

Medieval embankment and post-medieval development at Bermondsey Wall West

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with contributions by

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An excavation at Bermondsey Wall West revealed evidence of activity from the medieval to the late post-medieval periods. The site was crossed by a natural channel that was reinforced in the early medieval period with rammed chalk cobbles either as a beaching place for small river vessels or possibly a tide mill tail-race. Timber stakes of probable 12th century date associated with the chalk surface might have been mooring stakes or alternatively could have been the remains of fish weirs or eel-traps. The channel was later blocked with a timber revetment and wattle hurdles as the major feature on site when the 13th century riverside embankment, Bermondsey Wall, was constructed. The riverside was formalised with the building of the river defences and by the 17th century the area had been built upon as a result of the urban growth of Southwark. The remains of structures of 17th, 18th and 19th century date were revealed fronting the south side of Bermondsey Wall West and the immediate area to the south. A series of timber pipes was witness to the management of the water supply or drainage. Among the later timbers recovered from the site were a number of re-used ship timbers.

Introduction

The site at Bermondsey Wall West occupies an area of land on the south bank of the river Thames in Bermondsey just east of St Saviour's Dock, which is the mouth of the river Neckinger (centred TQ 3428 7977; fig 1). The limits of the site stretched between North Flockton Street and residential warehouse conversions fronting the river on its western boundary and Chambers Wharf to the east. The site also extended south across Chambers Street as far as its boundary with St Michael's School. The excavation was undertaken in advance of the construction of residential housing units, but the scheme also involved the retention and renovation of several 19th century warehouses. The locations and sizes of the trenches were largely determined by the positions of the retained warehouses.

Berkeley Homes (City & East London) Limited, through their consultant CgMs Consulting, commissioned Pre-Construct Archaeology Limited (PCA) to evaluate and excavate the site. The evaluation, which took place between August and November 2001, comprised five trenches (trenches 1–5) and proved the survival of post-medieval remains at various locations across the site. This was followed between December 2001 and March 2002 by an expanded excavation of trench 2 and a watching brief which was undertaken on twelve geotechnical test pits (TP6–18) of varying sizes, one of which (TP17) was extended to form evaluation trench 17 (fig 2). The archive comprising written, drawn and photographic records and artefactual material from the site will be deposited at the London Archaeological Archive and Research Centre (LAARC) at 46 Eagle Wharf Road, London N1 under site code BCB01.

Geological and topographic background

The underlying geology of the Bermondsey area consists of Eocene London Clay, which is overlain by the Late Devensian Shepperton Gravels, deposited by a fast-flowing and braided river Thames (Gibbard 1994).

During the early Holocene, the north Southwark area consisted of a dynamic landscape with a series of shifting sand dunes that formed within the Thames. These have been traced along the river from Westminster to Rotherhithe (Sidell *et al* 2000, 103–10) and, in the

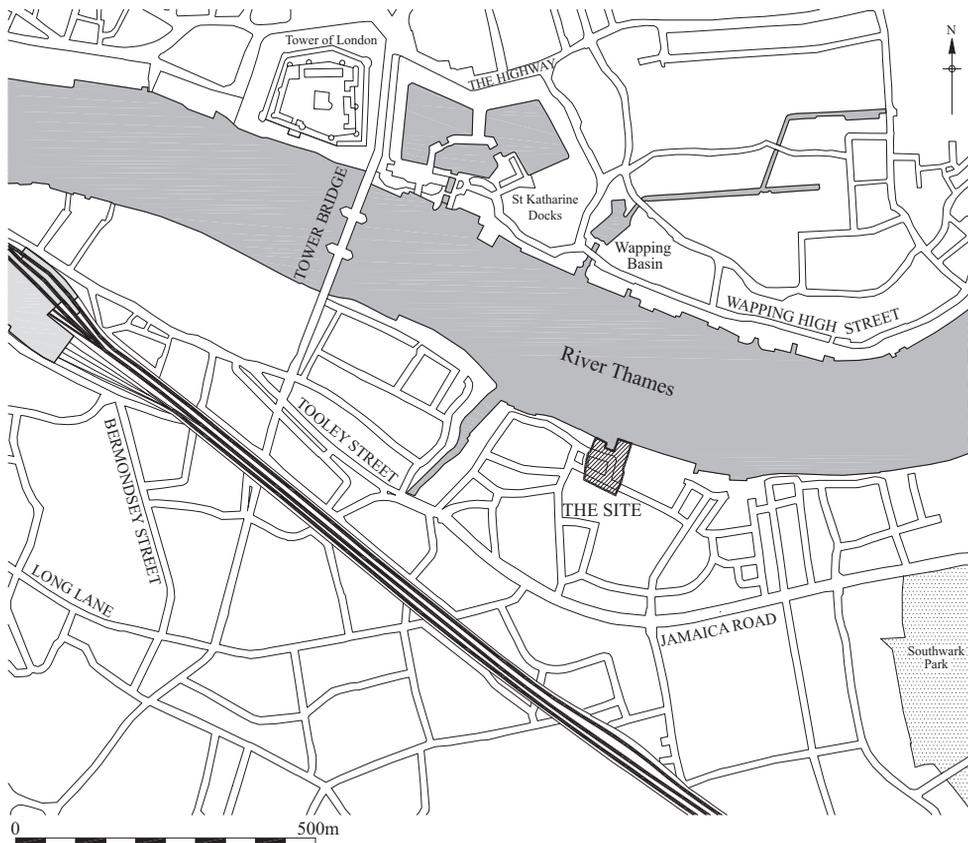


Fig 1 Bermondsey Wall West. Site location. (© Crown copyright Ordnance Survey. All rights reserved)

Bermondsey area, had sufficiently stabilised to permit human activity upon them by the late Mesolithic period, some 5500–6500 years ago (Proctor & Bishop 2002). By this time the north Southwark landscape would have consisted of a series of islands, or eyots, surrounded by a landscape of river channels, marshes, mudflats and lakes.

The landscape was subjected to continued and widespread alluvial sedimentation throughout the Holocene, resulting in the inundation of the Late Devensian landscape under a wedge of sands, silts, clays and peats, varying in thickness from less than 5m in Southwark to over 35m at Canvey Island in the Thames estuary (Marsland 1986); this was further complicated by a continually evolving natural drainage regime, with each new watercourse eroding earlier deposits.

Despite many observations, no detailed lithostratigraphy has been formulated for the area (Bates 1998, 10; Gibbard 1994). Simplified models based on broad-ranging marine transgressions and regressions within the lower Thames valley have been devised by Devoy (1977; 1979), and more detailed models, dependent upon the pre-existing late Devensian topography combined with an appreciation of local sedimentary development, have recently been proposed for the area (Ridgeway & Meddens 2001; Sidell *et al* 1995; 2000). These localised developments can have major archaeological implications for the nature, extent and chronology of the exploitation of particular locales within the flood plain.

The subject site is situated on low-lying ground adjacent to the Thames, close to the northern limits of the Bermondsey eyot. This is the largest of the eyots in north Southwark, with an area of some 2km² (see Sidell *et al* 2002, fig 37). The surface of the natural sands

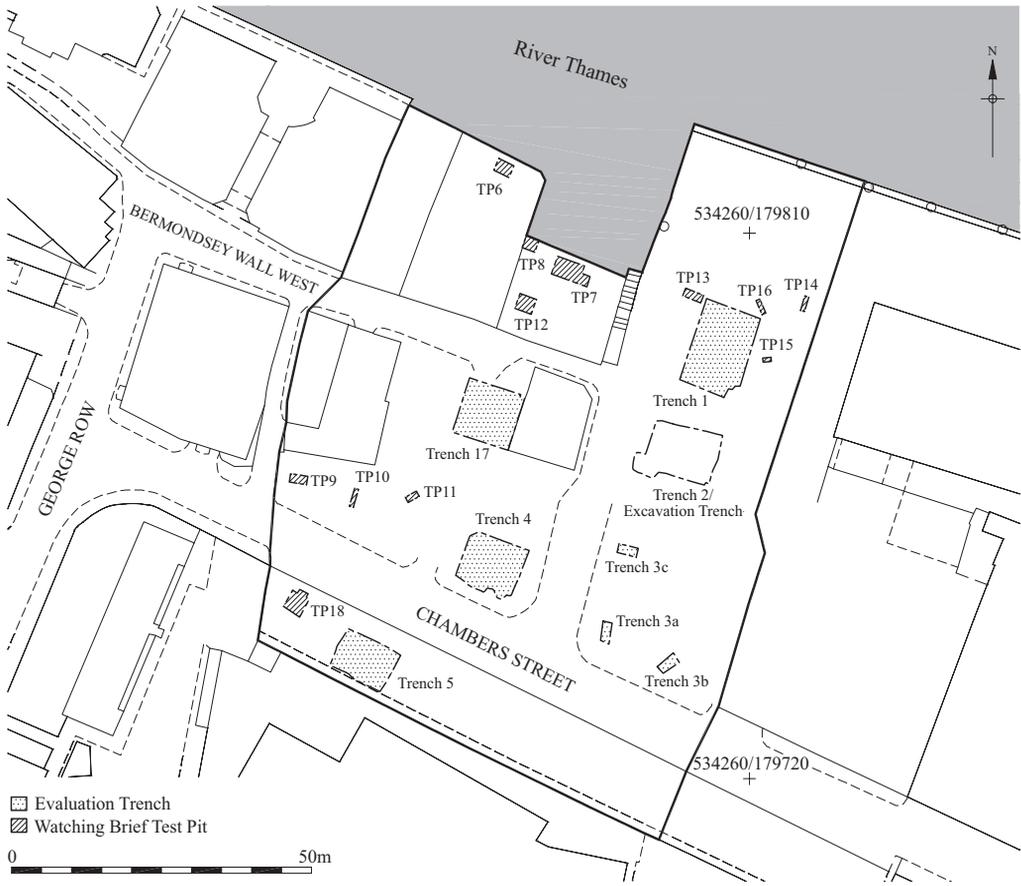


Fig 2 Bermondsey Wall West. Trench location. (© Crown copyright Ordnance Survey. All rights reserved)

from which it is formed range between +1.2m OD, to a maximum of +2.2m OD and is capped by brickearth to the east, but this has been removed elsewhere by fluvial erosion (Heard 1996, 76).

Historical and archaeological background

Settlement along the south bank of the river Thames has always tended to focus on the relatively higher ground of the eyots, particularly those of Southwark and Bermondsey. Although low-lying, they formed crucial dry areas within a complex landscape of marshes, mudflats and tidal channel networks, which would have characterised the marginal land along the Thames. Although the archaeological evidence for early prehistory in the Southwark area remains sporadic, recent archaeological work suggests that the Bermondsey eyot and its surrounding marshes were continually exploited throughout the prehistoric period (Heard 1996, 77–8).

Evidence of early prehistoric activity has been identified on the higher ground of the eyots, including Mesolithic, Neolithic and Bronze Age flint implements (Sidell *et al* 2002). However, these periods also show a significant level of activity on the marginal land at the edges of the eyots, in the channels and marshland.

By the Bronze Age a more sustained pattern of exploitation emerges. Worked and burnt flint and Bronze Age pottery together with flint-tempered pottery dated to 500–400BC were

all recovered from cut features on the northernmost limits of the Bermondsey eyot. Within the channel of the Neckinger itself, at Phoenix Wharf (fig 3.2), Bronze Age pottery was found within a cooking pit, associated with a burnt mound and sealed by a land surface showing signs of prehistoric plough cultivation. These plough marks were mirrored at Wolsey Street (fig 3.3), closer to the modern Thames foreshore and Bermondsey Wall West (Heard 1996, 77–8). This pattern presumably reflects growing human exploitation of the drier land during the marine regression commonly associated with the period. It is worth noting, however, at two adjacent sites on Tanner Street (fig 3.4) a Late Bronze Age/Early Iron Age ditch, orientated east–west, probably with a bank on the south (landward) side, have been interpreted as river defences, indicating the commencement of a transgression phase (Leary in prep).

Iron Age and Roman activity seems to have been more closely focused on the higher ground of the eyots themselves, reflecting a subsequent marine transgression. Development and settlement in Roman Southwark appears to have been centred some distance to the west of the site, in the vicinity of the river crossing at London Bridge (Drummond-Murray *et al* 2002) and along the bridgehead road. Recent excavations in the vicinity of Bermondsey Square (fig 3.5), have revealed the presence of buildings and other occupation activity closer to the subject site (A Douglas, pers comm).

The landscape and land use of this area of Bermondsey probably changed little by the Saxon period, continuing to be defined by extensive marshland and water meadows. These were probably intersected by drainage ditches, with some basic rural exploitation of the higher and drier land. Documentary evidence suggests that some effort was made to manage these marshes by the Saxon or early medieval period, referring particularly to the construction of an embankment forming large-scale tidal river defences (Dennis 1981).

The process of land reclamation behind the ‘Redriff’ embankment (later known as Bermondsey Wall) accelerated during the medieval period, as development in Southwark spread out from the bridgehead. The rate of growth would have been increased by the

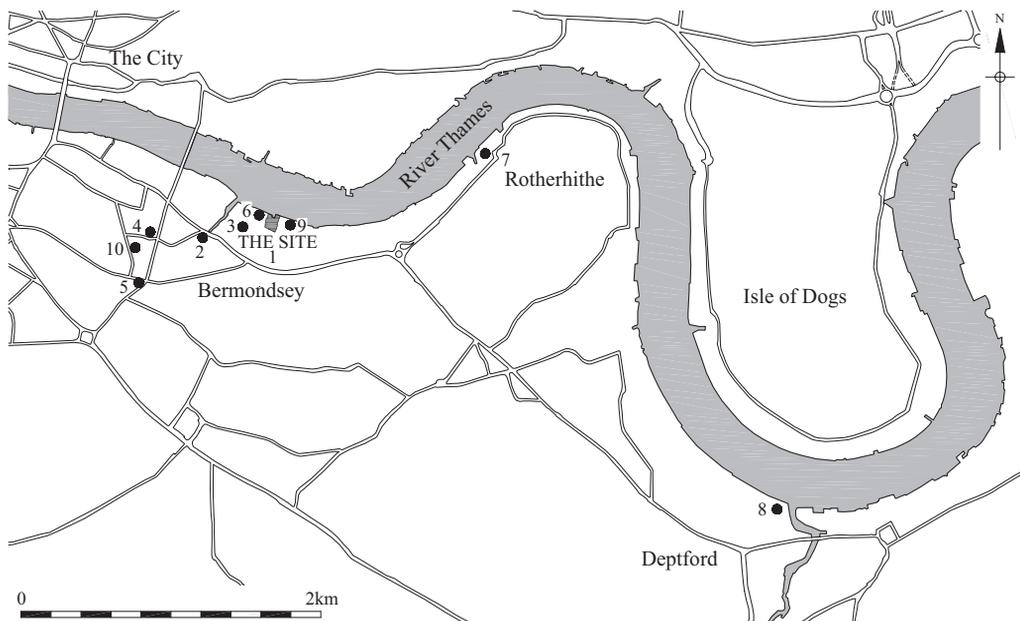


Fig 3 Bermondsey Wall West. Location of other sites mentioned in the text: 1) The site; 2) Phoenix Wharf; 3) Wolsey Street; 4) Tanner Street; 5) Bermondsey Square; 6) Adlards Wharf; 7) Pacific Wharf, Rotherhithe Street; 8) Deptford Power Station; 9) Chambers Wharf; 10) 156–170 Bermondsey Street.

founding of the Priory of St Saviours (Bermondsey Abbey) in about 1089 by William Rufus on the former royal manor of Bermondsey. This was a Cluniac monastery, bearing strong links with France through its allegiance to the Norman abbot of Cluny, for whom it was established (Thomas 2002). As such the monastery was almost certainly linked to the construction of the nearby 'Savory' or St Saviours Dock, which is known to have served the abbey during the medieval period (Weinreb & Hibbert 1995, 60).

Bermondsey Wall West, the modern fossilisation of the river defences, is but a part of a linear arrangement that some sources suggest extended along the south bank of the river between Vauxhall and Deptford (Manning & Bray 1804, 224). West of the subject site, with the exception of the lip of the north bank at Adlards Wharf (fig 3.6), very little of the river defences has been recorded (Divers 2002, 46, fig 4). To the east the approximate line is represented by Bermondsey Wall East and Rotherhithe Street (fig 3.7) (Heard with Goodburn 2003, 3–4) and has been recorded archaeologically in Deptford (fig 3.8) at the site of the former power stations (Divers 2004, 24, fig 5).

The abbey clearly had a strong impact on the development of the surrounding area, probably having feudal links with much of the local population and industry, such as the tidal mill on Jacob's Island, in the river Neckinger (Cowan *et al* 2000, 41). By the 12th century, although probably not at the location of the subject site, parts of the northern wall of the embankment had been strengthened and began to serve as wharves used for trading goods from waterfront properties, a process that continued well into the post-medieval period. Strengthening the Thames waterfront helped to 'win' the land behind Bermondsey Wall, providing impetus for the establishment of roads and property on this previously marginal ground.

The importance of these riverside wharves grew in conjunction with the steady rise in Britain's naval power from the 15th century onwards and London's increasing importance as a commercial centre for imports and exports. In particular, riverside expansion boomed in the 17th and 18th centuries as international trade and exploration increased.

The southern embankment became a road and was described by Daniel Defoe in the 1720s (Defoe 1724–6) as:

a long street, of about nine miles in length, as it is now built on eastwards; reaching from Vaux-Hall to London Bridge, and from the bridge to Deptford, all the way up to Deptford Bridge, which parts it from Greenwich, all the way winding and turning as the river winds and turns.

Although development along the northern bank of the Thames was always more advanced, the construction of a number of large dry docks and shipyards in the Rotherhithe and Deptford area highlights the growing importance of shipbuilding and related maritime industries. Upstream towards London Bridge the waterfront continued to be dominated by wharves (Divers 2002). The growing industrial importance of the area inevitably stimulated the steady process of urbanisation, which gradually moved south from the waterfront, forming the basis for modern Bermondsey.

Phase 1: the natural deposits and prehistory

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The excavations at Bermondsey Wall West showed that the site lay on a bed of silty fluvial deposits representing marginal waterlogged land. Gravel was not found during excavation on the site, but the earliest alluvial deposits were encountered at a height of -0.4m OD. These were overlain by a 0.5m-thick band of peat that was sealed by further alluvial deposits of similar thickness. In total the alluvial sequence reached a level of approximately +0.5m OD. This alluvial sequence was consistent with that found to the north-west during nearby

excavations at Adlards Wharf, the top of which was at a height of 0.0m OD (Divers 2002, 45–6). The discrepancy between these levels may well be due to the closer proximity of the latter site to the waterfront.

A large north–south channel, some 8m wide, ran through the main excavation area, with a proven depth of 1.8m. This may have been related to another small north–south channel, at least 1.56m wide (possibly up to 3m in total width) found cutting alluvium in trench 4 which was recorded only partially in section within a sondage. The channels formed small tributaries that emptied into the Thames and cut across the marginal ground between the two eyots. A similar smaller channel was identified during excavations at nearby George Row (Divers 2002, 39 & fig 3).

