



# HUMAN–ENVIRONMENT INTERACTIONS AT THE WETLAND EDGE IN EAST LONDON: TRACKWAYS, PLATFORMS AND BRONZE AGE RESPONSES TO ENVIRONMENTAL CHANGE

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## SUMMARY

*An archaeological excavation at the Golfers' Driving Range site at Beckton, on the margin of the former East London wetlands, revealed a timber platform and trackway within peat deposits, dating to the Early and Middle Bronze Age respectively. The site is located in a landscape where a large number of trackway structures of Late Bronze Age date have been encountered on adjoining land parcels at the Beckton Nursery, Beckton 3D and the A13 Woolwich Manor Way sites. The platform consisted of two layers, a substructure and a superstructure. The trackway was of simple brushwood construction, primarily consisting of three layers of small roundwood rods laid along the track. A cow's deciduous tooth was recovered from near the base of the roundwood. The trackway and platform are likely to have played a role in the herding of livestock on the rich wetland pasture out in the marsh. The high-resolution palaeoenvironmental sequence demonstrates that the trackway and platform are associated with a period of increasing wetness of the marsh surface preceded by cereal cultivation in the vicinity on the adjoining dry land. During the period of use of the timber structures cereal cultivation is absent, but returns following the abandonment of the constructions, and further increases in wetness on the marshland surface.*

## INTRODUCTION

The excavation was undertaken by Pre-Construct Archaeology Ltd at the former Golfers' Driving Range, Woolwich Manor Way, North Beckton, in the London Borough of Newham, and commissioned by CgMs Consulting on behalf of Fairview Homes plc. The site code was GWB02.

The site is located near the intersection of the A13, Newham Way, with Woolwich Manor Way (the A117) (Figs 1 and 2), and its central National Grid Reference is TQ 4290 8204. Two stepped trenches were excavated, one measuring 10m by 10m at the top, the second 19.5m east–west by 16m north–south (Fig 3a–b). Both went down through the alluvial sequence to the upper surface of the natural gravels.

## GEOLOGICAL AND ENVIRONMENTAL SETTING

The site is located within the Thames floodplain, and sits in extensive areas of alluvium and gravel terraces. The alluvium extends about 2km southwards to the



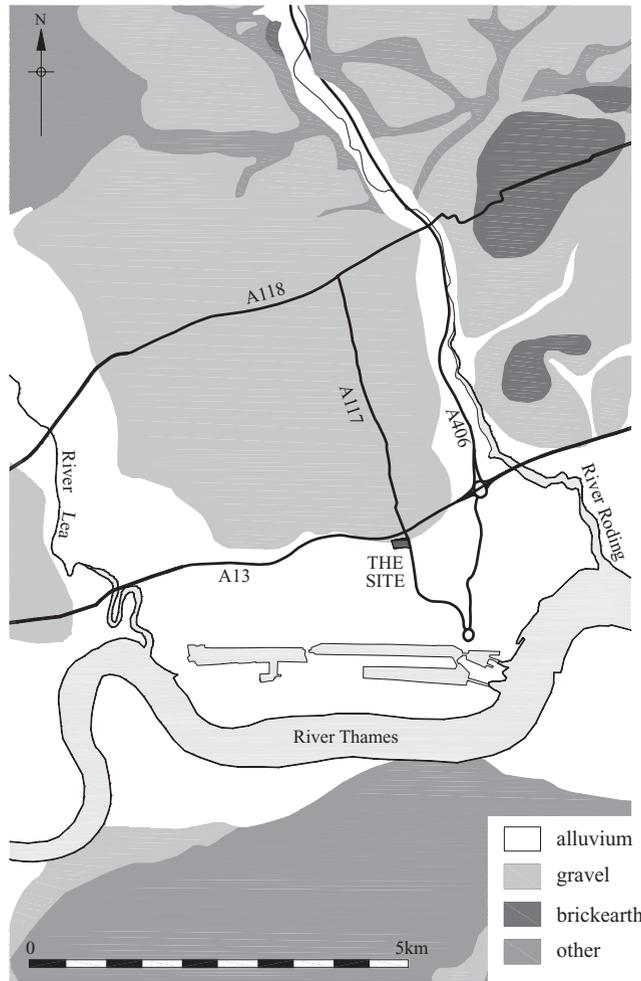


Fig 1. Site location and background geology

Thames, and up the smaller floodplains of the River Lea, about 4km to the west, and the River Roding, within 2.5km to the east. It is immediately south of the East Tilbury Marshes Gravel terrace, the equivalent of the Kempton Park Gravel in the middle Thames. This belongs to the Middle Devensian substage, dating to between 45000 and 30000 BP (Gibbard 1994, 192).

To the north the height of the gravel meant that the pre-Holocene land surface was above the tidal reach for all periods, to its south the gravel underlies the alluvium. Locally the A13 runs along the firm ground just on the north side of the site boundary. Further to the south, within the floodplain, the alluvium overlies the totally submerged Shepperton Gravel, which forms a lower, and later, river terrace (Bates & Whittaker 2004).

This has been dated to 15000 to 10000 BP, when periglacial conditions prevailed.

A period of relative land surface stability during the earlier Holocene is demonstrated by the presence of a weathered horizon in the upper part of the sand, as found immediately to the north in the A13 Woolwich Manor Way investigation (Gifford & Partners 2001). The archaeological evidence suggests that the surface existed for a considerable period, through the early and mid-Holocene, and was finally flooded during the late Mesolithic to early Neolithic.

The topographic template left by the river systems of the late Pleistocene and early Holocene produced a diverse landscape. Although the sand and gravel would have formed a broad plain on a larger scale, more locally habitats would have varied

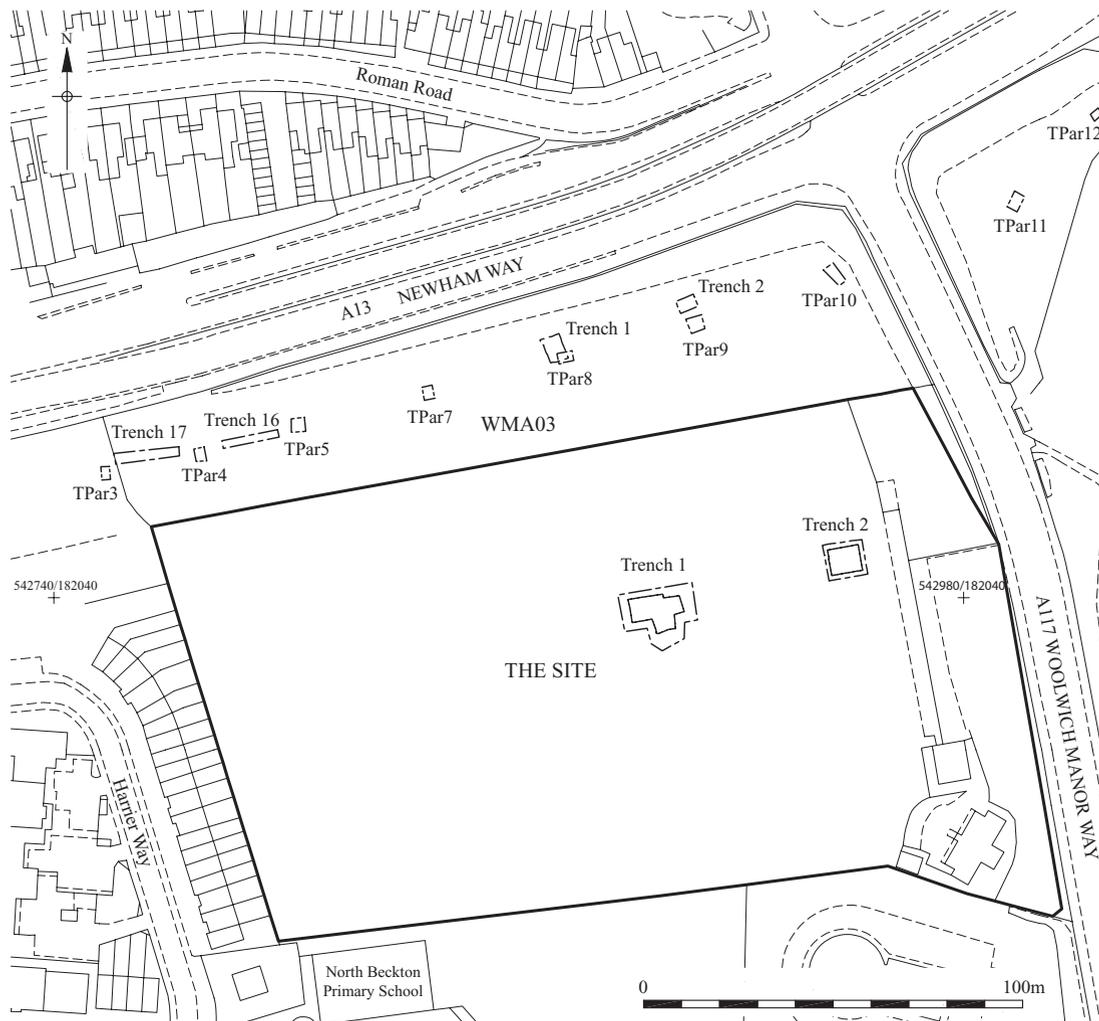


Fig 2. Trench location and trenches on adjoining A13 improvement scheme

with topographical and hence hydrological conditions. There would have been rivers and streams crossing the gravel terrace, as well as lakes and marshes present, and redundant braided channels (Wilkinson *et al* 2000). These lacustrine environments would have become progressively infilled by minerogenic and biogenic sedimentation.

Evidence for the environmental history of the early Holocene around London is limited, and needs to be drawn from a wider area in the Thames region and beyond (Rackham & Sidell 2000, 19–26). Initially an open landscape dominated by herbaceous plants can be envisaged. This was relatively

quickly replaced by birch (*Betula*) and pine (*Pinus*) woodland (during the pre-Boreal and Boreal periods), followed by lime, alder (*Alnus*), and hazel (*Corylus*), and then oak (*Quercus*) and elm (*Ulmus*). Before the end of the Boreal (*c.*6000 BC) drier areas would have had a temperate mixed deciduous forest, dominated by oak, elm and lime, with wood fen and alder carr where it was wetter. Once this stable equilibrium had been achieved subsequent vegetational change in inland areas, before human impact became more significant, would have been limited, although climatic changes would have had some effect. Changes would have been

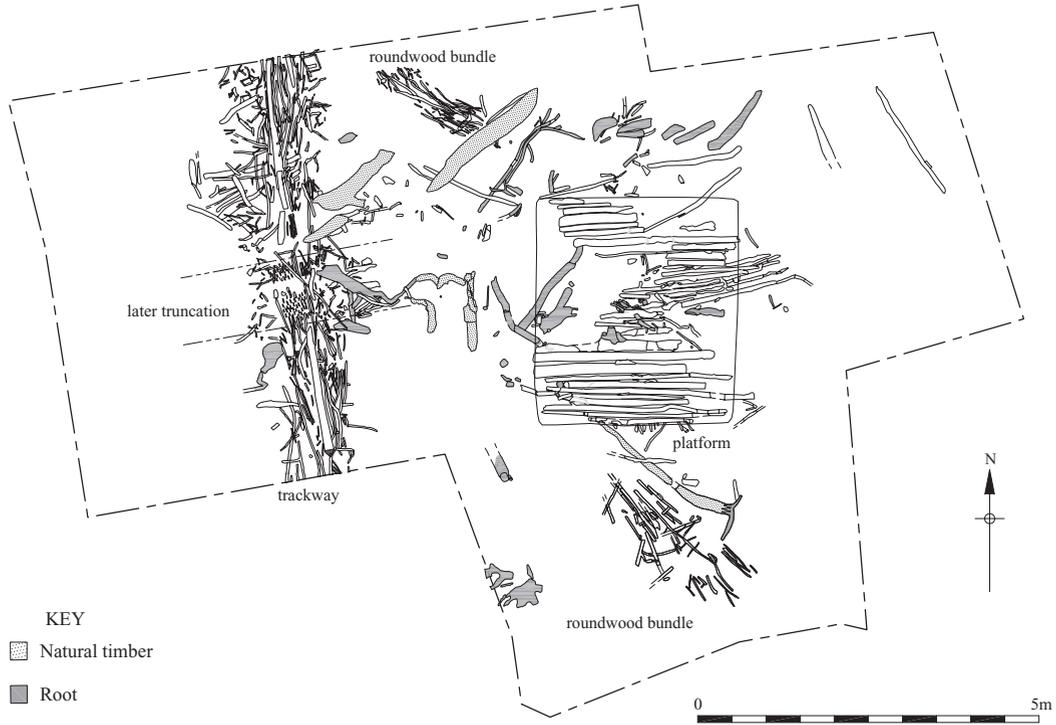


Fig 3. (a) Trench 1 with trackway, platform and roundwood spreads  
(b) Trench 1 with trackway, platform and roundwood spreads in situ, looking south

much more dramatic around coasts and estuaries, where rising water levels would have submerged some land and would have affected the hydrology of other lower lying areas.

By the (earlier) middle Holocene rising sea levels resulted in a period of instability associated with expanding wetland conditions. During the (later) middle Holocene, a temporary fall in sea levels appears to have taken place, resulting in peat growth and considerable variation within the wetland environment. By the later Holocene much of the evidence for the earlier topography was lost and widespread manmade embankment work and manipulation of the fluvial regime took place (Bates & Whittaker 2004, 54–60).

