CITY OF
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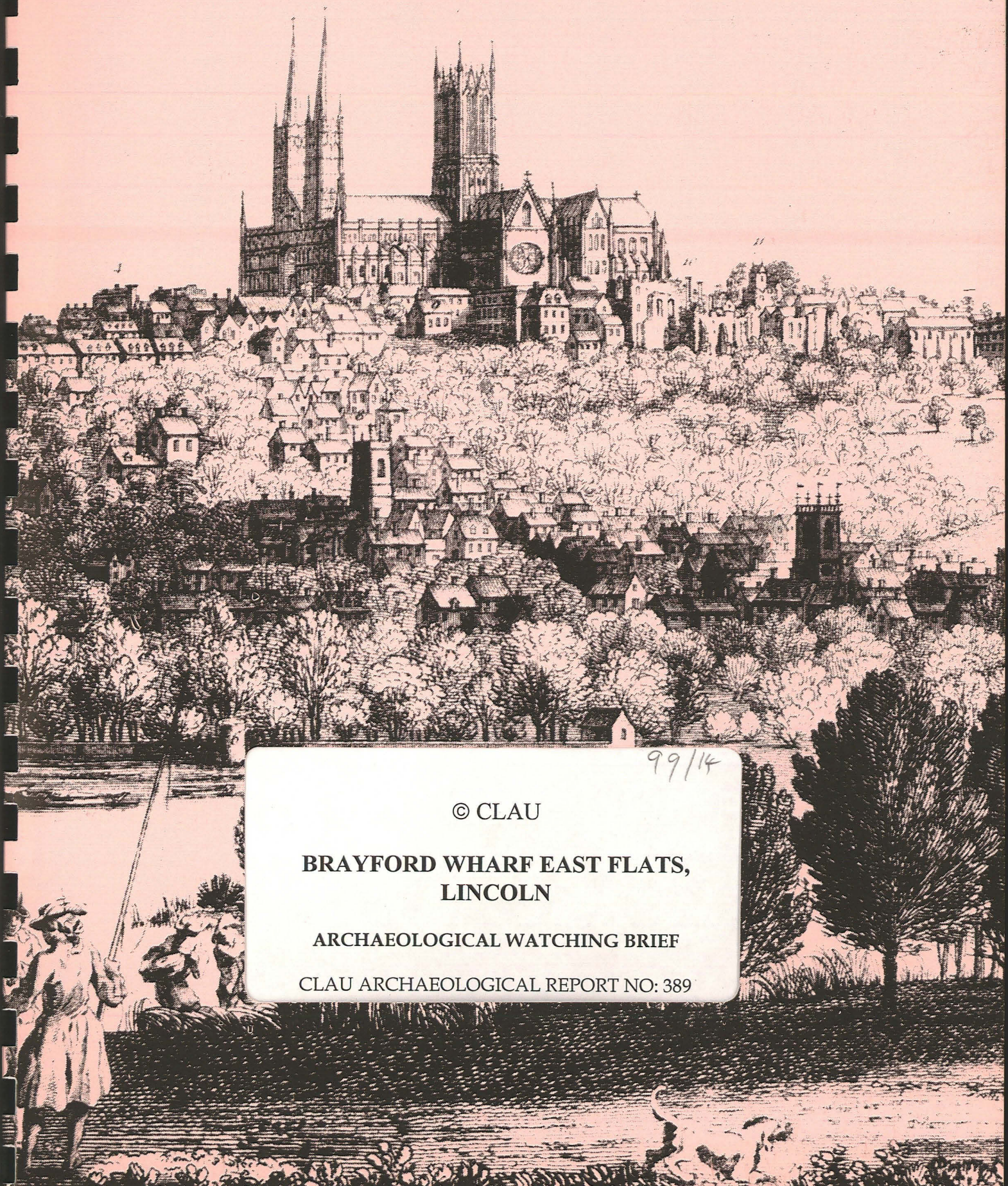
UNIT



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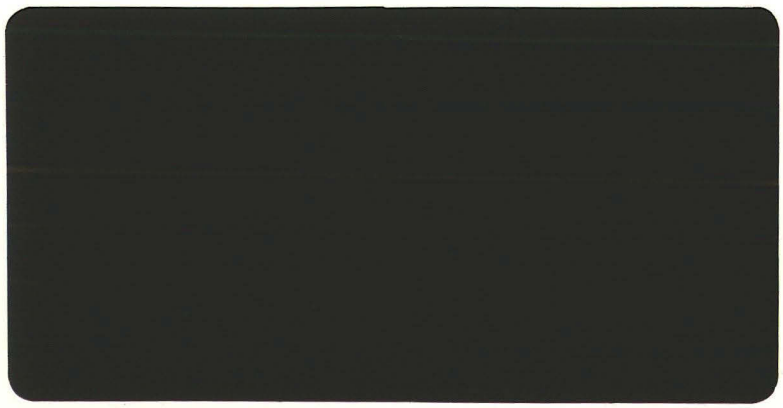
BRAYFORD WHARF EAST FLATS, LINCOLN

ARCHAEOLOGICAL WATCHING BRIEF

CLAU ARCHAEOLOGICAL REPORT NO: 389



A
Report to
The
Kingswater (Lincoln) Ltd
and
Lindum Group
Partnership

August, 1999

Prepared by

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BRAYFORD WHARF EAST FLATS, LINCOLN

ARCHAEOLOGICAL WATCHING BRIEF

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BRAYFORD WHARF EAST FLATS, LINCOLN

ARCHAEOLOGICAL WATCHING BRIEF

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BRAYFORD WHARF EAST FLATS, LINCOLN

ARCHAEOLOGICAL WATCHING BRIEF

NON-TECHNICAL SUMMARY

Between 21st September and 4th November 1998, the City of Lincoln Archaeology Unit undertook an archaeological watching brief, on behalf of the Kingswater (Lincoln) Ltd and Lindum Group Partnership, on the site formerly occupied by Hercock's warehouse, Brayford Wharf East, Lincoln. The watching brief was carried out during groundworks associated with the construction of a 6-storey block of flats on the site. The client had commissioned the CLAU to carry out an archaeological evaluation of the site during 1998, and subsequently, to produce a mitigation strategy document designed to protect, through design mitigation measures, the buried archaeological resource.

Plate 1: General view of the site, looking west as the development's groundwork progresses. Although apparently destructive, mitigation measures have ensured that much of the buried archaeological resource has been preserved in situ.

Mitigation measures achieved a high level of preservation on the site, and as a result of this the watching brief revealed little new evidence regarding the archaeology of the site. Groundwork excavation, although penetrating deeper than the site's earlier archaeological evaluation, revealed the nature of deposits to be very similar to those revealed by the evaluation. Events representing medieval and post-medieval land reclamation were recorded and fit securely in to the archaeological sequence already identified (during the evaluation of the site).

The analysis of the three commercial borehole samples, taken during the site's evaluation, was also carried out as part of this report, and concluded that during the Saxon to medieval periods the area in question was a marshy environment and was probably unsuitable for wharfing or boats.

BRAYFORD WHARF EAST FLATS, LINCOLN

ARCHAEOLOGICAL WATCHING BRIEF

1.0 INTRODUCTION

Between 21st September and 4th November 1998, the City of Lincoln Archaeology Unit (CLAU) undertook an archaeological watching brief, on behalf of the Kingswater (Lincoln) Ltd and Lindum Group Partnership, on the site formerly occupied by the now-demolished Hercock's warehouse, Brayford Wharf East, Lincoln. The watching brief was undertaken in order to discharge an archaeological condition on the granting of planning permission for the construction of a 6-storey block of flats on the site (Planning Application No. 98/115/F). Previously the client had commissioned the CLAU to carry out an archaeological evaluation of the site (Jarvis, 1998). The client subsequently commissioned the CLAU to produce a mitigation strategy document using the results from the site's earlier evaluation. The mitigation document was designed to protect, through design mitigation measures, the buried archaeological resource. This document also set out such measures to ensure that, if destruction to archaeological remains was unavoidable, a strategy to record them adequately could be implemented (see mitigation document - Hockley, 1998).

The Site is centred upon National Grid Reference SK 9737 7110 in the triangular parcel of land bounded by Wigford Way to the north-east, Brayford Wharf East to the west and the CGU building and NCP car-park to the south (see Fig. 1).