BERMONDSEY WALL WEST AND THE PREHISTORIC LANDSCAPE

Although the excavations revealed no prehistoric pottery or significantly diagnostic dating material from this period both burnt and struck flint fragments were recovered. The bulk of the assemblage was technologically most characteristic of Mesolithic or Early Neolithic industries and the presence of a possible tranchet axe fragment and a burin strongly favoured the former (Bishop 2001). This places the site firmly within the complex prehistoric landscape of Southwark, mirroring finds from the nearby foreshore at Chambers Wharf (fig 3.9), where both worked and burnt flint and prehistoric pottery was found at a height of between -2.5 and -3.0m OD (Drummond-Murray *et al* 1994, 254). There is a discrepancy in height between the two sites, but it should be noted that the foreshore at Chambers Wharf was lower and would have been eroded farther into the underlying alluvium and gravels. The absence of later prehistoric finds and continued build-up of silts and clays on the area suggests that the site remained marginal and that the marginal nature of the local landscape did not change until the medieval period.

Phase 2: Saxon and early medieval land use

The Saxon and earlier medieval phases appear to reflect the growing changes in land-use observed elsewhere as land was gradually exploited and reclaimed. The first significant human activity on the site was recorded in trench 2 located towards the east of the site and centred on a north–south orientated channel (fig 4). This channel, at least 7m wide, cut through the naturally deposited alluvial sequence and drained into the Thames to the north. The basal deposits were free of anthropogenically generated material, being composed of shingle and organic clay. Above this the channel fill contained occasional animal bone, ceramic building material (CBM) fragments, oyster, whelk and mussel shell, as well as two iron nails, a turnshoe sole and pottery sherds dated between AD 1180 and 1220. The pottery recovered from this fill included sherds of London-type ware (LOND) jugs, dated 1080–1350 and also London-type jugs decorated in the North French style (LOND NFR), dated 1180–1270. The presence of a wheel-thrown bowl and jar in sandy shelly ware (SSW), dated 1140–1220, provides a *terminus post quem* for the deposit. This indicates that the stream was open and free-flowing around the 12th or early 13th century.

The exact formation date of the channel was hard to pinpoint and is subject to debate for a number of reasons. The absence of any silting before its subsequent disuse and backfilling suggests that the channel was not open and flowing for a long time. However, the gravelly nature of the earliest fills suggests that it was either subject to a fairly fast flow rate or, more likely, high-energy tidal action, both of which would work to prevent silting in the channel. If the channel was kept open by human intervention, by dredging for example or possibly for use as a mill tail race, the primary fill might have been expected to yield a more diverse residual assemblage of anthropogenic material over a wider range of dates. It seems likely, therefore, that the channel was formed sometime in the late Saxon or early medieval period, perhaps representing a short period within the migration of an already established watercourse.

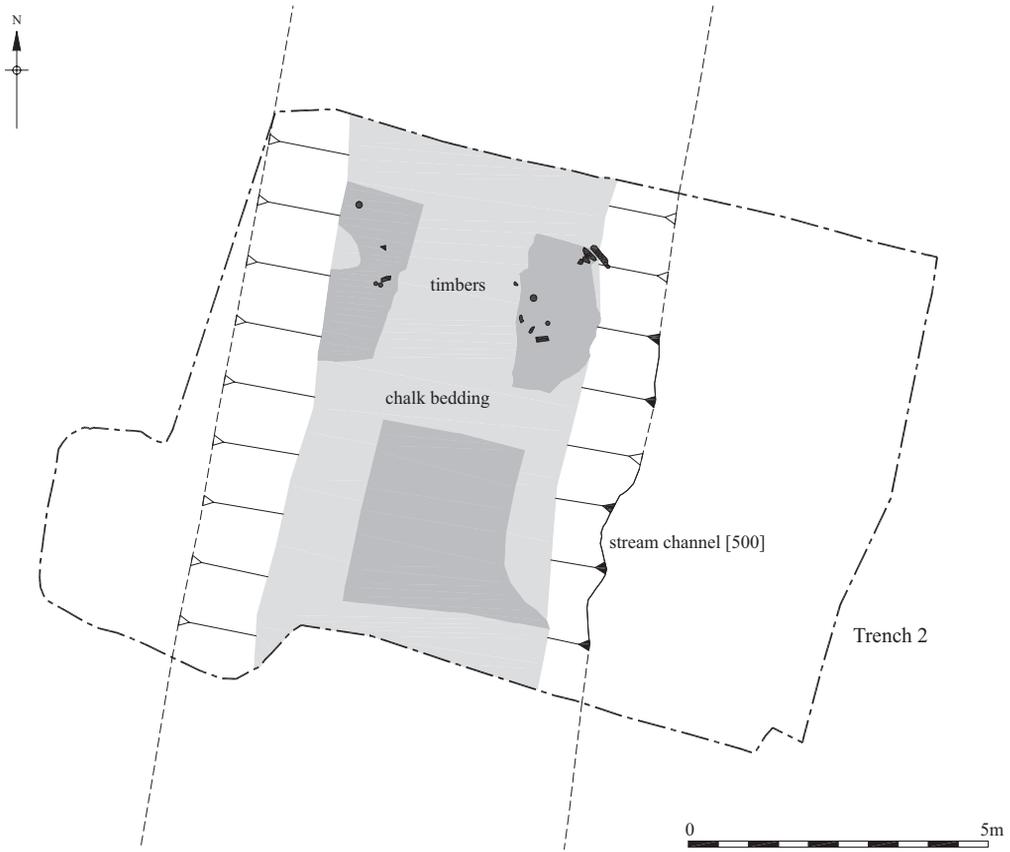


Fig 4 Bermondsey Wall West. Phase 2: stream channel, rammed chalk and timberwork.

However, analysis of the environmental evidence (specifically archaeobotanical and *Mollusca* data) would rather suggest that this was a slow to moderate flowing stream. The *Mollusca* assemblage also highlights, unsurprisingly perhaps, a degree of tidal or estuarine influence (see Keen, below, for an expanded discussion), while the archaeobotany suggests a generally damp wetland habitat, possibly representing extensive marshland (see Vaughan-Williams, below).

The first evidence for exploitation of the channel was a bed of poorly sorted, roughly hewn, chalk fragments averaging between *c* 80 and 180mm in diameter (figs 4 and 7). The chalk bed was coarsely laid, showing no signs of being deliberately ‘set’ into the base of the channel and was sealed by an apparently waterlain bluish clay-silt matrix, from which further pottery dated between AD 1140 and 1220 was obtained. The pottery assemblage was small but included several fragments of London-type ware, as well as single fragments of Early medieval shelly ware (EMSH), Early Surrey ware (ESUR), both dated 1050–1150, and sandy shelly ware (SSW), the latter providing the deposition date.

Interspersed among the chalk blocks were several upright wooden stakes averaging 50–100mm in diameter (figs 4 and 5). Only the base of the stakes survived, to an average length of 250mm, the tops having degraded completely to the surface of the chalk bed. This suggests that they may have formed a ‘structure’ that stood freely within the flow of the channel. Although the alignment of the stakes was irregular they spanned the channel in a broadly east–west direction.

The stratigraphic relationship between the wooden structure and the chalk bed remains unclear because it was impossible to determine whether the stakes were driven through the chalk or whether the chalk was laid around them. The surface of the chalk bed was at a height of between -0.7 and -0.25m OD, *c* 2.5m below the mean high water spring tide level. Other sites in Southwark have revealed that in the mid-15th century the wharves were at a height of *c* +2.4–2.6m OD (Blatherwick & Bluer 2009) which would have been set above the mean high water spring tide level. It seems likely that the chalk was deliberately laid to form a ‘beaching surface’ for small vessels using the channel as a docking point. Chalk is still used for this purpose, because it is free draining and its relative softness minimises abrasion to the vessels’ hulls (see Goodburn, below). If this is correct then it remains possible that the stakes could have been small mooring stakes associated with the ‘beaching surface’. However, it has also been postulated that the rammed chalk might have been part of a tide mill tail-race and if so the stakes may have formed part of a fish-weir or eel-trap, which are a common occurrence in such a location. This is consistent with various techniques for constructing such structures, which often involve the setting out of stakes to support a wattle panelling or piled brushwood fish weir across a fish route, either in the sea or a river, to deflect the fish into nets or wicker baskets (Salisbury 1988).

Three of the stakes (fig 5), all roundwood, were submitted for radiocarbon dates, suggesting a 12th century date for the structure, which is similar to the pottery dates of the chalk raft. The results are tabulated below.

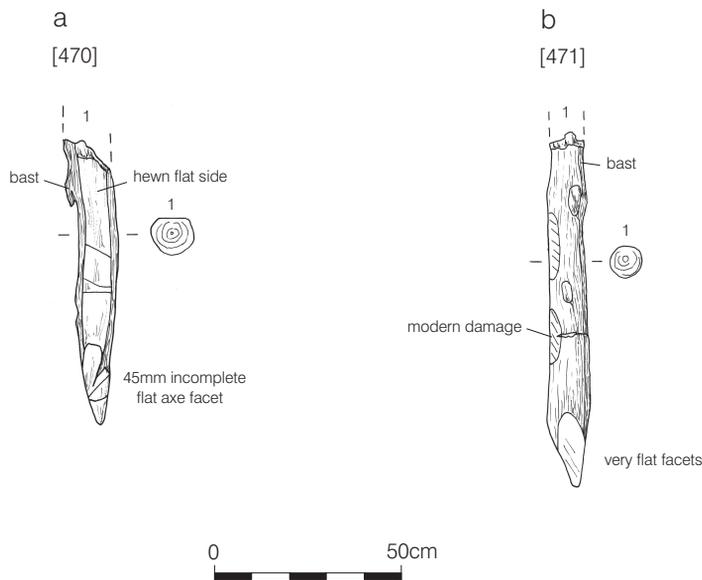


Fig 5 Bermondsey Wall West. Earlier medieval stakes on the foreshore: a) stake 470, b) stake 471.

Table 1 Date of pre-wall timbers suggested by ^{14}C analysis.

Laboratory code	Material	Context numbers	Uncalibrated radiocarbon years	Calibrated age (2-sigma, 95.4% probability)
Wk-14157	Roundwood	470	877 \pm 39 BP	AD 1030–1260
Wk-14158	Roundwood	474	893 \pm 39 BP	AD 1030–1230
Wk-14159	Roundwood	495	962 \pm 39 BP	AD 990–1180

Phase 3: the 13th century Bermondsey Wall

As already noted, there appears to have been some effort to manage the diurnal and seasonal flooding and therefore the resultant tidal marshes of the Southwark area by the early medieval period. Indeed, documentary sources allude to the construction of a *c* 11.5km chain of riverside embankments linking the firmer gravels at Deptford with those at Vauxhall by the 13th century. It has been suggested that these defences may have originated in the late Saxon period, although this has been difficult to prove archaeologically because they generally lie below modern streets such as Bermondsey Wall West (Dennis 1981).

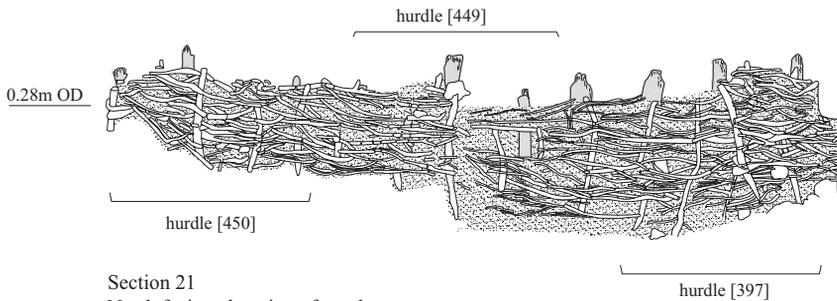
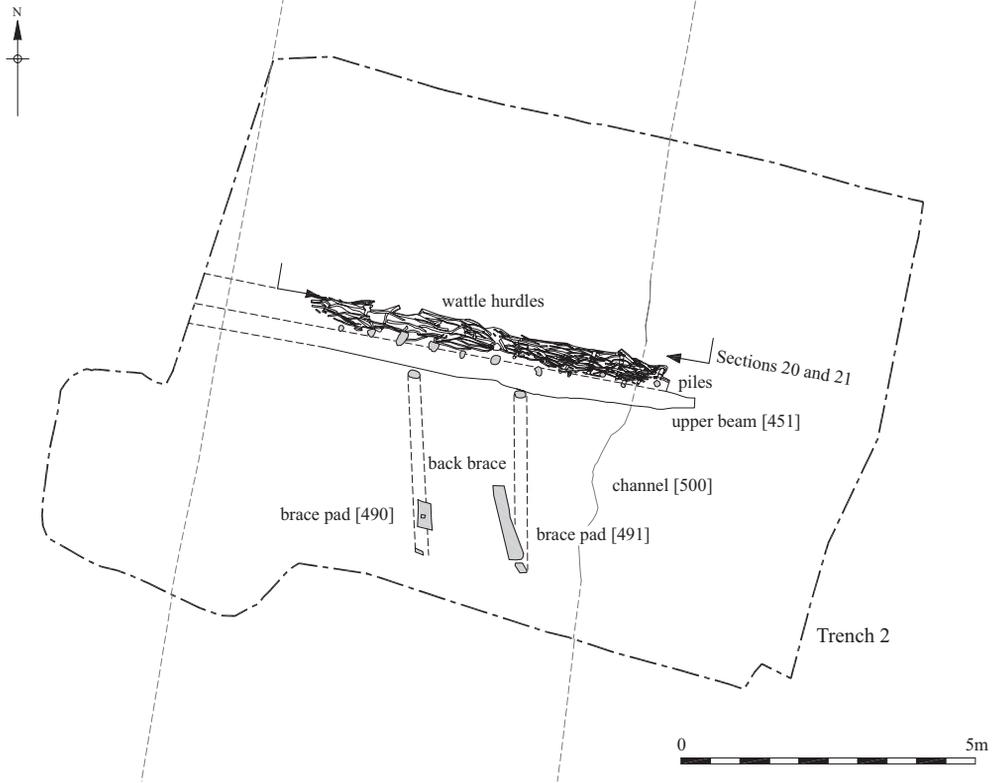
Nevertheless, during the excavations at Bermondsey Wall West a substantial river defence embankment was identified and recorded. The embankment was orientated east–west, running parallel to the Thames, which at present flows 45m to the north of the excavation area. The exact date for its construction remains ambiguous although a *terminus post quem* for the short section at the subject site is provided by both pottery within the stream and the radiocarbon dates for the stream structure. However, the feature described below may be anomalous to the river wall structure as a whole and dates should be treated cautiously if applied to other wall structures recorded elsewhere. No diagnostic material was found within the make-up of the bank; however, the wall filled and sealed the early medieval channel and the deposits that sealed the bank dated to between the 16th and 17th centuries. This appears to place the original date of construction firmly within the medieval period, later than the documented Saxon river defences, although it is possible that a managed ‘breach’ was located at this point. Unfortunately, it was not possible to recover the full dimensions of the bank because the northern edge extended beyond the limit of excavation. Similarly the surface of the bank was completely truncated at a higher level by post-medieval buildings.

Despite this, the method of construction of the ‘mud wall’ embankment was quite clear from the excavation. Prior to the construction of the main embankment, the channel was dammed and backfilled; then the bank was built up with dumps of redeposited alluvial and fluvial silt. The first stage in the process of blocking the channel was the construction of a large revetment structure, spanning the width of the channel (figs 6 and 7). Two horizontal square-cut beams, *c* 6.7m long with a width of between *c* 300 and 400mm, were set into the east and west channel banks and onto the base of the channel, one above the other. The uppermost was set at a height of between +0.34 and 0.5m OD, the lowest being some 0.6m below. These cross-beams were both abraded and had distinct ‘relict joints’ (fig 8) and were clearly re-used, possibly originating from a large timber dock, bridge or possible mill structure (see Goodburn, below, for an expanded discussion).

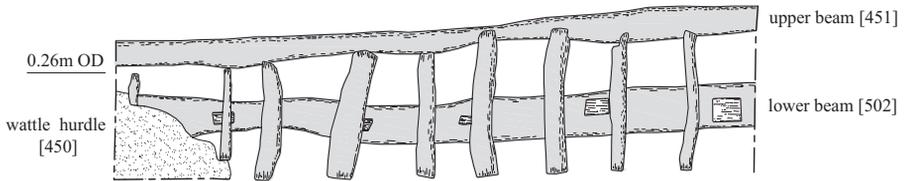
Driven into the underlying alluvium in the base of the channel were eleven upright piles. These varied between 1.0 and 1.4m in height, all were roundwood, but debarked, with a diameter between 140 and 180mm. The piles were set along the northern (Thames-side) face of the timber cross-beams. Set in front of the vertical piles to the north were three wattle hurdles, which were also driven into the channel. The hurdles averaged *c* 800mm in height with the easternmost and westernmost being *c* 1.4m and 1.2m long respectively, while the centre panel was *c* 2.8m long (figs 6, 9 and 10).

On the south side the crossbeams were retained by two substantial vertical posts, approximately 2m apart, but off-centre, closer to the east than the west bank. Approximately 3m south of these were two morticed base-plates or pads (raking shore pads) which were themselves pinned into place by two short stakes. Originally the pads would have held raking shores which would have supported the upright posts and hurdle panels. Tool marks and stylistic attributes of the mortices suggest that the timbers were of a late medieval date and were obviously re-used.

To complete the construction of the ‘dam’ structure a homogenous layer of redeposited mid-grey/brown, clay-rich silt was dumped to the north of the revetment against the wattlework. At the base this dump was more than 4m wide and continued beyond the northern limit of excavation. At the deepest point of the channel the infill deposit was *c* 1.3m



Section 21
North facing elevation of wattle revetment



Section 20
North facing elevation to show wooden bracing supporting south side of wattle revetment



Fig 6 Bermondsey Wall West. Phase 3: wattle hurdle and revetment.



Fig 7 Bermondsey Wall West. The timber revetment.

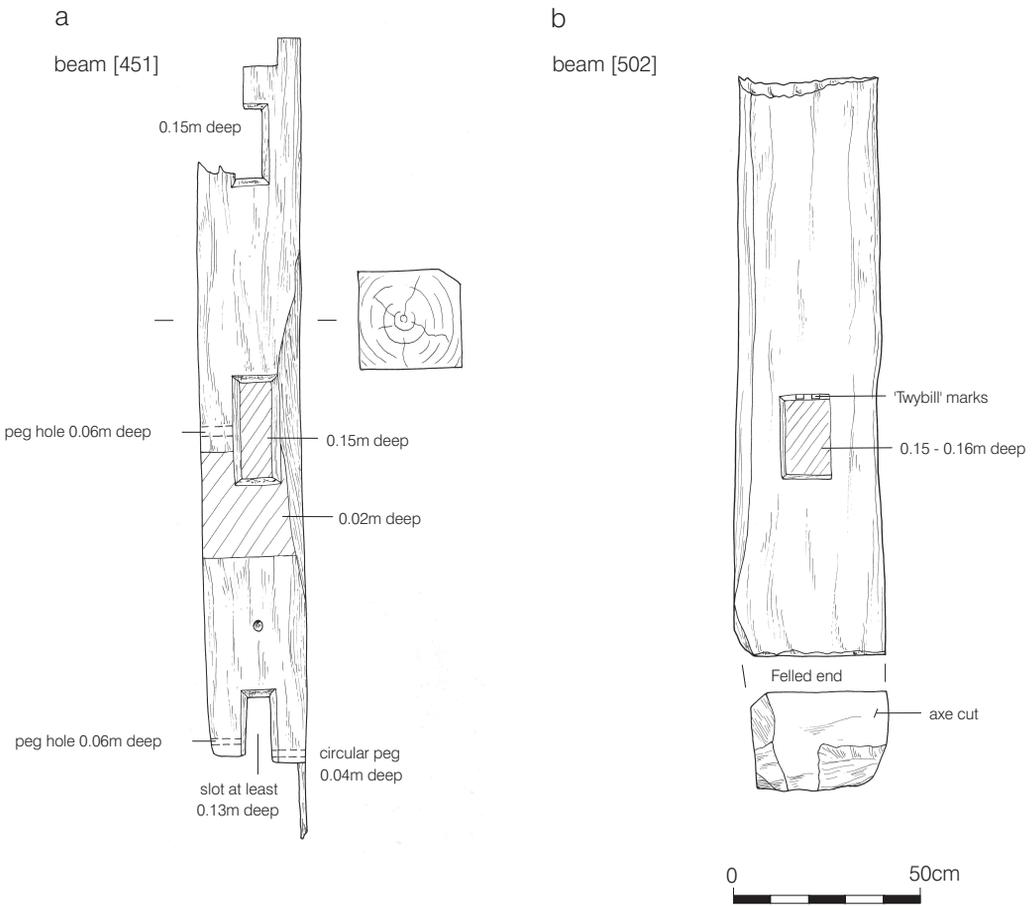


Fig 8 Bermondsey Wall West. Sections of large oak beams re-used to brace the northern foot of the Bermondsey mud wall: a) part of beam 451, b) part of beam 502.



