Vancouver Center and Clough Lane Car Park

King's Lynn

Norfolk

Post Excavation Assessment and Updated Project Design

Oxford Archaeology

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Alfred McAlpine Capital Projects

VANCOUVER CENTRE AND CLOUGH LANE CAR PARK KING'S LYNN, NORFOLK

POST-EXCAVATION ASSESSMENT AND UPDATED PROJECT DESIGN

Planning References 2/97/0552/O, 2/01/1877/O, 2/02/1188 2/02/1187/SA and 2/03/1801/F

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NGR TF6120 (Vancouver Centre - centred)
NGR TF6219 (Clough Lane Car park - centred)

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Summary

During 2003-2005 Oxford Archaeology (OA) carried out a programme of archaeological work ahead of the demolition and redevelopment of the Vancouver Centre, King's Lynn, and the construction of the Clough Lane Multi-storey Car Park. The work was carried out on behalf of Alfred McAlpine Capital Projects and the scope of the work was agreed with the Development Control Archaeologist on behalf of Norfolk Landscape Archaeology.

Despite extensive modern construction at the Vancouver Centre, archaeological features, structures and deposits of medieval date were recorded along the existing frontages of Broad Street and New Conduit Street. Archaeological deposits, building foundations and yard surfaces of late medieval/post medieval date were recorded in the car parks to the rear of Sainsbury's, the rear of Broad Street and to the south-west of New Conduit Street.

In addition to the archaeological remains, OA exhumed and re-interred the burials from a Quaker Cemetery to the north of New Conduit Street and a Baptist Cemetery to the north-west of the car park to the rear of Broad Street.

OA also commissioned the installation of piezometers in order to carry out a two year monitoring programme on the physical and chemical effects of the development's piled construction on the underlying (otherwise unexposed) reclaimed marine and estuarine sediments.

Evaluation and excavation of the Clough Lane Car Park site revealed an intact marine sediment sequence underlying all of the development area as well as localised medieval structures and features.

This document presents a MAP2 assessment of the fieldwork results and sets out a proposal for analysis, publication and archiving of the results of the archaeological works at the Vancouver Centre and the Clough Lane Multi-storey Car Park.

1 INTRODUCTION

1.1.1 During the period February 2003 to March 2005 Oxford Archaeology (OA) carried out a programme of work comprising archaeological evaluation, strip and map, excavation and watching brief integrated with the demolition and redevelopment of the Vancouver Centre, Kings Lynn, and the construction of the Clough Lane Multi-storey Car Park.

1.1.2 The work was carried out on behalf of Alfred McAlpine Capital Projects. The scope of the work was agreed in response to requirements for archaeological works issued by the Development Control Archaeologist on behalf of Norfolk Landscape Archaeology.

Vancouver Centre

1.1.3 Despite extensive modern construction, archaeological features, structures and deposits of medieval date (12th-15th century) were recorded along the existing frontages of Broad Street and New Conduit Street. Archaeological deposits, building foundations and yard surfaces of late medieval/post medieval date (15th and 16th-18th century) were recorded in localised areas in the car parks to the rear of Sainsbury's, the rear of Broad Street and to the south-west of New Conduit Street.

1.1.4 In addition to the archaeological remains, OA exhumed and re-interred the burials from a Quaker Cemetery to the north of New Conduit Street and a Baptist Cemetery to the north-west of the car park to the rear of Broad Street.

1.1.5 OA also commissioned the installation of piezometers in order to carry out a two year monitoring programme on the physical and chemical effects of the development's piled construction on the underlying (otherwise unexposed) reclaimed marine and estuarine sediments.

Clough Lane Car Park

1.1.6 Evaluation of the Clough Lane Car Park site revealed an intact marine sediment sequence underlying all of the development area as well as localised medieval structures and features.