The general trend was for rapidly rising sea levels early in the post-glacial period, slowing during the mid-Holocene. Models since Devoy (1980) have envisaged that this process was not smooth, and Long *et al* (2000) have proposed a three-stage sequence of estuary development, applicable to Southampton Water, the Severn, and the Thames, and therefore driven by regional rather than local processes. It is proposed that the early rapid rise in sea level resulted in an episode of estuarine expansion and deposition of clay. This was followed by the growth of large areas of semi-terrestrial marsh along the floodplain edges, causing a contraction of the estuary. This is dated to between 4900 cal BC and 1250 cal BC, when the rate of sea level rise fell sufficiently for peat formation to occur. During the third stage there was another period of expansion of the estuary, when the marshes were submerged and covered with more clay, possibly but not necessarily due to a return to an increased rate of sea level rise. The preferred hypothesis is that it was due to an increase in minerogenic sediment supply resulting from loss of vegetation cover caused by human activity, coupled with deterioration in organic preservation caused by a reduction in the average rate of sea level rise (*ibid*, 275–6; also see Haggart 1995). Even if the overall trends of the history of the Holocene river regime of the Thames are becoming better established, there are substantial variations in the dates of the sedimentary sequences at different locations, and local variations are significant.

The peat grew at times when the area was

covered by reed swamp and fen carr, and was therefore drier than at times when clay was being deposited. Sedimentation had more or less caught up with the rise in the water level, allowing these environments to develop. The peat is therefore associated with stabilisation or reduction in the rate of sea level rise, although more localised influences may have been very significant in the timing of the initiation of peat growth. As the local underlying topographic variations were progressively reduced by the clay and peat deposition, the environment may have become more homogeneous, but across the floodplain there would still have been variation between the wetter, more open, reed swamp and the drier fen, and between fresher and more brackish areas. There were also variations within this floodplain environment, such as lagoons.

While the bulk of the peat in East London is composed of the remains of reed swamp, alder fen and mixed deciduous woodland, the evidence for yew trees in the former marshes is widespread. They are known in the floodplain, as first flagged up by Pepys in a cutting at Blackwall in 1665 (Whittaker 1889) and from Dagenham to Beckton as evidenced in John Perry's account of work on the flood defences written in the 18th century (Perry 1771). Not only was yew a component of the mixed woodlands, concentrations of it have been found in recent years early within the peat sequences (Rackham & Sidell 2000, 23), where they comprise the remains of Neolithic yew forests.

The peat continued to grow until a renewed episode of flooding, related to further expansion of tidal influence over these areas. This drowned the vegetation and covered it with the upper layer of alluvial clay. The date of this transgression is complicated by the prevalence of eroded contacts, but freshwater peat accumulation persisted longer in the inner parts of the estuaries than further out. In the mid and outer estuary this was dated to the Bronze Age, but in the inner estuary Iron Age dates are more common, and Roman dates are also known.

Environmental evidence from several Bronze Age trackways within the peat in the Beckton area suggests that they may have been constructed in response to increasing wetness of the peat surface, which is

consistent with their position towards the upper contact between the peat and clay (Rackham & Sidell 2000, 23). Deposition of this upper clay continued in a saltmarsh environment until the layer was up to 2m thick in places.

Reclamation of the floodplain for farmland has been recorded in East London from the Anglo-Saxon period on, and has continued since, accelerating in the medieval period with the investment of considerable resources in this enterprise by monastic houses. This process halted the deposition of alluvium.

Five boreholes were drilled across the Golfers' Driving Range site. These can be combined with the other archaeological and non-archaeological information from this and neighbouring sites to model the sub-surface topography. The sand and gravel reduces in height from north to south, as would be expected from the position of the gravel terrace to its north. It falls away from the higher terrace to the lower one below the alluvium. It also falls away from east to west, as Woolwich Manor Way sits on a slight promontory of gravel extending out into the wetlands. The highest level recorded was therefore towards the north-east corner of the site at -3.20m OD in Trench 2, and the lowest towards the south-west corner at -5.95m OD. As the gravel rises up to the north-east the lower deposits thin and wedge out. The lower alluvial clay, between the fluvial gravel and the peat, was present only towards the southern side, and was thickest in the south-west corner.

The peat layer covered the whole site, with a greater thickness in those parts where the sands and gravels are located deeper down. It varied from 2.15m thick in Trench 2 to 3.60m in Borehole B. This reduced the range of the level of the upper surface of the peat to around 1.15m, recorded at -0.95m OD (Borehole A) and -2.10m OD (Borehole D). Originally this surface may have been more level, as subsequent compaction may have had a greater effect on the thicker peat, and differential scouring will have truncated parts of its surface.

The first peat would have formed over the lowest sand and gravel interface (recorded at -5.05m OD in Borehole E), expanding up the gravel slope over time. The lower the gravel/peat contact therefore in any particular

location, the earlier the date of the initiation of the peat is likely to be. The A13 Woolwich Manor Way investigation showed that just to the north-west of the present site the early stages of the peat development was around, or shortly before, the Mesolithic–Neolithic transition. All the cultural material here was Neolithic or of indeterminate tradition (see below). Samples from the base of the peat produced radiocarbon dates of 4580–4350 cal BC (Beta147956; 5690 ±60 BP) at -3.50m OD in Trench 1, 4470–4240 cal BC (Beta152741; 5560 ±70 BP) at -3.19m OD in Trench 17, and 4460–4060 cal BC (Beta152740; 5520 ±80 BP) at -3.13m OD in Trench 16 (Gifford & Partners 2001). One radiocarbon estimate was produced from the top of the peat, 1750–1490 cal BC (Beta147954; 3380 ±60 BP) at -1.98m OD in Test Pit 1, showing that peat growth here ceased after the Early to Middle Bronze Age.

Analysis of the peat from sites in Beckton and elsewhere in the Thames floodplain in East London shows that it is heterogeneous in character. The organic content varies, reflecting both the input of minerogenic sediment, primarily of estuarine origin, and the degree of humification of the organic matter, largely controlled by its aerobic or anaerobic state. The pollen, plant macrofossil and diatom records indicate a complex vegetation history, including alder carr, yew woodland, brackish dominated vegetation and saltmarsh.

## ARCHAEOLOGICAL BACKGROUND

As mentioned above, it has been demonstrated through excavations since the late 1980s and early 1990s that during the Bronze Age a large number of wooden trackways and other timber structures were built across the former wetlands of both East and West London, but particularly towards the East (Meddens & Beasley 1990; Meddens 1996). This activity is concentrated in the upper levels of the peat, and in the Middle to Late Bronze Age. The highest density found to date is in the Beckton area. The structures have also been more frequently found in investigations conducted in the alluvium close to the floodplain edge than further towards the river.

## THE ARCHAEOLOGICAL EVIDENCE FROM THE GOLFER'S DRIVING RANGE SITE

### Chronology and environmental context

Four timber structures were identified within the peat sequence located at the Golfer's Driving Range, comprising the remains of a yew, alder, birch, hazel and ash platform, an alder brushwood trackway, and the remains of two small areas of concentrations of man modified alder brushwood. Radiocarbon dates form the basis of the chronology and phasing for the site: there are no dated artefact assemblages, although the tool marks on the wood are broadly datable. Nevertheless, it is possible to add to this framework by considering the lithostratigraphy and the levels of the remains (Table 2), given the sequence of accumulation at the site. Both trenches have been incorporated into a single phasing scheme, with approximate dates (Table 3).

A detailed and consistent environmental history, corroborated by the archaeological evidence, has been produced. The samples used were from the peat and alluvium of Trench 1, and analyses of the lithostratigraphy, organic matter content, pollen (Table 1, p. 8), plant macrofossils and Coleoptera (beetles) were completed.

At the start of the peat sequence (*c.*–3.62m OD) the lithology and organic matter content indicate that the area was relatively dry, with a well humified wood peat having a high organic content, of around 80%, implying semi-terrestrial conditions. Fluctuations seen in the organic matter content will have been due to periodic sedimentary inputs of clay during flooding events. Pollen from these levels represents mixed carr woodland, dominated by both alder, a species that tolerates wet ground, and oak, which is less tolerant of waterlogged roots. The latter may have derived from the nearby dry land, as small quantities of birch, lime, and hazel pollen certainly did. Herbaceous pollen shows that the tree cover was not complete, and that there were areas that were more open. The plant macrofossil assemblage is diverse and rich, including a mix of species of trees, shrubs, and grassland, and indicators of disturbed ground. The Coleoptera

confirm that the tree cover was deciduous woodland and alder carr. Compared to other Thames wetland sites, this peat accumulated in woodland that was more mature and heterogeneous, containing more deciduous trees, such as oak, beech, sycamore, elm, and birch, and less dominated by alder. The results also indicate that the local area included vegetation-rich water and stagnant water habitats. Evidence for these remains present throughout the peat sequence. Species associated with woodland margins, grassland, and sunny, open areas are also present but not frequent until subsequent to the abandonment of the wooden structures, after which they dominate.

Between *c.*–3.00m OD (*c.*4080–3860 cal BC) and *c.*–2.46m OD (*c.*3270–2990 cal BC, using radiocarbon age-depth modelling (Blockley *et al* 2007; Bronk Ramsey 1995; 2001; 2007)), the organic matter content begins to decline towards a minimum of around 50% indicating more frequent flooding and the site becoming increasingly wetter. The pollen record shows the corresponding expansion of alder, and the plant macrofossils are less diverse and more dominated by alder (*Alnus*), carrot family (Umbelliferae), and bramble seeds (Rosaceae), with nutshells and sedge (*Cyperaceae*) also present.

Following this, the organic matter progressively rises to around 70% at *c.*–1.67m OD (*c.*1530–1260 cal BC), still with marked fluctuations, implying a return to comparatively drier conditions in the period before the wooden structures were built (at *c.*–1.70m OD). During this period the pollen is more dominated by alder than oak, indicating an alder carr, but the consistent presence of yew pollen shows that species requiring drier and more stable ground than normally present in alder carr were also able to survive. The replacement of deciduous woodland by alder carr is also expressed in the relative frequency of Coleoptera species associated with these habitats. Areas of deciduous woodland, drier ground with yew, open ground, stagnant water, and vegetation-rich water were present in the vicinity. A strong signal for the initiation of cereal (Poaceae) cultivation on the nearby dry land is present in the pollen record. However, caution must be used when interpreting cereal pollen from wetland contexts due to the similar

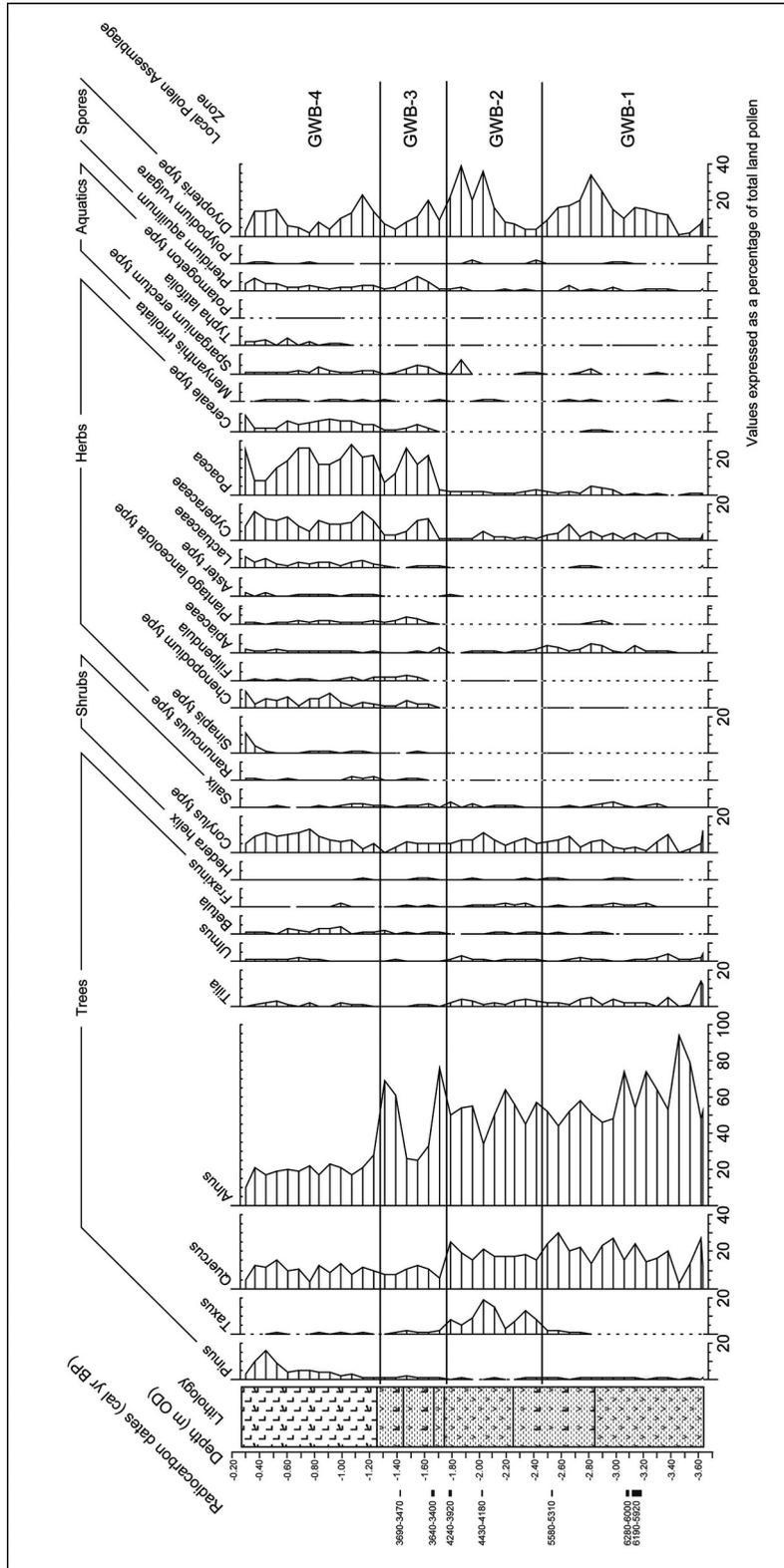


Table 1. GWB summary pollen diagram

pollen grain morphology of other wetland grasses (Andersen 1979).