Fig 9 Bermondsey Wall West. The wattle hurdle and chalk bed.

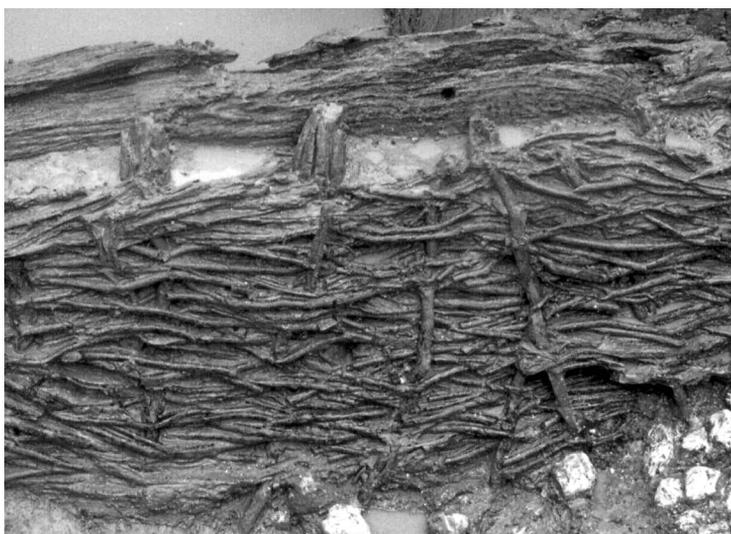


Fig 10 Bermondsey Wall West. Detail of wattle hurdle.

deep, with the basal *c* 0.8m containing an abundance of peaty sods. The backfill contained residual Saxo-Norman pottery, the latest sherd being part of a London-type ware jug base, dated 1080–1350, as well as small amounts of other cultural debris.

It is unclear how long the dammed channel stood open to the south of the revetment. The channel itself was almost certainly redirected, possibly via a back ditch, since there was no through drainage at this point. However, the only archaeological evidence for a back channel on the site was found *c* 22m to the west in trench 17, where the northern edge of a linear cut was identified running east–west, parallel to the southern limit of excavation, towards the mouth of the Neckinger (fig 12).

It seems probable therefore that the Bermondsey Wall West channel fell into disuse following the construction of the dam, being infilled with a solid revetment reinforced with

bands of alluvial clay and peat. The backfilled revetment and channel were covered with a homogenous dump of blue-grey redeposited alluvial clay which in turn was overlain by a further dump of orange/brown, slightly sandy, clay silt, forming the main bulk of the bank. At its highest surviving point, to the north of the site, the surface of this bank was at $c + 1.59\text{m OD}$, sloping down to $+1.04\text{m OD}$ in the south.

As noted above, the actual morphology of the bank was masked by later truncation; the total height of the wall has been postulated as being around $c + 2.4\text{--}2.6\text{m OD}$, or slightly higher, in the 13th century. This hypothesis is based on estimations of the high spring tides (Highest Astronomical Tide or HAT) in the 13th century at $c + 2.3\text{m OD}$ (see Goodburn, below, for an expanded discussion). The presence of clay silt deposits resembling the upper dump of the bank, recorded during groundworks just to the north of the excavation area at a height of $+3.16\text{m OD}$, suggests that in some areas close to the site the embankment may still remain almost to its full height (fig 11). However, it is probable that this top part of the bank may be a 16th–17th century addition as suggested by the finds recovered from the top layers. For comparison, part of a possible medieval mud embankment was recorded further to the east at the site of the Deptford Power Station where the top of the slighted embankment was at $c 3.0\text{m OD}$ (Divers 2004, 24, fig. 5). At Pacific Wharf in Rotherhithe the maximum surviving height of the 17th century river wall was $+3.00\text{m OD}$ (Heard & Goodburn 2003, 9).

It seems likely that the embankment would have sloped down to a similar, or perhaps somewhat larger, revetment which would have retained the structure to the north, on the Thames side of the wall. Some evidence for this type of structure was found at the nearby Adlards Wharf site which yielded timber and chalk revetment of tentative 14th century date, some 5m north of the line of the current Bermondsey Wall, apparently forming the northern edge of the medieval embankment (Divers 2002, 46). This also comprised large re-used, square-cut, timber cross-beams retained by substantial piles. This in turn supported a chalk bed on the south side (perhaps also serving as a Thames-side barge bed), although there is scarce evidence for the continued exploitation of the riverward side of the embankment during this period at Adlards Wharf (Divers 2002). By comparing both the southern reaches of the embankment deposits (as seen during the excavations at Bermondsey Wall West) and the northern reaches seen at Adlards Wharf, in relation to the documented line of Bermondsey

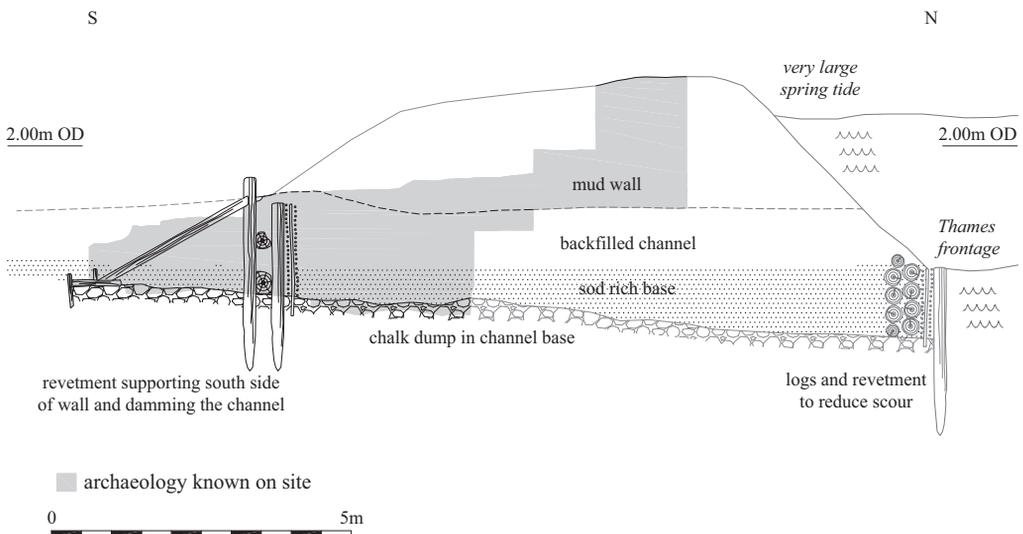
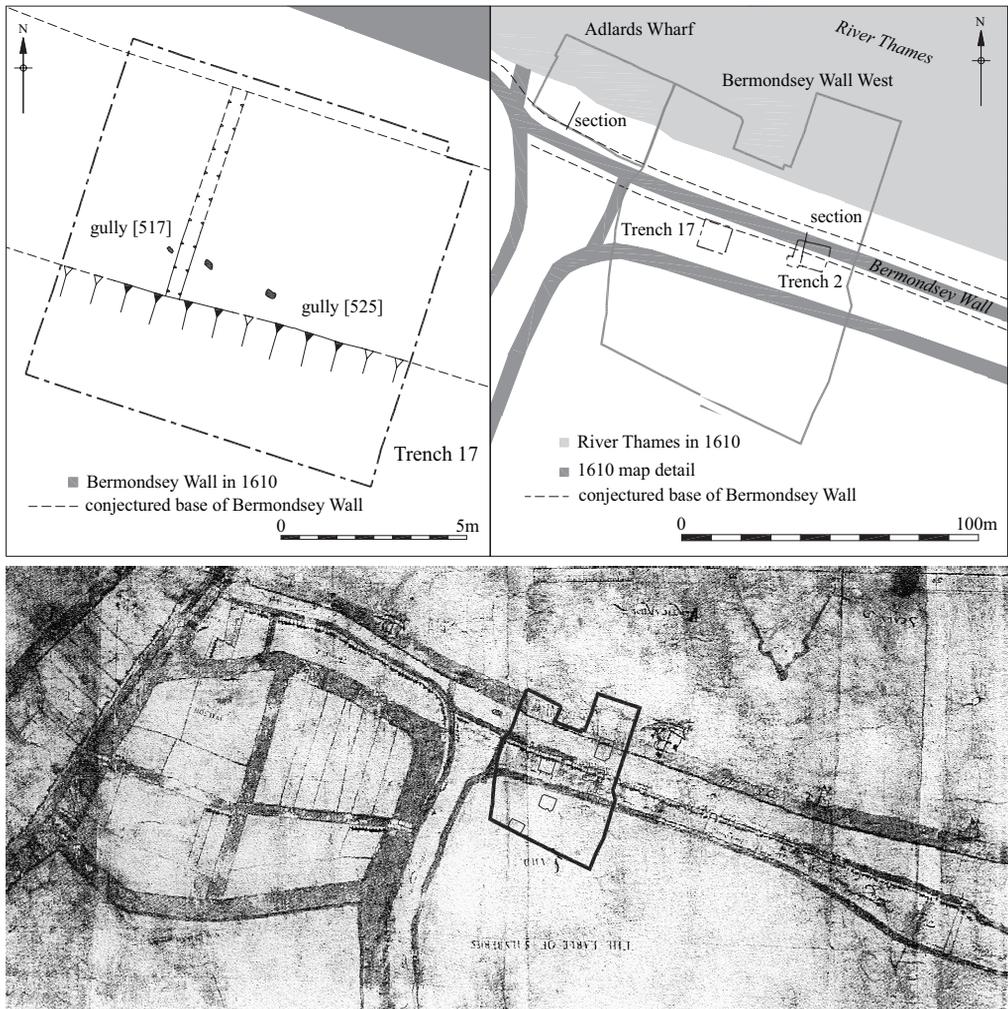


Fig 11 Bermondsey Wall West. Reconstructed section across river wall.

Wall (fig 12), it is possible to speculate that the total width of the embankment would have been somewhere between 12 and 16m across at the base. That at Deptford appears to have been narrower, possibly up to 12m at the base.

Back channels to carry away excess water and/or diverted channels have been identified behind banks and revetments elsewhere on the Thames, often draining into key tributary channels further along the riverside. One such medieval channel was cautiously identified early in the sequence at the Adlards Wharf site (Divers 2002). The wall and back channels at the location of the subject site are shown on a map of 1610 of Jacob's Island, which was drawn up for the Earl of Salisbury who had recently acquired a large estate in Bermondsey (fig 12).



1610 map of Jacob's Island

Fig 12 Bermondsey Wall West. Phases 3–4: evidence for the wall and back ditches from the estate map of the 1st Earl of Salisbury, 1610. (Reproduced by courtesy of the London Borough of Lambeth Archives Department)

**Phase 4: early post-medieval levelling and consolidation
(1550–1700 – probably 16th/early 17th century)**

At Adlards Wharf considerable evidence for the construction of wharves, river walls and waterfronts from the 17th century onwards was recorded (Divers 2002). Unfortunately, owing to the relatively limited access afforded at the subject site and the severity of truncation at the north, complementary evidence was largely lacking, largely but thankfully not entirely. A number of timber structures have been tentatively dated to the 17th century. To the north of the excavation area some evidence for a 17th century east–west river or dock wall was identified in TP 8 (fig 13). Although only a limited amount was exposed, there were three squared uprights, and adjacent planks set on edge which must have been nailed to them on the riverward faces as is often found in later post-medieval timber river and dock walls in London (Divers 2002; 2004; Saxby & Goodburn 1998). It is considered stylistically that such a construction is 17th century or later in date.

To the east, in trench 1, and recorded over a distance of 1.6m (north–south), were two planks, one directly above the other (fig 13). Within the limited excavation area there was no evidence for posts to which the planks would have been fastened, but their combined height, 0.56m, precludes them from being part of a free-standing structure. Similarly, the form of the structure is unclear, although it is possible it formed part of a late 17th century wharf or jetty. Pre-dating the wooden structure was a sequence of ground-raising dumps containing a variety of cultural waste, including pottery securely dated to after 1630. The pottery was both domestic and industrial. The former included Surrey–Hampshire border whiteware (BORD), dated 1550–1700 and fine redwares from Essex (PMFR) dated 1580–1700 and German stonewares. One of the stoneware vessels (a Cologne stoneware, KOLS, mid-16th century jug) had an applied medallion with a representation of a helmeted

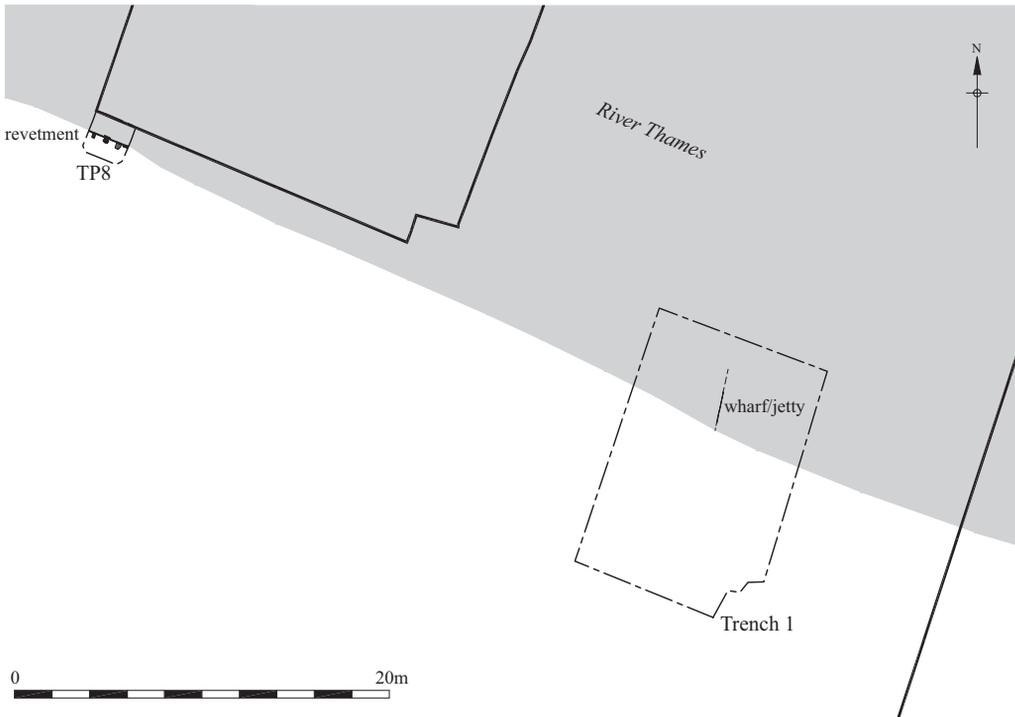


Fig 13 Bermondsey Wall West. Phase 4: test pit 8 revetment; trench 1 wharf/jetty.

male head. Other refuse from these dumps included leather shoe-making trimmings and a knife hilt plate. Apart from similarly dated CBM no finds were recovered from the dumps in front of the structure.

To the south, also at the east of the site in trench 2, was a sequence of ground-raising dumps and debris that included a group of at least 23 timber planks (fig 14). These were well ordered and roughly coursed: north–south orientated pieces at the base and east–west orientated ones above (see Goodburn, below). The planks were laid out down the slope of the embankment and were set among accumulated dumps of clay silts to a height of between +0.32m OD and +0.94m OD. The timberwork and dumps extended south beyond the limits of excavation. A single sherd of Surrey–Hampshire white earthenware pottery recovered from these dumps broadly dates to between 1550 and 1700, which suggests that concerted efforts to consolidate the ground in the area did not begin until well into the post-medieval period, possibly in response to a growing need for industrial land close to the river. Of some minor note was that between the boards and the underlying clay dump was a large deposit of sawdust and wood chips. This indicates the presence of woodworkers on or close to the subject site, but the nature of the manufactured products was not apparent.

Overlying the timber and clay ground-consolidation dumps was a second sequence of dumping across the lower southern half of the site. This contained demolition materials including CBM, mortar, and occasional timber fragments. It would appear that this material was imported to the site as there is no evidence for masonry buildings at an earlier date. One layer to the south-east of the site was defined by the presence of chalk lump inclusions. These dumps may well have been levelling activity in preparation for the erection of buildings; by the end of the sequence the ground level was between c +0.84m and c +1.19m OD.

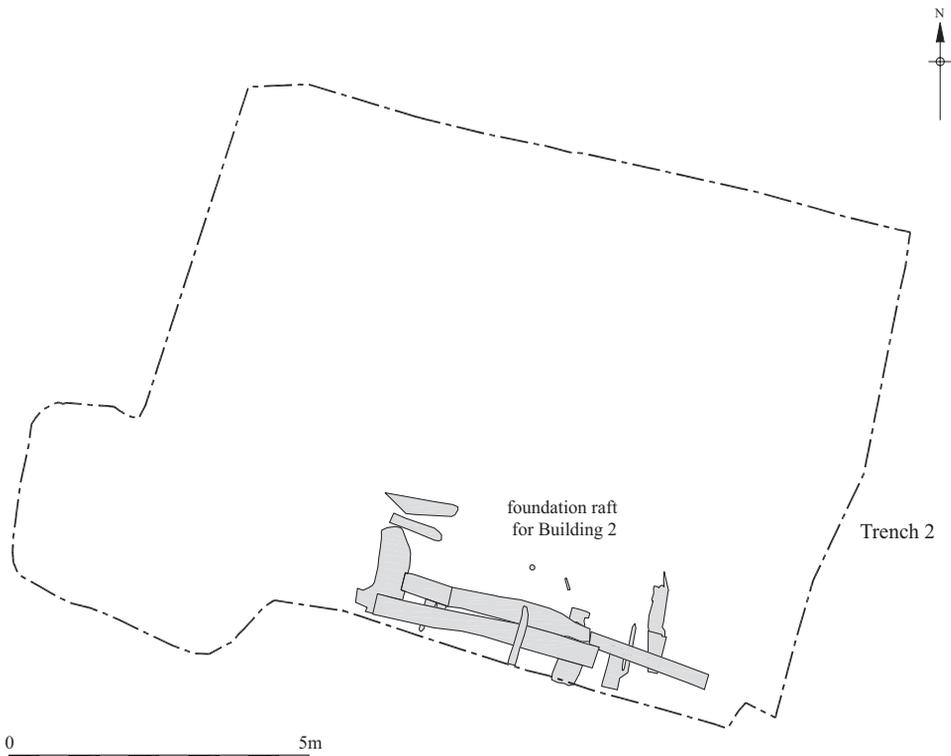


Fig 14 Bermondsey Wall West. Phase 4: foundation raft for Building 2.