1.1.7 This document sets out a proposal for analysis, publication and archiving of the results of the archaeological works at the Vancouver Centre and is generated in line with the principles established in MAP2 (English Heritage 1991) and informed by English Heritage's draft *Minimum standards for MAP2 project designs and assessments*.

2 PROJECT BACKGROUND

2.1 Location

2.1.1 The sites are located with in the modern town centre of King's Lynn. The Vancouver Centre is centred on national grid reference TF6120 and is bounded by The Old Sunway to the north and Sedgeford Lane to the south-west (Fig. 1). The principal areas of development are located south-west of New Conduit Street, north-east of New Conduit Street, west of Broad Street, east of Broad Street and within the car park west of Sainsbury's shopping centre.

2.1.2 Clough Lane Car Park is located *c* 200 m to the south-east of the Vancouver Centre at national grid reference TF6219. It is bounded by Clough Lane to the west, north and east and Regent Way to the south.

2.1.3 The locations are illustrated on Fig 1 and Fig 2 . The following area designations will be used hereafter:

Area	Construction/ Archaeological Works Designation	Norfolk Historic Environment Record number
Car Park West of Sainsbury's Shopping Centre	Zone A	37720 KLY
Car Park (Vancouver Court) west, and to the rear of Broad Street	Zone B	37719 KLY
North East of New Conduit Street	Zone C	37722 KLY
South West of New Conduit Street	Zone D	40313 KLY
Clough Lane Car Park	Zone E	37721 KLY

2.2 Geology

2.2.1 A complex sequence of recent geological deposits made up of marine clays, sands and peats, between 4 m and 10 m thick, underlies the whole of King's Lynn and the surrounding area. All of this former marshland has been reclaimed from saltmarsh within historic times. The earliest reclamation probably dates from the mid-to-late Saxon period. The reclaimed saltmarsh deposits are soft reddish-brown clays with silt laminae, generally 1 m to 2 m thick.

2.2.2 Within these strata lie a complex network of silt-filled channels, the remains of a former pattern of tidal creeks (which may be the precursors of some minor fleets within the town). Peat occurs as a continuous layer, generally less than 1 m thick, beneath the reclaimed saltmarsh deposits. It is soft, composed largely of reeds, and beneath the King's Lynn area is usually woody. The four major streams flowing into the Ouse, the River Nar, Millfleet, Purfleet and the Gaywood River to the north, have come to define the extent of the several settlements and extensions to the town.

2.3 Archaeological and historical background - documents and publications

2.3.1 The most informative archaeological publication on King's Lynn is Clarke and Carter (1977). This work details the excavations and observations of the King's Lynn Archaeological Survey Advisory Committee between 1963 and 1970. Many of these investigations are within the area of, or close to, the Vancouver Centre and Clough Lane Car Park development.

2.3.2 All of these archaeological 'events' are registered individually on the Norfolk Historic Environment Record (NHER).

2.3.3 The archaeological and historical background of the area of the Vancouver Centre development up to 1997 has been documented in a desk-based assessment produced by the Norfolk Archaeological Unit (NAU 1997). This was carried out on behalf of Ove Arup's in relation to a proposed development of the Vancouver Centre that was never realised, but was commensurate in location and scale to the present development.

2.3.4 An evaluation (NAU 98) was carried out (again in relation to the abandoned earlier development proposal) in New Conduit Street and to the south of the Vancouver Centre Car Park.

2.3.5 The present programme of work commenced with an evaluation by OA in 2003 (OA 2003b) - to the north of New Conduit Street, to the west of Broad Street and within the Sainsbury's car park east of Broad Street - the results of this evaluation were detailed in a report submitted to NLA prior to the onset of development in order for an appropriate level of mitigation to be agreed.

2.3.6 An evaluation of the Clough Lane Car Park site was carried out by OA during December 2003 and January 2004. The results were reported to NLA (OA 2004b). NLA issued a specification for mitigation of the development (NLA 2004). OA in conjunction with Alfred McAlpine Capital Projects carried out design amendments to the construction and generated a mitigation design (OA 2005) which was agreed with NLA.