2.0 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Archaeological interest in this site lies in the westward movement during the 10th-16th centuries of the edge of Brayford Pool. Excavations carried out in 1972/3, immediately to the south of the site, beneath the area now occupied by the CGU building, showed that reclamation of the Brayford had advanced the medieval waterfront westwards by over 50m during this period. The 1998 evaluation of the site was partly designed to establish the position of the medieval waterfront, and at what depth below ground level archaeological remains survived.

The case for any substantial pre-historic settlement in Lincoln remains unproven, although traces of 1st Century BC activity have been identified through pottery of Late Iron Age or early Roman date recovered during excavations at the former site of 181-3 High Street (HG72) approximately 100m south-east of the proposed development location.

The site lies 140m west of Ermine Street, the main north-south Roman road through the city. Previous excavations have revealed evidence indicating that the Roman waterfront lay approximately 50m east of the site. Abandonment of the Roman City seems to have started in the late 4th Century, with town life reduced to a small community between the 5th and 9th centuries. Following the Viking take-over of Lindsey in 874, Lincoln became a centre for a Viking army and, subsequently a Viking Town. Evidence for increasing urbanisation in the 10th and 11th centuries has emerged from all parts of the former Roman settlement. Earlier excavation has demonstrated that extensive reclamation began during this period leading to a rapid westward movement of the east bank of the Brayford Pool. The 1998 evaluation revealed no evidence for Pre-Roman, Roman or Anglo-Saxon occupation as the area occupied by the site was thought to have lain within the pool until after the Norman Conquest. However, the earlier, deeper deposits may contain artefactual remains, environmental evidence, and even boat remains belonging to these periods.

The main post-Conquest change to be noted archaeologically was the introduction of stone buildings which commenced in the late 12th or early 13th century. Excavations carried out 200m south of the site, on the former site of Dickinson's Mill (DM72) in 1972/73, showed that the east bank of the waterfront

was advanced by c.65m between the 10th and 13th centuries. Evidence found during the site's 1998 evaluation for medieval occupation on the site revealed it to be associated with reclamation of the Brayford Pool. Extensive westward dumps of soil across the site suggested that the medieval waterfront lay close to the line of the present day frontage. A stone structure, possibly a building, was also found towards the south-eastern corner of the site. Archaeological evidence suggested that this structure was erected during the early/early-mid 13th century and was subsequently demolished sometime in the late medieval period (15th century).

The 14th to 17th centuries saw a period of decay in the city with some abandonment of previously occupied areas. Recovery occurred from the 18th century when the Brayford Pool was turned into an inland port, with substantial wharves and warehouses attesting to the rapid growth in the city's fortunes. Maps and documentary sources indicate occupation of the site during this period culminating with the early 19th century construction of a series of buildings, most recently the now demolished Hercock's Banana Warehouse. Early post medieval activities recorded during the evaluation of the site were revealed to be deposits indicative of further reclamation/levelling. This, and a further, subsequent build-up of ground level during the 16th century, also appeared to be consolidating the land first reclaimed during the medieval period.

3.0 AIMS & METHODOLOGY

The aims of the watching brief were:

A. to produce an archive record of deposits and remains generally within the constraints of the groundwork contractors' working methods and programme as related to the project design, with due regard to current Health and Safety legislation.

B. to produce a report on the archaeological importance of the discoveries.

C. to produce a project archive from which the potential for further study and academic research could be assessed.

D. to provide information for accession to the County Sites and Monuments Record (SMR) and the Lincoln Urban Archaeological Database (UAD).

Archaeological Methodology

All archaeological features were recorded on CLAU pro-forma context record sheets. Scale drawings of sections and plans of archaeological features were made and a full photographic record compiled.

All artefacts, deposit samples and other material recovered and retained from the investigations were packed and stored in the appropriate materials and conditions to ensure that minimum deterioration took place and that their associated records were complete.

4.0 ANALYSIS & CONCLUSION

Design mitigation measures, as set out in the mitigation strategy document, had, for the most part, greatly reduced archaeological interventions on the site, preserving *in situ* much of the buried archaeological resource. Although archaeological deposits were encountered during many of the groundworks observed, the nature of the stratigraphy limited its interpretation and recording beyond a basic level.

4.1 Analysis

Enabling Works

Prior to the commencement of piling, and the subsequent excavation of groundbeams and pile-caps, the site had to be levelled (Formation level: *c.*5.33m OD). This operation was carried out by mechanical excavator, under archaeological supervision, and as stated above, the nature of the

archaeology, compounded by the site contractor's working methodology, meant that only limited interpretation of the deposits found was possible.

Groundbeam & Pile-cap excavation (Figs. 2 & 3 and Plate I)

Monitoring the excavation for groundbeams and pile-caps revealed little in the way of interpretable information. Mitigation measures did much to reduce the impact of the development on the site. Excavation for a pile-cap group, immediately to the north of the lift pit, revealed at its deepest point (4.86m OD), [016], a compact, grey/brown clayey silt deposit, thought to be associated with late/post medieval reclamation of the Brayford Pool area. Lying above [016] was [015], which was revealed to consist of 3 horizontal bands of firm, light grey ash/clay with very frequent charcoal inclusions (4.93m OD). [015] was considered to represent an occupation surface. Sealing [015] at 5.40m OD was [014], an extensive (up to 700mm thick) dump of compact, mid grey/brown clayey silt (very similar to a late/post medieval reclamation dump found during the site's 1998 evaluation). A large pit feature, [013], was noted cutting in to [014]. This pit was seen to be 2.5m wide and in excess of 700mm deep, continuing below the base of the groundbeam trench. Small limestone fragments forming the piling mat sealed the pit and deposits exposed at ground level. No further features and/or deposits were recorded during the excavation for groundbeams and pile-caps.

Plate II: General view of the lift pit trench looking south-east.

Lift Pit (Figs. 2 & 3 and Plate II)

Although the excavation for the lift pit was the most intrusive of all the groundworks monitored during the watching brief (maximum depth - 3.78m OD), little new information regarding the site's archaeological content was revealed. The earliest deposit encountered was [010], an extensive (600mm+ thick) deposit of dark brown silty sand with interleaved lenses of organic material (4.35m OD). This deposit probably related to the reclamation events dated to the 13th century and revealed during the 1998 evaluation of the site. Overlying [010] were several narrow bands of north-sloping silty soil forming a second reclamation event ([004]-[009] - 4.98m OD). As with [010], this event can be placed within the sequence recorded during the evaluation as late/post medieval in date. Deposits and features associated with Hercock's warehouse ([002] & [003] - 5.18m OD), sealed the previously described event. A 200mm - 500mm thick deposit of limestone fragments laid down by the contractor

to form a level platform for the piling machine ([001]) constituted the latest deposit present. No further features and/or deposits were recorded in the area of the lift pit.

Drainage

For the most part, drainage for the new development was located above existing ground level (the flats were located on the 1st floor, the ground floor being given over to car-parking). Connection of the foul-water drainage into the existing system, present beneath Brayford Wharf East, did not impact upon archaeological deposits, being contained within previously disturbed ground.

4.2 Conclusions

The watching brief has revealed little new evidence regarding the archaeology of the site. Although some of the groundwork penetrated deeper than the site's earlier evaluation, the nature of the deposits revealed was very similar. No further evidence for the stone building found during the evaluation was forthcoming.

Analysis of the samples recovered as part of the pre-construction commercial bore-hole programme, and later analysed by an environmental archaeologist, revealed valuable information regarding the environment of the Brayford area during the Roman to late medieval periods - see Appendix 4. In summary the analysis of the samples concluded that deposits associated with Saxon to medieval periods are present below the levels reached during the evaluation of the site and that these deposits indicate a gradual reclamation of the edge of Brayford Pool rather than a rapid undertaking as was previously found to the south of the site at Dickinson's Mill. Analysis of the sediments suggest that here the banks of the pool were shallow with silt and reed beds present and probably indicate its unsuitability for boats or wharfing during this period. Evidence for iron working was recovered from the boreholes as were domestic animal bone, fish bone, shells, nuts and fruit stones and other debris normally associated with urban refuse of the period.

5.0 ACKNOWLEDGEMENTS

The City of Lincoln Archaeology Unit would like to thank the Kingswater (Lincoln) Ltd and Lindum Group Partnership for funding the watching brief, and thanks are especially extended to David Trinder, Geoff Taylor and David Coy of the company.