The overall sequence of dumping was repeated in most of the trenches excavated, reflecting the value of prime waterfront land behind Bermondsey Wall.

Phase 5: post-medieval building (17th century)

BUILDING 1

The result of the dumping and land consolidation was that it provided a surface to build upon. In trench 5 were the remains of a late 17th century timber-framed building, Building 1 (fig 15). Evidence for this building was limited to a close-set, but charred, plank floor surface, of which *c* 2m² was within the excavation area, and patches of charcoal located beyond the areas of charred wood. Beneath the planks was a bed of oyster shells, interpreted as a damp-proofing course. The floor was bounded on the west and south sides by wooden posts suggesting that the superstructure was of vertical posts with horizontal planking. Earthfast post buildings with plank cladding were a common building technique for ancillary structures but not for houses. The minimum dimensions of Building 1 were 7m east–west and 4m north–south.

Roughly parallel with the west wall of Building 1 and set approximately 0.60m from it was a large elm log pipe (figs 15 and 16). Two main lengths of pipe were found, both constructed from bored-out sections of debarked elm trunk. How, if at all, this drain related to Building 1 was not determined and as a similar bored log drain was identified in trench 2 to the north, it is possible that these pipes serviced areas to the south of the subject site. West of the subject site, at Hay’s Wharf, it is recorded that wooden water pipes were made from hollowed-out tree trunks, usually elm, and so important was the industry that in the mid-17th century it was known as ‘Pipe Boarers Wharf’ (Cowan *et al* 2000, 42).

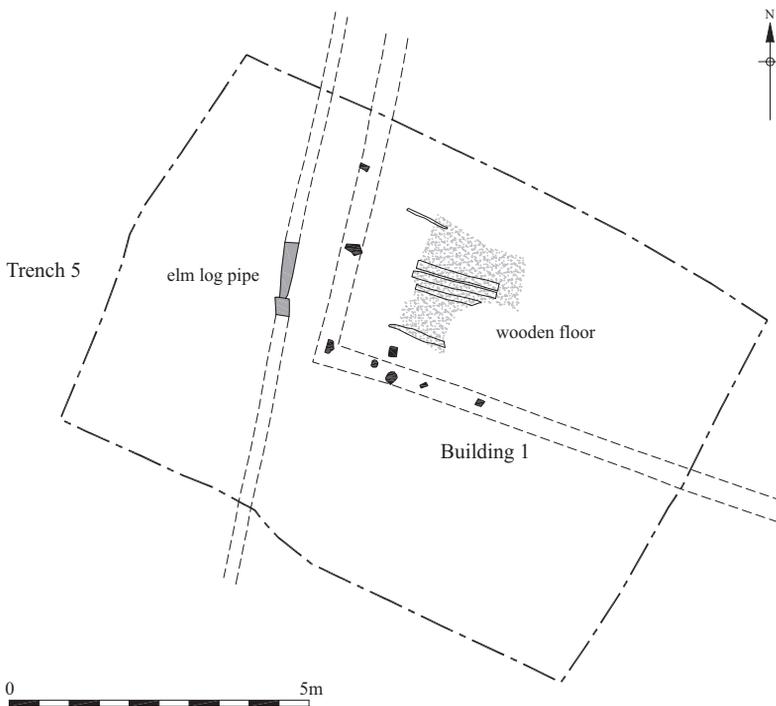


Fig 15 Bermondsey Wall West. Phase 5: building 1 and elm log pipe.



Fig 16 Bermondsey Wall West. The elm log pipe.

BUILDING 2

Overlying the levelling dumps containing the timber planks was a second and more northerly building, Building 2 (fig 17). This structure was rectangular in plan and measured 9m east–west and 5m north–south. In contrast to Building 1 its walls, at least at foundation level, were constructed of brickwork: orange/red bricks up to four courses high and bonded with a grey/yellowish white mortar. The north, west and south walls were approximately 0.4m thick but the east wall was considerably wider. The surviving fragment, located close to the south-east corner, was 0.8m wide although the robber trench to the north suggests that the remainder of this wall was narrower at 0.6m.

Abutting the north-east corner of Building 2 was a 4m length of narrow robber trench, and midway along was the eastward projection of a second robber trench. It is proposed, but unsubstantiated, that these two elements were also part of Building 2, indicating that it was originally at least of three rooms and possibly had an open yard on the north side.

In the northern area was a layer of redeposited ‘brickearth’ containing stones and CBM fragments that may have represented a discrete floor surface. Concentrated in the southern part of the building were bands of sand and sandy silt yielding late 17th century pottery including a Surrey–Hampshire border green-glazed whiteware flat-rimmed chamber pot (BORD CHP2), possibly to improve drainage or to serve as bedding for a long-removed tile floor. There was however a disparity in the levels of the surfaces: that in the north was at +0.77m OD and that in the south *c* +1.2m OD. The difference in levels and materials may reflect the position of an otherwise unrecognised partition.

The internal deposits were then sealed by a brown silty clay, which was in turn cut by a circular pit of uncertain function, *c* 1.2m in diameter and backfilled with a very rubbly clay-silt. The area between the walls was then sealed by a 50–100mm thick dark brown/black layer of cinders and charcoal. There was no evidence of fire damage to the adjacent structure or underlying deposits and this material was presumably a ground-raising or preparation dump. Pottery, including a sherd of tin-glazed cylindrical mug with a manganese speckled glaze (TGW B) dated 1630–80, and 22 clay tobacco pipe bowls were recovered from this deposit, which suggest a deposition date between 1660 and 1680.

A group of sixteen *ex-situ* nautical timbers was found on this surface, towards the north-east corner of the building (fig 18). Their presence suggests that this room/building may at this time have functioned as a workshop, possibly repairing ship timbers or salvaging the

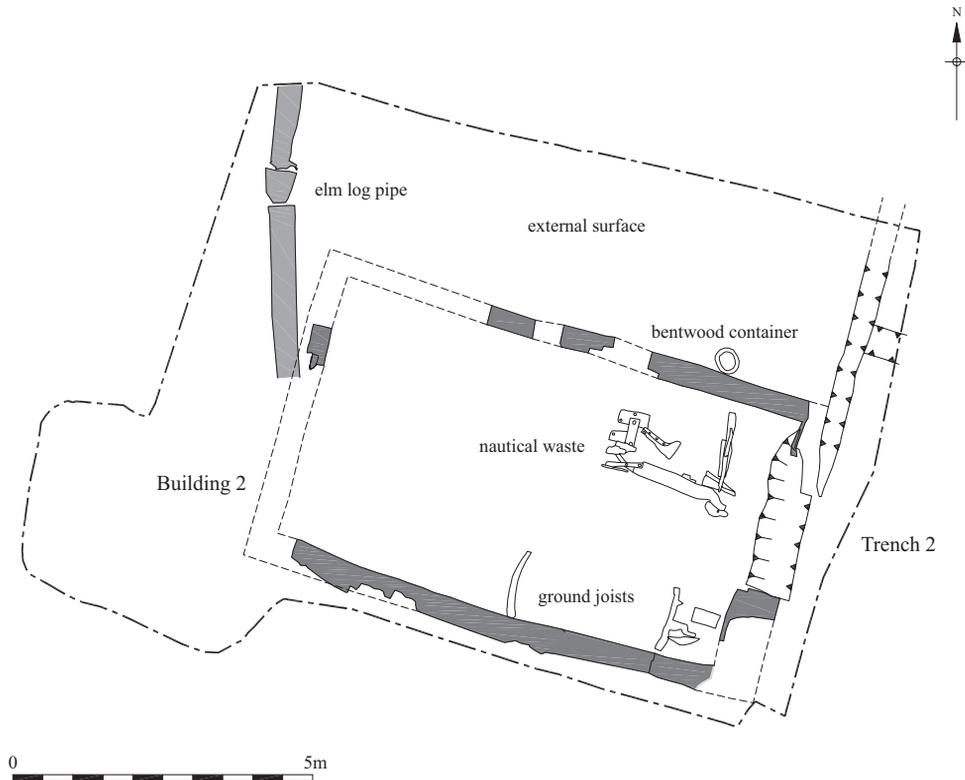


Fig 17 Bermondsey Wall West. Phase 5: Building 2 and elm log pipe.

timber and fittings for re-use elsewhere. It has also been suggested (see Goodburn, below) that the timbers might have served as supports for a robbed rough plank floor surface, but their specific location in only one area appears to preclude this. A further 250mm of dumped material sealed the timbers, suggesting that the workshop activities had been discontinued. Unfortunately, the pottery recovered from these deposits was diagnostic only in that it provided a 17th century date, but could not refine the deposition date further.

Cut into these dumps was a shallow pit of uncertain function having an irregular diameter between 500 and 800mm, the uppermost fill of which contained pottery, a tin-glazed charger with a Wanli border (TGW A), dating to between *c* 1630 and 1650.

Adjacent to the north wall, on its north side, possibly in an exterior yard location, was a small cylindrical ‘bentwood’ container (figs 19 and 29), *c* 320mm in diameter and *c* 165mm deep, which might have served as a sump (see Goodburn, below). The fill of the container included clay tobacco pipes dated to 1680–1710 and an ornate copper-alloy tap (fig 21). There was no indication that this ‘yard’ area was surfaced.

A bored elm log pipe, in three sections was recorded to the west of Building 2, although the exact relationship between the two was not established owing to later truncation. The overall length within the trench measured more than 5m and the sections fitted together with a tapering joint, sealed with lead sheeting. The northern section was exposed to a length of *c* 1.24m and the southern section was exposed to a length of *c* 1.88m. Both sections had a maximum diameter of between 270 and 370mm, with the bore diameter ranging from 176 to 200mm. Interestingly the pipe sloped down from +1.04m OD (on top of the log) at the northern end to +0.66m OD at the southern end; there was a clear fall *away* from the river

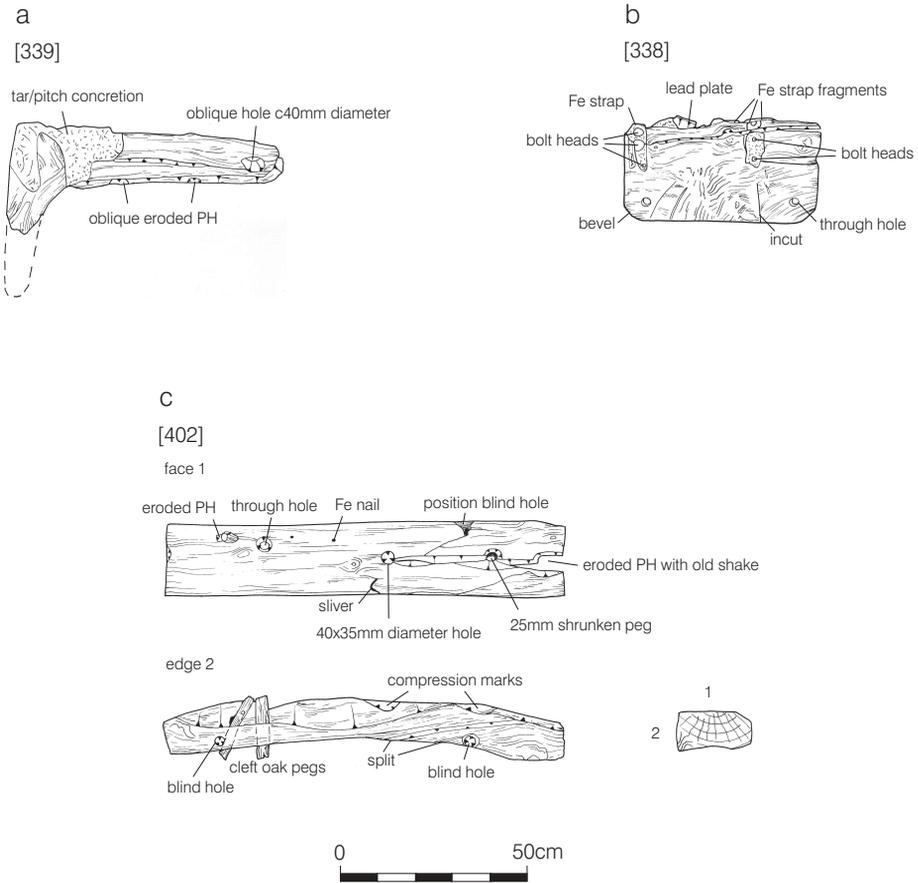


Fig 18 Bermondsey Wall West. Re-used nautical waste timbers found at Bermondsey Wall: a) an oak knee 339, b) a sawn oak hatch cover or possible gun port lid 338, c) an oak frame fragment from a carvel-built vessel with oak trenails 402.

Thames. As such it is suggested that the pipe may have served to carry water inland from the Thames, as opposed to serving as a drain.

The disuse of Building 2 was marked by the partial robbing of the eastern wall. Tin-glazed earthenware pottery, including a charger with a Wanli border (TGW A), found in the robber cut was residual, dating to between 1625 and 1650. However, a clay tobacco pipe recovered from the fill was dated to 1660–80 suggesting that although apparently modified at least once, the lifespan of this structure was fairly short-lived, probably being demolished after 1680. Demolition debris sealed Building 2 at a level of between +1.02 and 1.21m OD. The cartographic evidence outlined below hints that this structure may represent part of a range of terraced buildings seen more clearly in Phase 6, as opposed to being a discrete structure, although this was not demonstrated archaeologically.

DISCUSSION OF PHASE 5

The later phases revealed by the excavation reflect the gradual urban development of the land behind the embankment. This mirrors the northward expansion of the wharves recorded



Fig 19 Bermondsey Wall West. The bentwood container.

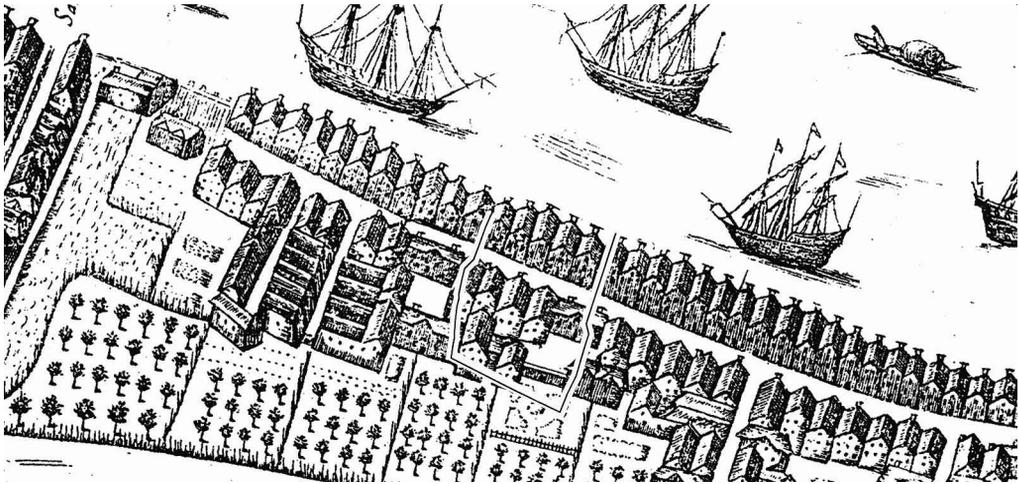


Fig 20 Bermondsey Wall West. Newcourt & Faithorne's map 1658.

on nearby sites such as Adlards Wharf (Divers 2002), which revealed a continual process of revetting and northward land reclamation over some 20m northward throughout the 17th, 18th and 19th centuries, serving to strengthen and consolidate the land won behind Bermondsey Wall during the medieval period.

Certainly by the mid-17th century the Newcourt and Faithorne map of 1658 (Newcourt & Faithorne 1658) (fig 20) shows a well-developed pattern of linear settlement to the east of the already established 'Savory Dock' (later St Saviours) along the line of what is almost certainly the present Bermondsey Wall. The single row of terraced buildings to the north shows no sign of sophisticated docks, with the buildings fronting directly onto the Thames. To the south development is also limited, focusing on small clusters of buildings stretching along the line of the road. The southern limits of these buildings are mostly gardens and orchards, then open ground. Although the development is limited there is no sign that the

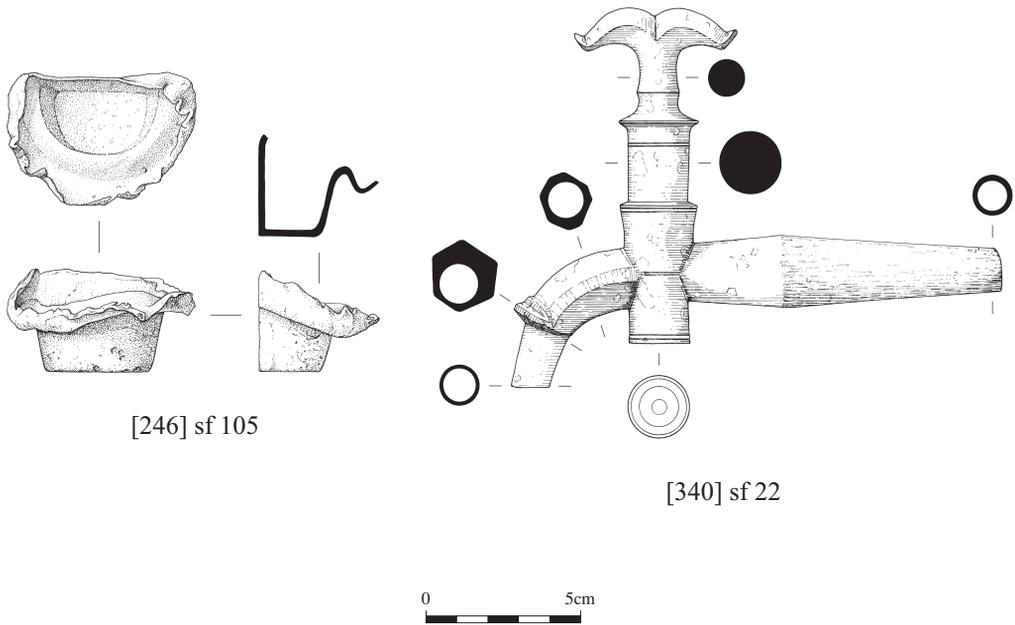


Fig 21 Bermondsey Wall West. Bird feeder and copper-alloy tap.

area was still marginal land. There already seemed to be a row of terraced buildings present on the location of the site.

Irrespective of the nature of the structures, which was not determined, Buildings 1 and 2 represent the increasing urbanisation of the area at this time. Newcourt and Faithorne's map indicates rapid development since the Jacob's Island map of half a century earlier and shows large properties on either side of the Bermondsey Wall. Although this map may be somewhat schematic it shows a single line of buildings on the north side of the wall/road lining the river, the majority of which were two storeys with attic space. On the south of the wall/road were further groups of properties separated by north–south lanes. Within the subject site there may have been as many as five properties fronting the road to the north, the eastern one parallel to the road on an east–west orientation. This reflects the alignment of Building 2 and it is possible that it is this structure which is depicted on the map. Three other houses are shown to the rear of the site, one of which may be Building 1. The south-east corner of the site was at this date largely devoid of properties.