The wooden structures mark a sharp transition, in which the organic matter content falls dramatically to around 30% between *c.*–1.67m OD and *c.*–1.44m OD (*c.*1530–1260 cal BC onwards), representing very much wetter conditions and a less stable surface. This is corroborated by the presence of aquatic spore taxa in the pollen samples. Non-arboreal pollen rises to over 30%, which means that the area became much more open; this can be attributed to the hydrological conditions. Plant macrofossils from this level reflect this, with much greater abundances of grassland species such as knotgrasses (*Polygonum*), violet (Violaceae) and buttercup (Ranunculaceae), and some from the daisy family (Asteraceae), although the assemblage is still relatively diverse and alder and brambles are still well represented. The Coleoptera indicate that running water and reed marsh habitats are found around the site from the level of the wooden structures, and there are species associated with flooding. Species characteristic of alder carr and mixed deciduous woodland are no longer present. The position of the wooden structures also marks a point after which the chronology of the stratigraphic sequence becomes uncertain; although radiocarbon dates have been obtained from seeds and bulk peat above the trackway (Table 3), they are considered invalid, as they are chronologically older than those submitted from the lower horizons, and likely to be allocthonous (Batchelor 2009).

The wetter conditions appear to be associated with a decline in cereal cultivation and arable agriculture in the vicinity. At the same time increased use of the wetlands for the grazing of cattle may have been developing. The large number of trackways found along the Beckton margin of the Thames floodplain may in this respect be linked to enabling herders to cross wetter areas to gain access to monitoring platforms and herds pasturing on grassland, in the reed swamp and in the marsh.

Following this period of wet conditions, there is a partial and temporary recovery of organic matter content, between *c.*–1.44m OD and *c.*–1.24m OD, when the uppermost layer of peat was laid down. The plant macrofossils

are dominated by grassland species, but with alder and brambles also present. We can envisage an open landscape that was intermittently flooded, principally of reed marsh and wet grassland, with water tolerant trees such as alder and areas with running water, stagnant water, and vegetation-rich water. Evidence for cereal cultivation is seen to return on the dry land and continues to be present in the remainder of the sequence.

When wetter conditions returned, at *c.*–1.24m OD, they did so emphatically, with a second sharp transition to low organic matter content; this time it falls to 10–15% and the lithology changes to alluvial clay. From this time on the sedimentary environment of the site was within an estuarine saltmarsh or mudflats, and peat generating plant communities were unable to re-establish themselves. A further 1.40m of alluvium was deposited in this system. The results of analysis of samples from similar deposits at the nearby site of Beckton Nursery suggested a gradual accumulation of fine sediments in a low energy environment, characteristic of regularly flooded mudflats. The presence of temporarily exposed surfaces was confirmed there by the presence of a ditch cut observed about half way up the sequence; this was filled with a series of clearly defined highly organic muds interleaved with bands of fine alluvial clays, demonstrating that its silting processes had taken place over a series of consecutive seasons.

The environmental record demonstrates that the point in the sequence when the wooden structures were built, at *c.*–1.70m OD, was a time of pronounced change in the local wetlands. The surface was initially dry but became increasingly wet, with flooding becoming more frequent between *c.*–1.67m OD and *c.*–1.44m OD. While this may have been related to the regional rise in sea levels, the hydrological conditions are also likely to have been significantly influenced by more local factors within the lower Thames valley. Whatever the reason, the environmental changes recorded in this part of the Beckton sequence represent a short-term event that may have initiated the abandonment of the structures. At present, it is unclear how large an area was affected by these changes, although a similar picture appears to be emerging from ongoing multi-



proxy palaeoenvironmental investigations of material from Bellot Street (Greenwich) on the opposite bank of the river. In addition, the high density of timber structures identified in the Beckton area, combined with the discovery of timber structures of a similar date at Rainham, Barking, the Isle of Dogs, Southwark and Vauxhall, and lower down the estuary in Essex, further suggests that the impact was considerable and had a very wide footprint. The environmental changes affected the vegetation cover and habitats present on the wetlands, replacing carr woodland with open areas of reed marsh and wet grassland.

## PHASE DISCUSSION

### **Late Glacial/early Holocene gravel and sand: Phase 1**

In Trench 1 naturally formed high energy, fluvio-glacial, gravel was found at the base of the sondage. Lower energy, fluvial, sand was not present. Its absence may relate to the sloping upper surface of the gravel, recorded between -3.44m OD and -3.61m OD, which could be either its original form or, more likely, a truncated horizon.

Both the gravel and overlying sand were present in Trench 2. The upper surface of the gravel was found at -3.40m OD, while the sand formed a level surface at -3.24m OD to -3.29m OD. This showed signs of weathering, in that it had a grey to bluish grey colour and was very silty; careful examination and excavation produced no evidence of cultural activity on this palaeo-landsurface, although the area exposed at this depth was limited.

### **Mesolithic/Neolithic to Early Bronze Age peat: Phase 2**

Peat was present in both trenches from Phase 2 to Phase 4, but away from the timber structures of Phase 3 there was nothing observable in the stratigraphy to indicate where divisions were in the sequence. As peat is an accretionary deposit, the chronological horizons would have been more or less horizontal, although the levels of the timbers in Trench 1 dipped down slightly to the south, which suggests that the synchronous surface followed this pattern.

In both trenches above the fluvio-glacial and fluvial deposits there was a layer of gravely peat, consisting of a mixture of the layers above and below, with the proportion of gravel decreasing with height. This layer was laminated, having thin layers of sand or grit, indicating deposition in a dynamic tidal environment, and it was up to 0.15m thick in Trench 1 and up to 0.07m thick in Trench 2. One piece of burnt flint came from this layer in Trench 2 and was the only potential cultural material recovered from Phase 2. It is likely to have been reworked into the peat from the palaeo-landsurface below. Such a small quantity, especially in a context where it had almost certainly been reworked, is not above what one might expect as a background level, and so has very limited implications for activity patterns.

In Trench 1 the rest of the peat below Phase 3, the worked timber horizon, comprised generally well humified dark brown wood peat, approximately 1.80m thick, described in more detail below. While the site itself effectively produced no direct evidence of human activity for this part of the sequence, the environmental history suggests that the wetlands would have been an attractive resource for the communities living on the dry land to the north, and potential non-economic uses of the wetland should also be considered. The balance of resources will have changed over time, and the advantages of the high diversity seen lower in the peat will have been reduced to some extent when alder carr began to dominate over the deciduous woodland. If the wetland resources were exploited, or the wetlands used for some other purpose, it may have been advantageous, or even necessary, to build structures such as platforms and trackways to facilitate access. However the peat was well humified, meaning that preservational conditions, on the surface at least, were not sufficiently good for wood to have survived intact. Therefore timber structures could have existed through this part of the sequence, but any such activity would have remained archaeologically invisible unless non-organic remains were also left behind.

Two peat layers below the timber horizon in Trench 2 were identified in the field, 1.25m and 0.30m thick respectively, the lower one having frequent areas of silty clay.

### Early to Middle Bronze Age cultural horizon: Phase 3

#### Trench 1

Four structures were present, two major ones, a platform and a trackway, and two minor ones, each consisting of a small quantity of roundwood. A number of natural timbers were also found which may have been opportunistically incorporated into the structures.

The upper surfaces of the introduced timbers were at between -1.40 and -1.80m OD (Table 2). The level of the top of the timbers dipped down by approximately 0.20–0.25m from north to south, across a distance of 9m. To some extent this may

reflect a lower surface further out into the marsh at the time, but may also be due to greater compaction of the peat layer further to the south-west.

Twelve radiocarbon determinations were obtained from samples from Trench 1, dating the two major structures, and the peat immediately above and below them (Table 3). There are reversals in the dates above both of the structures. These show that there was about 100 to 630 years separating the platform and the trackway, and they are therefore unlikely to have been contemporary. Their presence at a similar level within the peat suggests that the time gap was probably towards the lower end of this range.

Table 2. Trench 1: levels of the timbers

Structure	Range of levels for top of timbers:
Platform	-1.45m to -1.75m OD
Trackway	-1.40m to -1.60m OD
Roundwood spread (north side of trench)	-1.40m to -1.50m OD
Roundwood spread (south side of trench)	-1.65m to -1.80m OD

Table 3. Radiocarbon dates from Trench 1

Laboratory Code	Material and location	OD height	Uncalibrated <sup>14</sup> C date (BP)	Error (±)	δ <sup>13</sup> C (‰)	Calibrated <sup>14</sup> C date (BC)
Beta181168	Plant material (Alnus sp. seeds & catkins)	-3.19 to -3.12	5260	50	-28	4240-3970
Beta181167	Plant material (Alnus sp. seeds & catkins)	-3.10 to -3.08	5350	40	-27.9	4270-4050
WK19032	Bulk peat	-2.64 to -2.63	4696	37	-29.7	3630-3370
WK19033	Bulk peat	-2.03 to -2.02	3896	36	-28.4	2470-2240
Beta180308	Seeds; below platform (Alnus sp.)	-1.87 to -1.85	3700	50	-23.7	2210-1940
WK11770	Wood; platform (Alnus sp.)	-1.87 to -1.79	3467	61	-32	1940-1620
WK11769	Wood; platform (Alnus sp.)	-1.86 to -1.79	3517	56	-29.7	2020-1680
Beta180307	Wood; platform (Alnus sp.)	-1.85 to -1.79	3540	50	-25	2010-1740
Beta180306	Seeds; above platform (Alnus sp.)	-1.79 to -1.77	3680	50	-33.8	2210-1920
Beta180310	Seeds; below trackway (Alnus sp.)	-1.80 to -1.78	3730	50	-28.5	2290-2010
WK11772	Wood; trackway (Alnus sp.)	-1.79 to -1.67	3153	59	-29.6	1530-1260
WK11771	Wood; trackway (Alnus sp.)	-1.78 to -1.67	3135	57	-30.3	1520-1260
Beta180309	Seeds; above trackway (Alnus sp.)	-1.67 to -1.65	3300	50	-29.7	1690-1450
Wk19034	Bulk peat	-1.43 to -1.42	3352	35	-29.3	1740-1520

The wetter conditions or increased runoff of Phases 3 and 4, together with the associated effects on vegetation, habitats, and over time the topography of the landscape, would have had a profound impact on the resources available on the marsh. While the plants and animals within the expanded areas of open marsh and water would have had their uses, the resource base available from the wetlands would almost certainly have been less varied.

The radiocarbon dates and stratigraphy suggest that the platform was built close to the onset of the transition to wet, unstable, and more open conditions (2010–1740 cal BC (Beta180307; 3540 ±50 BP); 2020–1680 cal BC (WK11769; 3517 ±56 BP), and 1940–1620 cal BC (WK11770; 3467 ±61 BP)), and the trackway when this had advanced further (1520–1260 cal BC (WK11771; 3135 ±57 BP) and 1530–1260 cal BC (WK11772; 3153 ±59 BP)). The intensive period of trackway and platform construction found along the edge of the gravel terrace marshland interface here in Beckton demonstrates a dynamic response of the local population to changing circumstances. Whether this resulted from their own activities with respect to the deforestation of the surrounding dry land, or climate change involving raised water levels and increased precipitation, is at present unclear.

A single, very small, piece of struck flint was recovered from the peat at the level of the timber structures, but not associated with any of them. It could just represent a background presence.

#### Timber platform

The timbers of the platform consisted of two elements, a lower layer, or substructure, and a top layer, or superstructure (Fig 4). The substructure was more roughly made than the superstructure, and represents consolidation of the peat surface to prepare it for the superstructure, rather than an earlier phase that was later replaced.

#### Platform substructure

The platform's substructure (not illus) measured 3.5m north–south and 4.5m east–west. It consisted of about 35 to 40 rods, laid

in a systematic manner, with a clear principal east–west orientation, and a secondary north–south orientation. A few were more randomly placed. The bulk of it was made from the 12 largest rods, all of which were yew, generally lopped (debranched) main stems, mostly over 2m in length and averaging about 50mm in diameter. With one exception they had been roughly aligned east–west. They were concentrated on the east and north of the platform, extending well beyond the eastern edge of the superstructure, but not reaching as far as its southern or western edge. In addition there were three groups of smaller rods. The first of these was located slightly lower down within the peat on the eastern edge of the substructure, and consisted of about ten rods 1–2m in length and about 25mm in diameter, also roughly east–west aligned. Most of these were also yew with one of an unidentified softwood, and there were also one piece of ash, and one of alder. The second group, of seven rods, was aligned east–west and extended from the superstructure centre to beyond its east side. The third group, of ten rods, was aligned north–south and stretched from the superstructure centre to its south side. The second and third groups were entirely hardwood species; those identified were ash or alder, with birch and possibly hazel also present. They were up to 1.50m in length and averaged about 25mm in diameter. Smaller fragments and lengths of roundwood were also present within the substructure.

