefore recommended that the assemblage should be examined in more detail and fully described for publication, alongside illustrations of relevant pieces.

8 Geoarchaeological deposit model

The following section summaries the deposits across the site and synthesis the results of the specialist palaeoenvironmental analysis.

8.1 Methodology

The information recorded from the exposed trench sections was entered into a digital (Rockworks 2006) database as point data. Each deposit component (gravel, sand silt etc) was given a colour and a pattern and, as a result, the two major variables of any deposit were stored in the Rockworks database and used to construct the deposit model. The data was complemented by previous geotechnical boreholes done in the area and with boreholes from the Lea Valley Mapping project (Burton, et al, 2003)

A cross-section (transect) was drawn through the point data and correlations were made between key deposits. Individual lithostratigraphic units with related characteristics within a trench or borehole were grouped together and then linked with similar deposits, which may be made up of a number of individual contexts (lithostratigraphic units) in adjacent trenches. Linking deposits produced a series of site-wide deposits (facies), which are representative of certain environments. Thus a sequence of environments both laterally and through time has been reconstructed for the site.

A transect drawn across the site forms a major means of illustrating the buried stratigraphy in this report (see, Fig 14). The location of the stratigraphic data used (trenches and boreholes) and the location of the transect is illustrated in Fig 13. A key to the lithostratigraphy and its interpretation is provided with the figures illustrating the transect. The landscape characteristics identified across the site are illustrated in Fig 15.

8.2 Discussion of Deposit Sequence

The earliest deposits on the site consisted of the floodplain gravels which were generally characterised by mid brown or greyish brown coarse sandy gravels (facies 1). The greyer sandier gravels occurred towards the north east and central parts of the site within trenches East-2, 1B, 2A, and 2B. Within trenches West-2 and 3 the gravels tended to be oxidised to an orangey brown colour with coarser sized gravel clasts within the matrix. The level of the gravels was fairly constant across the site occurring at 2m OD within trench West-2 towards the west, and 1.7m OD within trench East-2 towards the north eastern part of the site. However, a gravel high was apparent within trench 2a where the gravels existed at 2.8m OD.

A topographic plot of the gravel surface (see Fig 2) produced from previous data taken from the Lea Valley mapping project (Burton et al, 2003) demonstrates how these gravels form a low terrace extending out into the main part of the Lea Valley floodplain. Recent work at Site 25 demonstrated that the gravel surface dropped to around 0-1m OD where the gravels were overlain by sands and organic sediments deposited by a migrating tributary channel. To the west of Site 26 the gravel surface drops further to below 0m OD forming the deepest part of the floodplain and the main channel area.

The occurrence of the two distinct gravel units on Site 26 may suggest that they result from two different aggradational events. The gravels were probably deposited during the Late Pleistocene in a cold climate braided river environment (c. 18,000 BP), before downcutting during the last stage of the Devensian glaciation (c. 15 to 10,000 BP) cut the deepest part of the channel towards the west of the site. The more oxidised appearance of the gravels towards the eastern part of the site could suggest that this part of the site became high and dry within a braided channel while gravels continued to be deposited towards the central and eastern parts.

Alternatively the gravels in the north eastern part of the site may be later than the Pleistocene, and could possibly result from a tributary channel flowing across the area during the Late Pleistocene\Early Holocene interface or even later. The gravels do have similar characteristics to the lower lying Holocene floodplain gravels identified on Site 25, suggesting that they may be of a contemporary date. Organic marsh clay deposits (facies 3) above these gravels were radiocarbon dated to AD 650 to 810, suggesting that a channel may have flowed across this part of the site until the Saxon period. However, so little of this deposit survived that it was not possible to determine whether the deposit infilled a cut feature, or was the result of natural accumulation on the margins of an active channel.

Within trenches West-2, 2A, 2B and 3 the floodplain gravels were found to gradually grade into a mid orangey brown sandy clay which fined up through the sequence to a silty clay or clay unit (facies 2). The deposit generally appeared to be well oxidised with frequent iron stained root channel and worm holes occurring throughout the deposit. The origin and date of this deposit is uncertain, but it is likely to be of a Late Pleistocene/Early Holocene date and relate to fluvial deposition either through overbank flooding or in channel marginal areas where channel flow became sluggish. This deposit certainly formed a dry buried soil horizon into the Prehistoric period as made evident from the Bronze Age and Iron Age features found to truncate the deposit. The deposit displayed a more grey mottled appearance within the north western end of trench 2A suggesting the landsurface underwent substantial waterlogging in this part of the site. This buried soil horizon was found to occur at around 2.6m OD.

Evidence from a site just to the south of Warton road (Perry, *in prep*) where a Roman ditch feature was sealed by alluvial clays, suggests the low terrace remained dry at least until the Roman period, after which overbank flooding inundated the area. On Site 26 this is evident from the mottled clays (facies 5) which overlie the buried soil horizon.

This horizon generally consists of a lower band of a brown partially oxidised clay, overlain by a greyer gleyed manganese stained clay. The thickness of the deposit varies across the site depending on the level of truncation, but generally measures up to 0.8m thick and occurs between 3 to 2.6m OD. The change in the nature of the alluvial clay up through the profile suggests that the area was becoming progressively more waterlogged over time leading to the gleyed appearance of the upper clay. However, horizontal variations in the clay were also apparent across the site. The central and northern parts of the site, as indicated by the north western end of trench 2, displayed more frequent greyish mottling of the deposits which extended down into the underlying buried soil horizon. This colouring is likely to be post depositional and result from the increased waterlogging of the ground due to the closer proximity of the wetlands to the north on Carpenters road, with prolonged periods of ground water saturation during wetter periods.

The pollen analysis of the sampling columns through the sequence in trench West-2, (facies 2 and 5) demonstrated that pollen only survived in the upper most part of the dry soil horizon, and was found in moderate quantities in the above alluvial clays. Although the pollen report states that the whole sequence is thought to be Pleistocene, this only applies to the origin of the dry soil horizon, as the alluvial clays are thought to be post-Roman in date.

The lack of pollen in the lower dry soil horizon is not unsurprising given the heavily oxidised and bioturbated nature of the deposit which would have degraded the pollen spores. Pollen form the upper alluvial clays suggested the surrounding environment consisted of an open grassland habitat with evidence of cereal cultivation, with a resemblance to modern open agricultural environments. The on-site plant community consisted of a grass sedge fen with some evidence of standing water. This picture is further corroborated with the plant macro evidence recovered from the bulk samples. Aquatic plants such as pond weed and water plantain were common, as were plants that grow on damp ground such as gipsy-wort .The diatom evidence was less conclusive as preservation was found to be poor, although a few aerophilous diatoms which survive well in dry soil horizons were present in the soil horizon.

The environmental evidence as a whole does indicate a rise in river levels and an inundation of the dry soil horizon with overbank flood deposits forming a damp surface with pools of standing water. As yet these deposits are undated, but this inundation is likely to have occurred sometime after the Roman period. The upper part of the alluvium contained brick and tile fragments suggesting the area remained as a seasonal flooded grass meadow into the Post-Medieval period.

This sequence of the dry soil horizon overlain by alluvial clays and then the modern made ground is defined by Landscape Zone 1. This zone occurs across the central and western parts of the site. In general this zone has a high potential for occupation and low potential for palaeoenvironmental evidence. However the alluvial clays do contain good pollen preservation for landscape reconstruction. If these alluvial clays can be securely dated they may be able to provide useful environmental information for the environment of the Lea Valley which existed in the historic period.

Towards the north east corner of the site in the vicinity of trenches 1 and East-2, a significant amount of truncation from clay extraction pits has removed the natural sequence down to the level of the floodplain gravels. However within trench East-2 a small area survives which contains deposits not observed elsewhere across the site.

Above the floodplain gravels a humic clay (facies 3) occurred at c.1.95m OD. This deposit was similar to humic clays observed on Carpenters Road, and is characteristic of a marshy marginal environment at the edge of an active channel. However, so little of this deposit survived it was difficult to determine whether the deposit infilled a natural hollow, or anthropogenic cut, or represented a wider marshy environment lost to the truncation of the clay extraction pits. The base of the deposit was radiocarbon dated to the Saxon period.

The deposit was sampled by Monolith column {14}. The pollen and plant macro evidence from this deposit suggested the unit was deposited in a freshwater grass-sedge fen, with the presence of pond weed suggesting episodes of standing water. The nearby environment consisted of predominately open herbaceous grassland, and suggested woodland clearance had taken place with both arable and pastoral agriculture being practised. This is a similar environment to the pollen present within the upper alluvial clays on the rest of the site.

The diatom evidence from this deposit, although poorly preserved, consisted of shallow freshwater species which suggested an ephemeral aquatic environment such as a marginal channel, prone to periods of drying out.

Although this deposit only existed in a small part of the site, it is possible other areas, perhaps of an earlier date may have survived the clay pit truncation. This deposit has the potential to reconstruct the environment as existed from at least the Saxon period onwards.

The humic clay was truncated by a pond feature infilled with a black anaerobic clay (facies 4). This deposit occurred at c. 1.8m OD. This deposit was also dated to the Saxon period. This feature had a clear cut, suggesting that it was deliberately constructed rather than forming by natural processes.

The feature was sampled by Monolith {13}. The pollen evidence from the profile was similar to that from Monolith {14}, with the nearby environment predominately open with evidence of cereal cultivation. The on-site plant community consisted of aquatic sedge fen species. The diatom samples from this deposit produced a more diverse range of species and in better preservation than other samples taken across the site. Of particular interest from this deposit was the presence of both freshwater diatoms and also those usually found in the higher salinity waters of the tidal Thames. This suggested that an upstream flood event from a high tide inundated the feature with brackish water.

In general this deposit had good levels of preservation of plant macro remains, pollen, diatoms and molluscs. Such features if encountered on other parts of the site have the greatest potential for palaeoenvironmental evidence.

This part of the site is defined by Landscape Zone 2. Within this zone a large part of the natural sequence is likely to have been truncated by the clay extraction pits. However marginal marsh deposits may survive in areas and the dryland soil horizon identified within zone 1 may also occur within this zone.

9 Archaeological potential

9.1 Realisation of original research aims

The extent to which the evaluation has been able to address the research objectives established in the *Method Statement* for the evaluation is discussed below:

Are there any high gravel islands, which may have been exploited in the prehistoric or early historic eras? Or do the gravels shelve gently towards the river?