Project Team

Michael Jarvis	Project Officer (Field/Post-excavation)
John Hockley	Projects Manager
Mick Jones	Editor
Jenny Mann	Registered Finds/Ceramic Building Materials
Jane Young	Post-Roman and later pottery (Lindsey Archaeological Services)
James Rackham	Environmental Specialist (The Environmental Archaeology Consultancy)

6.0 BIBLIOGRAPHY

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NOTE

The information in this document is presented with the proviso that further data may yet emerge. The Unit, its members and employees cannot, therefore, be held responsible for any loss, delay or damage, material or otherwise, arising out of this report. The document has been prepared in accordance with the terms of the Unit's Articles of Association, the Code of Conduct of the Institute of Field Archaeologists.

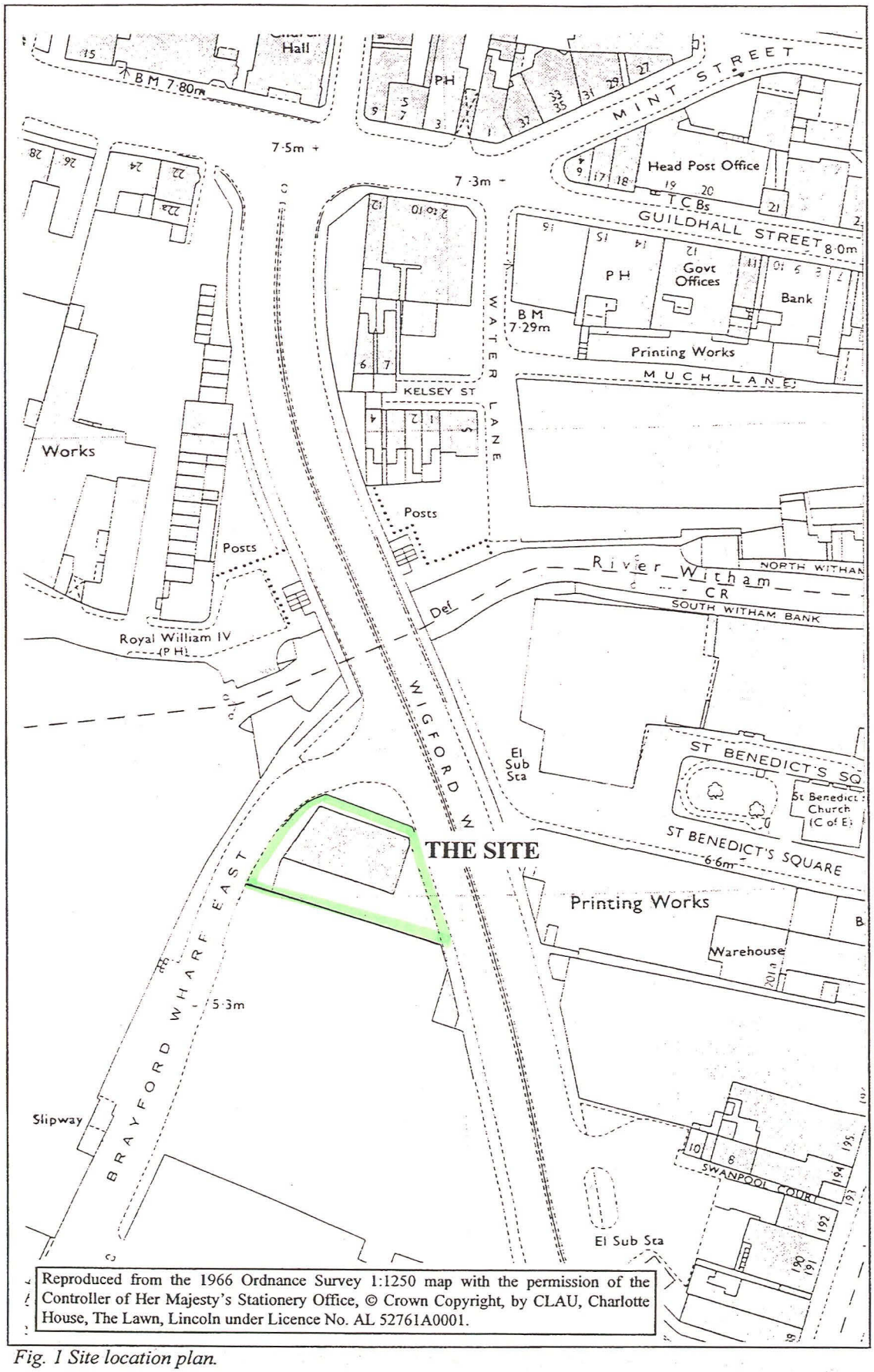


Fig. 1 Site location plan.

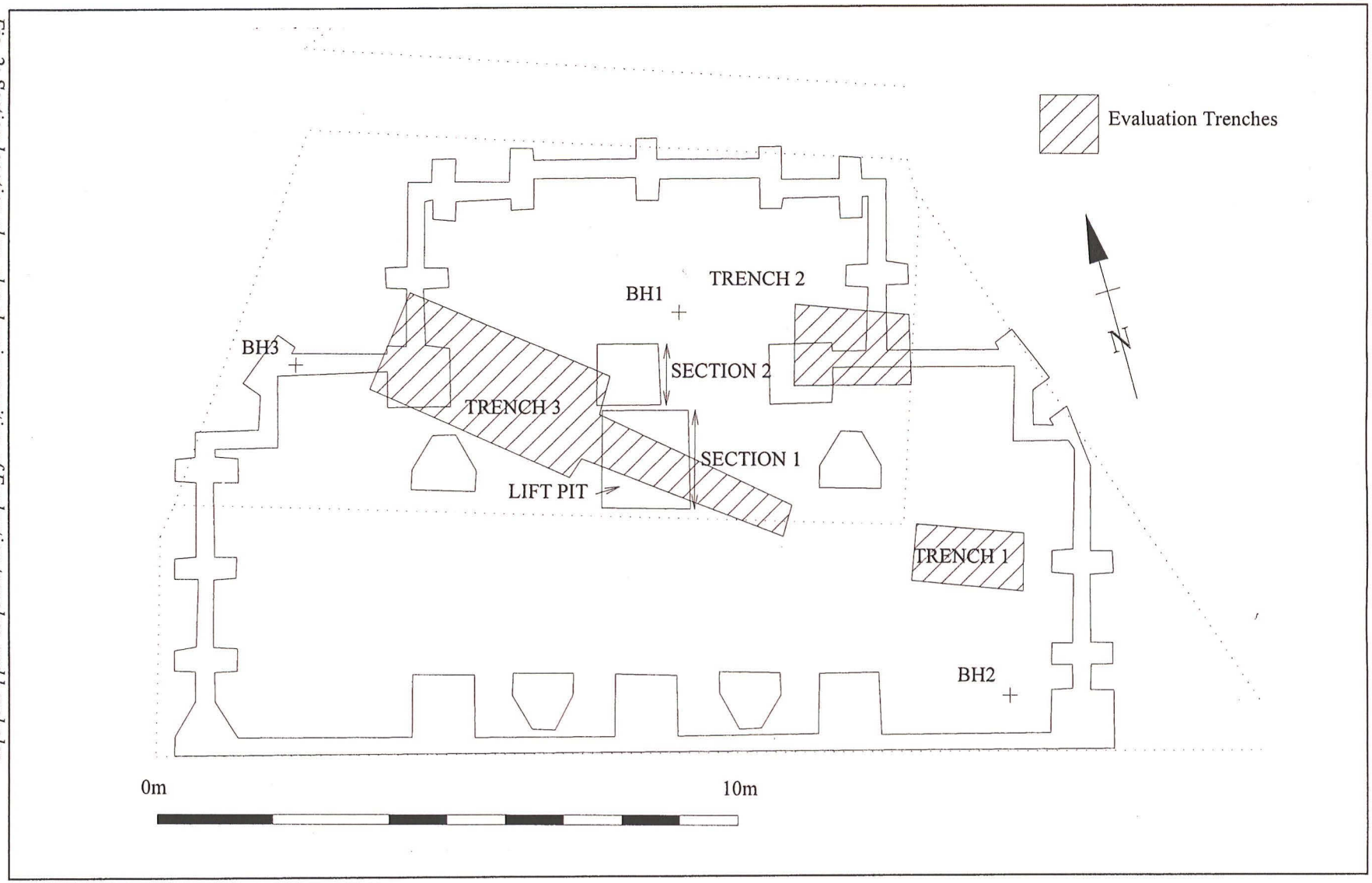
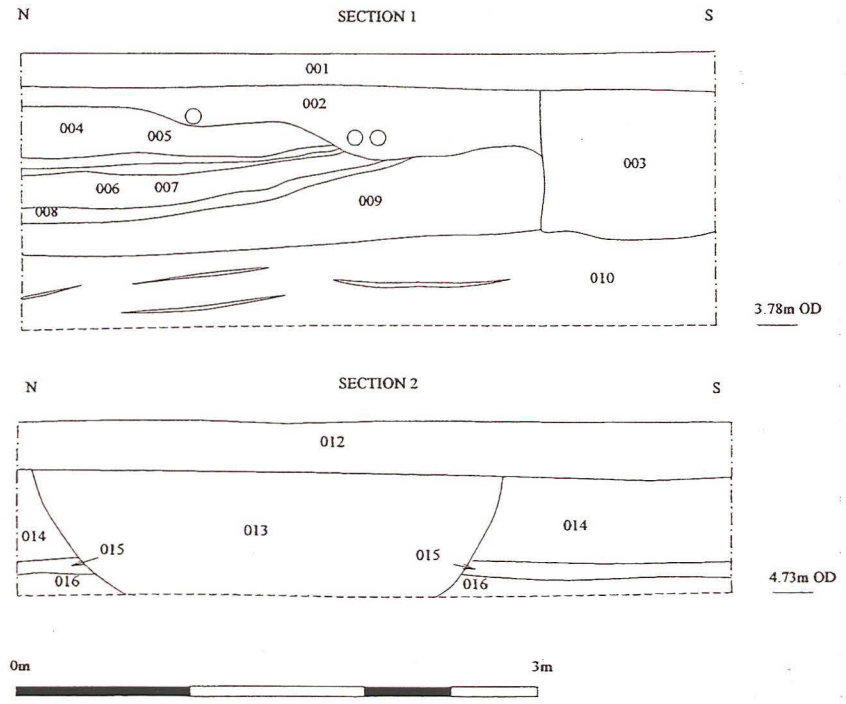