The side branches of the yew stems had been trimmed off, with one exception, but little care was taken to ensure that this was done neatly, and the stubs were relatively long, generally about 50mm but up to 150mm. The ends had two forms: wedge (two diagonal facets, eg Fig 5.1) and chisel (one diagonal facet, eg Fig 5.8). Both were represented in the stem ends, chisel being slightly more frequent than wedge, whereas all the branch ends were of chisel form. They had been left sharp, which was particularly the case with the chisel form ends. This confirms that the substructure was intended to firm up the ground rather than be used as a platform itself. Bark was generally still present, although it usually was sufficiently decayed that it did not survive the lifting of the timber samples. There was a greater

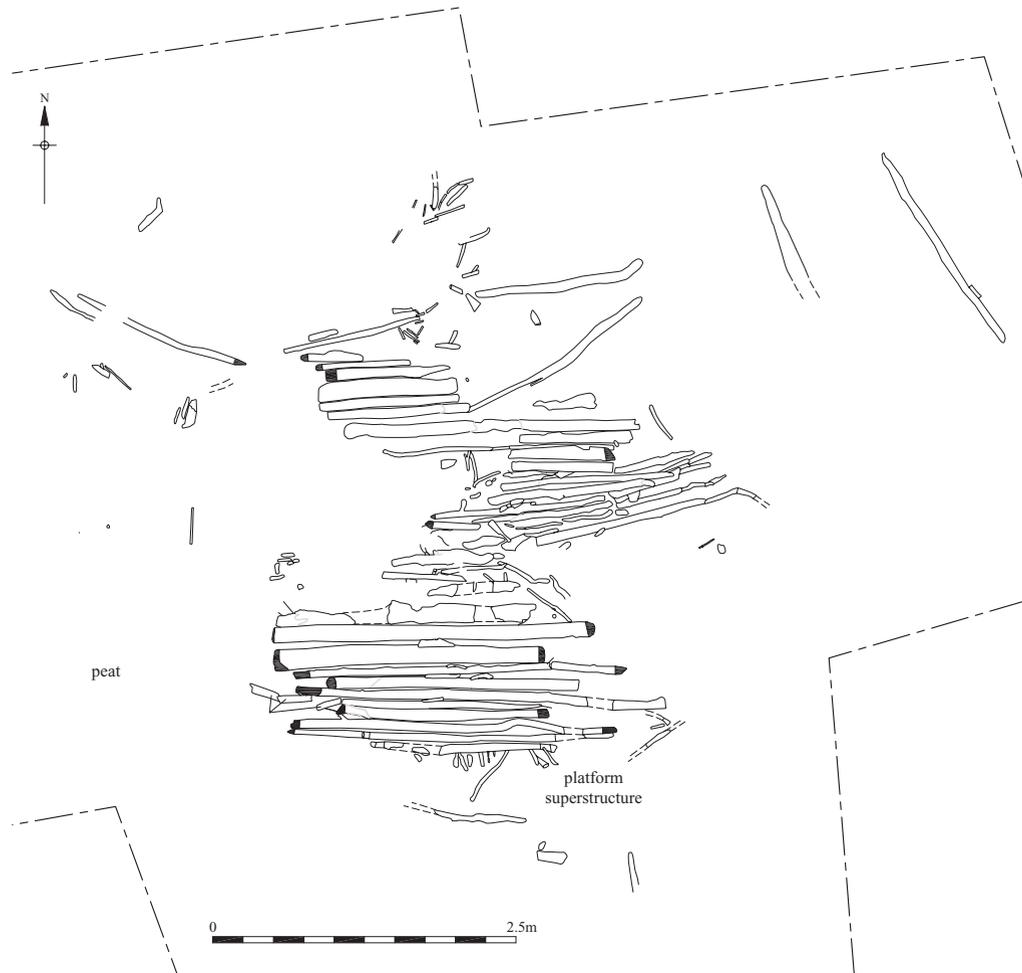


Fig 4. Top level of timbers in platform construction

range of variation in the size of material used for the substructure than the superstructure. The wood was generally less than 60 years old, and had grown at a moderate to slow rate.

One of the yew timbers, on the extreme east of the substructure, was a split fragment of a branch or curved stem that was larger than those used for the rest of the substructure. The rest of this timber was not present. It was created as debris from woodworking, and it is unclear whether this was actually part of the substructure, rather than entering the peat by chance when the platform was in use.

While the substructure was almost certainly completed in a single operation, the group of smaller yew pieces on its east side was laid

down first, followed by the main bulk of larger yews, and lastly the groups of hardwood. The two groups of hardwood were probably each spread out from a small faggot, rather than laid as individual rods, and may have been included to strengthen this side of the construction.

The lopping of the branches from the timbers in the substructure seems to have happened largely away from the platform, as only three woodchips were recovered that are likely to have come from the substructure. These were yew, and were found between the substructure and the superstructure. Similarly with the superstructure only one woodchip of hardwood, possibly alder, which came from the upper surface of the

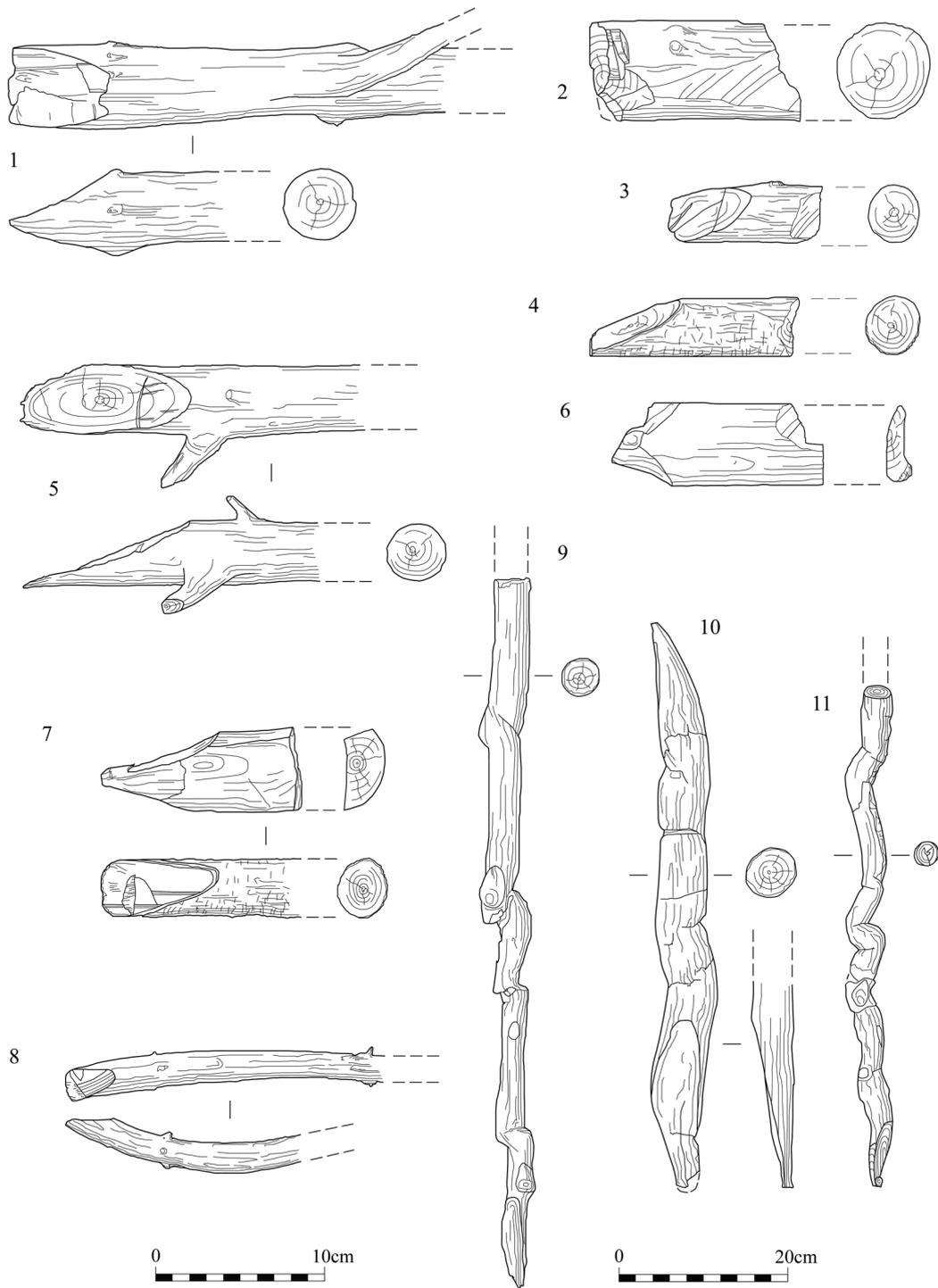


Fig 5. Worked yew and alder used in the trackway and platform with associated tool signatures (Scale 1:4 (Nos 1–8); 1:8 (Nos 9–11)). 1. Yew branch [181] from platform [112]; 2. Alder wedge [156] in trackway [107]; 3. Alder [156], possible left-handed work, in trackway [107]; 4. Alder, typical of many in [156] trackway make-up; 5. Yew [178], axe cut; 6. Alder [156], multi-faceted wedge end; 7. Alder [178], three-faceted roundwood pole end from trackway [107]; 8. Axe cut chisel form yew end branch [174]; 9–11. Alder roundwood stakes [161], [165], [159] from trackway [174]



superstructure, was recovered from around the platform.

The superstructure was not laid directly over the substructure but was offset to the west by *c.*1m, comparing centre to centre. This implies that more consolidation was required on the east side, and less on the west, which is confirmed by the group of smaller yew members at a slightly lower level within the peat on this side. Presumably this was because the peat on the east side was softer and wetter rather than because more weight was going to be put on it. It is conceivable that there had originally been more superstructure timbers above the east side of the substructure, which were either salvaged or decayed, but it seems more likely these were never present.

There does not appear to have been a specific functional reason for using yew, although the wood was locally available, which in itself is a perfectly good reason for its use. Its hardness would have been disadvantageous in terms of difficulty of working, although this characteristic also means that it is solid and hardwearing. It is worth noting that yew lashings have been found used in the construction of Bronze Age boats, and its wood and leaves have been identified in the lining of a grave inside a Bronze Age round barrow. Various Bronze Age wooden figurines from Ireland and Humberside are in yew, as are elements set in alder wood block wheels used to tie the separate parts together, also from Ireland. The wooden stave lining of several bronze mugs of a similar date (Bevan-Jones 2002, 154–69) should also be noted. These other uses of yew during the Bronze Age demonstrate an implicit ritual role which, together with the traditional sacred nature of this wood manifest in later Roman, Celtic and medieval mythology, suggests a possible use in the platform for reasons other than structural integrity.

The amount of work needed to create the substructure would not have been substantial, and could have been done by one individual. The tool marks on the yew show use of a sharp metal axe.

#### Platform superstructure

The platform's superstructure measured

3.3m north–south and 2.8m east–west. It consisted of 34 carefully trimmed hardwood poles laid neatly side by side in a corduroy fashion, with their ends roughly aligned to achieve an approximate rectangular shape. It had been affected by some later disturbance.

The poles near the south edge, and one towards the north, extended across nearly the full width of the platform. The south end was best preserved and was the most regular part of the superstructure. Several of these timbers had both ends worked, indicating that they were intact. This implies that the rest of the platform also originally consisted of a row of similar timbers. They averaged about 2.35m in length and 50–85mm across, the range being due to their oval, compressed, shape. The rest of the timbers were not only shorter but also slightly thinner, at 40–75mm across. All but two have been identified: the majority, 23, were alder, seven were ash, with two that were either alder or hazel.

The timbers of the superstructure were very much more uniform than those of the substructure, and more care seems to have been taken over their selection and preparation. This is presumably because of the need to fit them together side by side to form a continuous, smooth surface. However the wood had been preserved much less well than that of the substructure. This is what would be expected: firstly the wood used was softer than yew (the classification into 'hardwood' and 'softwood' is on biological criteria, and does not necessarily reflect mechanical properties, hence alder is a hardwood but is mechanically soft, whereas yew is a softwood but is mechanically very hard). Secondly when in use, and for some time afterwards, the conditions it was exposed to would have been more oxygenated and subject to greater decay. Thirdly it may have been subject to wear and tear on its upper surface.

Two sections had been destroyed, one in the north-east corner and the other in the centre of the west side. This was caused by something more damaging than the wear and tear, weathering, and decay that had affected the remainder, and happened when the platform was exposed, or as a result of root damage subsequent to burial. The latter could have broken up the timbers,



or displaced them upwards into a more oxygenated layer where they decayed. There were concentrations of roots in the peat beneath these areas, and some of the poles in the centre, next to the area of damage on the eastern side, had been tilted.

Many of the timbers in the centre were smaller in diameter than the ones to the north and south of them, at 30–60mm across. It is possible that these represent a repair, with the original timbers having been removed or destroyed.