Phase 6: Buildings 3–6 (mid-18th/early 19th century)

To the south, in trench 5, there was evidence of continued ground-raising and water management. At this location a small shallow north–south ditch or gully, probably feeding into the back ditch or possibly structures beyond the site, was subsequently developed. Unfortunately non-archaeological constraints restricted the amount that could be investigated, but a 3m length was examined (fig 22). The drain was constructed from wooden planks, possibly re-used boat timbers that were retained internally and externally with timber piles. For the most part the external posts were round and the internal ones squared. The base of the drain was also plank lined. The sides of the drain were tarred and covering the base and part of the sides was a dirty clay layer up to 48mm thick. Both the tar and the clay indicate a waterproofing function. Within the clay was a certain amount of mixed refuse including CBM, bone fragments and some pottery.

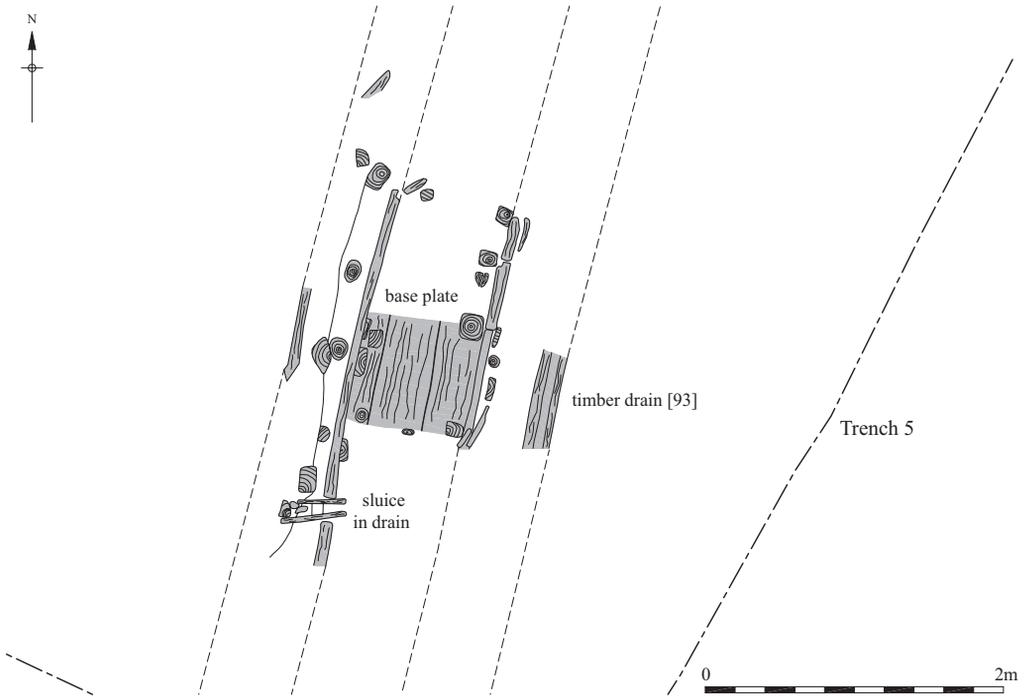


Fig 22 Bermondsey Wall West. Phase 6: detail of timber drain 93.

This feature was severely truncated in the south but on the west side there was some evidence that the drain incorporated a sluice into its design. Set at right angles in a gap between the north–south side planks were two thinner parallel planks. The space between the two was approximately 40mm. It is suggested that a vertically lifted sluice or gate was originally positioned within the drain, although none of the actual gate was present.

Dating for the structure is relative, but it post-dated 1800 – possibly as late as 1830 as evidenced by pottery recovered from stratigraphically earlier features. The feature was deliberately backfilled and the dumped material extended beyond the confines of the drain. Pottery from this dump dated to the mid-19th century, but it may have been of slightly later date suggested by the find of a button bearing the legend ‘Royal Militia T H 1’ surrounding an illustration of the Tower of London (fig 23). The button is 15mm in diameter and similar to a regular army 14mm coatee sleeve button of the late 19th century (Ripley 1983). It seems therefore that this represented the 1st Royal Tower Hamlets (King’s Own Light Infantry) Militia, which was formed in 1861 and based a short distance to the north on the opposite bank of the Thames from the subject site (Chichester & Burges-Short 1900).

By the mid-18th century, Building 2 in trench 5 had been replaced by a range of east–west terraced buildings, Buildings 3–6 (figs 24 and 25). Again the clearest evidence for the buildings was recorded in trench 2. The four buildings in this trench shared a common southern external wall, from which projected three north–south walls, the northern parts of the buildings being beyond the limits of the trench. The mid-18th century date was supported by similarly dated finds from the construction cut backfills. However, an earlier and interesting find was recovered from the construction trench of Building 3/4, which was that of a late medieval or early post-medieval lead bird feeder (fig 21).

At the base of the construction trenches all the walls were built on wooden rafts presumably to overcome the difficulties of building on soggy ground. The rafts were constructed of readily available planks and off-cuts, probably originating from the already established shipbuilding

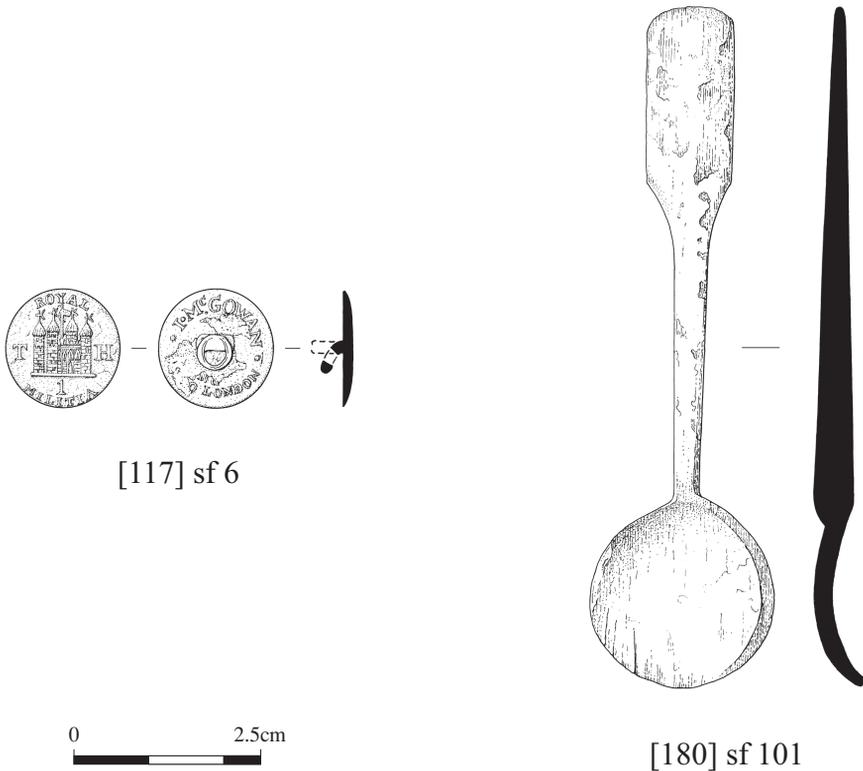


Fig 23 Bermondsey Wall West. Military button and spoon.

yards in the vicinity (see Goodburn below). They were occasionally lightly nailed together but such rafts did not require sophisticated carpentry to work.

For the most part the walls had been removed in antiquity and all that remained were seven or eight courses of stepped foundation, averaging between 450 and 500mm in width at base and constructed from red unfrogged bricks. The buildings are described from west to east.

BUILDING 3

Only the easternmost 2m of Building 3 survived within the trench, being only 5.6m long and the limited evidence suggesting that at this level there was only one room. A basal dump of dirty clay formed a make-up deposit for a thinner dump of crushed brick and mortar which itself appears to have formed the bedding layer for beam slots. Three north–south slots were evident in the floor and extended into niches in the south wall. These slots indicate that the primary floor surface comprised timber boards and although these did not survive into the record the top surface would have been at $c + 1.38\text{m OD}$. Subsequently the timber floor fell into disuse or was dismantled. A thin layer of dirty cinder was laid over the mortar from which was recovered a copper-alloy curtain ring and pot fragment. The cinder apparently formed the bedding layer for a new surface, this time of brick, of which only patches survived. The top of the floor was at $c + 1.45\text{m OD}$.

BUILDING 4

Building 4 was located on the east side of the party wall it shared with Building 3 and was shown to be a single room, 4m wide by at least 5m in length (north–south). The interior of



Rocque, 1739-47

Horwood, 1792-99

Horwood, 1819

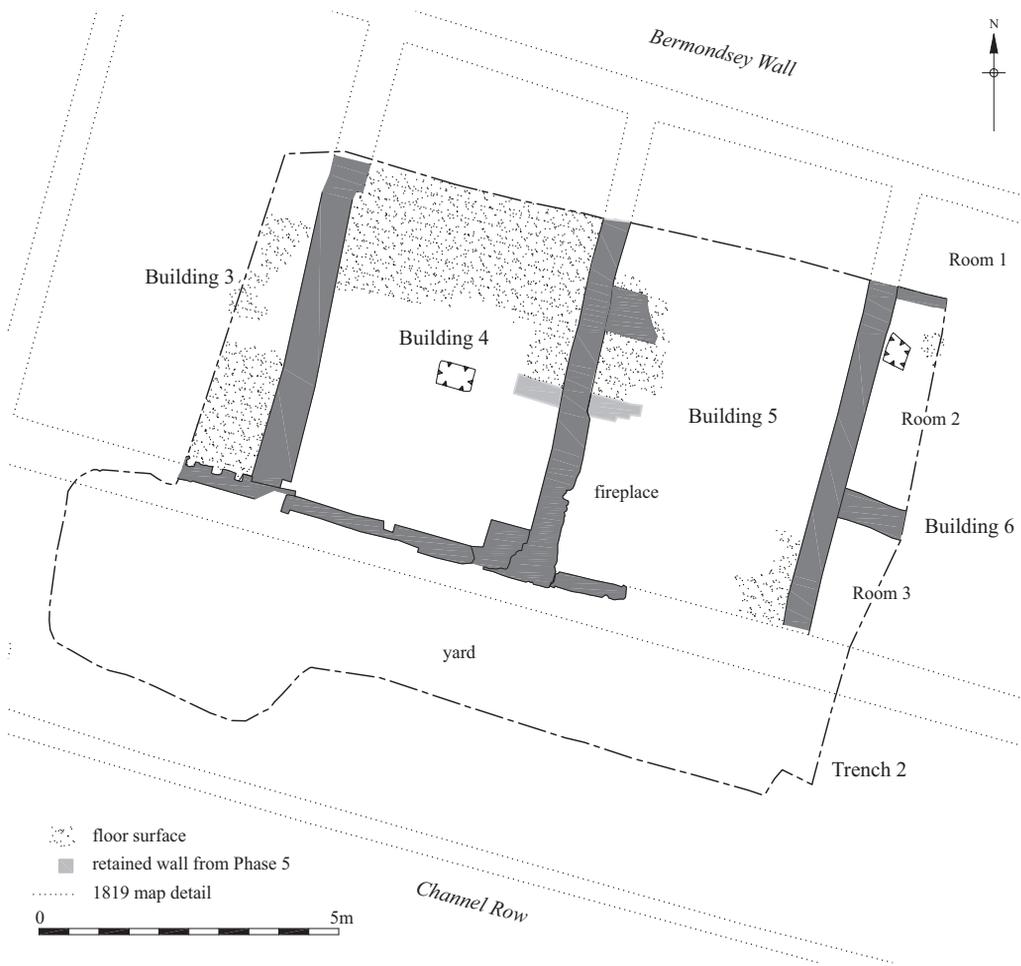


Fig 24 Bermondsey Wall West. Phase 6: Buildings 3-6 with historic maps definition.



Fig 25 Bermondsey Wall West. View of Buildings 3–6.

the building was filled with a large levelling dump up to 200mm thick. This served as a bed for the principal working surface, an irregular flagstone floor set at an approximate level of 1.6m OD, which was badly truncated on its south side by replacement modern floors.

In the south-eastern corner of this room were the foundations of a large fireplace, *c* 2.4m wide and 0.8m deep. This was an original feature constructed with brick bonded into the south and east (party) walls. Originally the hearth space was floored with flagstones, subsequently replaced with a brick and tile surface. Eventually the fireplace was replaced with a small brick coal burner measuring *c* 0.4 x 0.6m located towards the south edge of the original.

Apart from the fireplace there were no other distinguishing architectural or structural features of the building. In the middle of the floor area was a small rectangular cut, lined with decayed wood. It is possible that this represents a structural posthole contemporary with the use of the room, but equally it is possible that the feature was cut from higher in the sequence.

BUILDING 5

To the east of this area was Building 5 that covered an area some 4m east–west x 5m north–south. Again the internal surfaces of the room were founded on a layer of dumping, finally levelled by a compact mortar layer at a height of *c* +1.36m OD. The mortar contained impressions of floor joists, indicating that the room was initially floored with timber. Located in the south-western corner of the building was a fireplace, forming a mirror image to that in Building 4. Although the fireplace again had a brick hearth, the remnants of a badly truncated flagstone floor were also present at a surface height of *c* +1.6m OD both in the west and the south-east corner of the building indicating that the timber floor had been replaced.

Overlying the flagstone floor towards the north-west of the building and abutting the east wall was an brick feature of unknown purpose, three courses high and roughly 1m². Its eastern interior face was curved, and it is suggested that the feature represents the remains of a brick stair base, although this is by no means certain.

BUILDING 6

As with Building 3, only a very limited extent of Building 6 was recorded within trench 2. In contrast to the other structures, Building 6 showed internal divisions, suggesting at least three rooms at this level. At the north of the trench was an east–west wall beyond which would have been Room 1. It is suggested that Room 1 was a corridor or store as it appeared to measure only 1.5m in width. The central room, Room 2, measured 3.3m in length and was originally surfaced with flagstones set in mortar, although this was subsequently repaired with brick. The top of the floor was at *c* +1.56m OD. Room 3, the southernmost room, was shorter, at 2m, and was also originally floored with flagstones set into a matrix of ashy silt which itself was set over a bed of crushed mortar. The latter deposit would suggest that a timber floor may originally have been present, as in Buildings 3 and 5.

To the south of the common external wall was probably a yard area, presumably communal. However, no remains of a surface were revealed during the archaeological investigation.

DISCUSSION OF BUILDINGS 3–6

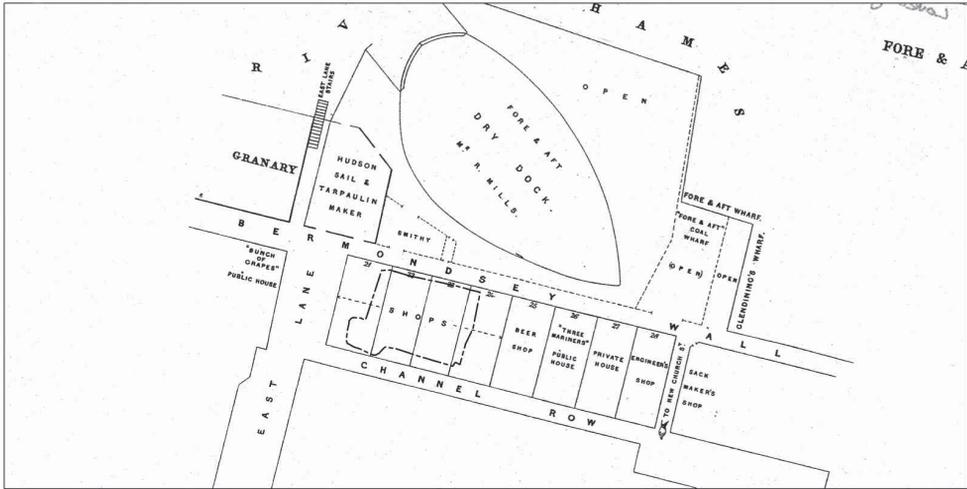
By the mid-18th century, Rocque's map (Rocque 1746) shows a far more carefully managed area, with buildings fingering southwards from Redriff Wall (now Bermondsey Wall), along the line of a network of roads that forms the basis of the modern road system (fig 24). By contrast, however, the Thames-side region to the north of Bermondsey Wall shows signs that the terracing immediately fronting the river was cleared, presumably to make room for the valuable wharf space required to serve expanding industry in the area. Nevertheless, to the south of the road the block of terraced buildings which would have sat close to, or over, the site are still shown, where they appear to remain throughout the 19th century as depicted on Horwood's maps of 1792–9 and 1819 (Horwood 1792–9; 1819) (fig 24), Loveday's map of 1857 (Loveday 1857) (fig 26) and the OS 25-inch maps of 1872 and 1894 (fig 27). Curiously there is little distinction between these 18th century buildings and the earlier 17th century row, suggesting that the earlier Phase 5 structure, outlined above, may not be a discrete structure, but an early phase of the cellar range outlined in Phase 6.

Phase 7: modifications to Buildings 3–6 (late 18th/19th century)

The cartographic evidence shows that the terrace represented by Buildings 3–6 was retained throughout the 19th century, although the archaeological evidence is less complete. The most significant change is that all the buildings were extended by building over the open space to the south. Walls found within the trench correspond with the evidence of the 1894 OS map, and walls missing from the archaeological record can, in effect, be restored (fig 27). Using this evidence it can now be shown that the building and yard plot in the 19th century measured 13.5m north–south (outside wall to outside wall), the front range of rooms being 6.3m long, and the south 4.2–4.5m long (both inside face to inside face). Abutting the south of the building plots was a new road, by 1851 known as Channel Row, but more recently as Chambers Street.

The south range of Building 3 – 21 Bermondsey Wall – was in fact two spaces divided by a narrow brick wall, the western area being part of the covered structure, while the east was uncovered, possibly a yard. The putative yard measured 4.5m in length x 1.5m in width, of which 3.5m was within the excavation area; its cobbled surface provided further support for this interpretation. Cut through the cobbles was a shallow pit/depression 180mm deep that contained oyster shell-rich clayey silts. No floors survived within the western room to indicate function.