2.3.7 The following area specific text summarises known sites, observations and find spots within the proposed development area which are listed within the SMR (NHER), documented within NAU 1997, or were revealed during the NAU and OA evaluation works.

2.4 Review of literary sources

2.4.1 A review of literary sources was conducted by OA's Heritage Management Services Department through an examination of references within the published works of Parker (1971) and Owen (1974) to ensure the accuracy and integrity of the text. This was supplemented by a further search of documentary sources, including grey literature held by the Norfolk Record Office (NRO) in Norwich, to check for more recent literature that may impact on the understanding of the archaeology of King's Lynn. A list of relevant primary sources was compiled and is included in Appendix one, with a bibliography of secondary sources included in the Appendix.

2.4.2 It should be noted that the material held by the NRO is not entirely comprehensive, lacking some of the more recent publications and unpublished material such as the recent evaluations carried out on the Vancouver site.

2.4.3 A rapid survey was carried out of the land deeds relating to the site of proposed development, which are currently held by King's Lynn Borough Council. This ascertained date, location of the property and content of the document, it was hoped that this might provide further detail on the location of specific features and land use.

2.4.4 Study of the literature suggests that the foundation and early history of the town (before 1200 AD) must largely be reconstructed from the archives of the priory of St Margaret, which have always formed part of the muniments of the cathedral priory at Norwich of which it was a cell; from the records (chiefly cartularies) of religious houses owning property in the town, and now mostly in the British Library; and from the Pipe Rolls of the royal exchequer. The Chancery rolls, and for a brief space those of the *Curia Regis,* provide much detailed information about the public life and trade of the town before 1450. Later, unprinted, public records include customs accounts, chancery petitions, plea rolls, gild certificates, poll-tax lists and the registers of the Prerogative Court of Canterbury.

2.4.5 Although the Bishop of Norwich was lord of the town, the diocesan records provide little useful material apart from one or two administrative documents and some wills of inhabitants of South Lynn. The records of the lordship of Lynn, and of its courts and probate jurisdiction only survive in fragments; a few of them are in the Bodleian Library (Bodleian Charters Norf. 238-41, 289), but the majority were transferred to the municipal authorities with the lordship in 1537 (KL C/2/48). Only isolated specimens have remained in official custody although these include the particularly important rental/survey of Bishop's Newland (No 174). No probate register earlier than 1532 for the Bishop's liberty has as yet been found.

2.4.6 The principal medieval records of the borough consist of royal and episcopal charters, chamberlains' accounts, hall rolls and books, lists of admissions to the freedom of the town, and enrolled wills. The earliest administrative record of the town, the Red Register, includes records of proceedings in hall, admissions, ordinances, and enrolments of wills and deeds which involve property (KL C/10/2). Another equally miscellaneous book, apparently used as an oath book, contains a further series of admissions to the freedom (KL C/9/1). The hall-books, chamberlains' accounts and other financial records attracted some attention during the nineteenth century, especially after Henry Harrod had been employed by the corporation to list its muniments, and a number of extracts and partial editions were printed (Harrod 1874).

2.4.7 Medieval correspondence, even of an official nature, is relatively rare and only a handful of royal mandates (KL C/3) survive among Lynn's medieval records. There is, however, another source of letters in a miscellaneous volume compiled by William Asshebourne, who was common clerk of the town in the early fifteenth century. The volume preserves much correspondence relating to diplomatic moves against the Hanseatics, copies of miscellaneous administrative correspondence in and out of Lynn, concerning the affairs not only of the corporation itself, but of individual burgesses and visitors, returns made to official inquiries, and narratives of the municipal upheaval of 1414.

2.4.8 At the Reformation the Mayor and burgesses of Lynn acquired not only the liberty of the Bishop, but also the property of the gilds of Holy Trinity and St George (KL C/2/50) and the town thus took over the charters, memoranda, bede-roll, accounts and "morrow speech" rolls of the Trinity and Corpus Christi gilds.