#### Displaced timbers

A number of timbers appear from their size, species, and working to have been part of the superstructure, but were not in their original positions. Four of these were at the north edge, and their displacement may represent a degree of breaking up of the northern side of the platform, as they do not appear to have moved far from their original positions. Two ended up relatively isolated to the west of the rest of the platform. They could conceivably have got there during construction, if lost in the peat or discarded as surplus to requirements, but it seems more plausible that they were displaced following damage to the platform.

#### Fixings for the platform

The area around and beneath the platform was checked carefully for pegs or stakes that could have been used to hold the timbers down, but none were found. There was also no evidence for ties, made from twisted saplings or from other fibrous materials, binding the timbers together. The substructure would not have needed fixing, as it was within the peat and below other timbers, but it might be expected that the superstructure would be secured. It is unlikely that there were pegs or that the timbers were tied together to form a raft but the pegs or rope left no trace. It is more likely that no fixings were used, as the platform was effectively floating on soft peat and would only really need holding down if the surface was so wet that the timbers risked being carried off. Once the timbers had been pressed into the peat they may not have been easily moved due to cohesion with the peat body; the additional labour involved

in securing them further may not have been considered worthwhile.

#### Tool marks and signatures on the platform

The forms of the toolmarks on the platform timbers show that the axe or axes used were metal, which will have been bronze given the date. The hardness of the wood meant that they were very much better preserved on the yew substructure timbers than elsewhere. Where they were less well preserved on the softer timbers, the gross morphology of the worked ends could still be seen, including the facets and stop marks from individual axe blows. These provide evidence about the size and shape of the axe blade employed. On the yew, preservation was good enough to see the fine striations left on the surface of the toolmark produced by nicks and other imperfections in the axe blade. These are specific to each axe, even if they can change when an axe is either damaged or sharpened. They can be matched between different timbers, and so give information about how many axes were used. On the softer timbers decay and compression had removed the fine detail required to make this identification possible.

Two different signature marks could be identified on the yew, with six reasonably clear examples of one and three of the other, plus some cases where identification was less certain. However both of them could have been created by different parts of the same axe blade, and both were present on the different ends of one timber, which suggests that this may well have been the case. The stop marks on both the platform substructure and superstructure are up to 60mm across and strongly curved. The largest examples are not quite complete, missing the impression of a corner of the axe blade, implying that the blade width was about 65mm. This is consistent with the 65mm size of the largest woodchip from the platform, which may be close to the full width of the axe. This woodchip is of hardwood, probably alder, so may have been derived from one of the superstructure timbers.

The platform toolmarks, both in their gross morphology and their signatures, indicate that the axe or axes had blades 65mm wide, and that the number of axes used was most



likely just one, possibly two, but unlikely to have been more than two. This blade width corresponds most closely with palstave type axes, rather than the generally narrower, later, socketed axe or wider, earlier, flat axe, although there is overlap in the blade width ranges. However the Early Bronze Age radiocarbon date of the platform (Table 3) corresponds better with the period when flat axes were still in use, so the axe was on the small side for this period.

#### Construction and use of the platform

Working with a hafted bronze axe, and assuming the raw materials of small yews and larger but still young alder trees were found not too distant, it is reasonable to suppose that it would have taken in the order of two or maybe three person-days to build the platform. This is on the basis that it would take less than a day to cut, trim, drag in and lay the wood for the substructure, and rather more than one day to do the same for the superstructure. If only one axe was used, it is plausible that it was the work of either a single individual or a small work party.

There is little about the platform to suggest anything other than a utilitarian approach from the people that built and used it. It had been made pragmatically and economically, with no indication of being made to be visually impressive or special in any way, and when damaged it was repaired in the same manner. It was presumably made to create a drier and firmer surface than was afforded by the peat, but the reason this was needed is not clear, although perceptions of the utilitarian nature of the structure may well be culturally biased. There are many cultural activities and manifestations, which to the outsider would appear neither special nor inherently meaningful, which to the individuals involved in acting them out or their construction would be highly meaningful and full of complex symbolism. It is therefore best to remain cautious of being too categorical in making pronouncements on any aspects of hidden meaning of the platform. There were no artefacts around or beneath it to suggest a non-functional use, although its yew construction *per se* suggests a potential ritual function.

The samples used for the radiocarbon dates

were from timbers in the initial construction, not the repairs. While there is no direct evidence about how long it could have been used for, even with repairs it seems plausible that such a light structure would have lasted a matter of years or tens of years.

A contemporary trackway coming off the gravel terrace on the north side of the adjoining Woolwich Manor Way site had half of a late Beaker placed by its side suggestive of some form of associated symbolism (Gifford & Partners 2003a). However, recent additional radiocarbon dating of the trackway renders a direct association of it with the Beaker far less likely, with the trackway being of a later date 1610–1570 / 1560–1430 cal BC (GU18860 3230 ±BP) than that attributed to the Beaker (2500–1600 BC).

#### Trackway

The trackway at the Golfers' Driving Range site consisted of three identifiable layers of small roundwood rods laid longitudinally (Figs 3a–b, 6–7). Together these formed a relatively thick structure, which was lens-shaped in section. It is most unlikely that this shape was created deliberately by cutting into the peat, instead the rods would have been laid on the surface, with the shape of the lower surface of the trackway being caused by consolidation as it was pressed into the soft peat.

The layers were differentiated primarily by the size of the roundwood, with the lower and upper layers being made from larger material, around 30–45mm in diameter, than the middle one. The latter was largely around 10–30mm in diameter but with some larger rods and also occasional areas of very fine woody material that appeared to be twigs and leaf litter. Secondary differences were a more clayey matrix in the lower and upper layers, compared to the more organic middle one, and the upper layer also had lenses of bluish grey clayey silt towards its top. The rods had compressed over time into an oval shape, and were generally 0.40–0.70m long, although this may be an underestimate of the original lengths, due to post-deposition breakages not always being identified as such. The upper layer of roundwood appeared to be more worn and weathered. The relatively clayey nature of much of the matrix in the

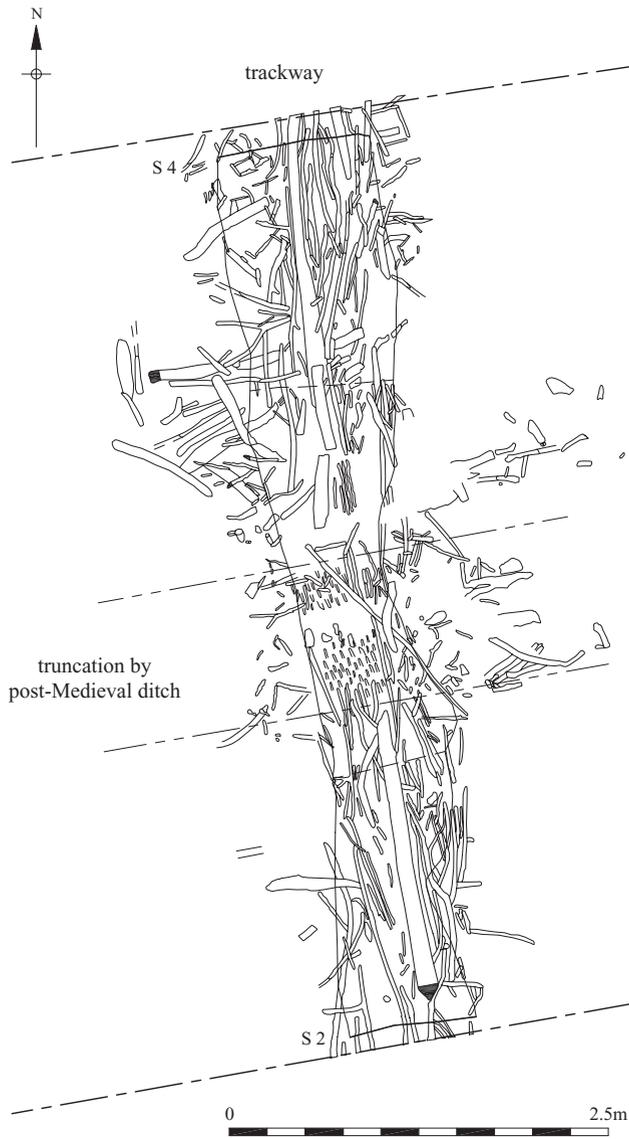


Fig 6. Trackway construction

trackway may reflect the flooding at this time. In the centre of the trench the upper layer was partially truncated by the base of a post-medieval ditch.

Almost at the base of the trackway, near the interface between the roundwood and the peat below it, there was a deciduous ('milk') tooth from a cow. It is likely to have been shed by a live sub-adult animal rather than being derived from a carcass. The lack of other bone or teeth, despite good preservation of the one found and complete excavation of the whole length of the trackway within the trench, is

consistent with the interpretation that it was shed rather than representing either food waste or other post-mortem deposition.

This supports the notion that one of the uses of the trackway included a role in cattle management on the marsh. Although sheep are also possible for wetland grazing, this former wetland has produced little evidence for sheep grazing. A small number of sheep bones came from the Freemasons Road (FRU01) site along the former wetland edge from a small assemblage dominated by cattle (Gifford & Partners 2003b). In many parts

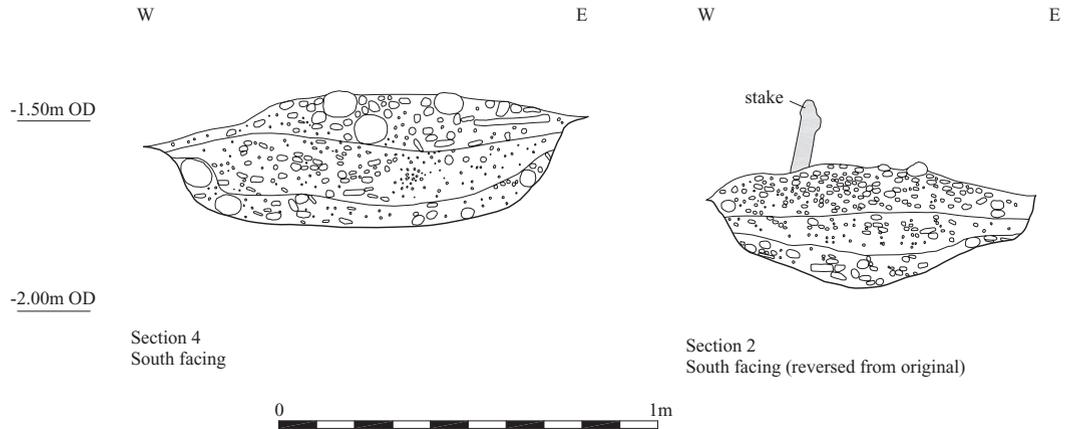


Fig 7. Trackway sections

of the world today, cattle are tolerant of wet conditions and will graze in areas where the water comes up to their bellies or even where they need to swim short distances (Fig 8). The vegetation is generally rich and liked by

them. A system where the cattle were moved off into the marshes during the summer months would not only provide high quality pasture but keep the stock away from the ripening arable crops. The trackways were



Fig 8. Cattle grazing in a wetland marsh (Puquio area Peru)



probably used by the herders to allow them to monitor the animals, milk and manage them. The cow's tooth from this site fits into a pattern on the wetland sites in which bones are not very abundant, but when found are normally or predominantly cattle, such as the examples from the Barking Tesco's site, Kingsford Way, Freemasons Road underpass, Royal Community School, Custom House, as well as Fort Street in Silvertown and the Bridge Road site in Rainham. The total sample from the London area is still small, but is heavily dominated by cattle bones, with occasional remains of pig. The latter was identified at the Fort Street and Freemasons Road sites where its presence dates to the Bronze Age (Crockett *et al* 2002).

A possible engineering advantage to using varying thicknesses of wood in its construction may have been to render the trackway more adaptable to the variable peat and marsh surface which it passed over. If the three layers were not created just by some chance effect in the selection of the roundwood used, the track may well have been built up progressively over some time (Fig 7), with different raw materials being available. If this was the case, then a layer of roundwood would have been put down and used until it sank into the peat too much. When this happened more would have been put down on top of it, until it was restored to a usable condition. As it became thicker and wider it would have been less prone to sink, and have required less frequent addition of new material. Eventually it may have become stable enough not to sink further, and needed only minimal maintenance. Building up the trackway may also have become necessary due to rising water levels, which otherwise would initially have made it usable for less time during the year, and eventually not at all. The trackway had a relatively uniform thickness and profile along the length within the trench. However, it may have varied in thickness over a larger distance, depending on the height and softness of the ground that it traversed.

Repeated periods of accretion to the trackway is also the simplest explanation of the lens-shape of the profile. If the wood for the layers was not harvested at the same time it is to be expected that it would not be quite the same size. When excavated the

trackway was 0.35m thick, but the degree of compaction had clearly been considerable. The oval profile of the rods themselves suggests that they had been compressed about 30–50%, while the space between them would have been very much greater when they had some strength. The trackway may therefore have been compacted to about half of its original thickness, and so could have been usable with a wider range of water levels than would appear from its shape as it was found. It is unclear how much compaction was due to normal overburden pressure and humification within the peat, and how much was due to trackway use.

Construction in one event, without allowing for the roundwood to bed down layer by layer, would have produced a structure with a greater ratio of height to width, which would have tended to spread out sideways. Without a cradle or stakes preventing this, the rods would have needed to be held together by being tied into bundles, and even then it may have been precarious before it compacted down. No evidence for this was recovered, and even if the preservation conditions for organics may not have been quite good enough for cord to have survived, it seems slightly improbable that there was no evidence for bundling, such as wear or pressure marks from a rope.