The surface of the terrace gravel appears to be relatively consistent across the site; the level varies between 2m OD to 1.60m OD. The only anomaly to this was an area of higher ground in the middle of the site in trench 2a. Here the natural rose to 2.80m OD. It is probably no coincidence that it was in this area that the Mesolithic – early Neolithic flint scatter was found within the buried dry land soil horizon.

Is there any peat on the site which can inform the palaeoenvironmental understanding of the ancient landscapes?

No organic deposits, including peat, were recorded on the site. The only exception to this was a thin organic layer encountered within a Saxon pond feature. This feature truncated a small area of humic clay with good organic preservation. These deposits were severely truncated, but such deposits may occur elsewhere across the site. These deposits were shown to contain good levels of pollen, diatom and plant macro preservation.

Is there evidence for prehistoric human exploitation of the landscape? If so, is it possible to characterise the status of occupation or land use exploitation?

A small number of postholes, pits and a single curvilinear gully were recorded on site, the majority of which were concentrated in the south-western area of the site. These appear to represent settlement activity, with radiocarbon analysis dating it to the Late Bronze Age. The recovered pottery also indicates a Late Bronze Age/Early Iron Age date for occupation.

A small assemblage of struck and burnt flint dating to the Mesolithic – early Neolithic period was also recovered from the evaluation. The presence of such finds indicates the presence of possible hearth activity nearby, around which knapping and other industrial activities may have taken place. Although the settlement activity on site is small scale, it illustrates continuous occupation and exploitation of the local resources from as early as the Mesolithic through to the Iron Age.

Is there evidence for the London-Colchester Roman road? Does it share similar characteristics to the fragments excavated to the west at Old Ford? What is the nature of the landscape that is adjacent to the road and some distance from it?

No evidence for the road was found and it appears unlikely that it crossed the areas of the site examined.

What evidence is there for post-Roman exploitation, in particular is there evidence for water inundation and water management? If so how are these activities characterised?

The upper alluvial clays represent seasonal flooding of the wetland periphery. No evidence for water management was found. A truncated Saxon pond feature and humic clay deposit was recorded in the north-eastern part of the site. The pond may have functioned as a watering hole for animals pastured within the marsh.

Are there any in situ deposits of archaeological significance within the made ground or is it all of 19th/20th century dump and make-up deposits?

All the made ground observed consisted of 19th/20th century dump and make-up deposits.

Is there evidence of pre-19th century industrial features?

No pre-19th century industrial features were identified.

Has all of the alluvial clay been removed from the eastern part of the site?

Within the eastern end of evaluation trench 1 all the alluvial clay had been removed down to the terrace gravel. In the eastern end of trench 2b however, alluvial clay still existed and appeared to continue east beyond the trench limits. Therefore it appears that the clay extraction pits seem to have intermittently and sporadically truncated the underlying alluvial clay.

Where is the boundary for the edge of the brickearth extraction quarry?

The exact boundary for the clay extraction on site cannot be determined. It appears that sporadic truncation of the alluvial clay took place with no definitive line or edge to it. This is in part due to the spacing of the evaluation trenches across the site.

Can the gravels be reached by the evaluation trench and has its surface been severely truncated?

The gravel was reached in every evaluation trench and appeared to have little or no truncation. The clay extraction pits previously mentioned represent the majority of truncation on site, although this was only to the top of the terrace gravel.

9.2 General discussion of potential

The evaluation has shown that the site lay on the dry land periphery of a known wetland environment to the north for most of prehistory. This became seasonally inundated meadowland during the historic period.

The natural gravel appears to differ from the gravels observed elsewhere in the Lea Valley. The gravels on the site appear to form an earlier ‘low terrace’, from which a downcutting event cut the later Holocene channel recorded on site 25 to the north. This ‘low terrace’ extends along the eastern side of the valley from Temple Mills to the Stratford area. This terrace formed an area of dry land, following downcutting in the Late Glacial period, over which early Holocene dryland soils began to develop.

The formation of a dry land weathered soil horizon was represented by a silty clay deposit, sealing the natural gravel and overlain by the alluvial sequence. A small assemblage of struck and burnt flint was recovered from this horizon, within the central area of the site. The struck and reworked flints were dated to the Mesolithic – early Neolithic, although a couple of the pieces possibly date to the Bronze Age. The lack of any diagnostic piece meant that this couldn’t be determined exactly. Such remains are evidence of temporary, seasonal occupation of the site, utilised by small mobile groups that would have had many of such camps within in a much wider landscape of inhabitation.

In the southern area of the site the dry land horizon was a cut by series of features, comprising postholes, small pits and a possible ring gully representative of low-scale settlement activity. This illustrates that the area continued as a high and dry soil environment at least until the Late Bronze Age. Sedentary occupation involving agricultural activity and animal husbandry may have taken place. Further fieldwork and analysis may determine the presence or absence of such activities.

The evaluation has shown that the site appeared to be continually occupied from at least the Mesolithic period until the Early Iron Age. Further occupation evidence may exist beyond the limits of the evaluation trenches, especially in the proximity of the flint scatter, which may have existed close to a burnt mound or flint-lined hearth. Further analysis of the site and its setting in relation to other prehistoric sites along the Lea Valley will add to our current understanding for patterns of prehistoric migration, occupation and settlement.

With the exception of the humic clay and pond fill encountered in trench East-2, palaeoenvironmental evidence was generally poorly preserved across the site. The well preserved deposits only survived in isolation, with severe truncation removing a large part of them. It is not known whether the humic clay is part of a wider expanse of marginal marsh land that once existed across the site, or how far such a deposit may extend. However, this deposit and the pond fill have good potential for landscape reconstruction. Further analysis of the palaeoenvironmental remains recovered from the pond fill would refine the characteristics of the Saxon landscape, a period which is currently poorly understood within the Lea valley.

The alluvial clays sealing the dry soil horizon did contain reasonably well preserved pollen. However, the upper part of these deposits contains modern material and is generally not of any great thickness across the site. Thus the chronological resolution of such deposits is likely to be poor, as they accumulated very slowly across the site from the post-Roman period into modern times. Dating these deposits would also be difficult, due to the lack of any significantly sized organic matter suitable for radiocarbon dating.

9.3 Significance

Very little is yet known about the evolving environment of the Lower Lea, its relationship to the changing landscape and the river regime of the Thames, and to the archaeology of the river terraces on either side of the valley floor.

The potential of the analysis of the settlement activity on site and its relationship and setting to other prehistoric sites along the Lea Valley will add to our understanding of prehistoric settlement, migration and occupation patterns, which is of local and regional significance.

The records and samples of the alluvial sequence and cultural remains surviving on the site contribute to our current understanding of the site's past environment and its surroundings. The site is undoubtedly of local significance.

10 Proposed development impact and recommendations

The evaluation has shown that the dry land soil horizon containing artefacts and cut features of archaeological interest lie below *c* 2.40m OD on the site. The alluvial deposits that seal this horizon are fairly homogenous and therefore have low potential for past environmental reconstruction.

Any groundworks associated with any proposed development that potentially extend to more than 2m below current ground level (ie: below *c* 2m OD) are likely to impact upon deposits of archaeological survival/interest, especially in the areas of the flint scatter and the settlement activity.

Further fieldwork in advance of any works on this site which may have impacts would clarify the exact nature and extent of the archaeological evidence already identified as existing on the site.

The analysis of the environmental remains has shown that Monolith {13} and {14} contained good levels of pollen preservation. Monolith {13} also contained good levels of diatom preservation with the associated contexts rich in mollusc and plant macro remains. These deposits are known to be of a Saxon date, although the top of the sequence is as yet undated.

At present the analysis of the environmental material recovered from the site has only been done to assessment level. Further analysis of the material recovered from trench East-2 would be able to refine the landscape characteristics that existed in this part of the Lea Valley from the Saxon period onwards. Such work should be considered after further field work has been done and an updated project design devised. If similar deposits are encountered during further fieldwork they should be adequately sampled for such palaeoenvironmental evidence. A full analysis of these samples would be of particular significance if no environmentally rich deposits are uncovered on the site during further work.

Beyond the mitigation noted above, the results of this exercise should be incorporated into any future analysis/research or publication programmes on the Lea Valley area.

The decision on the appropriate archaeological response to the deposits existing on the site and samples taken from them rests with the Local Planning Authority and their designated archaeological advisor.

11 Acknowledgements

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13 NMR OASIS archaeological report form

13.1 OASIS ID: preconst1-17695

Project details

Project name	An archaeological Evaluation and Mitigation Excavation at Site 26 Warton Road, London Borough of Newham
Short description of the project	An initial archaeological evaluation was undertaken at the proposed locations of two shafts, with a small mitigation excavation subsequently being undertaken at one of the shaft locations. In addition three long evaluation trenches were excavated across the site. All these investigations revealed natural gravel sealed by a buried dryland 'soil horizon' from which was recovered a small Mesolithic - early Neolithic flint assemblage. Cut into this horizon was a series of features suggest settlement activity dating to the Bronze Age. Alluvial clays and modern made ground completed the sequence
Project dates	Start: 12-09-2005 End: 18-10-2005
Previous/future work	No / Not known
Any associated project reference codes	OL-00305 - Sitecode
Type of project	Field evaluation
Site status	Area of Archaeological Importance (AAI)
Current Land use	Other 13 - Waste ground
Monument type	PIT Late Bronze Age
Monument type	PIT Late Bronze Age
Monument type	PIT Late Bronze Age
Monument type	POSTHOLE Late Bronze Age
Monument type	POSTHOLE Late Bronze Age
Monument type	RING GULLY Late Bronze Age
Significant Finds	FLINT SCATTER Late Mesolithic
Methods & techniques	'Sample Trenches','Targeted Trenches'
Development type	Service infrastructure (e.g. sewage works, reservoir, pumping station, etc.)
Prompt	Direction from Local Planning Authority - PPG16
Position in the planning process	Not known / Not recorded

Project

location	
Country	England
Site location	GREATER LONDON NEWHAM STRATFORD Site 26, Warton Road
Postcode	E15
Study area	20000.00 Square metres
National grid reference	TQ 3819 8406 Point
Height OD	Min: 1.65m Max: 2.80m

Project creators	
Name of Organisation	MoLAS-PCA Ltd
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	MoLAS-PCA Ltd
Project director/manager	Peter Moore
Project supervisor	Neil Hawkins/Jim Leary
Sponsor or funding body	London Development Agency
Project archives	
Physical Contents	'Environmental','Worked stone/lithics'
Digital Archive recipient	LAARC
Digital Contents	'Environmental','Worked stone/lithics'
Digital Media available	'Survey','Text'
Paper Archive recipient	LAARC
Paper Contents	'Environmental','Worked stone/lithics'
Paper Media available	'Context sheet','Diary','Drawing','Map','Matrices','Photograph','Plan','Report','Section','Survey ','Unpublished Text'

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	An archaeological Evaluation and Mitigation Excavation at Site 26, Warton Road, London Borough of Newham, E15
Author(s)/Editor(s)	Hawkins, N.
Date	2006
Issuer or publisher	MoLAS-PCA Ltd
Place of issue or publication	London
Entered by	Peter Moore (pmoore@pre-construct.com)
Entered on	7 September 2006

Appendix 1: Glossary

Alluvium. Sediment laid down by a river, and usually well-sorted. Can range from sands and gravels deposited by fast flowing water and clays that settle out of suspension during overbank flooding. Other deposits found on a valley floor are usually included in the term alluvium. Peat develops when there is little mineral sediment deposition and impeded drainage, which limits biological decay; and tufa accumulates when springs rich in calcium carbonate discharge in damp well-vegetated situations.