Fig. 2: Section location plan, also showing position of Evaluation trenches and boreholes.



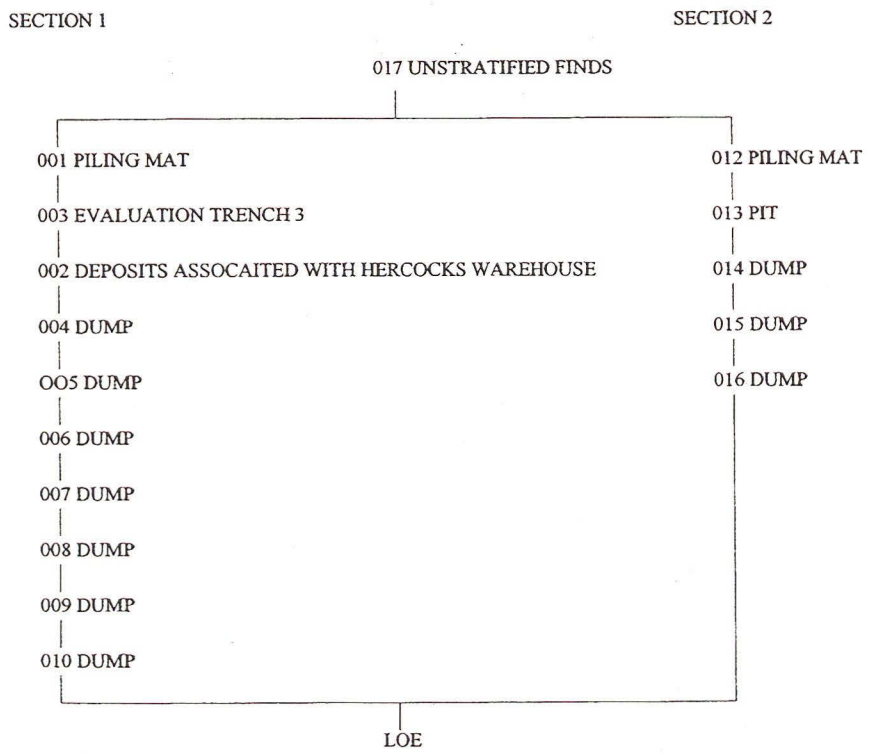


Fig. 3: Sections 1 & 2 and Stratigraphic matrices.

BRAYFORD WHARF EAST FLATS, LINCOLN,

ARCHAEOLOGICAL WATCHING BRIEF

APPENDIX 1 - LHA NOTE & ARCHIVE DETAILS

LHA NOTE DETAILS

CLAU CODE: BWEG98

CLAU REPORT No.: 389

PLANNING APPLICATION No.: 98/115/F

FIELD OFFICER: Michael Jarvis

NGR: SK 9737 7110

CIVIL PARISH: Lincoln

SMR No.: -

DATE OF INTERVENTION: 21st September - 4th November 1998

TYPE OF INTERVENTION: Watching Brief

UNDERTAKEN FOR: Kingswater (Lincoln) Ltd and Lindum Group Partnership

ARCHIVE DETAILS

PRESENT LOCATION: City of Lincoln Archaeology Unit, Charlotte House, The Lawn, Union Road, Lincoln, LN1 3BL.

FINAL LOCATION: The City and County Museum, Friars Lane, Lincoln.

MUSEUM ACCESSION No.: 183.98

ACCESSION DATE: -

BRAYFORD WHARF EAST FLATS, LINCOLN,

ARCHAEOLOGICAL EVALUATION

APPENDIX 2 - CONTEXT SUMMARY

Context	Section	Brief Description
001	1	type one stone
002	1	accumulation of many soils related to the occupation on the site of banana warehouse.
003	1	BWEF98 evaluation trench 3
00	1	firm compaction, mid brown silty soil with occasional-frequent shell and charcoal inclusions
005	1	firm compaction, mid brown silty soil with occasional-frequent shell and even more frequent charcoal inclusions
006	1	firm compaction, pale brown ashy soil with charcoal, shell and tile flecks
007	1	Firm compaction, light green/brown silty soil with occasional/moderate shell, bone, tile and charcoal flecks and fragments
008	1	firm, light green (brown hue) sand/silt deposit with occasional charcoal and coal flecks and fragments
009	1	firm compaction, mottled grey/green sandy silt with occasional small angular limestone fragments, charcoal/coal and shell flecks
010	1	firm-plastic, mid-dark brown silty sand deposit with interleaved lenses of organic material. occasional small angular limestone fragments, some charcoal and tile flecks
011	n/a	n/a
012	2	type one stone
013	2	compact mid-grey/brown clay silt containing frequent charcoal and small angular limestone flecks. some roof tile
014	2	firm compaction, mid brown clay/silt soil containing occasional-frequent shell and charcoal flecks
015	2	firm-plastic compacted, bands of light grey ashy clay with very frequent charcoal and shell flecks and fragments
016	2	compact plastic, grey/brown clay soil with occasional shell and charcoal flecks
017	2	unstratified finds from site

BRAYFORD WHARF EAST FLATS, LINCOLN,

ARCHAEOLOGICAL EVALUATION

APPENDIX 3 - FINDS ASSESSMENT

Assessment Report on the Ceramic Building Material

Jane Young

Introduction

Thirty five pieces of ceramic building material were recovered from the site. These were examined and recorded at a basic archive level (form type by fragment count and weight, with note of diagnostic subform) using locally recognised codenames.

Condition

With the exception of a few small pieces of tile (weighing below 20g) and two friable fragments of fired clay, the material recovered was not particularly worn and consisted of medium to fairly large sized fragments (mostly weighing between 50g and 175g). Less than one quarter of the tiles have mortar adhering, some with mortar over both sides. The unglazed floor tile is well worn on the upper surface.

Overall Chronology and Source

The range of ceramic building types present is limited to unglazed flat roof tiles, two fragments of fired clay and single examples of a late post-medieval or early modern drain and a floor tile. With the exception of the floor tile and drain all of the material is likely to be of Lincoln or local manufacture.