Trackways of a simple brushwood type would have been easy to construct with minimal effort or technical know-how. If the investment of work into the trackway was spread over time it would be possible for a very small group to have created and maintained it. This is especially true if it was done as part of the annual subsistence cycle, with use and maintenance at the same time each year. On the other hand, a community may have had a number of trackways to maintain, as well as a need periodically to construct new ones. The number of trackways found in Beckton, when considered in relation to the number of archaeological investigations, indicates that there may have been a considerable density of them over this area of marsh at any one time. This may have simply been a question of fully exploiting the available wetland pasture, but it could have been important to its management, for example leaving areas ungrazed for a year or more would allow parasite eggs to die off.



At the north end of the trackway within the trench the roundwood sat on top of a large, naturally fallen, oak timber, probably a trunk, diagonally across the bottom of the trackway. It is possible that this log was opportunistically used as a firm place for the trackway, but as it was at least 0.10m below the level of the widest point of the trackway, it may have been there already buried for some time before the construction of the track was started.

While the roundwood was generally oriented along the trackway there was some variation, with some at a diagonal or dipping slightly. In between the middle and upper layers there were about nine timbers set at right angles across the trackway. These were mostly in a group near the north side of the trench; there were not enough of these to make them an important part of the structural composition, but they may have been used in an attempt to raise the surface using less wood.

Three stakes had been driven into the southern half of the trackway, and there was a fourth in the section on the southern side of the trench, all at a similar level. The three recovered were of hardwood and a similar size, 0.60–0.85m long and 40–65mm wide. They had sharpened ends (one in chisel form and the others with two angled concave facets). While three of them had broken off upper ends, the one that survived to the highest level (-1.31m OD) had been eroded into a point, very probably by water action (Fig 5.9–11). All three dipped down between north-east and south-east, with the two on the west side having only a slight angle, and the one on the east side sloping more.

Along the centre of the trackway, on top of its upper surface, there was a single longitudinal string of poles which were significantly larger and more regular than the rest of the roundwood (Figs 6–7). These were relatively uniform in size, with cross-sections of 120–140mm across, and of reasonable length; two of them had been over 1.90m and 2.10m long respectively. In the centre of the trench they had been truncated by the east–west post-medieval ditch. At one point two of the poles overlapped.

The poles seem to represent part of a more complex final modification of the trackway, although insufficient evidence remains to

reconstruct what it now looked like. A single string of poles on its own would not be very practical. They are unlikely to have been the remains of a further layer as it is improbable preservation effects or salvage would leave a single string.

Six woodchips were recovered from the upper surface, a further one from within its upper layer, and three within its middle layer. All of these were of hardwood, with one on the surface being oak. While there were more woodchips from the trackway than the platform, the only worked timbers in it large enough to produce these was the string of poles, which is consistent with the woodchips being both generally higher up within the trackway or above it, and being hardwood. This suggests that some of the preparation work for the inferred final modification was carried out on site, and the modification included some oak components.

#### Tool marks on the trackway

The toolmarks show that the axes were metal, and as the material was all hardwood insufficient detail was preserved for tool signatures to be identified. The smaller size of most of the wood in the trackway also means that there is less information about the size of the axes used, but a 55mm wide incomplete stop mark on one of the rods in the upper layer provides a minimum size for one of the axes used, and shows that the blade was again curved. This toolmark, and one in the middle layer, are suggestive of left-handed working, whereas the others either give no indication or suggest right-handed working.

The toolmark evidence for the trackway is less specific than it is for the platform, but is consistent with the Middle Bronze Age radiocarbon date of the timber. The axes that made the marks appear to have been within the size range expected of the palstave types current at that time.

#### Construction and use of the trackway

The amount of work that would have been required to make the brushwood trackway cannot be estimated, as its length is unknown. Because of its size and the amount of timber involved it represents more work than the



platform. A utilitarian approach is implied by the method of construction. The simple brushwood track would have been a practical and economical way to create a passage across the marsh suitable for people.

#### Relative chronology of the platform and trackway

The radiocarbon samples taken were from wood in the string of poles along the top of the brushwood, and so date the final adaptation of the trackway rather than its initial construction. How much earlier this happened is uncertain; however it is likely that it would have had a lifespan measurable in tens of years or less.

The lack of an obvious means of passage between the platform and the trackway supports the implication that they were unrelated, as indicated by the 100 to 630 year separation in their radiocarbon results. The possibility that they were contemporary should, however, not be dismissed, given that the samples from the platform were from its first creation and those from the trackway were from its final modification.

The position of the platform and trackway at a similar level within the peat means that they cannot be separated by too great an interlude, even allowing for possibly punctuated rates of sedimentation. Their levels could be reconciled with a difference in date between them by a number of factors. Any structure used for support and to consolidate soft ground can be pushed downwards through the sediments to some extent, and this could have affected the structures differently. The trackway was compacted to a greater extent, meaning that the original surface was higher, and it may well have had heavier use. Furthermore, if it was later then conditions were wetter and softer.

#### Roundwood spreads

In addition to the platform and trackway, two smaller timber structures of man-made origin were present, consisting of spreads of a limited number of parallel small roundwood rods. They appear to have been laid for some temporary or lightweight use; conceivably the bundles were dropped accidentally and not recovered.

On the north side of the trench, north-west of the platform and east of the trackway, one of the bundles covered an area of 1.65m north-west to south-east long by 0.50m wide. This was in a thin horizontal layer that was a maximum of 0.10m thick, representing at most two or three layers of roundwood. At its south-eastern end it butted up against a large unworked timber, and it is likely that it was created by one or more bundles of roundwood being placed on the peat surface next to this timber.

A charred fragment of cleft oak heartwood was recovered from the peat immediately overlying this, which was probably an ember from a fire. It may represent use of a torch or the loss of an ember being transported; Bronze Age peoples are known to have carried fire around with them. Had there been a fire on one of the structures more than one charred piece would be expected.

The second spread, on the south side of the trench, was less substantial, covering an area 2.40m north-west to south-east long and 0.80m wide. It consisted of a single layer of roundwood, with about twelve hardwood rods and one of yew that was longer and had branches. It was not dissimilar to the two groups of rods that formed part of the platform substructure, for which the presence of yew also suggests a connection. Like the other roundwood spread it was next to an unworked timber, a trunk with its roots.

If these easily created and presumably short-lived structures were not for supporting raised up fires or other objects, they may have been stepping or resting places for people, even though they do not seem to lead to specific places. The southern one did not extend to the edge of the trench, which, along with its insubstantial nature, makes it unlikely to have been the start of a trackway from the platform off to the south-east. Similarly, if the platform went out of use before the trackway was constructed (see below), the northern one could not have bridged the gap, and in any case it was also not in the most logical position for this.

#### *Trench 2*

At almost exactly the same level as the trackway and platform in Trench 1, there was a layer with a substantial number of

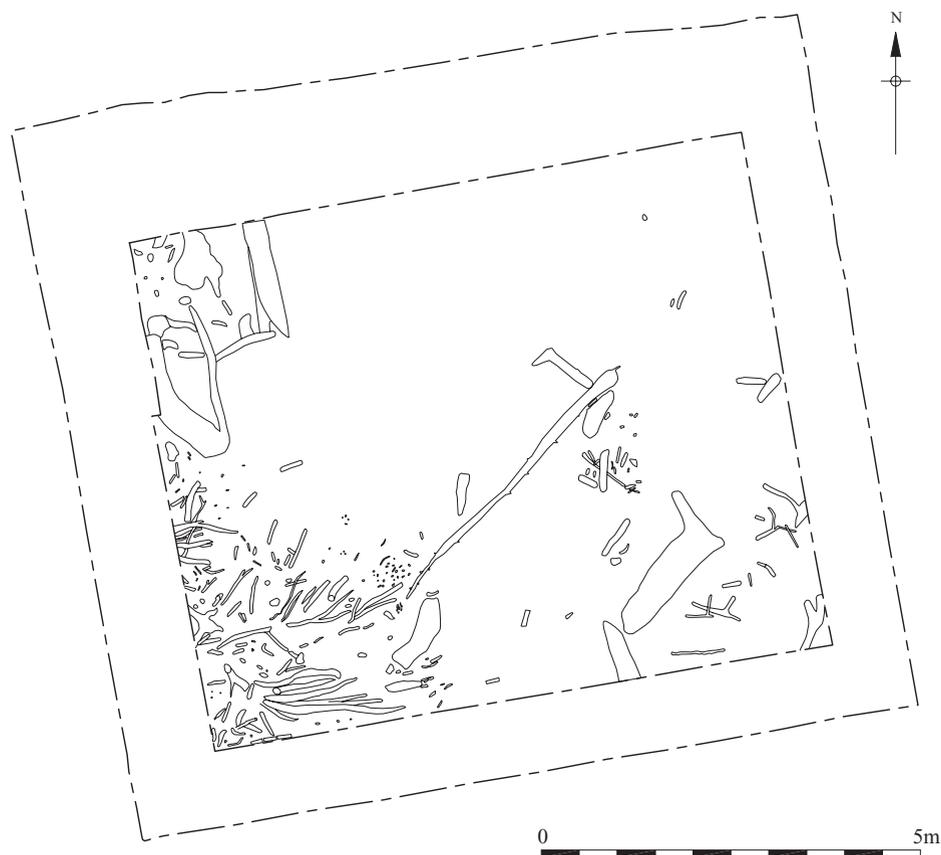


Fig 9. Natural wood accumulation in Trench 2

timbers in Trench 2 (Fig 9). No evidence for woodworking was found on them. They all appeared to have been in their natural state and naturally deposited. The upper surfaces of these timbers were at between -1.45m OD and -1.65m OD. This was the only recognisable discrete horizon with a concentration of timbers within this trench, although there were occasional isolated, and generally smaller, wood elements within the peat at levels above and below it.

It is not clear whether the timber horizon represents a normal situation of dead wood on the floor of the wetland wood or not. Some event could have killed most or all of the trees in the carr, producing a large amount of wood at once, but this would not explain why there were no preserved root balls, unlike at other nearby sites such as Beckton Nursery and Beckton 3D.

#### Middle Bronze Age peat: Phase 4

In both trenches above the timber horizon there was more peat, 0.65–0.75m thick in Trench 1 and 0.50m thick in Trench 2. No cultural material was recovered from this in either trench. The signal from the palaeoenvironmental record in Trench 1 of much wetter conditions at and above the level of the wooden structures compared to below them is corroborated by the water eroded upper end of one of the trackway stakes of Phase 3, and by visible areas of more minerogenic material, clayey silt, introduced by flooding events, in the peat of Trench 2.

While in Phase 4 the wetter conditions around during Phase 3 abated to some extent, the resources available on the wetlands probably remained less diverse compared to those of Phase 2. Biodiversity

is likely to have been lower, with the area dominated by alder carr, reed marsh and wet grassland, although there would also have been running, stagnant and vegetation-rich water. During this phase, the focus shifted from an emphasis on animal husbandry and exploitation of the marsh for grazing to arable cultivation on the terrace gravels.

#### **Middle Bronze Age to medieval alluvium: Phase 5**

No cultural material was found in this part of the sequence. At the top of the peat the increasingly wet conditions resulted in a cessation of peat growth. Saltmarsh or mudflat settings prevailed as a result of the persistent flooding of the surfaces until the 'inching' of the area in the medieval period, laying down 1.40m of clayey silt alluvium.

Cereals, grown on the gravel terrace to the north, are represented in the pollen sequence during Phase 5, from about -0.42m OD. This indicates an expansion in the amount of arable cultivation, consistent with the wider pattern of intensification of agricultural production from the Middle Bronze Age onwards (Yates 2001).

#### **Modern: Phase 6**

A substantial ditch of probable post-medieval date cut through the alluvium and into the peat, just truncating part of the top of the trackway. This ran east-west, and is likely to have been for drainage. Capping the sequence was 0.35-0.60m of made ground and soil, dating to after 1800.

### **DISCUSSION OF THE ARCHAEOLOGICAL CONTEXT**

#### **Neolithic**

Neolithic landuse of the dryland/wetland interface and the wetland itself is indicated at a number of sites, with the remains suggestive of a still relatively mobile population engaged in a varied range of activities, including the exploitation of wild and agricultural resources, contextualised in a ritual framework marking out aspects of the landscape.

Early Neolithic remains were found close to the site, in Trench 15 of the A13 project

at Woolwich Manor Way just to the north-east, on the slope of the higher ground formed by a gravel promontory (Gifford & Partners 2001). A scatter of pottery, struck flint and burnt flint was present within a layer of weathered silty sand, at -0.60m OD, representing a palaeo-landsurface that would not have been inundated at that time. Significantly there was also a considerable quantity of carbonised processed grain found here, principally emmer and possibly einkorn wheat, which has been radiocarbon dated to 3910-3370 cal BC (Beta153983; 4850 ±100 BP). The authors (Gifford & Partners 2001) suggested that the grain was part of a placed deposit. Similar artefacts, but without the grain and in smaller quantities, were also present in the organic sequence above the weathered sand. These may well have been reworked from elsewhere on the promontory in contrast to those in the sand, which are believed to have been *in situ*.