The rear of Building 4 – 22 Bermondsey Wall – also appears to have been a walled yard space originally measuring 4.5 x 4.2m. A small square structure, possibly a privy, is shown



Loveday's London Waterfront Surveys 1857

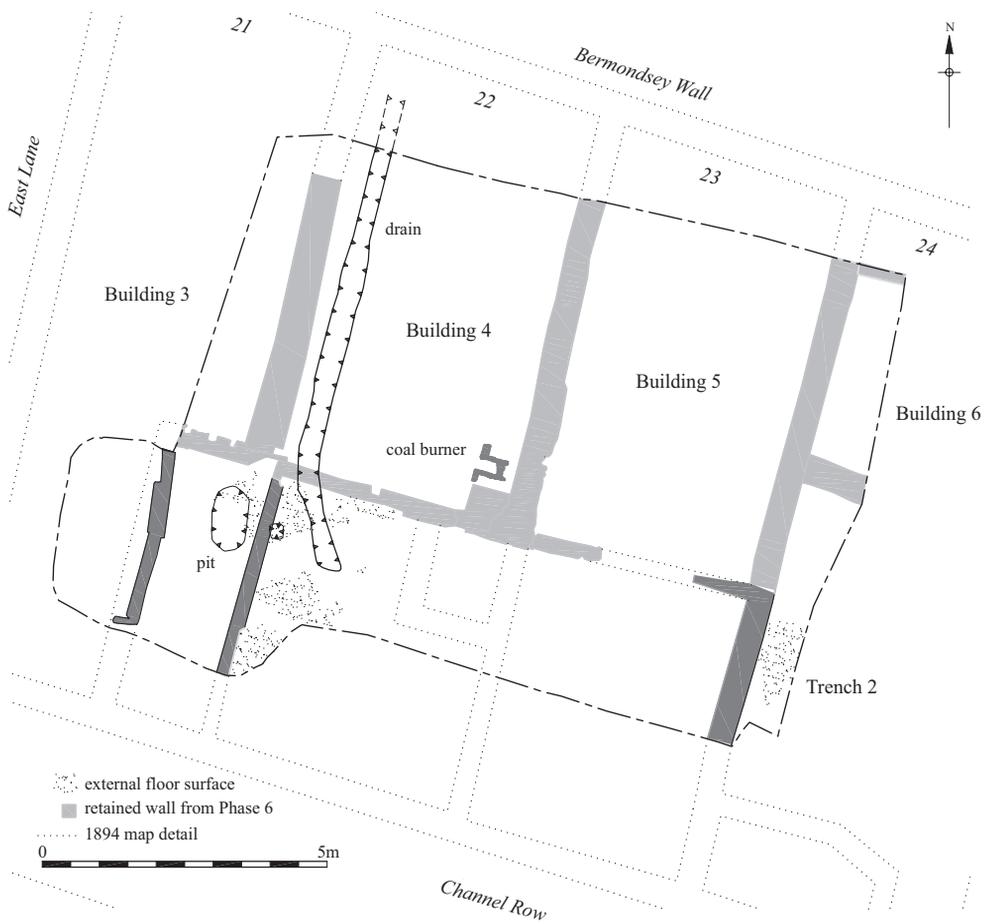


Fig 26 Bermondsey Wall West. Phase 7: additions to Buildings 3-6.

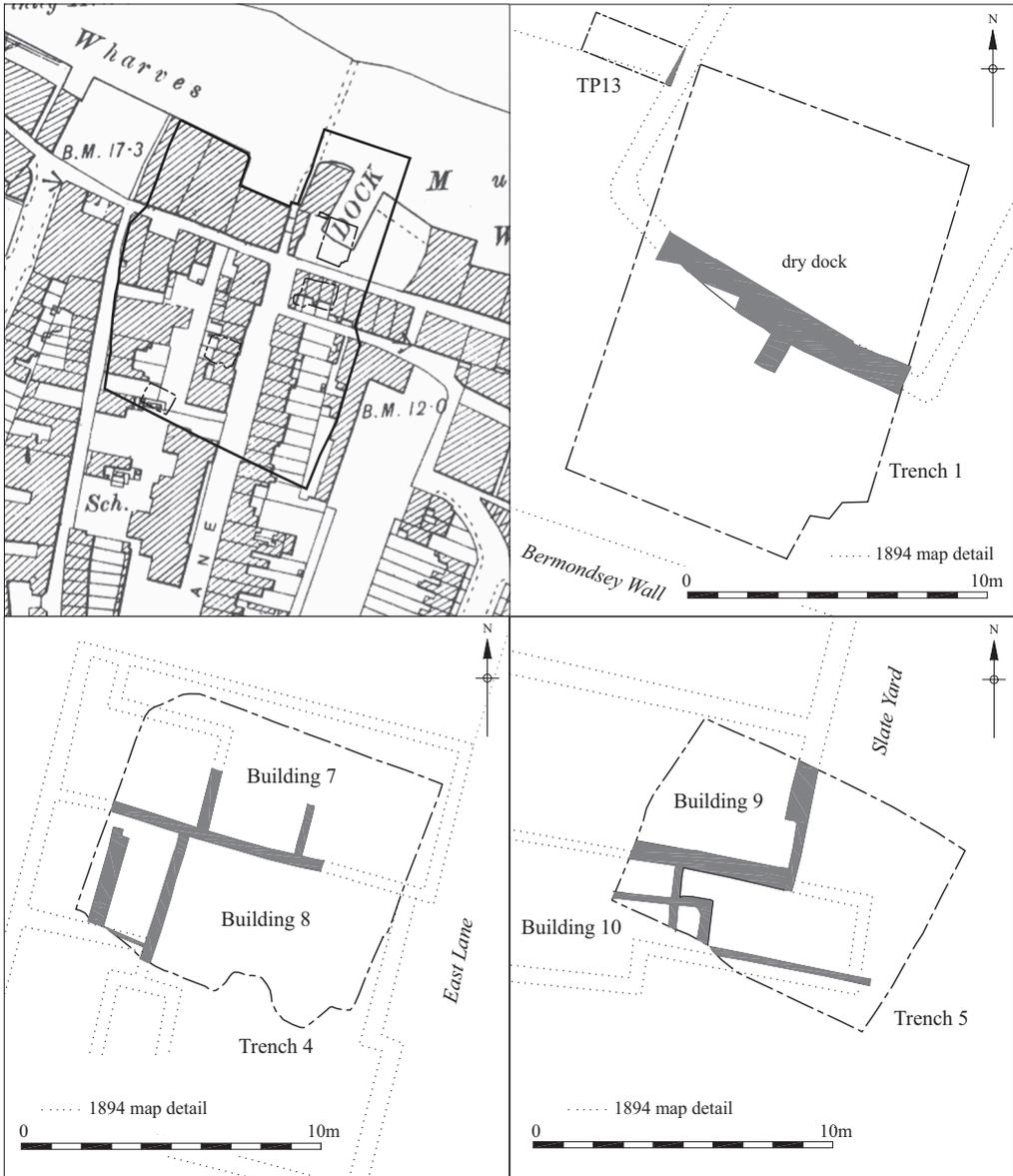


Fig 27 Bermondsey Wall West. Phase 7: Buildings 7–10 and Dry Dock in relation to the 1894 OS map.

on the 1894 plan, but it did not survive into the archaeological record. Over the west side only were the fragmentary remains of a flagstone surface, the eastern area having been truncated by later activities.

Possibly leading from the Bermondsey Wall frontage and set close to the west wall was a narrow drain or gully that cut through the rear wall and extended into the yard area. The purpose of the drain was not determined, and may even have contained lead piping, long since removed. From dumps below the yard a crudely carved bone spoon of 18th or 19th century date was recovered that was probably used for condiments. It measured 89mm in length and has a very shallow bowl with a fiddle shaped handle (fig 23). A circular bone gaming counter was recovered from a similar deposit.

Cartographic evidence shows that the rear of Building 5 (23 Bermondsey Wall) was also a yard, although for the most part the evidence was missing through later truncation. The east brick wall did survive as did an area of mortar abutting the wall, suggesting that this surface was paved.

Only a small area of Building 6 (no 24) survived into the archaeological record, but the 1894 map indicates that this, like Building 3, contained an open yard area and covered space. That within the trench was part of the yard and, as with no 22, was of flagstone.

Loveday's *London Waterfront Surveys* of 1857 indicate that at this date a thriving group of waterfront industries existed in the vicinity of the site, including a granary, a sail and tarpaulin maker, a smithy and a coal wharf together with the 'Fore and Aft Dock' (see below) owned by a Mr R Mills. The terrace immediately to the south of Bermondsey Wall is shown as shops to the west, with a beer shop, the Three Mariners public house, a private house and an Engineer's shop making up the eastern end of the row. The shops are almost certainly represented by the cellared buildings encountered during the excavations on site with Buildings 3–6 being designated as 21–24 Bermondsey Wall. Watkins Directory of London of 1854 lists the occupiers from west to east (nos 21–23) as respectively John Kidner, a butcher; Mrs Shepherd, a grocer; John Taylor proprietor of a coffee house, and John Lay also owner of a coffee house.

OTHER BUILDINGS

It is clear from cartographic evidence that by the mid-18th century in addition to the main thoroughfare marked by Bermondsey Wall a more complex landscape was developing behind the river defences, including buildings, gardens, lanes and alleys. Of the latter perhaps the most relevant within the site were Salisbury Lane, which marks the historic western site boundary, and East Lane towards the east of the site and with which Building 3 formed a corner property. A succession of maps between the mid-18th and first quarter of the 19th centuries shows buildings occupying these two north to south lanes. Unfortunately, nothing of the earlier buildings survived into the archaeological record, but at two other locations (trenches 4 and 5) fragments of buildings were recorded, the walls of which can be matched with the 1894 Ordnance Survey map (fig 27). These buildings may have had 18th and/or 19th century antecedents.

BUILDING 7

The Ordnance Survey map indicates that East Lane on its west side was formed of a terrace of irregularly sized properties and that trench 4 contained central elements of two properties, including their shared party wall (fig 27). The northernmost of these, Building 7, was apparently a three-roomed building *c* 5.2m north–south and 13.8m long, of which a maximum 4.6 x 10m occurred within the trench. It is probable that the third, rear, 'room' may have been a yard. The front room originally measured 4.2 x 4.6m (inside face measurements), but only parts of the rear wall were recorded. Room 2 was originally 3m wide but up to 7m long in the north, where there was a corridor to the rear. Room 3 or the yard was 4.4 x 4.6m, including a dogleg to the north. No internal surfaces were recorded.

BUILDING 8

Cartographic evidence indicates that Building 8, abutting Building 7 on the south side of a party wall, was a much more substantial structure. In plan it measured 13.6m in length and was at least 10m wide, although a maximum 9.8 x 5m was recorded within the trench. It contained three rooms, or two front rooms and yard to the rear. The front room was considerably larger than that in Building 7, being 7.2m long and at least 5m wide. Behind this, Room 2 was much smaller, 3.8 x 1.6m, and for which all of the walls were recorded.

The yard measured 3.8 x 2.2m. Rooms that were located beyond the trench are not discussed. No internal features were recorded in any rooms, owing to modern truncations.

BUILDINGS 9 AND 10

Towards the south-west corner of the site, at trench 5, were the fragmentary remains of two further structures, Buildings 9 and 10. In this instance only the backs of these properties were recorded, the frontages faced west on to Salisbury Lane, and their backs on to Slate Yard. By 1894 there was not even a building in the northern plot, the site of Building 9, but properties are shown on plans from the mid-18th century, and it is assumed that in the late 19th century the plot was awaiting redevelopment. The map indicates that this plot measured 5.6m wide and was at least 16m long.

The rear of Building 10 was formed of at least four rooms, varying in size, the maximum recorded being 6 x 2.4m. The maximum dimensions of this property were 10.8 x 3.4m. No internal features or surfaces were recorded.

DRY DOCK

Domestic buildings are depicted lining the north side of Bermondsey Wall on Newcourt and Faithorne's map of 1658 although such a density is not evident on maps of the 18th or 19th century, suggesting that the earlier map was more representational than accurate. Unfortunately, archaeology has not been of much assistance in determining the situation. Existing site conditions allowed only four small evaluation trenches in the north-west (TP 6) and north-central area (TPs 7, 8 and 12) in which either no features were located or there were dumped sequences only. In the east were a further four test pits (TPs 13–16) and a large trench (trench 1). Again buildings were not recorded, but on this occasion the reason is that by the mid-19th century, reflecting the importance of maritime trades along the Thames frontage, a dry dock structure had been constructed. This structure is shown on the 1894 Ordnance Survey map, and within the site the curved southern dock wall was recorded in trench 1, and part of the west wall in TP 13 (fig 27). The dock wall was constructed from brick and concrete, about 1m thick and curved, but the floor of the dock was not investigated. However, this dry dock was not the first in this location. One is shown on Horwood's map of 1819 (but not 1799). The 1857 Loveday plan shows that by this date there was a much larger dry dock at this location known at this date as the 'Fore & Aft Dry Dock'. Clearly the construction of this structure will have had considerable impact upon earlier features and it is perhaps unsurprising that earlier features are absent from this part of the site.

The full urbanisation of the area was complete when the 1872 OS map was issued, although the region around the site remained unaffected. By 1894–6 the dry dock had been modified and reduced in size and completely infilled during the 20th century, when the terraced buildings found in the excavations were also demolished.

Analysis of the key woodwork and aspects of the timber structures,

by Damian Goodburn

BACKGROUND

The site lies in a low-lying part of north Southwark where waterlogged timber and roundwood structures are typically found preserved a short distance below modern street level, as was the case here. This situation results from the low level of the surrounding land and the increase in sea level over the last few centuries. Aspects of the 'mud wall' structure built to deal with high tide flooding in the later medieval period are discussed below, as are aspects of the timber structures and re-used timbers found from the 17th century use of the site. Mud walls of all periods and riparian, generally maritime related, land use in the post-medieval period are

still relatively little recorded and have now been recognised as foci for more systematic archaeological investigations by English Heritage and county archaeologists of the region (Bedwin 1999, 32, 35). Extensive, systematic and focused archaeological work is now under way on both sides of the river east of Tower Bridge which has already resulted in several site reports and thematic publications (eg Divers 2002, 2004; Goodburn 1999; Saxby & Goodburn 1998; Tyler 2001).

This summary of the evidence of maritime woodwork, that is, re-used ship and boat timbers, touches on the ship-breaking, shipbuilding and repair activities of the whole region which lasted from the 16th to 19th centuries. Other woodwork found comprised drain structures, two log pipes, dumps of worked timber and floor substructures from the late 18th to 19th centuries and glimpses of post-medieval pile-and-plank revetments. Additionally there was some tentative evidence of foreshore structures pre-dating the medieval mud wall in the form of stake groups.

LIMITS ON THE RECORDING OF EXPOSED WOODWORK

It must be noted here that there were several access difficulties and contamination problems limiting the detail that could be recorded of some of the waterlogged woodwork found. Some of the trenches were briefly exposed test pits (eg TP 8), and in other evaluation trenches many timbers could only be partially exposed.

DISCUSSION OF THE WOODWORKING EVIDENCE IN PHASE ORDER

Stakes on the foreshore – Phase 2

Beneath the later medieval mud wall a spread of chalk rubble was revealed over the base of a small channel at *c* 2.5m below mean spring high tide level in the 12th century, as indicated by work on the City waterfront above London Bridge (quay surfaces of *c* +2.0–2.2m OD in 1120s at Bull Wharf for example (Ayre *et al* in prep)). The heads of several roundwood stakes were seen protruding above the chalk surface, probably representing parts of fish or eel traps, or small mooring stakes (fig 4). Some might even have been parts of dismantled, more substantial, revetment-type structures.

Only a small number of the stakes could be lifted but those that were formed a group of similar type. They were all visually identified as of an undiagnostic deciduous wood such as willow, poplar or alder, probably of very local river bank origin. The points were generally axe cut with four facets, the most complete axe stop mark was incomplete at 100mm wide on stake 49. The diameters ranged from 55 to 70mm. Some of the stakes, 470 and 474 for example, were hewn flat on one face for some reason (fig 5). It may be the case that they had been used to retain a sill beam or plank on edge of a revetment-type structure that had been removed. The trimming in this way of locating stakes is commonly found in medieval revetments upstream.

Structural woodwork associated with the construction of the late medieval mud wall and its tentative reconstruction – Phase 3 (13th century)

The rise over a clearly artificial bank could still be seen in the modern ground surfaces prior to the excavation, and it was known from documentary sources that the area was embanked and won from the tidal marsh by the 13th century (see above). This ‘mud wall’ was clearly a key focus of the excavation and much of interest was revealed. Unfortunately, it was not possible to examine the northern edge of the mud wall (owing to the presence of power cables etc) where it is likely that there was originally some form of low revetment or reinforcement of the erosion-prone frontage. Such protection is seen in many modern mud walls in the outer estuary. However, some insights into the original proportions and appearance, in general

terms, of the mud wall can be derived from the sources used to create a tentative diagrammatic reconstruction (fig 11).

Although prominent landscape features, they have been the subject of few archaeological investigations along the Thames. Towards the outer estuary two investigations of early mud walls have taken place, one on the Essex shore fairly near the Thames frontage, and one in north Kent well into a sheltered creek. The Essex example, at Foulness, is only briefly described as a bank with dimensions, as the primary focus of the investigation was a group of medieval timbers close by (Crump 1981). The dimensions given for the substantial clay embankment were 15.83m wide at the base, with well-battered sides surviving up to 1.82m above the then ground surface leaving a top width of 11.26m (the OD levels were not clearly provided). Close to this bank timbers of the late 15th century were found, and the bank may be accepted cautiously as medieval. The proportions of the eroded late medieval to early post-medieval creekside mud wall investigated at Faversham were very much smaller. From observations on site the overall width would have been less than 7m and the height less than 2m. Interestingly, horizontally laid elm and oak logs and occasional stakes reinforced the tidally exposed front of the mud wall (Priestly-Bell 2000).

The remains of a third mud wall were briefly sectioned on the Atlas Wharf site on the west side of the Isle of Dogs (Lakin 1998). A considered reading of the key section drawing through that structure shows a sequence of dumping events projecting upward and riverward with time. The sequence incorporated some type of pile-and-plank revetment-like structure which was partially dismantled and covered by later dumping up to a level of just over +4.00m OD. The whole sequence was interpreted as being 'post-medieval' in date; however, the presence of a possible turf line at c 3.00m OD might indicate a very late medieval to 16th century level of estuary defence work. Excavations at the site of the former Deptford power stations recorded a section through the medieval river wall, albeit in a very truncated form. At its base, the wall, constructed of alluvial clays, measured at least 8.50m in width, and was fronted with timber piles that held horizontally laid on edge planks in place (Divers 2004, 24). The top of the medieval wall had been horizontally truncated and survived to only +2.80m OD. However, this level might suggest a late 15th or 16th century date. Examples of later post-medieval river walls can still be seen in central London with good examples surviving on the Isle of Dogs in the vicinity of Westferry Road. The 19th century example at Winkleys Wharf was recorded at an elevation of c +4.00m OD (Wooldridge 2000).

Mudwalls, revetments and expected high spring tide levels

Much evidence bearing on the changing heights of spring high tides through the historic period has been found during waterfront excavations in London. Timber structures such as wharf frontages, river walls and jetties can often be closely dated and provide indications of the high tide levels they were built to operate with. This relationship has been explored for several decades now (eg Ayre & Wroe-Brown 2002, 77; Brigham 1990, 133; Milne & Milne 1982, 60). Recent unpublished analysis involving the very close dating and detailed recording of several medieval and early post-medieval structures (eg at Bull Wharf, City of London; Abbots Lane, Southwark; Rotherhithe Street, Southwark) has further refined our view of changing high tide levels along the lower Thames (Ayer *et al* in prep; Bluer *et al* in prep; Heard with Goodburn 2003). Taken together this work indicates that we would expect the 13th century spring high tide levels to be c +2.30m OD. We should also allow that the occasional level higher than that might occur with easterly gales and waves might therefore reach above that level. Thus, we can tentatively reconstruct the minimum height of the top of the Bermondsey mud wall of the 13th century at c +2.40–2.60m OD although it may have been higher.

Woodwork at the base of the mud wall

At Bermondsey Wall West the middle and southern edges were examined thoroughly. There a revetment of several elements was uncovered that supported the southern edge of the mud wall and effectively dammed the small channel over which it was built. The channel was presumably rerouted behind the wall. The presence of a back channel behind the mud wall is a common feature that can be seen at many points along the tidal Thames and its estuary today, both west and east of central London.