Only three suspension nibs were found. Two are likely to date to the 13th century and one to the 14th century. The remaining flat roof tiles date to between the late 12th and the 16th centuries.

Further work

The unglazed floor tile should be retained until it can be dated more closely.

Assessment Report on the Pottery

Jane Young

Introduction

An assemblage of 32 post-Roman sherds ranging in date from the medieval to the post-medieval period was recovered from the site. The pottery was examined and recorded at basic archive level (ware type by sherd count with note of diagnostic vessel form and date) using locally recognised codenames.

Condition

The assemblage consisted of unworn medium to fairly large sized sherds, many of which had fresh breaks. Despite this, only four vessels were represented by more than one sherd. One post-Medieval vessel has a white internal deposit.

Overall Chronology and Source

Few of the vessels present on the site were of Lincoln or local manufacture. Most of the material is regionally imported from production centres within the East Midlands and Yorkshire, and one vessel is a continental import.

A small number of sherds (4) date to the medieval to late medieval periods. Three blackware vessels are probably of 18th century date. The remaining material is of mid 16th century to mid 17th century date and includes a single continental imported stoneware drinking jug. The range of vessel types includes jugs, jars, drinking jugs, and cups.

Further work

1) This assemblage should be further fabric- and form-typed as part of any regional work on post-medieval pottery. Two vessels are capable of being illustrated.

BRAYFORD WHARF EAST FLATS, LINCOLN,

ARCHAEOLOGICAL EVALUATION

APPENDIX 4 - THE FINDS ARCHIVE

BONE

Context	Count	Type
007	3	ANBN
010	2	ANBN
013	4	ANBN
014	1	ANBN
016	3	ANBN
017	14	ANBN

BULK FINDS

Context	Name	Count	Comments
005	SLAG	1	SSL + FAS? 146 GM + HAMS
006	WOOD	1	CHAR 0GM DIS
007	SHEL	1	OYST DIS
009	SHEL	2	COCK DIS
010	SLAG	3	SSLX2 223GM FAS 19GM + HAMS
013	SHEL	1	OYST DIS

POST-ROMAN TILE ARCHIVE: WARE TYPES BY CONTEXT

Context	Form	Sherds	Weight	Subform	Comments
005	FIRE	2	10	-	-
005	PNRDISC	1	185	-	FLAT;MED-PMED;MORTAR
005	PNRDISC	1	95	-	FLAT;MED-PMED
007	PNRDISC	1	20	-	MED-PMED
007	PNRDISC	1	55	-	MED;LSWA
009	NIBDISC	1	50	3A	-
009	PNRDISC	3	85	-	MED;FLAT
013	PNRDISC	1	250	-	MED;FLAT;MORTAR;CORNER
013	PNRDISC	3	175	-	MED;FLAT;MORTAR
014	PNRDISC	1	25	-	MED;FLAT;CORNER
014	PNRDISC	5	165	-	MED;FLAT
016	NIBDISC	2	140	4A	-
016	PNRDISC	1	85	-	MED;FLAT
016	PNRDISC	2	85	-	MED;FLAT;CORNER;13TH
017	DRNDISC	1	75	-	WHITE STONE
017	FLOOR	1	0	-	UNGLAZE;225 X 225 X 50MM
017	NIBDISC	1	95	3	MED;FLAT;THIN;LSWA;CORNER
017	PNRDISC	1	145	-	MED;FLAT;MORTAR
017	PNRDISC	1	175	-	LMED-PMED
017	PNRDISC	2	10	-	SCRAPS

017	PNRDISC	2	235	-	LMED-PMED;VITR FABRIC

Key to Form Types

DRNDISC	DISCARDED UNGLAZED DRAIN OR WATER PIPE
FLOOR	UNGLAZED FLOOR TILE
FIRE	FIRED CLAY
NIBDISC	DISCARDED UNGLAZED NIB TILE
PNRDISC	DISCARDED UNGLAZED UNDIAGNOSTIC ROOF TILE

POST-ROMAN POTTERY ARCHIVE: THE SITE ARCHIVE

Context	*Form*	*Count*	*Sub-form*	*Fabric*	*Comments*
009	LSW2	1	-	JUG	BS; MH4
016	CIST	1	-	CUP	BS
017	CIST	4	-	SMALL CUP	-
017	LHUM	1	-	?	INT DEP
017	LSW4	1	-	JUG	-
017	GRE	1	-	?	BASE;BICHROME
017	MP	2	-	JAR	WIDE EVERTED RIM; ORANGE FABRIC PURPLE SURFS BROWN GLAZE
017	TB	1	Y	JAR	RIM; PRESSED STRIP AROUND NECK
017	SIEG	1	-	JUG	BS
017	TB	1	-	JUG	UNGLAZE
017	TB	1	-	JAR/JUG	GLAZE
017	TB	1	-	JAR/JUG	GLAZE
017	TB	1	-	JAR/JUG	GLAZE
017	TB	1	-	JAR/JUG	UNGLAZE
017	CIST	1	-	CUP	BS
017	CIST	1	-	CUP	BS
017	CIST	1	-	CUP	BS
017	CIST	1	-	CUP	BS
017	CIST	1	-	CUP	HANDLE
017	CIST	2	-	TALL MUG/JUG	BS
017	BL	2	-	JAR/CHAMBER	BASE;L17/18TH
017	BL	1	-	JAR/CHAMBER	BS;L17/18TH
017	BL	1	-	?	BS;L17/18TH
017	LSWA	1	-	JUG	THU BASE; SLIPPED; UNDERFIRED; LARGE FRAG
017	LLSW	1	-	JUG	BS
017	LSWA	1	-	JUG	BS;CU GLAZE

Key to Ware Codes

BL	BLACK WARE
CIST	CISTERCIAN-TYPE WARES
GRE	GLAZED RED EARTHEN WARES
LHUM	LATE HUMBERWARE
LLSW	LATER GLAZED LINCOLN WARE
LSW2	GLAZE LINCOLN WARE

LSWA	GLAZED LINCOLN WARE; FABRIC A
MP	MIDLAND PURPLE-TYPE WARE
SIEG	SIEGBURG STONEWARE
TB	TOYNTON OR BOLINGBROKE-TYPE WARE

POST-ROMAN POTTERY ARCHIVE: HORIZON DATING

Context	*Earliest horizon*	*Latest horizon*	*Probable horizon*	*Date range*
005	MH3	PMH4	-	12th to 17th;TILE ONLY
007	MH3	PMH4	-	12th to 17th;TILE ONLY
009	MH4	MH6	-	13th;FRESH
013	MH3	MH8	-	12th to 14th;TILE ONLY
014	MH3	MH8	-	12th to 14th;TILE ONLY
016	MH10	PMH4	-	15th to 17th
017	PMH8 OR PMH3	EMH OR PMH4	-	18th to 19th OR late 16TH to mid 17TH, FRESH BREAKS; MEDIUM TO LARGE FRAGS

REGISTERED FINDS

Context	*Finds No.*	*Material*	*Name*	*Comments*
010	1	IRON	-	FKEY?
014	2	IRON	-	-
017	3	COPP	BUCK	MED; 14-15; SPACER

BRAYFORD WHARF EAST FLATS, LINCOLN,

ARCHAEOLOGICAL WATCHING BRIEF

APPENDIX 4 - ENVIRONMENTAL REPORT

Brayford Wharf East 1998

Follow up investigation of the commercial borehole samples

Introduction

A report based upon the commercial borehole logs and three hand augered boreholes conducted in 1998 was produced and submitted in June 1998. Upon the recommendation of this report a further piece of work was commissioned to inspect and study the actual samples taken from the three commercial boreholes at the site. To this end all the samples that had been retained by LINCSLab from deposits above the basal river terrace gravels were collected for study.

The study was targetted at three objectives. Firstly it was considered possible that the four inch cores would retain enough sediment for dateable archaeological artefacts to be recovered from the core samples. Secondly the environmental circumstances for the sediment build-up needed to be established so that the archaeological significance of the deposits in this area of the Brayford Pool could be established. Lastly the initial report on the borehole data suggested that the Pool had been tidal in the past based upon the log descriptions of laminated clay sediments in the deposits overlying the basal gravels. The samples from these levels were checked to see if this or another explanation was more appropriate for the sediments.