Other trenches at the A13 Woolwich Manor Way site also produced burnt flint at the gravel peat interface. In Trench 17 (Fig 2), where this was at -3.15m OD, there was a sufficient quantity to suggest the presence of hearths or a burnt mound nearby, while the height and the radiocarbon date of the peat just above this, 4470-4240 cal BC (Beta152741; 5560 ±70 BP), indicate an early date. At Movers Lane further east along the A13, on a headland between two converging river channels, artefact scatters dating from the Mesolithic to Late Bronze Age were found, as were a small number of possible occupation features from the latter part of this period. Small quantities of both Peterborough and Grooved Wares were present (Wessex Archaeology 2003). At Freemasons Road, also east along the A13, the gravel was sufficiently high to have been dry during the Neolithic to Early Bronze Age. There were extensive artefact scatters, animal bone, fragments of wood and features dating to this period, which may indicate that it was on the periphery of a seasonal habitation area (Gifford & Partners 2003b).

At Kingsford Way, about 500m to the south of the Golfers' Driving Range site, further into the floodplain, the alluvial and peat deposits produced evidence of buried landscapes ranging in date from the Bronze Age through to the Iron Age (Jarrett 1996).

Half a cow mandible of Neolithic date was also recovered from this location.

At the Royal Community School, Custom House, 1.9 km to the south-west of the Golfers' Driving Range site, activity on a small gravel eyot well within the floodplain was present from the Mesolithic, when six flints were deposited, to later periods (Holder in prep). Middle Neolithic pottery and lithics were present in considerable quantities; microwear analysis has indicated that the latter had been used to cut grasses, cereals, rushes, or reeds. A few possible ard marks were also identified, and an early date for these is suggested by the excavator. A group of scrapers and a concentration of burnt flint, tentatively dated to the Late Neolithic to Early Bronze Age, have been interpreted as the remains of animal hide processing and a cooking mound.

At the site of the former White Swan Public House in Yabsley Street, at Blackwall in Tower Hamlets, occupation remains of Neolithic date, including lithics, pottery, a polished axe and a *petit tranchet* arrow head as well as burnt flint and a poorly preserved, possibly adult, female crouched inhumation burial, were found. The lithics suggest tool use rather than production. The burial cut included an oak timber plank which produced a radiocarbon date of 4220–3980 cal BC (KIA20157 5252 ± 28 BP) and a flint knife. There was also an Early Bronze Age hearth (Coles *et al* 2008).

At the Elizabeth Fry School site, east of the River Lea, some lithics including a broken axe of Neolithic date were recovered from peat deposits (Meddens 1996). Neolithic activity was also present at the floodplain edge at Rainham Brookway, and here the cut features, as well as associated pottery and lithics, are indicative of occupation (*ibid*). The Dagenham idol, a Late Neolithic anthropogenic wooden figurine, was uncovered in the excavation of a sewer trench in Dagenham and dates to 2350–2140 cal BC (OxA-1721; 3800 ± 70 BP) (Coles 1990, 326). This find confirms that the wetland landscape had a heightened spiritual or mystical value to the region's prehistoric inhabitants.

At Bridge Road, Rainham, along the margin of the Ingrebourne River, substantial cut features, including a ditch and pit, were found. No finds or datable material came

from these features, but they were below a substantial deposit of alluvium. On top of the former surface of this alluvial material extensive Middle Bronze Age remains were found (see below) and the earlier cut features are therefore likely to be Early Bronze Age or earlier.

A c.6000-year-old Neolithic timber platform or trackway was found at the Belmarsh Prison site in Thamesmead, on the south bank of the Thames, as was an Early Bronze Age alder log with metal axe tool marks.

Near the floodplain edge at Church Road, Erith, a very large quantity of burnt flint was uncovered, sealing the fill of a palaeochannel cut into the gravel (Dobson 1999; Bishop 1999). This was associated with a small number of struck flints that were probably Late Neolithic, but lacked diagnostic pieces and so could have been from Mesolithic to Bronze Age in date. The proportions and quantities of burnt and struck flint suggest a burnt mound, which could have originated in large scale cooking, or a sauna or sweat lodge, rather than being domestic material accumulated over a long period.

Further upstream along the Thames, on the foreshore at Chelsea, a Neolithic wooden club or beater dated 3530–3340 cal BC was found (Ganiaris & Webber 2004, 124–7). In Southwark at Hopton Street, pottery, cut features and a placed deposit comprising a Beaker bowl of Late Neolithic date have been identified just on the dryland side of the floodplain/dryland interface (Ridgeway 2000, 72–6).

### Bronze Age

During the Bronze Age activity in the wetlands and along its margins appears to intensify, with the wetlands being particularly used for the pasturing of livestock and management of woodland resources. Focal points of concentrated use develop evidenced by noticeable groups and successions of trackways accessing the marsh.

There are numerous sites along the floodplain margin of the Thames and its tributaries in the London area which have produced evidence for wetland use during this period. The peak of timber structure construction appears to have been in the Middle Bronze Age, c.1500–1200 BC, with some

earlier examples also known. The principal construction material used on sites dating to this time was brushwood, largely alder, and there was a degree of variation in the method of construction. There is clear evidence for the use of coppiced material, for example, at Bridge Road in Rainham and at Beckton 3D. This indicates an element of woodland management, which would certainly have been useful for the construction of timber trackways, which require large quantities of wood: an estimate of the requirement for a 1km-long trackway in the Netherlands, for example, is c.40ha of woodland (Casparie 2005, 404). The brushwood tended to be aligned along the direction of the tracks, sometimes with some cross-pieces and pegs. A slightly more complex technique was sometimes used, where roundwood had been woven into hurdles or was contained within cradles formed by stakes. The normal method of making a platform surface was to lay poles out in a corduroy fashion.

The building of trackways in the area may not have started with brushwood types. A few have been reported that may be older and were made from wood with larger cross-section, converted into the required shape. About 3km south-west of the Golfers' Driving Range, at Fort Street, Silvertown, several alder and ash planks were revealed, one of which has been dated to the Early Neolithic, and these have been interpreted as a short length of trackway (Crockett *et al* 2002). However a retaining post which was part of the postulated structure produced a Late Neolithic to Early Bronze Age date; furthermore no convincing discussions of any possible tool marks on the earlier timbers have been produced, raising uncertainties about either the dates or the inclusion of the timbers in a single structure. A small assemblage of Bronze Age pottery, lithics, and animal bone, including cattle and a single pig mandible, also came from this site.

In the palaeochannels at the Movers Lane site along the A13 were two simple trackways, three possible stake-built structures, a platform, and Late Bronze Age artefact scatters (Wessex Archaeology 2003). An additional platform also from Movers Lane consisted of a root system that had been further stabilised by the addition of more wood (*ibid*).

At the Royal Community School site, Late Bronze Age remains included a cooking pit and five shallow hearths, along with burnt flint and small quantities of animal bone. This mostly comprised domesticated cattle, with some pig, and a small amount of deer. A cluster of stakeholes may represent drying racks for hides or food, and the presence of numerous scrapers, some with microwear from processing hides, supports this. Peat may have been used as a tanning agent.

Some 60m to the north of the Golfers' Driving Range trenches, in Trenches 1 and 2 of the A13 Woolwich Manor Way investigations (Fig 2), three simple north-south brushwood trackways were found, which varied from being one or two layers of roundwood thick to more substantial constructions (Gifford & Partners 2003a). An area of burnt sand and another wooden structure were also present. A prehistoric flint arrowhead is known to have been found in the same area when it was being used for allotments. A further group of worked timbers revealed at Woolwich Manor Way may represent the corner of a platform but there was only a restricted area of this available for inspection within the trench (Gifford & Partners 2003a).

At the Beckton 3D site, immediately west of the Golfers' Driving Range site and also just on the floodplain side of the floodplain/gravel terrace boundary, there was a substantial cradle-supported brushwood trackway, dating to the Middle Bronze Age (Meddens 1996; Beasley 1993; Divers in prep). The cradles supporting the smaller rods were carefully made, and formed by an 'X-frame' arrangement of stakes, augmented by other timbers. Two artefacts were recovered: a small flint flake and, more intriguingly, a worked, disc-shaped stone. Similar stones have been found elsewhere, such as at the Iron Age Somerset lake village of Meare, where they have been interpreted as grinding stones or pounders (Coles 1987, 150-3, S1, S75). The objects are also similar in shape to stones used as an anvil in the 'paddle and anvil' type of pottery technology. There is little evidence for the use of this technique in British prehistory but this may be because it has not been looked for (Gibson 1997, 216).

At the Beckton Nursery site, adjoining and west of Beckton 3D, two brushwood

trackways were found as well as some further brushwood structures, including one with a wattle construction (Meddens 1996; Divers 1994; in prep). One of the trackways was large, and its rods were contained within V-shaped cradles of stakes. Two radiocarbon dates have been produced for this, one in the Early Bronze Age and the other in the Middle Bronze Age. The other structures, including the second trackway, were more ephemeral, and consisted of smaller rods only.

The Freemasons Road underpass site along the A13 became more boggy, or was even predominantly underwater during the Bronze Age. A line of substantial vertical oak posts (*c.*40cm in diameter) had been driven into the ground here. These were placed in closely spaced pairs, each pair being separated from the next by a distance of *c.*2.25–2.8m; a spread of artefacts and animal bone was contemporary with these. This alignment ran on an east–west orientation; one of the posts produced a radiocarbon date of 1870–1540 cal BC (Beta152738; 3400 ±50 BP). The nature and function of the feature found here is unclear. The posts are capable of having supported a substantial structure, or alternatively the configuration may represent an alignment defining concepts of space such as have been identified in the Cambridgeshire Fens (Evans & Knight 2001, 83–98).

Part of the way up the floodplain of the River Roding, at the Barking Tesco's site, a sequence of land use was identified comprising three brushwood trackways, two wooden platforms and elements of revetting of a stream bank. A Middle Bronze Age radiocarbon date as well as Late Bronze Age to Iron Age pottery and some animal bone, including a cow skull, came from the various phases of activity (Meddens 1996, 326–7).

A substantial causeway or burnt mound of gravel, burnt flint, and sandy silt, *c.*4m wide and at least 23m in length, sandwiched by peat deposits, appears to have provided access into the marsh at the Hays Storage Depot site in Dagenham during the Bronze Age. Radiocarbon dates from peats immediately overlying the feature date to 1380–990 cal BC (Beta70881; 2960 ±80 BP) and from directly below it to 1870–1520 cal BC (Beta70882; 3380 ±80 BP). Evidence for poaching or animal trample was recognised

in its surface and the matrix of the material was compacted (Meddens 1996).

On the bank of the Ingrebourne River, another Thames tributary, at Bridge Road, Rainham, there was a small brushwood trackway, which extended into the marsh from the gravel rise on which the village of Rainham stands. In addition, there was a small rectangular fenced area present on the foreshore of the gravel outcrop. These were made from alder stakes (Meddens & Beasley 1990), and their use may have been connected to animal husbandry.

At Atlas Wharf, on the west side of the Isle of Dogs, the remains of an extensive wooden platform were found, which was on the edge of a palaeochannel (Lakin in prep). The one edge of this structure that was exposed measured *c.*15m in length. It had three phases of construction and repair dated to the Early and Middle Bronze Age, separated in time sufficiently for the deposition of layers of peaty silt between them. The final platform surface had a corduroy construction largely formed of split alder logs. Evidence of woodworking, in the form of two oak cleaving wedges, was identified.

The trackways and wooden structures are more abundant on the north bank, but have also been found on the south side of the river. At Bronze Age Way, Erith, there was intensive use of the river edge in the Bronze Age (Bennell 1998; Masefield 1997); brushwood trackways of simple and hurdle construction and a gravel ramp or hard-standing that had been deposited over the peat have been identified.

At Greenwich (Philp & Garrod 1994) ephemeral remains of a possible trackway were identified and other work in the vicinity, at Bellot Street, has uncovered elements of a corduroy type track or a small platform (Hawkins 2005). The peat formations immediately above and below this structure have been dated to 1940–1730 cal BC (Beta204347; 3510 ±40 BP) and 1770–1620 cal BC (Beta204346; 3410 ±40 BP), placing the platform itself in the Middle Bronze Age. The poles of the structure were substantial and lithics and burnt flint were found in close proximity (Hawkins 2005).

In the Early Bronze Age, upriver at Bramcote Green, Bermondsey, were two phases of a log-built trackway connecting



two areas of dry land across a marsh which was about 1km wide (Thomas & Rackham 1996). The earlier one had two parallel lines of alder logs held in place with alder stakes, and the later one comprised a single line of oak logs, with alder stakes along one side.

Two roundwood alder log constructed platforms of Middle Bronze Age date were identified at the St Christopher's House site in Southwark, immediately south of the Tate Modern, on the edge of a former lake (Corcoran 2004).

A platform at the Bricklayers Arms site in Southwark consisted of brushwood that had been laid over clay deposited at the edge of a freshwater lake in the Early to Middle Bronze Age (Merriman 1992). At Phoenix Wharf there was an Early to Middle Bronze Age cooking pit and an associated burnt mound and retaining fence line (Bowsher 1991). Ard marks were also revealed, post-dating and partially infringing on the burnt mound. At Tanner Street there was evidence for wooden fence lines and a bank running parallel to the edge of a stream channel (Leary *et al* in press).