Arctic Beds. Cold climate deposits, pre-dating the Last Glacial Maximum and sometimes found within the gravels of the Lower Lea. They may survive within parts of the floodplain not reworked by the river during the Late Glacial.

Ecotone. A zone that lies between areas of contrasting environment, such as on the wetland/dryland margins.

Holocene. The most recent epoch (part) of the Quaternary, covering the past 10,000 years during which time a warm interglacial climate has existed. Also referred to as the 'Postglacial' and (in Britain) as the 'Flandrian'.

Knickpoint. A fall in base level (such as the low sea level at the end of the Pleistocene) gives rise to a discontinuity in the longitudinal profile of a river ie: steepening of the downstream channel gradient. The river tends to adjust to such a change by increased flow, which leads to increased erosion in the steepened section of the river and this results in the steepened section (knickpoint) cutting back in an upstream direction.

Last Glacial Maximum. The height of the glaciation that took place at the end of the last cold stage, around 18,000 years ago.

Late Glacial. The period following the Last Glacial Maximum and lasting until the climatic warming at the start of the Holocene. In Britain this period is subdivided into a warm 'interstadial' episode the Windermere Interstadial, followed by a renewed cold ('stadial') episode, in which local ice advances occurred (the Loch Lomond Stadial).

Pleistocene. Used in this report to refer to the earliest part of the Quaternary, the period of time until the start of the Holocene, about 10,000 years ago. However, since the present Holocene epoch is almost certainly only a warm interglacial episode within the oscillating climate of the Quaternary, it is often seen as being part of the Pleistocene epoch, in which case the terms Pleistocene and Quaternary are interchangeable. As it is necessary, in this report, to differentiate between the events that took place at various times during the last cold stage and earlier in the Quaternary and those that took place during the Holocene, the Pleistocene is used to refer to the parts of the Quaternary pre-dating the climatic amelioration that took place at the start of the Holocene.

Quaternary. The most recent major sub-division (period) of the geological record, extending from around 2 million years ago to the present day and characterised by climatic oscillations from full glacial to warm episodes, when the temperate was as warm as if not warmer than today. To a large extent human evolution has taken place within the Quaternary period.

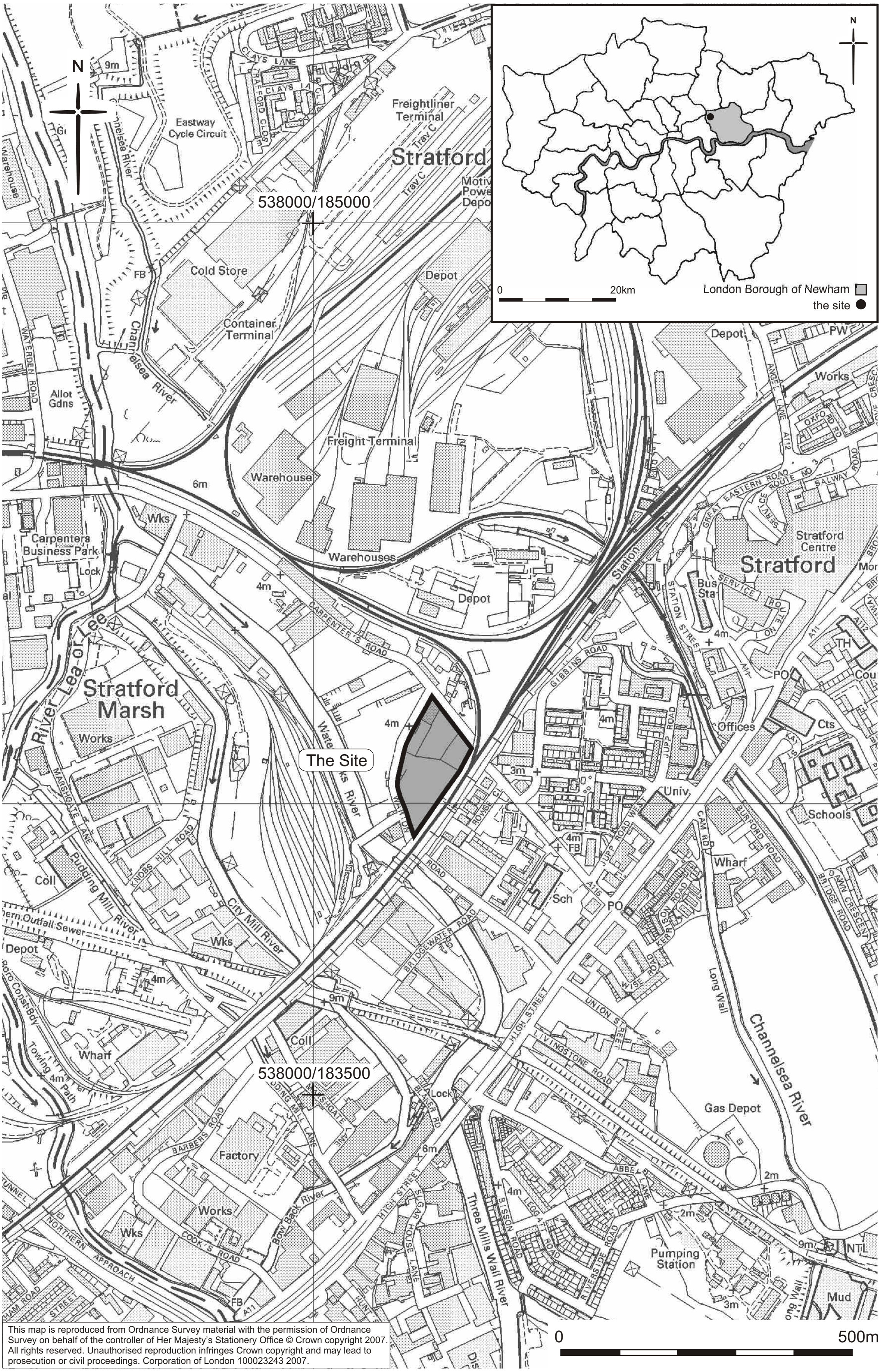

Fig 1 Site location

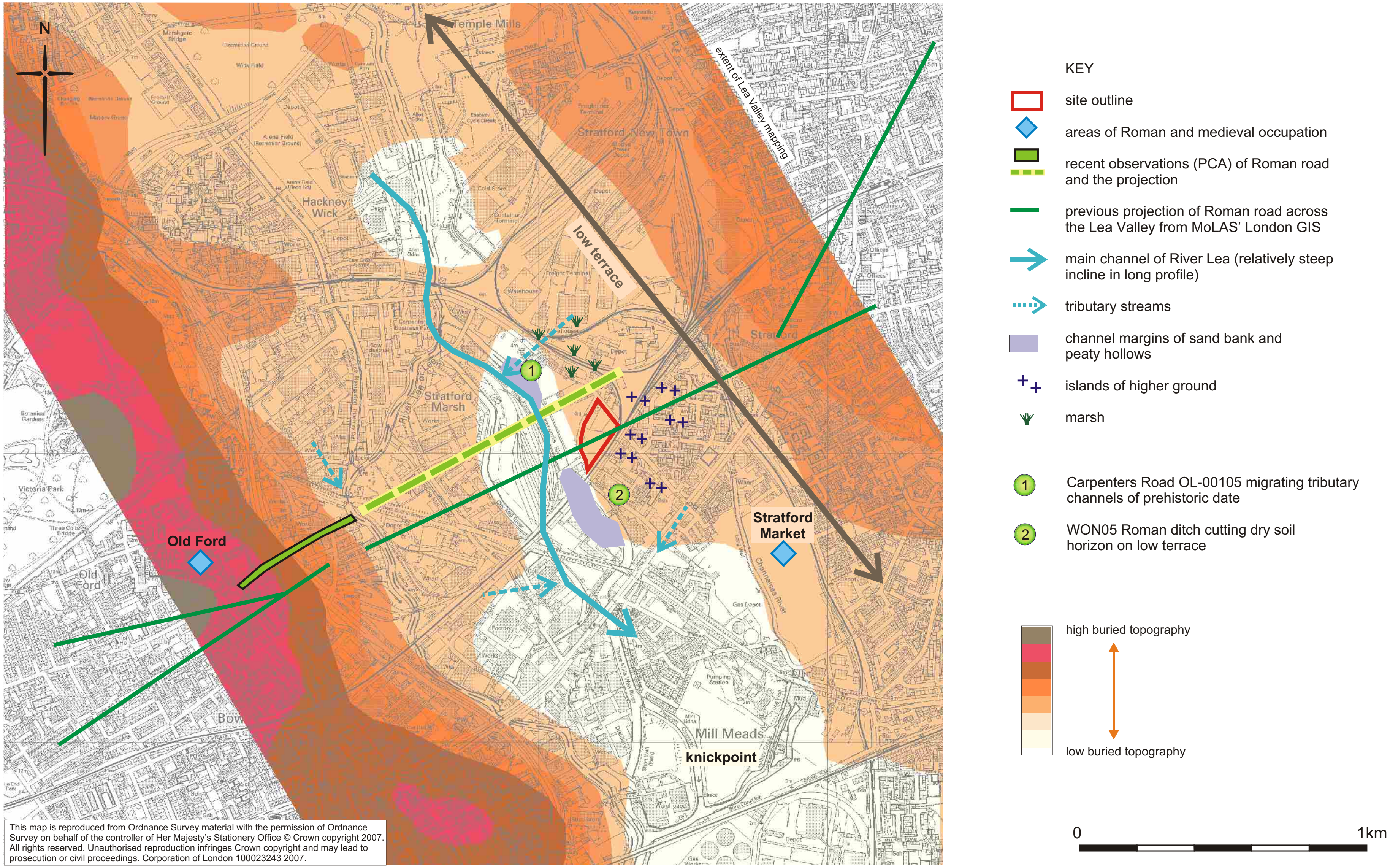

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Fig 2 Archaeological landscape setting and buried landscape