Methods

The sediment of each sample was described and then the samples were manually searched for artefactual material that might permit dating, specifically pottery, tile and brick fragments. Selected samples were washed to clarify aspects of the study, particularly the presence or absence of artefactual material within the sediments and secondly for additional evidence for the deposition of the sediment within a deep or shallow water, or terrestrial environment, through the identification of the mollusc and other invertebrate fauna within the sediment. Three 0.5 litre sub-samples from BH1 and BH2 and four from BH3 (see Appendix) were selected to identify changes in the sedimentary environment or for potential dating evidence, and were washed and floated over a 0.3mm mesh sieve, and the residue rinsed on a 0.3mm mesh sieve. The flot and residue were dried and the different fractions scanned for artefactual and biological remains. The results from this scanning are recorded in the sample descriptions below (Appendix).

There is some possibility that the samples could have become contaminated. During any boring exercise it is possible for material to be knocked down from deposits higher up and therefore occur out of context. In the discussions and descriptions below the finds are assumed to be *in situ*, although whenever fragments of brick or stone were found attached to the outside of a still intact core they were viewed as contaminants.

Results

The nature of the sediments in this area of the Brayford Pool and their chronology appears to be significantly different from that suggested by deposits on the University Site (Rackham 1998)

A diagramatic section presenting the results of the sediment descriptions is presented in Figure 1. Pottery and tile fragments were obtained from a number of the samples and these have been spot dated by Jane Young. This additional data allows both a correction of details in the earlier report and an expansion of the information on the chronology and sedimentary environment on the site.

Terrace sands and gravels occur at the base of all three bores at or below -3m OD. There is a pebble layer capping the gravels in each bore, occuring below -2m OD in BH2 and -3.5m OD in BH1. This may represent the washing of the upper terrace gravels by a water current that removed the fine sand matrix present in the sands and gravels below and rolled the stones. These levels are appreciably below the -1.4m OD recorded for the top of the terrace sands beneath the channel of the ancient River Till on the University site (Rackham (1998) and suggest that the site lies over an ancient channel of the Witham.

These gravels and the pebble layer are capped by a sequence of mainly finely laminated fine sands and silts with bands of poorly laminated clays. These have the appearance and consistency of the fenland marine silts and their laminated structure suggests that they were deposited in a tidal environment. A sample from BH 3 at a depth of -1.75m OD has been submitted for foraminiferal analysis to establish whether there is any evidence for a marine fauna in the deposits to confirm this interpretation. The interleaved clay lenses perhaps reflect episodes of flooding when the bulk of the sediment deposited derived from river floodwaters rather than local tidal movements. It is difficult to envisage these sediments being deposited within the main channel of the river which might be expected to scour them and the main river channel may have migrated, perhaps to the west during this period of deposition. If these deposits are tidal in origin it would suggest that a broad basin on either side of the main channel of the river was subject to daily innundation with the backing up of the river at each high tide.

These silts fine upwards, in all three bores, into a stiff grey brown poorly laminated clay. These sediments indicate a general change in the depositional environment. Their sedimentary character suggests flood waters or lacustrine deposits and it is not impossible that these reflect some change to the river system resulting in the formation of a pool or lake. This could be consequent upon changes in sea level or even human actions. Work in the fens (Waller 1994) has indicated that there is a rise in sea level in the late Roman period which could be one factor influencing the sedimentary environment at Brayford Wharf east. Alternatively although the date of these sediments is not known changes by the Romans to the river such as canalisation, revetment construction or lock installation could also account for, or have contributed to, the depositional change.

Up to this level the deposits show a broad stratigraphical correlation across all three boreholes and contain a low organic content. Above these sediments although similar depositional environments are indicated in all boreholes their stratigraphic correlation is much more problematic.

Overlying the clays in all bores are grey silty sands, generally poorly sorted, reflecting deposition under a much higher energy environment than the deposits either above or below. These clearly reflect a period when a current, the River Witham, flowed across the site on the eastern margins of the Brayford Pool. The slight differences in OD height and depth of these sands suggests that they are probably not synchronous and it is proposed that the current

migrated westwards from BH2 to BH1 and then BH3, and then presumably further west into broadly its present course across the modern Brayford. The occurrence of a sherd of 10th century fabric in this sand in BH1 suggests a late Saxon date for the period when the river current through the Brayford crossed the site.

Above these sands each borehole goes through a sequence of clay deposition followed by very dark brown/black organic silts and sandy organic silts. Although this sequence is consistent in each bore the different OD heights indicates that these do not represent synchronous deposits, but rather reflect the changing depositional environment at the location of each bore as the sediments build-up and the lake margins are reclaimed for human occupation.

This sequence of deposits in each borehole initially represents deposition of fine grained clay sediments in relatively deep water. Progressive shallowing of this water with continued deposition led to the formation of lakeside reed beds in which fine organic rich silt sediments accumulated. Continued shallowing of the lakeside leads to silty peat formation and then, as the margins of the lake move into the lake, sand and rubbish became incorporated into the sediments forming underwater along the edge of the lake.

The stratified organic sediments overlying the borehole samples described here are dated to the first quarter of the 13th century (Jane Young, pers comm), and their context and condition suggests primary deposition in organic rubbish dumped along the margins of the pool. In BH2 the closest to the lakeshore archaeological debris appears in the deposits from sample 12 upwards. Initially these are small fragments of brick or tile and bits of mussel shell, but in the higher samples the debris becomes more common, including stones, pottery, bone, large shell fragments and wood. The earliest dateable material was recorded from sample 10 (at approximately 2-2.2m OD) and was of 11/12th century date, with 12/13th century brick and pottery above in samples 9 and 7. The eastern end of the site was clearly still within the pool in the 12/13th century and the excavated 13th century material recovered during the evaluation must represent the first century of terrestrial occupation on the site.

In BH1 situated a little further into the pool dateable archaeological material becomes incorporated into the sediments at deeper levels. Leaving aside the 10th century sherd from the sands the lowest sample with archaeological debris is 19, with a few tiny fragments of brick or tile. The density of debris increases upwards and in sample 17 (at approximately 0.2-0.4m OD) a dateable sherd of 12/e13th century pottery was recovered. Subsequent organic silts included sherds of 10th to early 13th century, all deposited while the sediments were forming on the lake floor near its margin. A poorly sorted sandy silty clay (sample 5) at 4.56m OD suggests a disturbed deposit no longer within the naturally accumulating lake sediments at a date after the mid12th to early 13th century.

The final borehole BH3, a further 10 metres into the pool shows a similar sedimentary sequence, although it lacks a significant clay deposit. The latter, if it ever formed at this location, may have been removed by the river current that flowed across this part of the pool. Fragments of Roman tile are present in the sandy sediments (sample 16). A few tiny brick or tile fragments are present in the sediments from sample 17 (-1.58to -1.18m OD) upwards but the first dateable finds, other than Roman tile, occur in sample 12, which produced material of 12th, mid 12th, 12-e13th century date and two sherds of 17th century cistercian or blackware. While it is possible that these latter two sherds were taken down to this level by the boring equipment a general inversion in the dating of the pottery in this borehole - the earliest late

9th-early 10th century in sample 5, mid 12th to 12th + in sample 7, and 12th and 12th-early 13th in samples 10 and 12, and 17th century in 12 is problematic. It may however indicate that this area of the site still lay within the pool right up until the 17th century. All the sediments upto sample 7 (at 2.32 to 2.82m OD) were laid down in water, although sample 5 with much limestone, stones, mussell shell fragments, oyster, periwinkle, bone, brick or tile fragments may reflect the beginnings of dumping along the lake shore.

The molluscan evidence from the samples is almost entirely freshwater, with only one or two shells of *Hygromia hispida* and *Vallonia costata* representing terrestrial environments. The assemblage includes *Bithynia tentaculata*, *B. leachi*, *Planorbis albus*, *P. contortus*, *P. carinatus*, *P.vortex*, *P. laevis*, *Segmentina complanata*, *Valvata cristata*, *V. macrostoma*, *V. piscinalis*, *Lymnaea palustris* and a number of bivalves. Although this suite includes one or two species typical of marshes, ditches or closed ponds the bulk are associated with large bodies of water, with a number characteristic of mud and weed bed environments and running water (Macan 1977). This assemblage is therefore consistent with a large pool across which the river current was flowing.