Ard marks have been found at a number of sites along the edges of the Thames and on eyots within the floodplain. The majority come from a circumscribed area of Southwark. They have been located at Hopton Street (Ridgeway 2000) and Lafone Street (Bates 1996), while at the adjoining Three Oak Lane site stakes and pits were found as well as a wooden ard tip of Middle Bronze Age date, which came from one of the cut features here (Proctor & Bishop 2002). It should be noted that at all of these sites the evidence indicates a small number of ploughing events, as few as two or three. On this basis the use of the ard is unlikely to have been an effective tool in intensifying arable land use here.

At Vauxhall remnants of a sizeable structure, possibly representing the remains of a bridge or jetty, consisting of a row of vertical posts of c.0.5m diameter, placed in pairs some 4m apart, and dating to the earlier Middle Bronze Age, were situated. A pair of Middle Bronze Age side-looped bronze spear points were found each pushed point down into the sediments next to one of the wooden piles (Cotton 2000, 16–17).

### Iron Age–Roman

The Iron Age and Roman periods coincided with further rising water levels. There appears to have been a reduction of the use that was being made of the floodplain, or a shift in location; existing evidence favours the former. There is little suggestion of Iron Age activity from the floodplain. There is a wooden platform at the St Christopher's House site and an alignment of stakes at the Tanner Street site, both in Southwark, but no Iron Age material is known from the former marshland area around the Golfer's Driving Range site. The Iron Age activity focus appears to have been on dryland occupation sites, at small enclosures such as at Oliver Close, Dagenham Heathway and in the area of the Lea Valley Olympic Park, as well as the bigger hillfort sites such as at Uphall Camp. The Roman period witnessed extensive demographic change with the establishment of *Londinium* and Romano-British farmsteads around the area.

During the construction in the 19th century of the Great North Sewer at Roman Road on the gravel terrace, in the vicinity of the Golfer's Driving Range, Roman remains were uncovered, including a coffin, inhumations, grave goods and pottery. More recently, in Trench 15 of the A13 Woolwich Manor Way investigation Roman pottery was found in the alluvium along the marsh edge (Gifford & Partners 2003a).

Sites in East Ham, about 1km north of the site, have produced evidence of riverside activity along the foreshore, as well as possible settlements along the alignment of two roads running east from the city.

When the Royal Albert Dock was excavated in the late 19th century within the wetland area 1.5km to the south of the site, a Roman (3rd-century) wooden dug-out canoe was recovered, and the presence of a large quantity of Roman pottery was noted, believed to have originated from a settlement at North Woolwich. Nearby, to the south of the King George V Dock at Milk Street, investigations in 1996 produced significant amounts of Roman pottery, and the complete skeleton of a cow (Hanson 1996). Some of the pottery appears to have been burnt prior to deposition; it is of a broad date range within the Roman period,



probably late 2nd to late 3rd century. The site produced evidence for cereal cultivation and perhaps processing; emmer/spelt, oat seeds and wheat chaff were present.

There is little archaeological evidence of post-Roman activity in the vicinity of the site. Initially it is likely to have been marginal land, such as marsh pasture, but progressive ‘inning’ of the floodplain in the medieval period would have made it into valuable grazing. The area was mainly controlled by Barking and Stratford Langthorne Abbeys, which were responsible for extensive flood control measures in the East and West Ham Levels. There was little or no residential and industrial development on the floodplain until the mid-19th century. Major residential development has taken place since the 1980s.

#### WETLAND EXPLOITATION

The major potential wetland resources will have been fish, birds, reeds, wood and summer pasture. In addition drier gravel islands or eyots would have been available for seasonal habitation, and local communities may have wanted access to specific places within the marsh for other reasons.

Notwithstanding an expectation of a significant use of wetland birds and fish by the local populations in the area, concrete evidence for this has remained markedly limited, not just from this region, but indeed from prehistoric sites in the United Kingdom whether from dryland or former wetland locations. The most significant assemblages of fish remains have been found on coastal Bronze Age sites from the South-West of England. At Brean Down on the seaward side of the Somerset Levels along the Bristol Channel, Middle Bronze Age and Late Bronze Age deposits associated with settlement evidence produced cod, conger eel, ling, scad, mullet, Salmonid, sturgeon, pike and eel, the latter being the most frequent. Pike is the only one of these that is exclusively freshwater. Bird bones of wetland, marine, forest and farmland species were also identified (Levitan 1990, 231–6). At the coastal Bronze Age settlement site at Gwithian in Cornwall, significant quantities of fish remains have been commented on (Pollard *et al* n.d., 22).

Fish bone from Hardendale Nab in Cumbria of Bronze Age date suggests possible use of fish remains in a funerary context as a ritually placed deposit (Stallibrass 1991). Similar practices have been noted in Scotland in a burial cairn of Bronze Age date at Bu Farm, Rapness in Westray on Orkney, where a single cod premaxilla was found together with seven species of birds, including sea, wetland and moorland favouring species, and sheep, dog/fox and a common vole bone. These derived from a deposit underlying the basal cist slab of cairn 1 (O’Sullivan 1996, 113–14). Excavations in the Lower Nedern Valley at Caldicot in Gwent produced a substantial sample of fish bone of Bronze Age date, including possible flounder, salmon, eel and three-spined stickleback. This material was considered most likely to represent natural death assemblages. Some evidence for the human use of wetland birds was uncovered from this site, comprising cut marks on a mallard bone, an indication for the removal of its long flight feathers (Hamilton-Dyer 1997, 234–5). Evidence from Dyserth Castle in Wales for the exploitation of fish during the Bronze Age is ambiguous (*ibid*, 235). Evidence for a possible fish trap in a palaeochannel from the Lower Nedern Valley could alternatively be interpreted as remains of a waterfront structure (Brunning & O’Sullivan 1997, 168–9). At Hemington in Leicestershire a possible fish weir of Late Bronze Age date has been noted, although the evidence is rather limited, comprising several birch uprights in a former channel (Clay 1986, 39). At the Bronze Age fen edge site of West Row in Mildenhall in Suffolk five identifiable fish bones were found, comprising three pike vertebrae and two stickleback spines; the author states that the evidence here is insufficient to conclude that these were part of the Bronze Age inhabitants’ diet (Jones 1983, 57). There is considerable evidence for the consumption of fish from marine resources, in particular at some sites in Scotland, chiefly from Orkney (Balin-Smith *et al* 1994).

At sites in the London area fish and birds were rare to non-existent in the assemblages, even where animal bone preservation was good. At the Freemasons Road Underpass site, for instance, small mammal and amphibian remains such as field vole, rabbit,

frog and toad, as well as some three-spined stickleback spines (a fish not generally consumed), were recovered. This group of animal bone appears to be part of a natural death assemblage, and fish and wetland birds clearly were ignored as a resource.

Fish species have turned up in some considerable numbers on Neolithic, Bronze Age and Iron Age sites on the Continent and include pike, carp, sturgeon, salmon, eel, lesser grey mullet, cod, haddock, flatfish, and whiting (Bakels & Zeiler 2005, 326–7; Hogenstijn 2005, 429–31; van Wijngaarden-Bakker & Brinkkemper 2005, 494). Not only have fish remains been identified at these sites, but at contemporary sites in the Netherlands wooden fish traps, sizeable engineered sturgeon traps, fish hooks and fish spears have been recognised. Indeed a human burial dating to the late Neolithic at Molenaarsgraaf had a fishbone located in just the right position in the neck area of the individual to suggest that the man suffocated when the bone got stuck in his windpipe (Bakels & Zeiler 2005, 332). In comparison to the situation in England therefore, continental evidence for exploitation of fish during the Bronze Age is unambiguous and plentiful.

Later on, on English prehistoric wetland sites of Iron Age date, fish can be present but still tends to be rare. Its absence is remarked upon from the large animal bone assemblage from Outgang Road, Market Deeping in Lincolnshire (Albarella 1997). There are some instances when fish consumption is identified, such as of eel at Meare village in Somerset (Coles *et al* 1986, 233). In contrast fish remains are common from Roman deposits.

It has been suggested that a significant dietary shift took place over the Mesolithic–Neolithic transition, from a maritime to a terrestrial focus. Although the strength of the stable isotope evidence used to make the case for such a change in eating practices has been questioned and indeed rejected by some researchers in this field (Milner *et al* 2004, 9–20), comparison of animal bone assemblages with stable isotope analysis has indicated a strong correlation between the two and supports the hypothesis that significant dietary changes initiated with the Neolithic, involving a shift from a prevailing marine

contribution to the nutritional regime at coastal sites to one with a dominant protein input from domestic mammals (Schulting *et al* 2004, 144–52).

The lack of fish remains from the London Bronze Age prehistoric wetland sites therefore appears to be genuine rather than being the result of preservation or sampling bias. The exploitation of fish and wetland bird resources consequently may have been subject to some regional cultural taboo or technological factor.

The two confirmed economic uses of the former floodplain marshes in the London area for the Bronze Age are the pasturing of cattle and harvesting of timber.

## CONCLUSIONS

Although the wetlands undoubtedly afforded access to considerable potential resources, the timber structures uncovered may well have had important social and religious roles to fulfil. The evidence for ritual behaviour at the Golfer's Driving Range site was circumstantial at best, being limited to the use of yew in the construction of the foundation of the platform. The presence along the A13 of a placed pottery vessel, as well as an earlier deposit of carbonised grain, are indicative of a ritual aspect to the wetland landscape here during the Neolithic and Bronze Age. Water and wet places are seen by many authors as either important or central to the belief system and ritual life during this period, particularly because of the deposition of votive objects in these environments (Pryor 2003). Distinctions could have been drawn on other criteria between the most appropriate settings for particular actions (Cotton 2000, 24). People may have considered some zones fit for subsistence activities and others fit for ritual. This may be reflected in the 'ritual landscapes' that are in active use during the Bronze Age.

In terms of the exploitation of wetland resources, the firmer and drier area created by the platform at the Golfers' Driving Range could have been advantageous in the collection of timber, reeds, food plants, and prey animals. A piece of woodworking waste may provide some support for timber gathering, and it would have been suitable as a hunting hide. If pasture was the primary

attraction it may have provided the cattle herders with a dry staging or monitoring station in the marsh. The relatively low labour input value of the platform means that, in purely practical terms, having a platform would only need to have been a modest advantage to some activity for its construction to have been worthwhile.

During the Middle Bronze Age, the passage through the wetlands created by the trackway would have been useful, or essential, to reach the wetland pasture being grazed by cattle herds. The shed sub-adult cattle tooth supports the idea that the trackway was used to assist summer pasturing. One purpose of the trackways may have been access to specific places within the marsh. These places could include moorings for boats, in which case it would have linked the communities on the dry gravel terraces with a water based communication system, which, on a larger scale, became increasingly focused on the Thames during the Bronze Age. The site is also at the entrance to the floodplain of the Lea, which was an important communication route during this period. Communities living on the gravel terrace in this position are likely to have been involved with this, and possibly even able to exercise some control over it. Other possibilities are access to refuges, or even settlements, sweat lodges, shrines, or places for the ritual deposition of metalwork and human remains. As archaeological investigations in the Beckton area have found wooden structures far more frequently close to the north edge of the alluvium than more towards the river, it can be tentatively inferred that the trackways did not usually traverse the whole marsh. Even so they could have connected to channels of open water and so to the river.

Wooden trackways and platforms had been created on marshland from the Neolithic onwards elsewhere in Britain (Ellis *et al* 2002), and in the Thames Estuary (Crockett *et al* 2002). However they were rare until the Early to Middle Bronze Age when their number increased dramatically, especially in the Thames, where they were being built from central London to the outer reaches of the estuary in Essex and Kent. The impetus for increased trackway construction appears to be associated with either a rise in base levels, flooding of the wetlands, or part of

the intensification of agriculture during this period seen across southern Britain.

The archaeological remains found in the wetlands need to be considered in the context of the social and economic circumstances of the communities that left them. The site was on the edge of a substantial area of gravel, about 4km wide, between the Lea and Roding valleys and measuring 6–10km from north-west to south-east. This area will have been attractive for prehistoric agriculture, as it has light, well drained and easily worked soils, in contrast to the London Clay area further to the north, with far less easily used soils. This difference is reflected in the very much lower frequency of later prehistoric sites in the London region on London Clay as opposed to the gravel terraces.

There is widespread evidence across southern England, primarily in the form of organised field systems, of agricultural intensification starting in the Middle Bronze Age and continuing into the Late Bronze Age (Yates 2001). Cereal pollen is also more frequently found. This process was not evenly distributed, but was more pronounced in some regions, such as the lower and middle Thames, than in others. Within these regions, the evidence is very largely restricted to those geologies that are associated with suitable soils, especially the brickearths and gravel terraces along the major river systems. The area immediately to the north of the present site is at the heart of the East London gravels, one of the major areas of emerging intensification from the Middle Bronze Age. This intensified production is associated with other archaeological evidence, for example metalwork finds, indicating that the Thames area was experiencing a high point in its fortunes.

The changes in land use indicated by the initial evidence for cereal cultivation, followed by its disappearance from the pollen record at the period of trackway and platform construction, only for cultivation to reappear following the abandonment of the timber structures, suggests that human groups occupying the local area were responding to the short-term environmental changes recorded at Beckton. The focus at the time of the use of trackways appears to have shifted to the wetlands, almost certainly because of the substantial pasture they provided for the

Bronze Age cattle. Cattle will have offered a more secure resource during a time of changing local environmental conditions. Indeed, the edge of the gravel terrace would have been an attractive place for settlement throughout the prehistoric period because this location provided access to both dryland and wetland ecosystems.

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