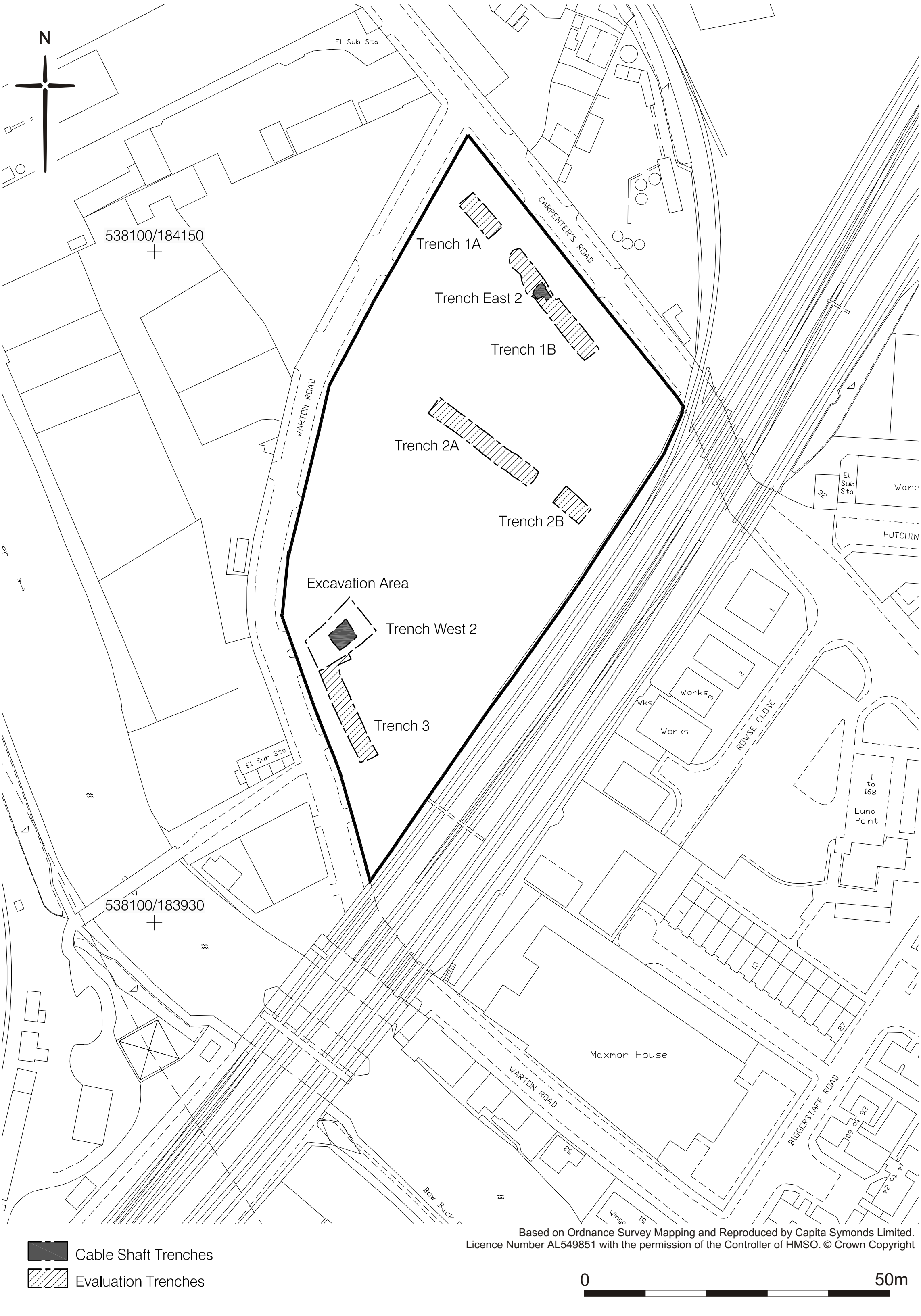

Fig 3 Trench locations

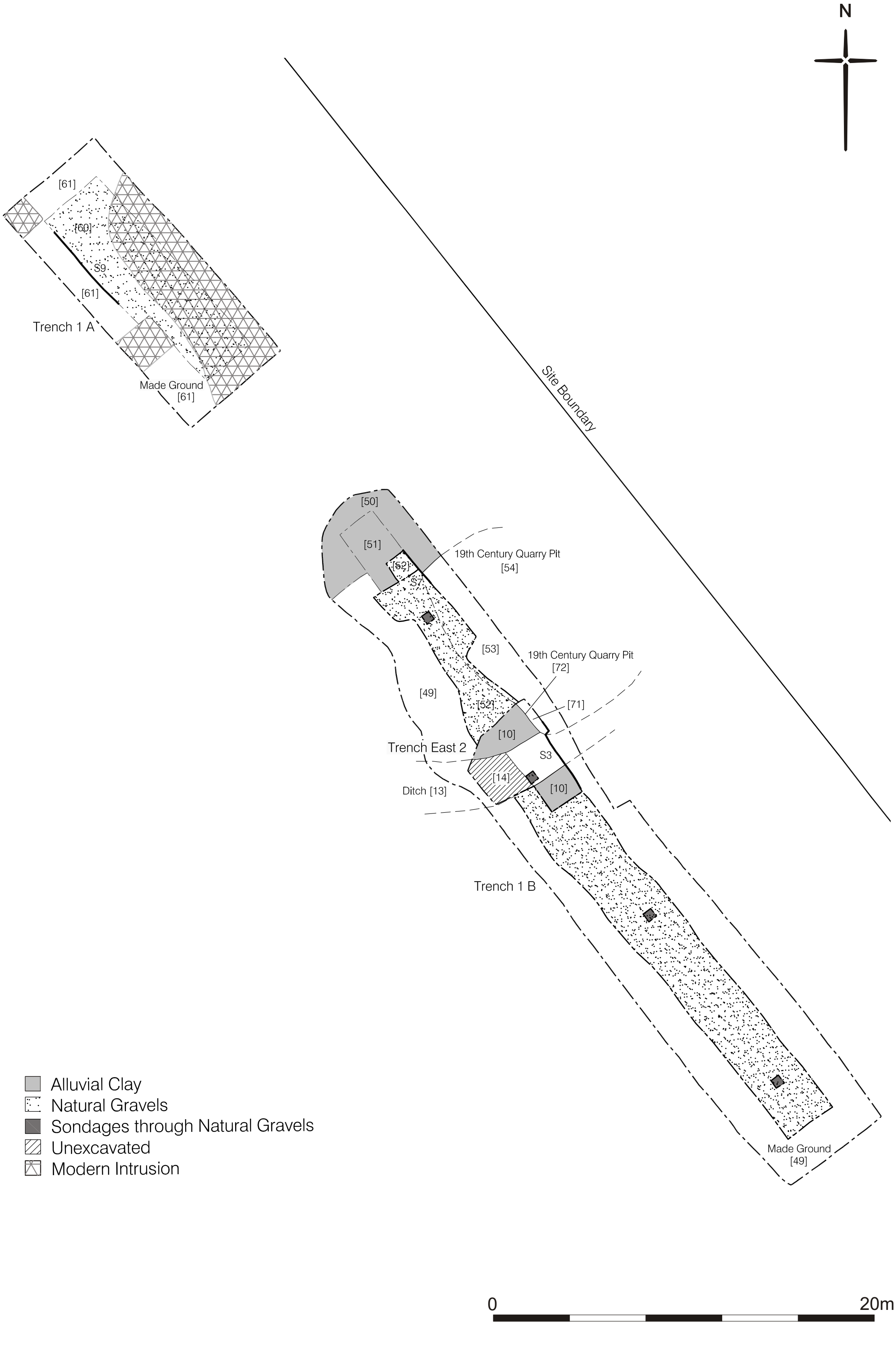

Fig 4 Plan of Trenches 1A, 1B and East-2

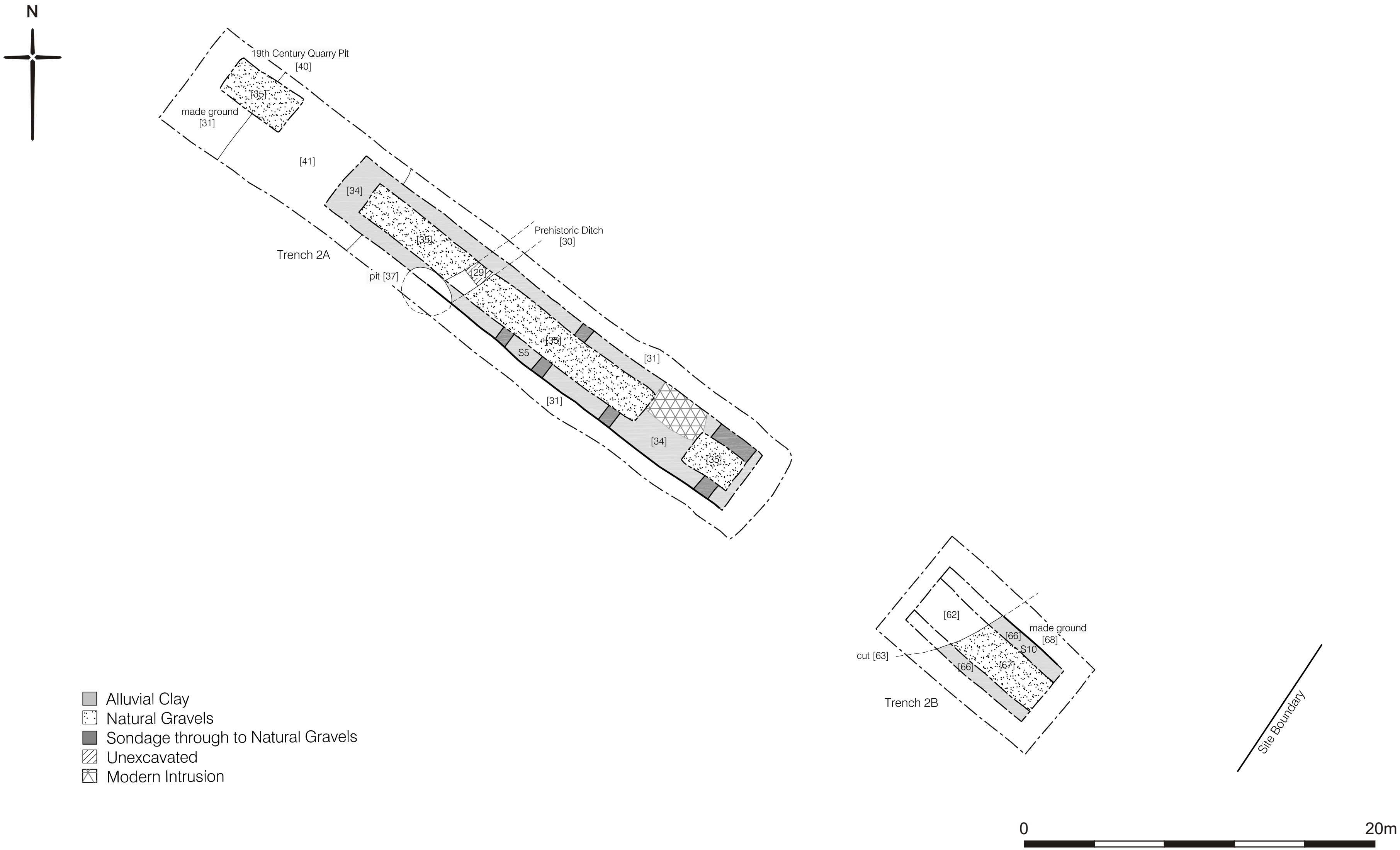

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Fig 5 Plan of Trenches 2A and 2B