2.4.9 The post-medieval documentary evidence for King's Lynn is reasonably comprehensive, especially in terms of material dealing with trade and economy. This material is dominated by the port books which detail vessels and goods shipped into and out of the port of King's Lynn, and a comprehensive series of trade directories which provide a detailed snapshot of the town in the 19th century.

2.4.10 Research within the NRO suggests that there are no further relevant primary documentary sources that are not already included in Owen (1984); however, it was noted that a number of primary sources are held by other institutions such as the Public Record Office, the British Library and the Bodleian which are not included in this literary review. Further background research on the general history of King's Lynn also confirmed that the history and development of King's Lynn presented in Parker (1971) and Owen (1984) still represents a balanced and current view that has not been superseded.

2.4.11 A review of the land deeds held by Kings Lynn Borough Council revealed a comprehensive collection of both deeds and wills relating to property and residents within the area of proposed development. However these did not pre-date 1800, with the majority dating from 1850 onwards. Although a thorough search of this resource might provide some further useful material, the relatively late date and general lack of detail within the documents suggests that this resource is of relatively low significance.

2.4.12 In conclusion this literary review has confirmed that the sources currently available, e.g. Parker and Owen represent a thorough and current background to King's Lynn. Furthermore, this study has checked the existing land deeds for relevant information and has concluded that they are of a relatively low significance. Limitations imposed by the brief excluded research on sources held outside the NRO and King's Lynn Borough Council.

2.5 Archaeological and historical background - area specific: Figure 2

Zone A (Sainsbury's extension and extension to 32-34 Broad Street).

2.5.1 This part of King's Lynn was known as the Paradise in the later medieval and post-medieval periods. Documentary evidence of the late 16th century indicates that this was a mix of tenement plots and open, probably marshy, ground. At 30-32 Broad Street a medieval hall rebuilt in the 17th century existed until the early 1970s (SMR 17904).

2.5.2 OA Trench 1: The archaeological deposits revealed in this trench consisted of a sand bank overlain (abutted by) an inter-digitating silt and peat formation. At the junction of these deposits a number of timbers (some re-used boat timbers) appeared to represent a displaced revetment. The sand bank, peat formation and timbers were overlain by a sequence of alluvial silt deposits. Pottery and the interpretation of wood technology for the timbers suggest a 14th-15th century date for the alluvial sequence. The upper part of the silt and peat formation contained pottery dating from the 12th-14th century and leather sole fragments characteristic of a 13th-century date. The sand formation was undated and may be a significantly earlier by-product of salt panning or a naturally deposited feature. Analysis of the forams and ostracods from a column sample taken through these deposits indicates that the sequence represents inter-tidal mudflats/saltmarsh evolving into a tidal creek.

2.5.3 OA Trench 2: The archaeology in this trench consisted of an undated bank of sand overlain by a sequence of alluvial layers, which were also undated but could be reasonably assumed to date to the 13th-15th centuries given the trenches proximity to the dated alluvial sequence in Trench 1. The alluvial sediments were cut by a series of pits. The earliest pit contained a single sherd of 16th-19th century pottery, as well as 13 sherds more suggestive of a 14th-15th century date No dating evidence was retrieved from the upper two pits which were in turn sealed by a humic/garden soil containing pottery of 17th-century date.

2.5.4 OA Trench 3: This trench was dominated by a cobbled surface and the partial remains of a later but probably associated brick wall running parallel to the surface. Pottery retrieved from immediately below the surface and from soil accumulations on the surface indicated a 15th-century date for the surface.

2.5.5 OA Trench 4: The earliest deposits revealed in this trench were two peat layers, the upper of which contained pottery dating to the 12th-13th centuries. These were overlain by an alluvial sequence (accumulating from the 12th to 15th century). Analysis of a column sample taken through the alluvial layers indicates that this part of the sequence represents sediments forming within a marsh creek evolving into a tidal channel. The upper part of this sequence was cut by a large pit partially filled with tile. The pit was sealed by a sequence of deposits characteristic of dumping/reclamation. The upper layer of which was cut by the construction trench for a brick wall of 16th-century or later date.