Discussion

Although archaeological material occurs within many of the sediments in these boreholes all the deposits except the uppermost samples of each borehole recorded (Figure 1 and Appendix) here were formed naturally, underwater.

A sequence of river, tidal?, flooded or lake environment, river current across a lake, gradually shallowing lake and lake margin, and finally lake edge being reclaimed environments are indicated. The earliest dating evidence is of the 10th century although fragments of identifiable Roman tile occur through much of the deposits, and the former occurs at 1.06-1.56m OD. Elsewhere in the Brayford Pool organic/peat sediments lying between 1.74-2.14m OD have been dated at 4100±50 BP and others between 2.14 and 4.10m OD to 3100±60 BP (Carrot *et al* 1994; Wragg 1994). These sediments indicate deposition of organic sediments elsewhere in the basin at a much earlier date than those recorded at Brayford Wharf East.

The absence of prehistoric organic peats on the site is probably due to the fact that it lies within the prehistoric course or channel of the River Witham, and such deposits either never formed or have been eroded away.

The apparent absence of any timber structures or major dumping suggests the gradual reclamation of the eastern edge of the Brayford during the medieval period, rather than planned revetment and rapid dumping. The sediments suggest that it was unlikely that this bank was suitable for boats or wharfing at this period, because of the silting and probable reed beds, but activities were clearly being carried out on the adjacent bank. The presence of hammerscale, iron and a single piece of bar iron certainly suggests a smithy on the bank, and the domestic animal bones, fish bones, marine shells, nuts and fruit stones are characteristic urban rubbish of the period.

Archaeologically, other than the finds thrown, washed in or dumped in the 'pool' it is unlikely that any significant structural evidence is present on the site below approximately 4.0m OD, although timber mooring posts, walkways or even boats could be chance finds in the lake muds. These deposits however represent an important palaeoenvironmental resource for

several hundred years probably covering the Saxon and early medieval period and apart from indicating basic changes in the character of the basin or Brayford Pool, may have important evidence, in its contained pollen assemblages, relating to the general development of Lincoln's urban and rural hinterland.

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Figure 1: Brayford Wharf East: Description, dating and interpretation of the commercial borehole samples

OD	Borehole 3				Borehole 1				Borehole 2				OD
	date AD	sample no.	description	interpret-ation	date AD	sample no.	description	interpret-ation	date AD	sample no.	description	interpret ation	
6m													6m
5										6	dark brown fine sandy silt	lake edge	5
4						5	slightly sandy brown silty clay	lake edge					4
3				lake edge		8	black organic silt	shallow lake margin	10-13th	9	very dark brown organic sandy silt	shallow lake margin	3
	19th-e10th	5	dark grey silty sand		10-e13th	9	slightly sandy black organic silt						
2	12-13th	7	slightly sandy organic silt	shallow lake margin		11	slightly sandy very dark brown organic silt slightly sandy black very organic silt		11/12th	10	black peaty silt	shallow reed? bed	2
		8	dark brown/black organic silt			12	black organic silt	shallow reed? bed		11	slightly sandy black organic silt		
1	12-e13th	10	slightly sandy dark brown/black silt	shallow reed? bed		13	black organic silt			12	very dark brown organic silt blue grey clay		1
		11	very dark brown organic silt		110-12th	14	dark grey slightly sandy organic silt			13	sticky grey slightly silty clay	deeper lake bed	
0	12-e13th 17th	12	dark grey-brown sandy slightly organic silt			15	black organic silt						0
		13	poorly laminated grey organic silt			16	black organic silt			15	blue grey clay		
		14	fine sand and grey silts	current flow	12/e13th	17	dark grey slightly sandy clayey organic silt dark grey clayey silt	deeper lake bed					
-1	Rom & ?12th	16	fine slightly silty sand			18	dark grey organic silt						-1
						19	poorly sorted medium silty sand	current flow		17	poorly sorted fine-coarse sand	current flow	
		17	stiff grey-brown poorly laminated clay	lake bed or flood		20	medium sand with some small gravel						
		18	stiff grey clay		Rom & 10th	21	dark grey silty medium sand						
-2			laminated brown fine silty sand	tidal?		22	stiff grey brown laminated slightly silty clay	lake bed or flood		18	grey clay with silt bands	lake bed or flood	-2
			laminated brown-grey silty clay with sand lenses			23	brown silty clay with laminated fine sandy silt at base	tidal?				tidal?	
		19	laminated brown-grey silty clay with sand lenses			24	laminated brown fine sandy silt			20	brown laminated very fine sandy silt		
-3			pebble layer	river bed		25	fine silt with small stones			22	pebble layer	river bed	-3
				terrace gravels		26							
			medium dense orange sand and gravel							24	brown medium dense sandy gravel	terrace gravels	
-4						27	pebble layer	river bed					-4
							medium dense brown sandy gravel	terrace gravels					

APPENDIX
Borehole 1 - BH1

Recorded samples:

sample	depth	OD	description
5	2.0	4.56	slightly sandy brown silty clay with many brick/tile fragments, mussel shells, oyster, occasional limestone fragments, bone and pebbles. Very little organic content.
8	3-3.45	3.11-3.56	black organic silt with few tiny brick/tile fragments, mussel shell, bone and wood
9	3-3.5	3.06-3.56	wet slightly sandy black organic silt with brick/tile fragments, mussel and oyster shell, limestone fragments and bone
			washed 0.5 litre sample: mussel and oyster shell, fish bone, mammal bone, eggshell, charcoal, wood, hazelnut, moss, waterlogged seeds, beetles, pottery, limestone fragments, brick/tile fragments, coal, spheroidal and flake hammerscale. The only snail was one shell of the terestrial snail *Hygromia hispida*
11	4-4.45	2.11-2.56	0-11cm - dark brown slightly sandy very organic silt with mussel shell, occasional brick/tile fragments, wood and freshwater snails, *Bithynia tentaculata*
			11-22cm - slightly sandy dark brown/black very organic silt with some tine brick/tile fragments, mussel shell, bone, small pebbles and limestone fragments. Visible organics with the density of finds low
			22-33cm - slightly sandy dark brown/black very organic silt with rare tiny brick/tile fragments, mussel shell, bone, small pebbles and limestone. Visible organics with low density of finds
12	4.45-4.6	1.96-2.11	black organic silt with bone fragments, occasional limestone and mussel shell
13	5.0	1.56	black organic silt with occasional tiny brick fragments, rare small stones, mussel shell, bone and freshwater snails
14	5-5.45	1.11-1.56	0.10cm - very sandy dark grey organic silt with mussel shell, periwinkle, bones, wood, small pebbles, hazelnuts, plum stones and freshwater snails, *B. tentaculata* and planorbids
			10-20cm - very sandy dark grey organic silt with mussel shell, bone, wood, small stones, pottery and freshwater snails, *B. tentaculata* and planorbids
			washed 0.5 litre sample: mussel and cockle shell, fish bone and scales, mammal bone, eggshell, wood, charcoal, twigs, waterlogged seeds, beetles, rare tiny brick/tile fragments, spheroidal hammerscale, ostracods and freshwater snails including, *Planorbis albus*, *P. contortus*, *P. carinatus*, *P. vortex*, *Segmentina complanata*, *Valvata cristata*, *Bithynia tentaculata*, *B. leachi*, and the terrestrial snail *Vallonia costata*
			20-30cm - slightly sandy dark grey organic silt with mussel shell fragments, small stones, limestone fragments, bone and freshwater snails, *B. tentaculata* and planorbids
			30-40cm - slightly sandy dark grey organic silt with fish bone, hazelnut shell, mussels, occasional small stones and limestone fragments and numerous freshwater and occasional terrestrial snails
15	5.45-6	0.56-1.11	black organic silt with twigs and wood, rare small stones and freshwater snails, *B. tentaculata* and planorbids
16	6.0	0.56	black organic silt with occasional small stones and mussel shell fragments, rare tiny brick fragments and freshwater snails, *B. tentaculata* and planorbids