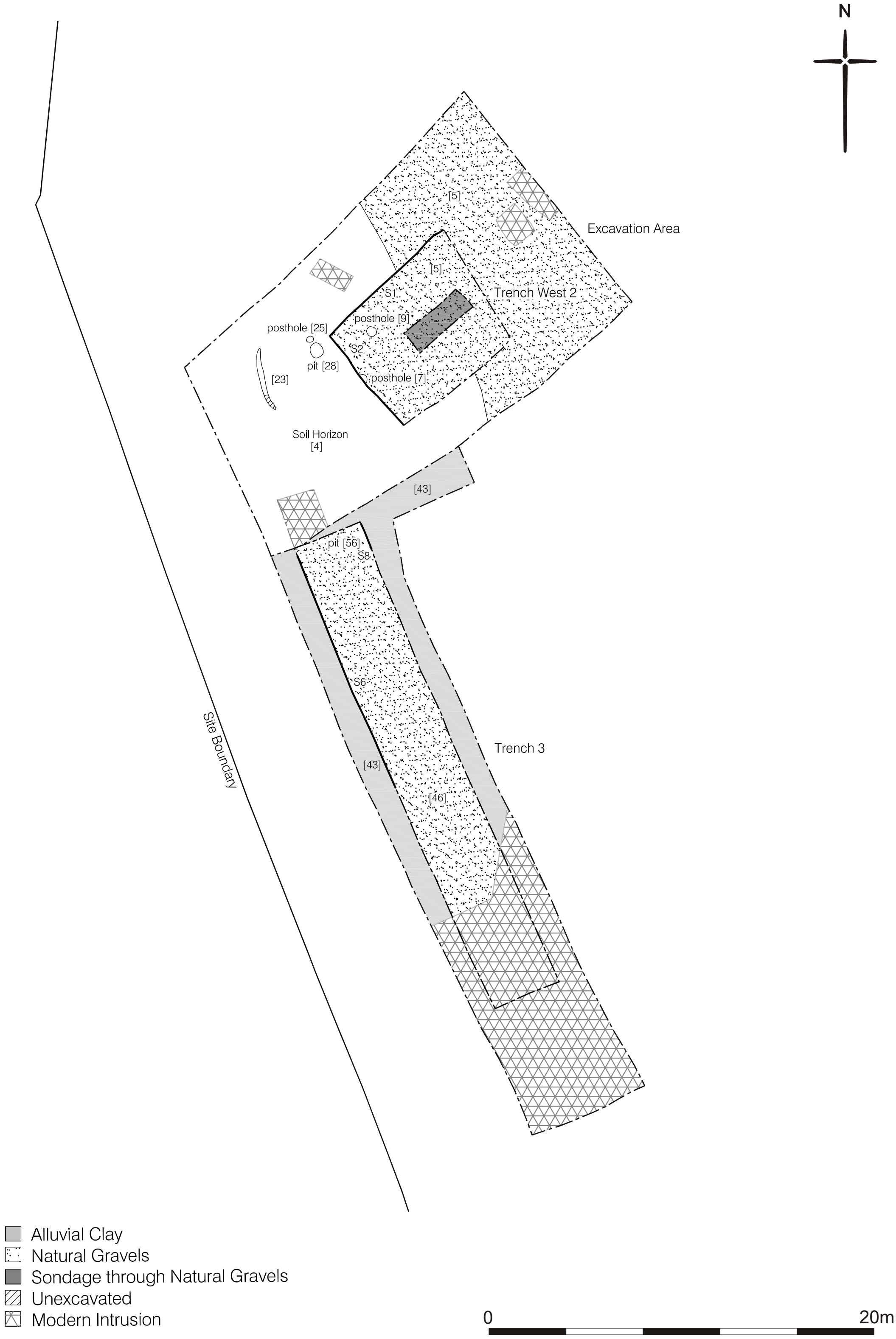

Fig 6 Plan of excavation area and Trenches 3 and West-2

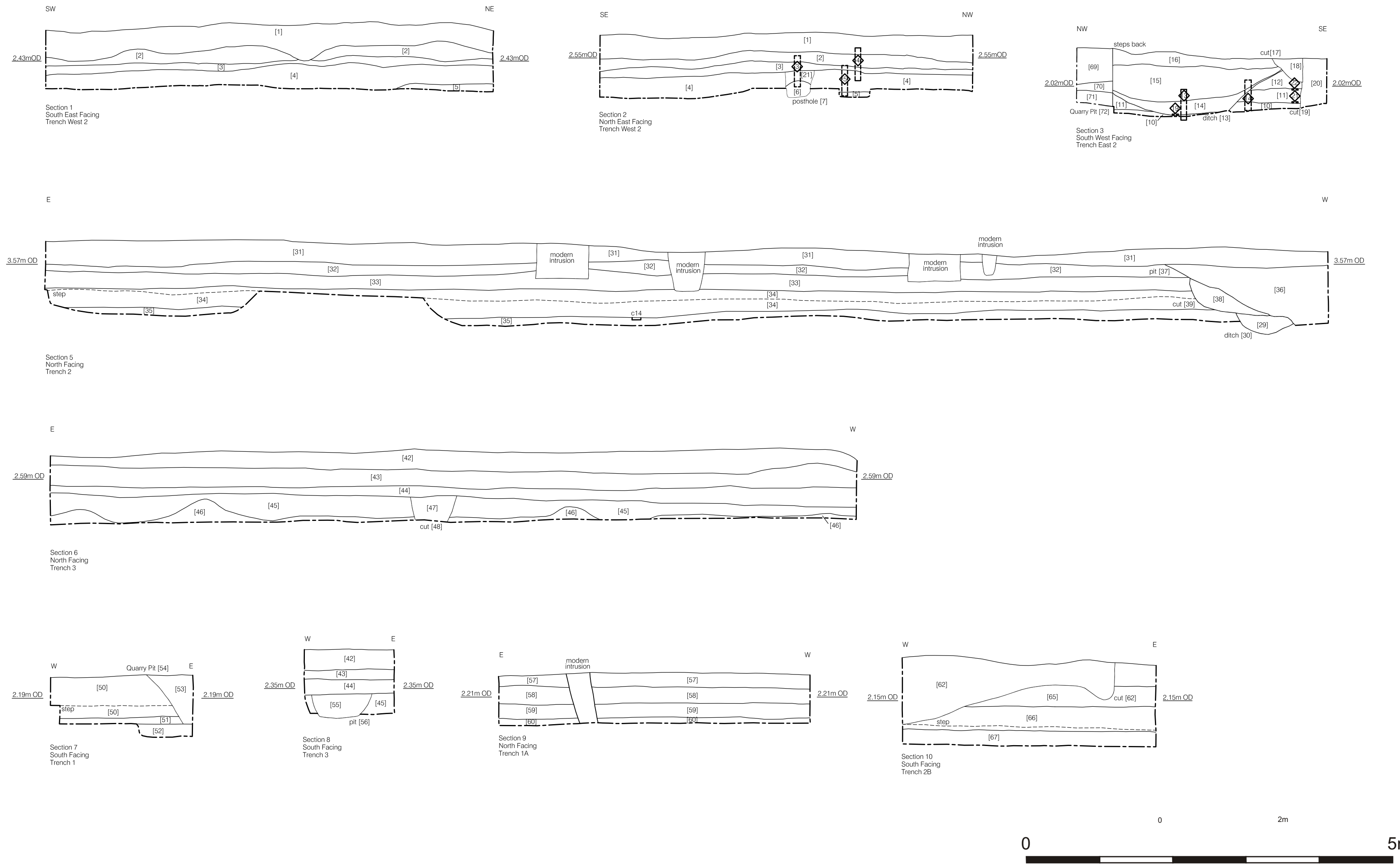

Fig 7 Trench sections

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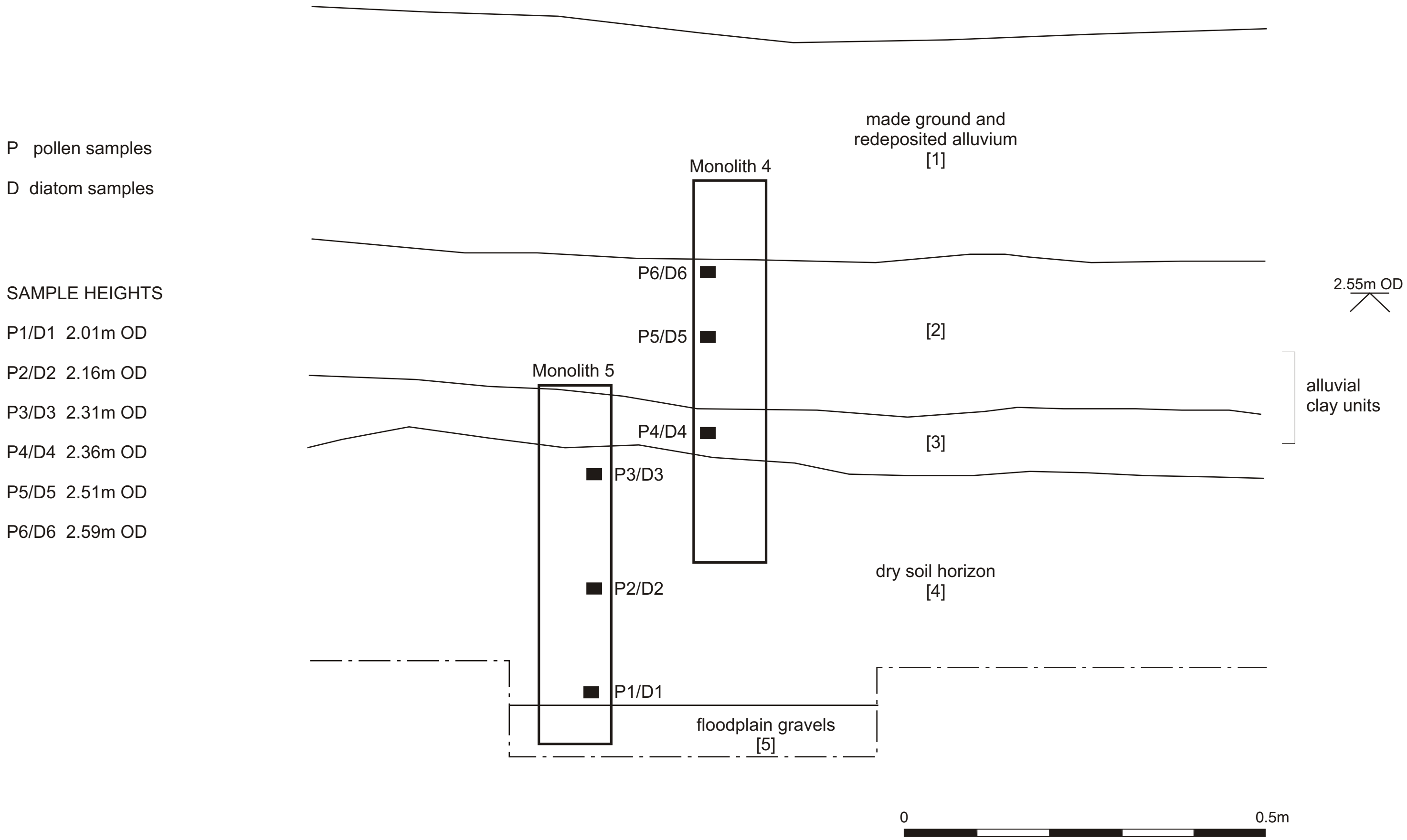

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Fig 8 North east facing section through trench West-2 illustrating location of pollen and diatom sub-samples from Monoliths {4} and {5}