2.5.6 OA Trench 5: This trench contained the internal and external spaces of a 16th century brick building, which has been subjected to a series of ?robbing and levelling events.

Zone B (West of Broad Street and Vancouver Court Car Park)

2.5.7 Broad Street was previously known as Webstar Row. Documents from the late 16th century show that the area was divided into property plots. These plots were shown during the ground works on the 1970s Vancouver Centre development, to have associated medieval remains including deposits indicative of cloth dying in the later medieval period (SMR 1183). To the south, in the middle of Broad Street, a timber lined 'leet' was observed and the Newland Survey of 1250 identifies fullers and tanners operating at the south end of Broad Street.

2.5.8 At the south end of the Vancouver Court Car Park, NAU evaluation Trenches 3 and 4 revealed remains of a post-medieval wall but indicated that this area had probably been open ground in the medieval period (NAU 1997).

2.5.9 Other SMR references include medieval floors at 3.9 m - 4.4 m OD noted at Baptists' Yard and probably contained within a 'sunken building' (SMR 1185) and medieval pottery sherds found at Broad Street (SMR 1181 and 1184).

2.5.10 OA Trench 7: This contained a sequence comprising an alluvial clay silt overlain by a 1.2 m thick sequence of floors, makeup layers and occupation deposits relating to a building(s) dating from the 12th-14th century. The sequence was truncated in the 15th century and the presence of negative features (cess and rubbish dumping pits) indicates the area was, by this period, open land (probably to the rear of later structures fronting Broad Street). The 15th-century features were sealed by a sequence of probable post-medieval levelling and demolition deposits, which in turn were capped by the construction layers for the existing building.

2.5.11 OA Trench 8: This trench revealed a sequence of gradual peat formations, alluvial silts with dumping episodes, within what was originally a freshwater channel. These deposits were formed (and dumped) during the 13th to 14th century. This build up of deposits was cut in the 15th century by a later channel (seen in the centre of the trench). A substantial brick wall had been constructed (cut into the later channel fills) in the 16th century. This structure had undergone several rebuilds and a later brick building (19th-20th century) had been tacked on to its western face.

2.5.12 OA trench 9: The earliest deposit sequence in this trench comprised a peat formation at the base of the trench overlain by alluvial clay-silts one of which contained a displaced timber pile/post. Pottery from the alluvial sequence suggests that it was formed during the 12th-14th century. A probable 16th century brick wall was constructed into the alluvial deposits and was abutted by further alluvial accumulation. A Victorian brick culvert was recorded in the northern half of the trench.

2.5.13 OA Trench 10: This trench revealed a sand formation at the base of the sequence overlain by undated alluvial sediments and peat formation. This sequence was cut by an undated linear feature (possibly a drainage channel). The upper fill of this feature was sealed by a series of imported garden soils. Within the garden soils a second ditch was noted which contained pottery suggesting a 15th century date. Pits dating to the late 16th (?)-17th century were cut through the upper horizon of the imported soils. These were sealed by modern demolition and car park construction layers.

2.5.14 OA Trench 11: The earliest deposit reached in this trench was a clay-silt on which several timbers forming a land tie for a channel revetment were revealed. Pottery from around these timbers suggest a 15th century date for the structure. A limestone block wall seen in the north corner of the trench may also date to this period. Redeposited/dumped clay- silts overlaid the timbers and abutted the wall. Pottery with a potential date range of 13th-15th century was retrieved from these layers. The top of this sequence was cut by a probable robber trench and pit (undated) a second pit (19th century) and the brick foundation of a 19th century (?) chimney stack/oven.