The revetment for the southern edge of the mud wall comprised three slightly overlapping, closely woven, hurdles constructed of relatively large stems (397, 449 and 450), retained by a series of large roundwood piles further braced by two large re-used oak beams set east–west (fig 6). The upper beam (451) was over 6.7m long and was rather weathered, with several relict joints and peg holes. This was retained by two round section uprights (452 and 509, neither of oak, but possibly of willow). The ends of the beams were let into holes in the bank of the channel. Approximately 1.5m to the south, in the blocked channel, were two pads for the feet of raking shores with locating stakes at their southern ends. These pads with their through mortices would have held the heels of raking shores ('front braces') that originally articulated with the heads of the uprights 452 and 509 providing a fairly rigid bracing system for the thrust of the base of the mud wall. A second large re-used oak beam was found wedged between the two braced uprights and the line of piles, timber 502. This beam was of similar proportions to the upper beam 451 and was also notched into the sides of the north–south channel.

Presumably the east–west beams were first wedged into recesses in the channel edges at low tide; the line of piles (460 etc) would then have been driven, together with the setting of the uprights, probably piles 452 and 509. The pads and raking shores could then have been set up and the hurdles set in position prior to the dumping of the mud fill of the mud wall. It is also possible that the pair of piles 452 and 509 and the two bracing assemblies were added a little later as the wattle revetment began to slump southward under the weight of mud above it.

The piles and the raking shore pads

The piles were only partially excavated, but they varied from about 140 to 180mm in diameter. They were made of a non-oak wood (probably willow) and were fast grown, probably deriving from the riverbank area. The piles had been barked and the side branches lopped, but were not otherwise hewn to shape, although the points were not seen.

The two pads for the shores (490 and 491) were made of logs of similar timber to the piles which had been split in half and hewn to a roughly rectangular, thick plank, section with the bark left on the corners. The through mortices were neatly cut and retained tightening wedges, although the raking shores had been removed.

The quality of the structural woodwork associated with the mud wall

The fact that no new oak or elm timber was used in the construction of the timber foundations for the mud wall implies that costs were being kept to a minimum. The use of second-hand oak beams and apparently local, low-value wood together with hurdles emphasises the limited expenditure on materials for this stretch of the wall. It is perhaps just permissible to speculate that the work might have been cheaply executed since it was undertaken as part of a feudal service by tenants of a large landlord (such as Bermondsey Abbey). Feudal services are well known in connection with the maintenance of large waterfront structures such as the nearby London Bridge (Watson & Dyson 2001, 73).

The wattle hurdles: a sample of the woodland hinterland of medieval London and a glimpse of coppices and hurdlemakers

The wattle work was clearly woven as hurdle panels that were self-supporting and portable rather than woven *in situ* as a continuous structure, which would have been difficult in any case due to the low level of the structure in relation to river levels. The locking of the ends of the weave of each panel by twisting and winding back some of the rods into the main body of the weave was clearly seen (see detailed photographs of weave: fig 10). Traces of a ‘waling’ type weave (a weave in which weavers weave round themselves as well as the uprights) were found on the lower edges of the hurdles preventing the rods from loosening on the sails (uprights), whereas the rest of the weave seemed a straightforward in-and-out weave. The upper edges were eroded away, although the hurdles still survived to just over 1.0m high in places, and a total length of *c* 2.8m (+9 feet). The easternmost hurdle (450) had eight sails, the same number as found in a *c* 16th century wattle hurdle found in Bermondsey Street (fig 3.10; Goodburn & Gale in prep). The sails were set on *c* 350mm centres. The other hurdles seemed broadly similar, all the rods were worked whole rather than split as is the practice in recent work with hazel in south-east England. In all the hurdles the sails and weavers were rather robust compared with the Bermondsey Street example and other wattle hurdles recorded in the City of London of Late Saxon or Norman date and a broadly contemporary example from the Fleet Valley project (Goodburn 1994).

The sails at the subject site were between *c* 30 and 60mm in diameter, and the often slightly crooked and branched weaver rods were between *c* 15 and 30mm in diameter. The ends of the rods were cut with simple oblique blows with a billhook or hatchet and the sail tips were shaped with more facets to blunt points. The general appearance of the hurdles was of particularly strongly made but fairly roughly finished work compared with other broadly medieval examples or typical modern hazel or willow hurdles.

The study of the wattle samples, by Rowena Gale

A total of 174 samples were taken of the wattle hurdles for wood species identification and annual ring counting purposes. Detailed study of the samples provided useful insights into both the selection of material for such work and the nature of the woodmanship practices concerned, and acted as a check on the initial interpretations.

The analysis showed that they were constructed of young oak *c* 3–9 years old with a single example of 11 years. This analysis also showed one rod of willow or poplar. The growth rate was found to be ‘moderate’ possibly implying poor soil. The rods were also found to have been cut during the dormant phase between the end of the summer and the following spring, which would fit the tradition of felling between October and March. The sails were made of the same species and age material as the weavers but were a little faster grown and of larger diameter.

Although perhaps a surprising choice, oak has been found in other early London wattlework, alongside the expected hazel and willow, and oak coppice can still be found on the fringes of south-east London today. In these semi-natural coppice-with-standards woods the oak coppice does not now grow as regularly as the hazel or chestnut close by and often sends out varied age shoots after the main regrowth. The slightly crooked stems look at first sight unpromising but experiment has shown that skilled workers can weave them into useful hurdles.

As wattle hurdles were bulky and relatively low-value items, they were almost certainly produced fairly locally. Patterns of woodmanship changed through time in south-east England and the London hinterland but details are lacking from many periods especially for the smaller roundwood. The results of this study of these three hurdles of the 13th century contribute to our understanding of the intensive medieval use of the woodland of the region, and add to the small but growing evidence for the development of the craft of hurdle making.

Two large second-hand oak beams re-used in the south edge of the mud wall and their possible origin – Phase 3 (probably 13th century)

The two large oak reinforcing beams, 451 and 502, used in the revetment to the south edge of the mud wall, were clearly re-used, both being somewhat abraded and having distinctive relict joints. The upper beam 451 was *c* 6.75m long and almost square *c* 260 x 280mm. It was of boxed heart conversion type but the method of conversion was uncertain owing to the very weathered condition of the surfaces. It had nine or possibly ten large blind mortices *c* 230–280mm long x 100mm wide and 130–150mm deep, each locked with one *c* 25mm square oak peg. In one case one of the large mortices was cut through a shallow lap joint where another large beam must have been set at right angles to 451. It was also pierced by occasional large (*c* 40mm diameter) through pegs of oak (fig 8).

The upper beam, timber 502, was also boxed heart with a little sapwood left on but again the method of conversion was unclear. Unlike beam 451 this beam was tapered in width from *c* 410mm wide at the west end to *c* 350mm at the east end, which was uppermost in the parent log. The beam was at least 5.5m long and 230mm thick. On the north face as found, five large blind mortices could be seen that were not locked with pegs. Most were similar in size to those of timber 451 but one at the west end was very large at 220mm long x 140mm wide x 170mm deep. Inside this joint the marks of either a very large chisel or more likely a morticing axe or ‘twybill’ were seen which had a square-ended blade 45mm wide. The larger western end also had clear traces of the axe felling cuts or ‘gob’.

Possible origins of the timbers

The timber size and the very large size of the joints were atypical of building timbers of the period 1200–1500. The beams probably derived from a timber-framed bridge-type structure, a very strongly constructed dock or river wall or possibly a tide mill. A very strongly constructed timber-framed, oak dock wall of the 1480s was found at Abbots Lane *c* 500m to the west which had timbers and joints of only slightly smaller scantling (Goodburn 2009). A review of Rigold’s (1975) seminal corpus on the excavated remains of medieval bridges, particularly those in moats, provides a number of parallel plate timbers. The general character of the timbers and the width and size of the mortices would be best paralleled between *c* 1180 and *c* 1300 in the London waterfront carpentry corpus such as in the sill beams of the early 13th century wharf walls found at Billingsgate (site BIG92, Milne 1992, 16).

Possible traces of a tide mill

It is also possible to speculate that the re-use of the old beam over a narrow channel lined with chalk rubble masonry might just be pointing to an origin in a mill. Masonry rammed into alluvium has been found lining a tide-mill wheel-house and tail-race channels on two sites in the region recently: a 15th–16th century example at Abbots Lane, Southwark (Blatherwick & Bluer 2009) and a 7th century instance at Northfleet in Kent (Hardy *et al* in prep). The building of the mud wall would have put the mill out of business, with the possibility of demolition to follow.

Late c 17th century groups of structural timbers, and a raft of worked timbers – Phases 4–5

Within ground-raising dumps located in trench 2 were a number of timber fragments that were probably all ship, boat or barge building yard waste. The mainly plank-type timbers were arranged using short lengths of offcuts, mainly of oak, as supporting cross chocks with longer lengths of softwood plank laid over them. In some places the timbers appear to have been lightly nailed to each other with small iron nails. Although this example is a particularly rough one, such foundation rafts are relatively common finds on the London waterfront

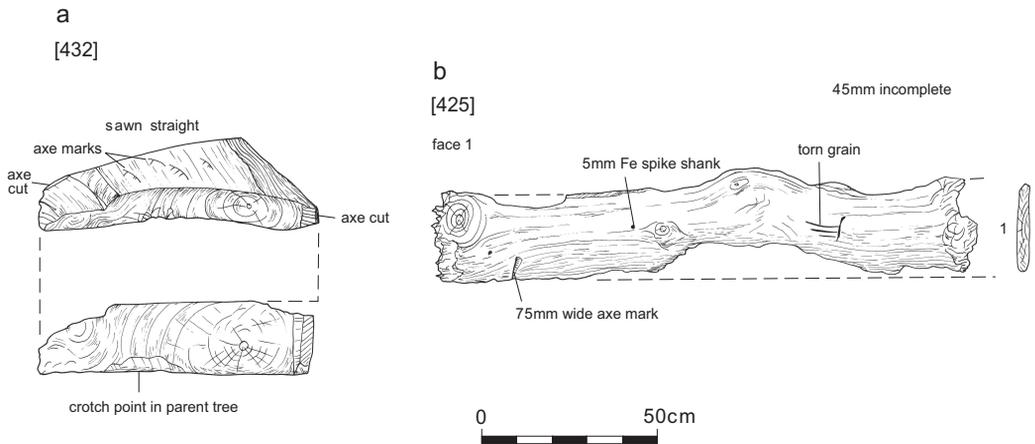


Fig 28 Bermondsey Wall West. Ship or barge yard off-cuts: a) an oak slab off-cut from making a knee 432, b) a waney axe-trimmed oak waste slab from pit-sawing work 425.

(Heard with Goodburn 2003; Saxby & Goodburn 1998). The material used varied from offcuts from the ends of curved oak timbers such as chock 432 to waste slabs from the sides of roughly hewn curved oak baulks (425 for example (fig 28)), to waste slabs from the outsides of elm baulks retaining the bark, such as timber 433 or 430. The flatter, more regular pit-sawn, softwood planking was mainly used. Some of this material was also sawn from the outside of hewn baulks and was therefore more waney, irregular and of very low value for ship work. Most of the softwood planking was *c* 30–35mm thick. Some of the timber might have been second-hand ship-framing such as the oak fragment 423, which was pierced with treenail holes.

Timbers from Building 2

Within Building 2 a dump of timbers was found on what has been interpreted as a sunken workshop or cellar floor of late 17th century date (it would have been one storey below high spring tide levels and other ground surfaces near the river in Rotherhithe at *c* 3m+ OD). The timbers may have been dumped in a semi-regular manner to serve as chocks to raise a now-robbed rough plank floor surface. The group comprised a varied assemblage of re-used timbers, most of which were of nautical origin. For example a small oak knee (bracket-like timber), timber 339, was found which was pierced by 15mm bolt holes for clench bolts. The strong bevel on it suggested an origin in the end of a vessel. Other timbers included two small and very similar oak planks, 336 and 338, which appear to have formed some kind of hatch covering originally for an opening *c* 0.53m long x 400mm wide. Timber 338 had traces of two iron hinges, still attached, and both planks were thicker in the middle and chamfered down to half their thickness at the edges. Their exact origin is unclear although use as small gun port covers is perhaps possible. A softwood plank with an oak cross batten, 335, may also have been a broadly similar item although the lighter scantling might suggest an origin in a locker lid.

A pair of timber ground joists

At a relatively high level in trench 1 two oak edge set timbers were found, 401 and 402, both just under 1.2m long. On cleaning, these were found to have been floor frame timbers from a carvel-built vessel. Both were somewhat decayed but several diagnostic features were visible

and it appeared that they probably derived from the same vessel. Both timbers were boxed heart sections with some sapwood pierced by treenail holes *c* 25–35mm in diameter, including some set in their edges which would have held other frame elements to them. They originated from a hull built in a frame-first tradition of carvel building rather than one in which the frames were set in afterwards, a technique which is also known at this period. Some of the oak treenails remained *in situ* and had single oak wedges in their inboard ends. Traces of a few small iron nails were also found. They both had an original siding (width) of *c* 200mm with a moulding (depth) of *c* 140mm; these proportions suggest an origin in a large boat or barge rather than a ship.

An elm log pipe cutting through the mud wall

The well-preserved remains of an elm log pipe (409) up to 350mm external diameter were found cutting the mud wall at the west side, and to the west of Building 2. It was made of three sections with the normal tapering joint partly covered by a lead sheet, which may imply that the pipes were damaged or re-used; no iron dogs or other fittings were seen. Oddly, the pipe was laid from south–north with a clear fall away from the river of *c* 0.4m over just 5m suggesting it took water in from the river rather than draining into it. The use of a very short connecting log and the great differences in the finish of the three log sections suggest re-use, or the use of leftovers from another project.

A bentwood container re-used as a possible sump

The remains of a well-preserved cylindrical bentwood container of late 17th century date was located in a yard area adjacent to the north of Building 2 (figs 19 and 29). The container was probably used as a small soakaway or sump. It was *c* 320mm in diameter and survived to a height of 165mm and had been made from a fast-grown, radially split and shaved, board of oak *c* 3–4mm thick that presumably had been bent by heat or steam. The ends overlapped and were fastened with small iron tacks. The lower edge had occasional peg holes that must have originally secured the base that was missing when found. Other bentwood boxes have been found in medieval and later deposits in London (for example at Suffolk House, City of London, Goodburn 2001) and such vessels had many uses from hat boxes to corn measures by *c* 1800.

Woodwork exposed south of Chambers Street in trench 5

The woodwork exposed in trench 5 all appeared to have been of *c* 17th century or later date, comprising a pile and plank-revetted drain, a later log pipe, and some probable foundation piles. As the trench was evaluated only, few of the timbers were fully exposed for detailed recording, but the general character of many of its elements was clear.

Within the trench there appeared to have been several phases of drain-lining (recorded above as Phase 6), but unfortunately recorded under less than ideal conditions. These exposed piles were mainly of oak and were clearly re-used with relict joints and fastenings. The planking was of two main types: some was of pit sawn softwood planking, rare before the late 17th century in London, and other sections were clearly of clinker-built boat origin. The edges of the slightly crushed boards were pierced with small nail holes that were originally used for the rove nails holding the overlapping boards of the boat's hull together (Milne *et al* 1998, 70). The whole of the inside of the drain was covered in a creamy lime-type deposit and the species of the clinker-built boat boards could not be seen for that reason. It is possible that the deposit was laid down by effluent from nearby tanneries. Some ship caulking materials were seen in the backfill of the drain cut. Some of the piles that were not clearly on the line of the drain probably functioned as foundation piles, but they were of broadly similar condition and character to those of the drain revetment.

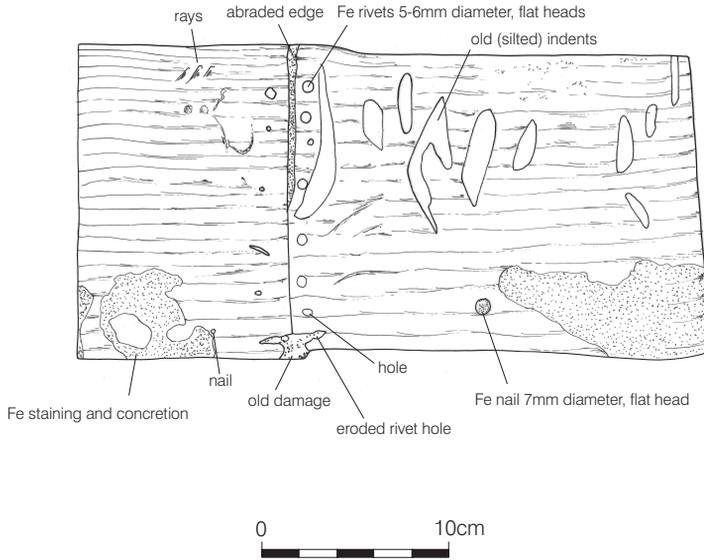


Fig 29 Bermondsey Wall West. An oak bentwood box (341) re-used as a sump or soakaway.

The log pipe, located to the west of Building 1, was in two sections: one of elm joined with the usual tapered male and female fit and a small softwood pipe section. The use of softwood for pipes is very rare in London.

Woodwork exposed in trench 1

Trench 1 for the most part lay to the south of a known dry-dock site, which is not shown on Horwood’s 1799 map, but does appear on the map of 1819 (fig 24). The later deposits visible in the edges of the trench at this time comprised alternating layers of thin planking over deposits of gas (?) tar, rope fibre and wood-chip layers. These tarry deposits also contained chips of yellow/brown resin and small wooden wedges that may have been treenail wedges. Unfortunately these deposits of maritime industrial debris (MID) were too contaminated to sample. The planking was a mix of tropical hardwood and softwood and probably dated to the 19th/early 20th century. The deposits appear to represent a series of ship or barge yard working surfaces.

Beneath these MID deposits a dark grey foreshore deposit could be seen, bounded on the west side by edge-set north–south softwood planking that must have been part of a substantial drain lining or a dock or river wall. The use of softwood again suggests a late 17th century or later date.

Re-used ship timber salvaged from spoil heaps to the west of the main area of excavation

From an area not subject to archaeological monitoring, five re-used timbers of uncertain origin were machined out from deposits below an adjacent warehouse and were briefly examined. Some were apparently found vertically set in clayey alluvium, and some laid horizontally. Those laid horizontally might have been parts of a set of ‘blocks’ or a ‘grid’ on which vessels were placed for repair and maintenance at low tide. All five timbers were large carvel ship frame elements from nearby breakers’ yards, some were floor timber fragments and at least one was a ‘first futtock’. All were of oak and were weathered when seen, with

oak treenails, and on technological grounds the timbers could be of 16th–19th century date. Another unprovenanced timber contained mortices and originated either from the internal structure of a vessel or possibly came from a building.

Small wooden objects – cooperage fragments

Several cooperage fragments were found including loose parts of a small stave-built vessel such as a tub or bucket (41) surviving as three fragments of abraded, radially cleft oak. Other cooperage debris included the desiccated remains of two very eroded radially split oak headpieces from small coopered vessels (402 and 403). Two softwood bungs were also found in context 506, the larger was *c* 55mm in diameter and the smaller 15mm; both probably originated from coopered vessels. In any maritime industrial zone cooperage was an important ancillary trade as so many materials from tar to wine to nails were carried in various forms of stave-built vessels.