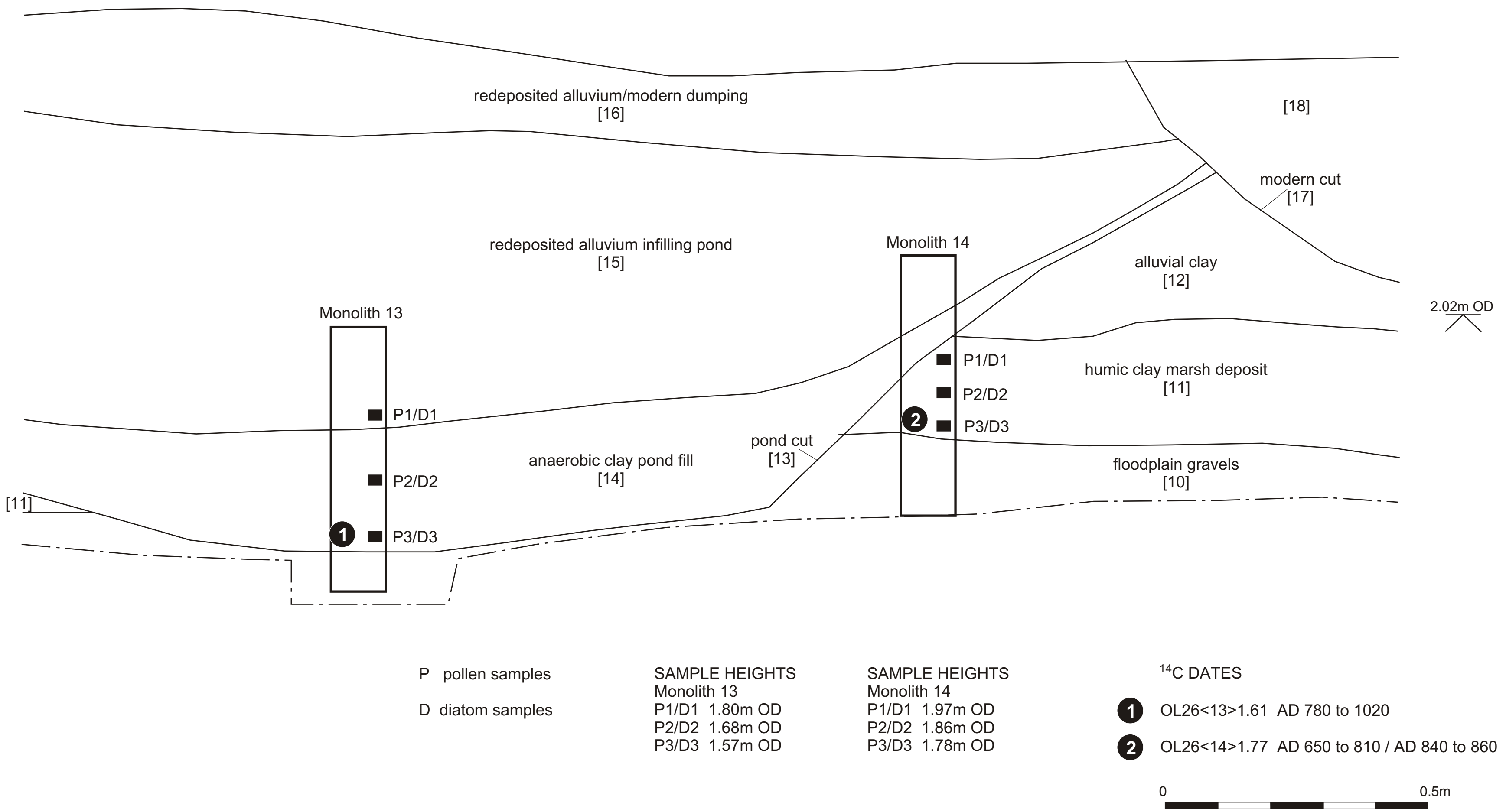

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Fig 9 South west facing section through trench East-2 illustrating location of pollen and diatom sub-samples from Monoliths {13} and {14}

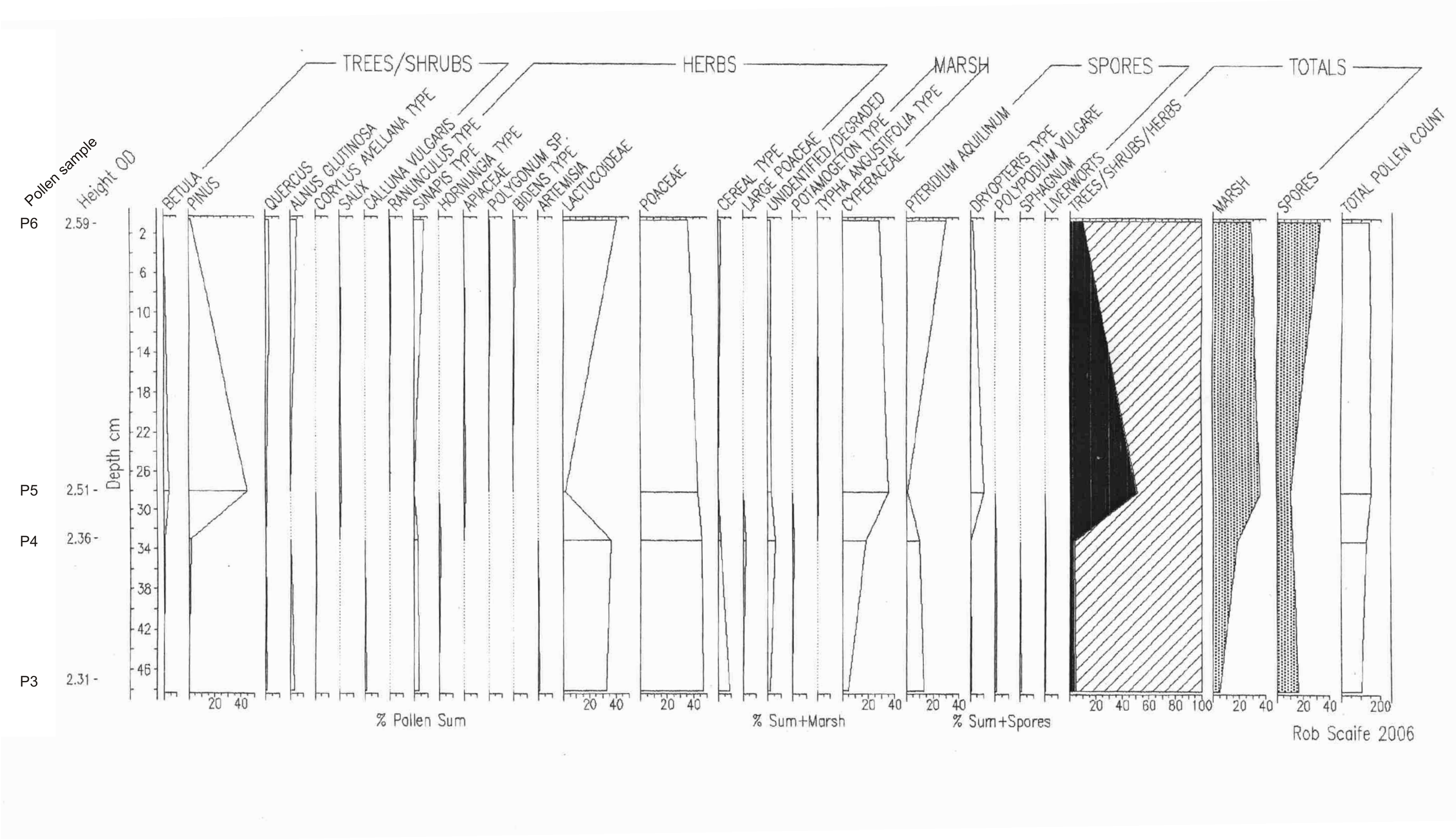

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Fig 10 Pollen profile through Monoliths {4} and {5}