Borehole 1 - BH1 (continued)

sample	depth	OD	description
17	6-6.45	0.11-0.56	0-11cm - dark grey slightly sandy clayey organic silt with mussel shell fragments, small stones and limestone fragments, tiny brick/tile fragments, fish bones, hazelnut shells, wood and freshwater snails, planorbids
			11-22cm - dark grey clayey organic silt with mussel shell fragments, small stones, brick/tile fragments, bone and pottery
			22-33cm - dark grey clayey silt becoming cleaner, with more clay, towards bottom with a rich layer of limestone fragments at the bae of the U100, and wood, brick/tile fragments, mussel shell, small stones, bones and freshwater snails, planorbids.
18	6.45-6.6	-0.04-0.11	dark grey organic silt with occasional small stones, mussel shell, rare tiny brick/tile fragments and freshwater snails, *B. tentaculata*
19	7.0	-0.44	poorly sorted medium silty sand with some tiny brick/tile fragments
20	7-7.45	-0.89 - -0.44	medium sand with some coarse sand and small gravel
21	7-7.5	-0.94 - -0.44	dark grey silty sand with tiny mussel and oyster shell fragments, occasional small pebbles, wood, rare tiny brick/tile fragments, larger pebbles and limestone fragments
			washed 0.5 litre sample: oyster and mussel shell, fish and mammal bone, eggshell, charcoal, wood, bark, twigs, charred grain, blackberry, waterlogged seeds, hazelnut shell, beetles, glass, pottery, hamerscale, slag, fuel ash slag, brick/tile fragments, freshwater snails including bivalves, opercula, *Bithynia tentaculata*, *B. leachi*, *Lymnaea palustris*, *Valvata cristata*, *Valvata macrostoma*, *Planorbis vortex* and *P. laevis* and the terrestrial snail *Vallonia costata*
22	8.0	-1.44	stiff grey brown laminated slightly silty clay
23	8-8.45	-1.89 - -1.44	U100 - brown silty clay, over grey clay, over silt band, over red brown clay, over grey clay, over brown clayey silt, over grey clay getting siltier towards base. Poorly laminated throughout, with a base of fine sandy silts.
24	8.45-8.6	-2.04 - -1.89	laminated brown fine sandy silt with a band of grey clay

Borehole 2 - BH2

Recorded samples:

sample	depth	OD	description
6	2-2.45	4.02-4.47	dark brown fine sandy silt with occasional small stones, mussel shell fragments, bone, pottery and tiny brick/tile fragments
9	3-3.45	3.02-3.47	very dark brown organic sandy silt with small stones, mussel shell, mammal bone, brick/tile and wood. unsorted sediment.
			washed 0.5 litre sample: mussel and oyster shell, sheep size bone, fish bone, scales and otolith - including eel, eggshell, charred grain, charred weed seed, charcoal, wood, moss, heather?, waterlogged seeds, hazelnut shell, beetle fragments, brick/tile, limestone, caddis larva case, fly puparia, *Valvata cristata*, *Planorbis contorta*, *Planorbis vortex*, *Succinea* sp.
10	4-4.45	2.02-2.47	slightly sandy black organic peaty silt with occasional small stones, mussel shell, bone, occasional tiny brick fragments, wood, organics and freshwater snails
11	4.45-4.6	2.37-2.47	slightly sandy black organic silt with mussel shell fragments, occasional small stones, organic matter and freshwater snails, *Bithynia tentaculata*
12	5-5.45	1.02-1.47	0-10cm - dark brown very organic silt, changing downwards into clayey silt, with mussel shell fragments, wood and bark
			10-22cm - dark brown very organic clayey silt with increasing clay content towards base, occasional limestone fragments, wood and visible evidence of root penetration and freshwater snails
			22-42cm - blue grey clay with wood and visible organics and evidence of root penetration
			washed 0.5 litre sample: wood fragments, waterlogged seeds, beetles, vegetation, and freshwater snails including bivalves, opercula, *Bithynia tentaculata* and indet gastropods
13	5.45-5.6	0.87-1.02	grey slightly silty sticky clay with organic material, wood and occasional small stones
15	6-6.6	-0.13-0.47	blue grey clay (oxidising to grey brown) with occasional small stones, mussel shell fragments, organic matter (the latter oxisided and iron stained)
17	7-7.45	-0.98 - -0.53	poorly sorted fine, medium and coarse sand with occasional small stones
			washed 0.5 litre sample: two or three tiny fragments of brick/tile, lots small fragments of rounwood, twigs, bark, some charcoal, waterlogged seeds and beetles
18	7.5-8.3	-1.83 - -1.03	clay- silty clay sequence with laminated silt bands similar to BH3
20	8.3-8.8	-2.33 - -1.83	brown laminated very fine sandy silts/silty sands

Borehole 3 - BH3

Recorded samples:

sample	depth	OD	description
5	3-3.45	2.35-2.8	dark grey silty sand with stones, limestone fragments, mussel and oyster shell, periwinkle, bird bone, brick/tile fragments - unsorted, very mixed
			washed 0.5 litre sample: mussel, periwinkle, rough winkle, fish bone and scale, bird bone, eggshell (poss goose eggshell), mammal bone, charcoal, wood, moss, hazelnut shell, waterlogged seeds, beetles, copper alloy, hammerscale, pottery, brick/tile fragments and one or two freshwater snails, *Bithynia tentaculata* and *B.leachi*
7	3-3.5	2.3-2.8	slightly sandy dark brown organic silt with wood and organic fragments, numerous stones and limestone fragments, mussel shell, bone, pottery, brick/tile and freshwater snails, *Bithynia tentaculata*
8	4.0	1.8	dark brown organic silt with mussel shell, bone, wood, limestone fragments, tiny brick fragments, and numerous freshwater snails, bivalves, *B. tentaculata*, planorbids
10	4-4.6	1.2-1.8	slightly sandy organic silt with small pebbles, brick/tile fragments, limestone, pottery, bone, mussel shell and bar iron.
11	5.0	0.8	dark brown organic silt with mussel shell, brick/tile fragments, limestone, bone, wood and freshwater snails
12	5-5.45	0.35-0.8	0-5cm - sandy slightly organic silt with small stones, brick/tile fragments, mussel shell and wood
			5-10cm - sandy gritty silt with many smal stones, some brick fragments, mussel shell, bone, iron nail and pottery
			10-15cm - sandy gritty silt with small stones, mussel shell, brick/tile fragments and pottery
			15-20cm - slightly sandy organic silt with few small stones, tiny brick/tile fragments, mussel shell and pottery
			washed 0.5 litre sample: oyster, cockle, periwinkle and mussel shell, fish bone and scales, mammal bone, eggshell, glass, pottery, brick/tile fragments, lots hammerscale and some small pieces of iron, leather, wood, twigs, charred grain, hazelnut shell and many freshwater snails including, *B. tentaculata*, *Valvata cristata*, *V. piscinalis*, *Planorbis albus*, *P. laevis*, *P. vortex* and bivalves
			20-25cm - sandy slightly organic silt with small stones, brick/tile fragments, mussel and cockle shell, iron nail, tooth fragment and wood
			25-30cm - black organic silt with patches of humified peat with a few small stones, limestone, brick/tile fragments, bone, wood and pottery, including a 17th century sherd near the outside of the core
13	5.45-5.6	0.2-0.35	poorly laminated (with sand partings) grey organic silt with occasional stones, brick/tile fragments and preserved organics including typha? roots, very few inclusions
			washed 0.5 litre sample: oyster and mussel shell, fish bone, eggshell, charcoal, wood, waterlogged seeds, beetles, limestone and brick/tile fragments, 2 flakes hammerscale and freshwater snails, *Planorbis laevis*
14	6.0	-0.2	poorly laminated fine sands and grey silts with occasional small stones, rare wood and a few tiny brick/tile fragments
16	6-6.5	-0.7- -0.2	fine slightly silty sand with several tiny brick fragments
			washed 0.5 litre sample: cockle, mussel and oyster shell, bone, eggshell, wood, hazelnut shell, moss waterlogged seeds, brick/tile fragments, hammerscale (quite alot) and lots of coal, some well rolled

Borehole 3 - BH3 (continued)

sample	depth	OD	description
17	7-7.4	-1.6 - -1.2	stiff grey brown very poorly laminated clay
18	7.4-7.85	-2.05 - -1.6	top - laminated banded stiff grey and brown silty clay. Many fine laminae in the brown bands, but the bulk of the sediment grey with some very fine sand. Occasional oxidised rootlets
			middle - brown poorly laminated fine silty sand with a thin lens of black material
			bottom - brown laminated silty fine sand with band of grey clay about 3cm thick within it
19	7.85	-2.05	laminated brown and grey silty clay with occasional fine sand lenses