CONCLUSION

Archaeological field recording and sampling work followed by detailed recording of timber and roundwood found on this site has thrown light on several areas of London region woodworking from the medieval to post-medieval periods. The investigation of the *c* 13th century wattle hurdles has illuminated little-known aspects of regional woodland crafts and woodmanship. The study of the re-used and offcut nautical woodwork has added to the corpus of information now accumulating for the key Southwark industries of ship, boat and barge building and of ship breaking. Lastly, the importance of the combined use of woody and earthen materials for land winning from the tidal marshes of this part of London has been demonstrated.

Archaeobotanical analysis, by Alys Vaughan-Williams

INTRODUCTION

Of the samples that were taken from the site seven were recommended for further analysis. All the samples were rich in waterlogged material, with only two charred grains found throughout. They contained a diverse range of species representing both aquatic and ruderal (rough ground) environments and preservation was predominantly good. Waterlogged wood and occasional fragments of charcoal were found in most of the samples. Six of the samples were taken from three consecutive fills of the 12th/13th century channel. Sample 6, from 444, was taken from a late 16th/early 17th century layer of sawdust (Phase 4). This report examines the nature of the environment through time, the consequent changes, as well as the influence the environment had on anthropogenic activity and *vice versa*. The results are summarised in table 2.

RESULTS

12th century

Sample <14> came from 480, the earliest context sampled, and the primary fill of the channel. Aquatics and plants of damp habitats were well represented through seeds of *Potamogeton* sp. (pondweed), *Eleocharis palustris* (common spike-rush), *Polygonum lapathifolia* (pale persicaria), *Rumex acetosa/crispus* (common sorrel/curled dock) and *Ranunculus repens* (creeping buttercup). Pondweed (*Potamogeton* sp.) in particular is an aquatic species, requiring a slow to moderate flow of water. The remainder are particular to shallow water or marshy ground. Ruderal ground is also suggested through the presence of *Sambucus nigra* (elder), *Polygonum* spp. (knotgrass) and *Rubus* sp. (brambles).

Table 2 Summary of the archaeobotanical analysis. Plant nomenclature and order of taxa follows Stace (1997)

Family	Sample Context	6	8	9	10	14	17	18
<i>Genus/species</i> (English name)	Period	16/17th	13th	12th	12th	12th	13th	13th
	Feature	s'dust	upper	lower	lower	l'fill	upper	upper
Ranunculaceae								
<i>Ranunculus repens</i> (creeping buttercup)		40	31	7	01	36	8	10
<i>Ranunculus sceleratus</i> (celery-leaved buttercup)		20	3	5	1	–	67	11
<i>Ranunculus trichophyllus</i> (thread-leaved water-crowfoot)		–	–	1	–	–	–	8
<i>Papaver</i> cf. <i>dubium</i> (long-headed poppy)		–	4	–	–	–	–	–
Urticaceae								
<i>Urtica dioica</i> (common nettle)		8	29	4	2	–	55	–
Betulaceae								
<i>Alnus</i> sp. (alder seeds)		–	–	–	–	2	–	1
<i>Alnus</i> sp. (alder catkins)		–	–	–	2	–	–	–
Chenopodiaceae								
<i>Chenopodium album</i> (fat hen)		–	–	–	–	4	–	–
<i>Atriplex</i> sp.1 (orache)		4	5	6	5	1	6	10
<i>Atriplex</i> sp. 2		–	46	3	9	12	–	3
<i>Atriplex</i> sp. 3		–	–	–	–	1	6	–
Caryophyllaceae								
<i>Agrostemma githago</i> (corncockle)		–	–	–	1	1	–	–
Polygonaceae								
<i>Polygonum lapathifolia</i> (pale persicaria)		–	2	–	3	16	–	–
<i>Polygonum hydropiper</i> (water-pepper)		–	–	22	–	–	–	45
<i>Polygonum</i> sect. <i>Avicularia</i> (knotgrass)		36	6	30	6	9	14	15
<i>Polygonum</i> sp. (knotgrass)		–	–	–	–	4	–	–
<i>Rumex acetosa/crispus</i> (common sorrel/curled dock)		36	29	12	4	28	28	41
Malvaceae								
<i>Malva</i> sp. (mallow)		220	–	–	–	–	–	–
Violaceae								
<i>Viola</i> ssp. (violet)		–	–	–	–	–	–	1
Saliaceae								
Indet		–	–	17	–	–	4	6
Brassicaceae								
<i>Brassica/Sinapsis</i> sp. (cabbage/mustard)		4	–	1	4	4	–	5
Rosaceae								
<i>Rubus</i> sp. (bramble)		–	–	1	1	6	–	4
<i>Potentilla</i> sp. (cinquefoil)		–	2	2	–	–	–	–
<i>Prunus</i> sp. (nutshell)		–	–	1	–	–	–	–
Vitaceae								
<i>Vitis vinifera</i> (grape)		2	–	–	–	–	–	–
Sparganiaceae								
<i>Sparganium erectum</i> (branched bur-reed)		–	1	–	–	–	–	1
Apiaceae								
<i>Berula erecta</i> (lesser water-parsnip)		–	1	–	–	–	–	–
Indet sp. 1 (carrot family)		8	–	–	1	2	–	2
Indet sp. 2		–	–	–	1	4	–	–
Indet sp. 3		–	60	–	3	1	4	14
Indet sp. 4		–	–	2	–	–	–	–
Solanaceae								
<i>Atropa bella-donna</i> (deadly nightshade)		4	–	1	–	–	–	–
Lamiaceae								
<i>Stachys</i> sp. (woundwort)		4	–	–	–	–	1	3
<i>Ajuga reptans</i> (bugle)		–	–	–	3	1	–	–
<i>Prunella vulgaris</i> (selfheal)		–	12	–	–	–	–	–
<i>Lycopus europaeus</i> (gypsywort)		–	11	6	–	–	8	2

Table 2 (contd)

	Sample	6	8	9	10	14	17	18
Family	Context	444	384	394	395	480	503	504
<i>Genus/species</i> (English name)	Period	16/17th	13th	12th	12th	12th	13th	13th
	Feature	s'dust	upper	lower	lower	1'fill	upper	upper
Plantaginaceae								
<i>Plantago</i> cf. <i>lanceolata</i> (ribwort plantain)		4	–	–	–	–	–	–
Caprifoliaceae								
<i>Sambucus nigra</i> (elder)		4	1	–	–	11	6	2
Asteraceae								
<i>Carduus</i> cf. <i>tenuifolius</i> (slender thistle)		–	–	20	–	–	10	37
<i>Cirsium</i> sp. (thistles)		–	–	90	1	–	81	51
<i>Onopordum acanthium</i> (cotton thistle)		–	–	2	–	1	–	2
<i>Centaurea</i> sp. (knapweed)		–	1	1	–	–	–	–
<i>Taraxacum</i> sp. (dandelions)		4	–	–	–	–	–	–
<i>Anthemis cotula</i> (stinking chamomile)		–	–	–	2	–	–	–
Indet (daisy family)		–	3	–	1	–	–	2
Potamogetonaceae								
<i>Potamogeton</i> sp. (pondweed)		12	2	5	–	2	2	5
Cyperaceae								
<i>Eleocharis palustris</i> (common spike-rush)		–	–	6	10	8	3	1
Indet (sedges)		4	7	12	4	8	15	3
Poaceae								
<i>Hordeum</i> sp. (barley grain – charred)		–	–	–	–	–	–	1
Indet (grass – charred)		–	–	1	–	–	–	–
Indet (pod – indet)		–	–	–	1	–	–	1

Samples <9> (context 394) and <10> (context 395) were taken from the fill above 480, but were similarly dated to the 12th century. The aquatic species *Potamogeton* sp. maintains a presence, as does *Eleocharis palustris* and Cyperaceae (sedges). *Lycopus europaeus* (gypsywort), occurs for the first time and is also associated with marshy locations or riverbanks. Seeds from the Asteraceae (daisy) family, especially thistles, make a dramatic appearance in <9>, along with occasional seeds from the Apiaceae (carrot) family. These can occur in a range of open habitats including ruderal, grassland, and cultivated gardens. *Rubus* sp. and *Brassica/Sinapsis* sp. (cabbage/mustard) are also occasional in these samples as either wild or cultivated plants. In addition, a single charred seed from the Poaceae (grass) family was present in <9>.

13th century

Samples <8> (context 384), <17> (context 503) and <18> (context 504) were taken from the upper fills of the same channel. A broader range of species was present, but represents a similar environment. Seeds of Cyperaceae, *Eleocharis palustris* and *Potamogeton* sp., along with abundant seeds from the buttercup genus with *Ranunculus repens*, *R. sceleratus* (celery-leaved buttercup) and *R. trichophyllus* (thread-leaved water-crowfoot). Sample <17> in particular contained a significant number of *R. sceleratus* seeds, which are particular to marshy fields or ditches. Numerous seeds of *Rumex acetosa/crispus*, which are commonly found in areas of damp grassland, occurred in all three samples. *Urtica dioica* (common nettle) was frequent to abundant in <8> and <17>, and <17> and <18> contained abundant Asteraceae seeds, predominantly *Carduus* cf. *tenuifolius* (slender thistle) and *Cirsium* sp. (thistles). These all inhabit a relatively wide range of habitats including grassland and potentially wet ground. *Polygonum hydropiper* (water-pepper), another favourite of shallow water or riversides, was a significant component of <18>, together with two fruits of *Sparganium erectum* (branched bur-reed).

One *Alnus* sp. (alder) seed was preserved, and there were few to numerous weed seeds including *Anthemis cotula* (stinking chamomile) and *Brassica/Sinapsis* sp., as well as *Urtica dioica*.

These are also found in ruderal environments. A single charred *Hordeum* sp. (barley) grain was present, but poorly preserved.

16th/17th century

Sample <6> (context 444) was the only sample from the post-medieval phase, and was taken from a layer of sawdust and wood chippings, which was reflected in the flot. Around 50% of this assemblage was composed of *Malva* sp. (mallow), which flourishes mainly in grassy and waste places (Stace 1997). These ruderal environments were also represented by the presence of *Ranunculus repens*, *R. sceleratus*, *Sambucus nigra* and *Plantago lanceolata* (ribwort plantain). *Urtica dioica*, *Corydalis* sp. (corydalis), *Stachys* sp. (woundwort) and *Brassica/Sinapsis* sp. populate such habitats as well, though they can be found in woodland and on cultivated land. The aquatic pondweed (*Potamogeton* sp.) was still present along with occasional sedges (Cyperaceae). Two grape pips (*Vitis vinifera*) were also found.

DISCUSSION

Flood events were frequent occurrences in the medieval era, resulting in much of Southwark remaining marginal until land reclamation measures were taken in the form of ditches and embankments (Divers 2002; Ridgeway 2003). At Bermondsey Wall West this is reflected in the aquatic and shallow water plants found throughout all of the samples, including the post-medieval sample <6>, as well as the ruderal plants that prefer damp rather than dry soils. Previous excavations in the area reflect both these environments. The work undertaken during the Jubilee Line Extension found evidence of a ruderal nature in several samples containing waterlogged plant remains, including *Rumex* spp., *Polygonum* spp. and *Sonchus* sp., along with occasional wetland plants (Knight 2002, 6). Other Southwark sites, such as Borough High Street and Finck Street, also reflect this disturbed and marshy environment, with many similar plants preserved such as seeds from the Cyperaceae family, *Lycopus europaeus*, *Polygonum* spp. and *Ranunculus* spp. to name but a few (Tyers 1988).

In the upper channel fills large numbers of thistle seeds were present, suggesting that a greater area of rough ground, possibly pasture, was present around the channel at this time. The preference of thistles for open ground together with a lack of any substantial evidence for trees from the plant macrofossils indicates a predominantly open landscape. Although only one charred grass grain was recovered from these samples this, in combination with the presence of ruderal and hence disturbed ground plants, does indicate that there was human activity in the vicinity. Some of the area may have been turned over to pasture in response to a growing population requiring space for its animals. The still precarious position of this area on the flood plain is unlikely to have encouraged extensive settling.

The evidence suggests therefore that the channel held a slow-flowing water supply that was subject to frequent flooding due to the environmental conditions at the time. The channel would have sustained pondweed and other aquatic weeds, while the constantly damp, marshy, fields around the channel were colonised by those plants that flourish in open rough ground or grassland, such as the common spike-rush, sedges, docks and water-pepper. Samples <8>, <17> and <18> show little change in the upper fill. The greater presence of the *Apiaceae* spp. (carrot family), along with other grassland species indicates that a drier environment had developed around the channel. However, with species such as gypsywort joining the sedges and rushes, marshland or, at least, wetlands must still have prevailed around the channel.

The post-medieval sample, coming from a layer of sawdust, is clearly related to human activity. However, little in the way of domestic foods was present. Waterlogged wood is abundant in the sample, and it is likely that the associated seeds reflect the environment from which this came. With a mixture of *Taraxacum officinale* (dandelion), *Rumex* sp., *Malva alcea* and *Chenopodiaceae* spp. among others, fairly extensive grassland is indicated along with woodland, which may have provided the raw material for the sawdust and wood-chippings.

However, it is not possible to say where these materials originated. In addition to these, garden species are hinted at through *Corydalis* sp., and trade through grape seeds (*Vitis vinifera*).

CONCLUSION

A consistently damp environment is presented from the mid-late medieval period through to the early post-medieval period. The channel clearly had a constant slow to moderate flow of water passing along it and the vegetation around the channel indicates a generally damp habitat, probably to the point where there was fairly extensive marshland. There are no indications from the plant macrofossils of any significant changes during the medieval period, although the appearance of numerous seeds from the carrot family and thistles suggests that it had become slightly drier after the primary fill had occurred. The abundance of mallow seeds in sample <6> indicates grassland or pasture was present along with woodland. Human activity is represented by the presence of two charred Poaceae grains in the medieval phase, as well as by the occurrence of plants of disturbed habitats. However, the proximity and scale of this activity cannot be determined.

Mollusca, by D H Keen

THE FAUNA

The molluscan assemblage consists of seven freshwater and three marine species (see table 3). Most numerous were shells of *Bithynia tentaculata*, although *Lymnaea peregra* was also quite common with other species being represented by fewer than ten individuals. Shell condition was good, with the fine growth lines of *Pisidium amnicum* and the colour bands of *Theodoxus fluviatilis* both well preserved. The marine species were present as shell fragments and represent the minimum number of individuals in the sample.

ENVIRONMENT INDICATED BY THE MOLLUSCA

The molluscan assemblage contains only a limited number of species and this restricts the comments that may be made about the environment of deposition. However, the occurrence of *T. fluviatilis* and *P. amnicum* indicates flowing rather than standing water. The small number of opercula of *B. tentaculata* compared with the rather large number of shells (ratio 1:26) also indicates flowing water sufficient to have separated the buoyant shells from their opercula *post mortem* and to have washed the shells away from the site of death (see Horton *et al* 1992 for discussion of this *Bithynia* ratio). The large numbers of *B. tentaculata* suggest an amount of aquatic vegetation (see Vaughan-Williams, above), although the complete absence of shells of Planorbidae is puzzling as members of this weed-dwelling family are almost always present when *B. tentaculata* occurs in numbers. The presence of a juvenile specimen of *Unio tumidus* indicates a water depth perhaps greater than 1m and the excavations suggest a minimum depth of 1.2m. The occurrence of *T. fluviatilis* suggests areas of hard substrate (pebbles, driftwood) as this species is a limpet, requiring hard surfaces for attachment and grazing the algae on which it feeds. The presence of *L. peregra* may indicate areas of muddy river bottom, as this is the preferred habitat of the species, although it is catholic in its habitat and will live in most watery environments. None of the freshwater species are totally intolerant of brackish conditions and *T. fluviatilis* is recorded by Kerney (1999) as readily tolerating salinities of up to 2.5‰. This being so, and the occurrence of three marine taxa (below), it is strange that no shells of the abundant brackish family, the Hydrobiidae, occurred in the sample.

The three marine taxa are all bivalves that have been used as food from early times and might perhaps be considered as food debris. However, the shell sizes present at Bermondsey Wall West are so small that their occurrence must represent their presence as a natural part

Table 3 Mollusca

Freshwater species	No	Marine species	No
<i>Theodoxus fluviatilis</i> (Linné 1758)	7	<i>Mytilacea undet</i>	2
<i>Valvata piscinalis</i> (Müller 1774)	4	<i>Ostrea edulis</i> (Linné 1758)	1
<i>Bithynia tentaculata</i> (Linné 1758)	53	<i>Cerastoderma edule</i> (Linné 1758)	1
Opercula	2		
<i>Lymnaea truncatula</i> (Müller 1774)	1		
<i>Lymnaea peregra</i> (Müller 1774)	17		
<i>Lymnaea</i> spp.	2		
<i>Unio tumidus</i> (Philipsson 1788)	1		
<i>Pisidium amnicum</i> (Müller 1774)	1		
<i>Pisidium</i> spp.			
Total (7 species)	88	Total (3 species)	4

of the fauna. All three taxa have wide salinity tolerances (Peacock 1993), and are common species of estuaries and lagoons around British coasts (Seaward 1982), although none are usually found in salinities of below 7‰. This value is somewhat higher than the maximum salinities under which the freshwater molluscs survive, so there is clear evidence of mixing of two populations of Mollusca, one from fluvial, the other from estuarine sources. The depositional situation was possible due to the site being located close to the stream/river mouth into which brackish/marine species would have been introduced by tidal action.

In summary, the environment of deposition was either a slow-flowing, predominantly freshwater, stream (as indicated by the plant fossils), but one which had saline (probably tidal) influences sufficient to allow the presence of marine bivalves in the area, or an estuary into which freshwater molluscs were washed in times of flood. Muddy and stony substrates were present and abundant aquatic vegetation occurred in the freshwater environment. Water depths may have been in excess of 1m. The absence of land molluscs rules out any comment on the land environment adjacent to the site of deposition.

Conclusion

While the riverfront has been investigated in some detail on both sides of the river in the City and Southwark west of Tower Bridge, the waterfront to the east is less well studied. Recent excavations at such diverse sites as Adlards Wharf, Deptford Power Station and Rotherhithe (Divers 2002; 2004; Heard with Goodburn 2003) have revealed a wealth of information regarding the docks and maritime history of the area. The archaeological investigations at Bermondsey Wall West have made an important contribution to the study of the area. The discovery of a possible medieval mill tail-race or beaching place provides a glimpse of the waterfront environment during that period. The information regarding the river defences is a significant step towards understanding the date of, and techniques employed in, the construction of the embankment. Important evidence has also been uncovered as to how the natural landscape of the area was modified by the damming and covering of at least one small channel. However, it can be seen that present knowledge regarding the river defences is still in its infancy and it must remain a priority research question for the area to attempt to determine the date and construction techniques of each successive attempt to raise defences against the encroaching river. A complete cross-section of the wall has yet to be uncovered. There is tentative evidence of at least two phases of such work – a medieval and a post-medieval one – on the subject site and the suggestion in the timbers used of an *ad hoc* and rather piecemeal approach with perhaps individual tenants of large landlords having to accomplish the work with whatever material came to hand. Such an hypothesis can only be tested by further excavation along its length. More evidence for urban spread along the river bank has

been forthcoming and the site provided useful information regarding this development in the period between the 17th and late 19th centuries.

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