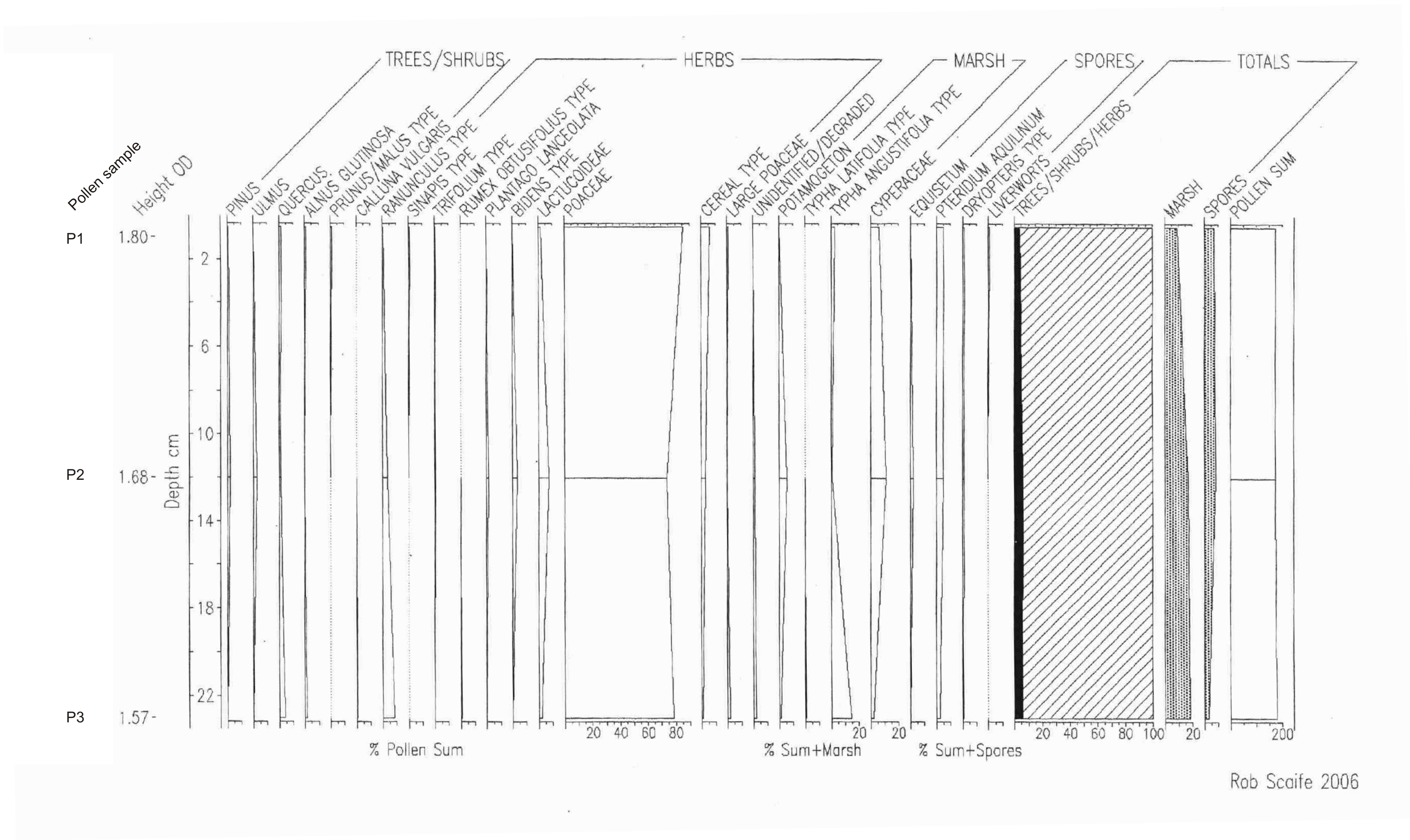

Fig 11 Pollen profile through Monoliths {13}

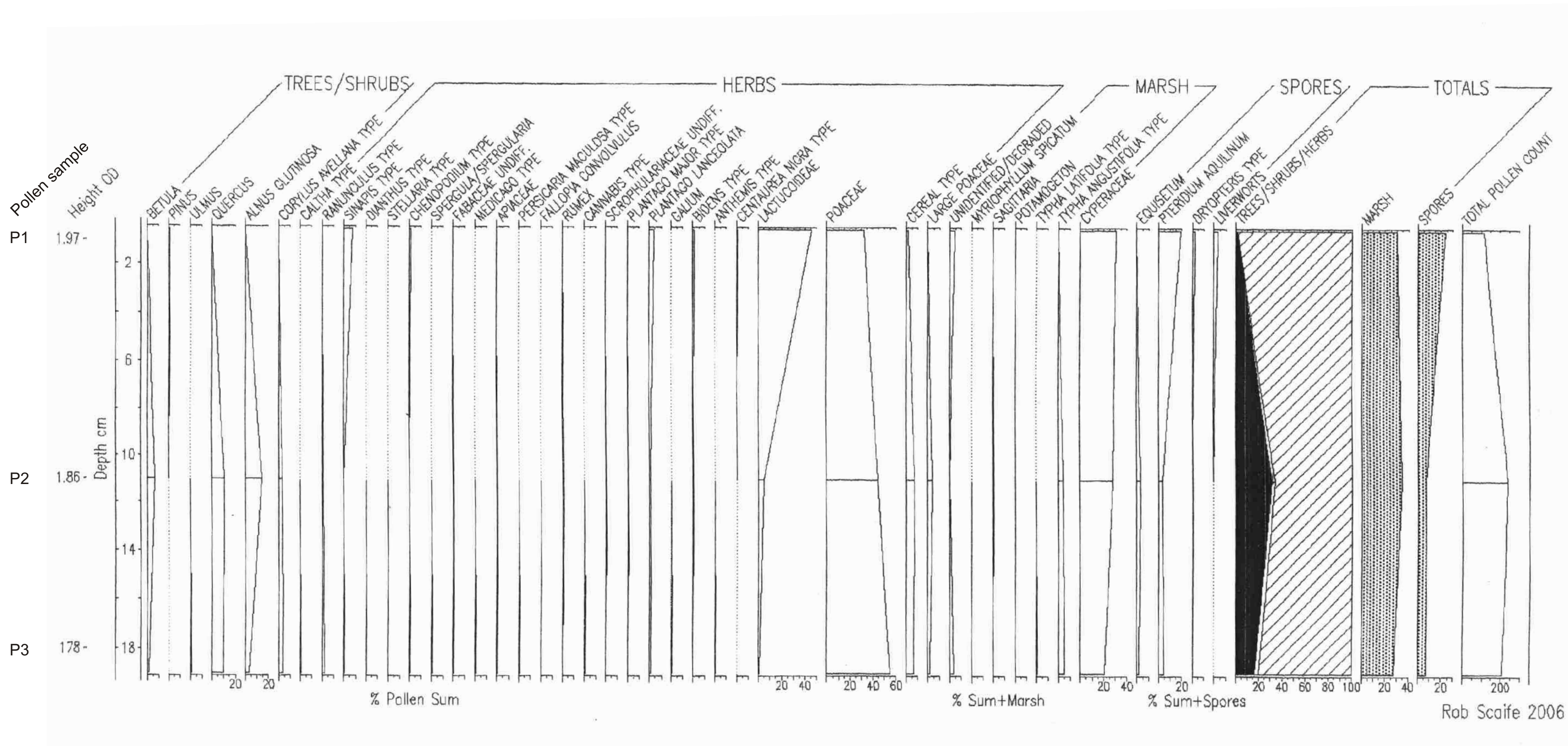

Fig 12 Pollen profile through Monolith {14}

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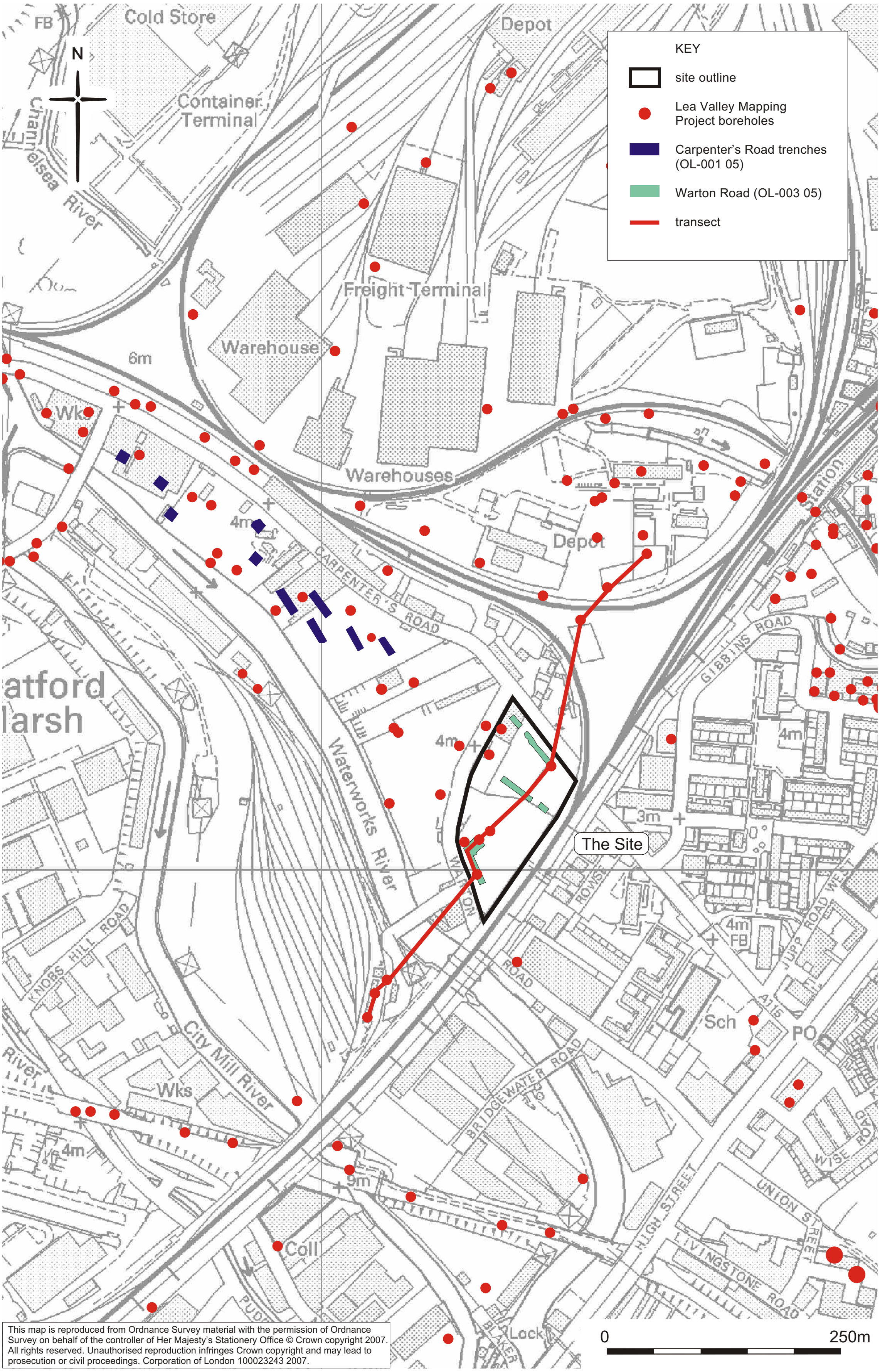

Fig 13 Distribution of stratigraphic data and location of transect

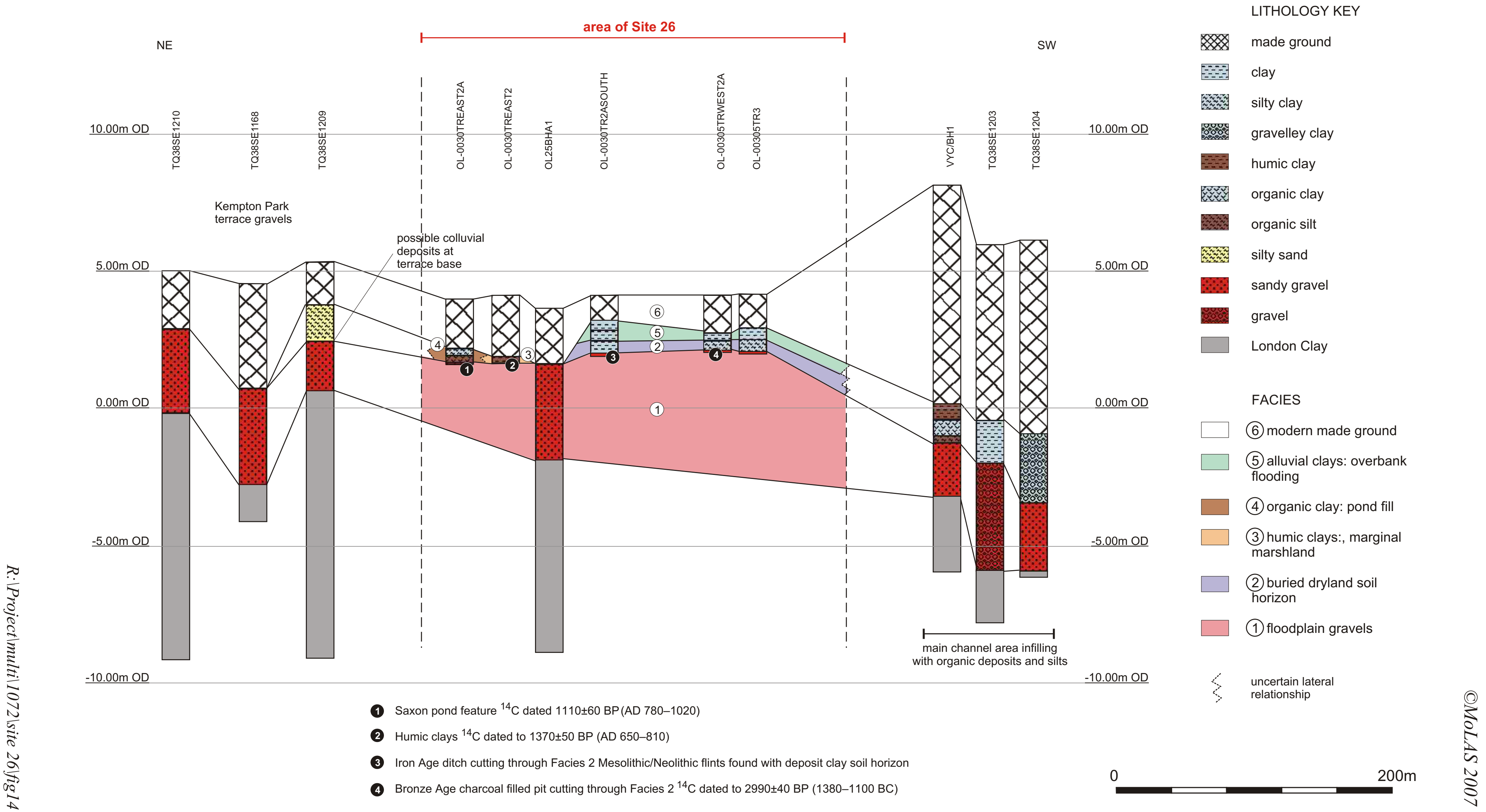

Fig 14 North east to south west transect across the site

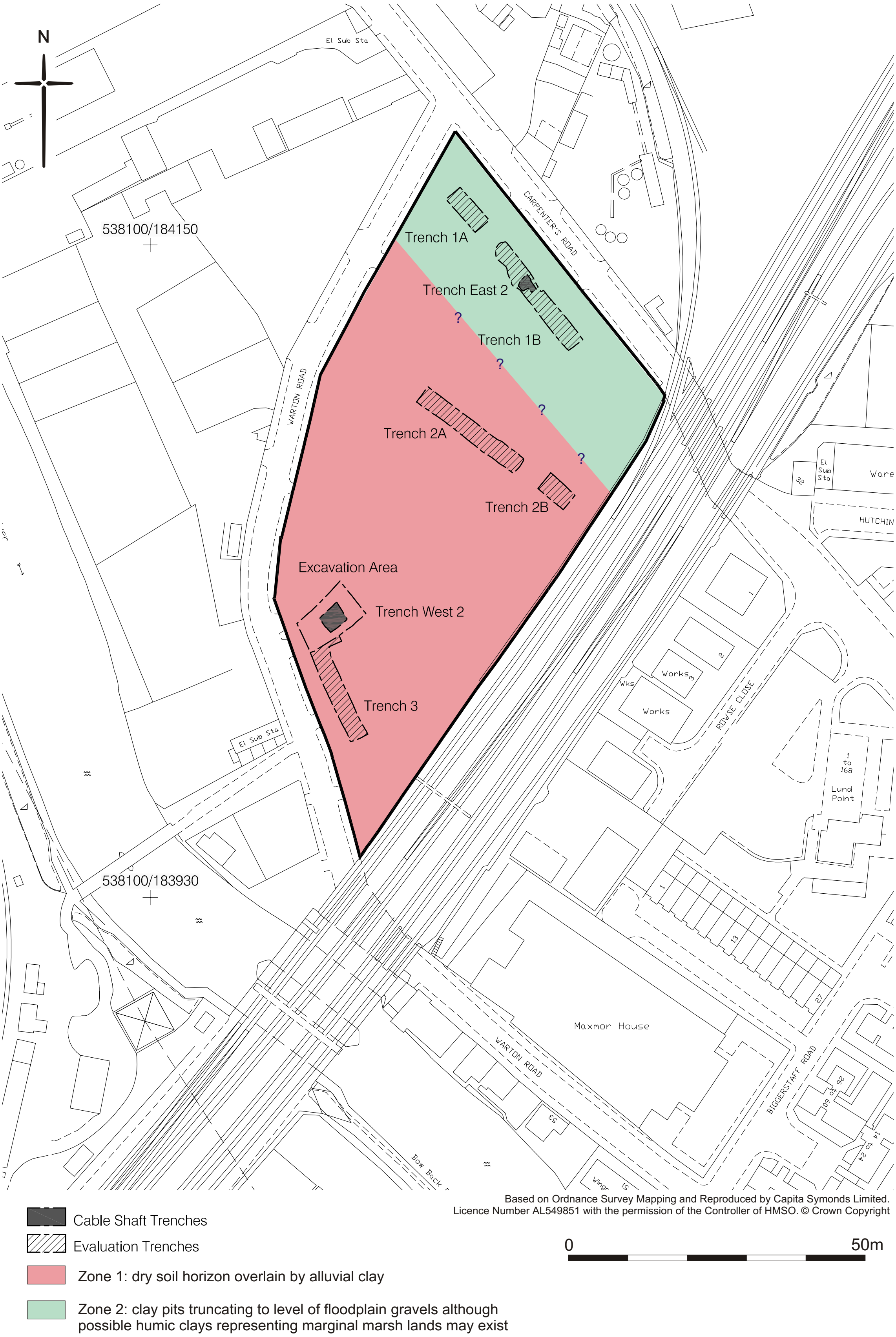

Fig 15 Landscape zones