2.5.15 OA Trench 12: This trench revealed an underlying sequence of peat formation and alluvial sediments over which a sandstone wall enclosed cobble yard surface, a cobbled pathway and a later limestone wall had been constructed. These structures are likely to date to the 15th -17th century (based on the character of build). Single sherds of pottery dating between the 13th-15th century were retrieved from contexts throughout the sequence, but these cannot be regarded as reliable dating. The structures appear to have been demolished and levelled prior to the construction of the existing car park.

2.5.16 OA Trench 13: This trench revealed an underlying sequence of alluvial sediments over which a 15th century cobbled surface and then a 16th -17th century brick wall had been constructed.

2.5.17 OA Trench 14: This trench revealed a structural sequence comprising a limestone wall defining the boundary between an external cobbled (yard or path?) surface and an internal timber floor. A second external cobble surface and a sandstone wall were later built over the original cobble surface. Based on the character of these structures and minimal artefactual dating (13th-15th century pottery from the internal floor sequence) these structures possibly originate in the 15th century.

2.5.18 A 19th century rebuild had been carried out on the internal space described above. This included the construction of a brick wall and pits, which were dug and backfilled with crushed brick, within the internal space, possibly for consolidation of the floor in order to support timber posts.

Zone C (North side of New Conduit Street.)

2.5.19 At 28 New Conduit Street medieval pottery with some surviving structural remains was recorded (SMR 1188). Similar observations were made to the west (SMR 1190 and 1192). At 15 New Conduit Street was the former Friends Meeting House, which possessed a medieval stone archway (SMR 5541). An associated burial ground is shown on the 1830, 1886 and 1905 edition Ordnance Survey maps.

2.5.20 NAU evaluation Trench 7 (NAU 1997) was excavated to the top of post-medieval floor and wall levels within 18 New Conduit Street (SMR 33255).

2.5.21 OA Trench 15: Archaeological deposits revealed in this trench represented the internal space of a 12th-14th century structure, sub-divided by a partially robbed chalk block wall and characterised by a 0.60-0.90 m build up of floor, floor make up and occupation layers. The structure was constructed on a deposit of gravel which may represent purposeful levelling.

2.5.22 OA Trench 16: This trench revealed a 1.5 m thick sequence of floor layers and structural features dating to the 13th-14th century. The structure evidenced several instances of rebuilding which may be associated with flooding episodes indicated by the presence of alluvial sediments within the occupation sequence.

2.5.23 OA Trench 17: This trench revealed a complex sequence of structural remains dating to the 13-15th century. The structural remains were characterised by the presence of beam slots, floor layers, postholes and post pads.

Zone D (South West of New Conduit Street)

2.5.24 The area south of the Purfleet (which is now partially capped and respected by the line of New Conduit Street) lay within the area of the Bishop's new town of *c* 1100, with the High Street as the main artery northwards from St Margaret's Church and Saturday Market Place across the Stone Bridge (see Site 5476).

2.5.25 The following is a list of SMR sites south of the Purfleet:

2.5.26 Site 1189: New Conduit Street, casual discovery (Clarke and Carter 1977, 458-9). A large area disturbed to a depth of *c* 2 m (ie. 3 m OD). Site of post-medieval house, removed. An adjacent site (1209) produced pottery from 1.2 m-1.8 m depth.

2.5.27 Site 1209: Sedgeford Lane, casual discovery and observation (Clarke and Carter 1977, 460-461). Black soil was seen at a depth of 1.2 m-1.8 m; there was no evidence of medieval street surfaces.

2.5.28 Site 1210: Sedgeford Lane. (Clarke and Carter 1977, 31-43). Of the five major excavations which have taken place in King's Lynn, only one was carried out within the development area - namely that between Sedgeford Lane and New Conduit Street on land formerly belonging to 29 and 30 Sedgeford Lane. An area 8 m x 12 m was opened on the north side of Sedgeford Lane between the street and the Purfleet, the northern edge being limited by a brick culvert through which the fleet now flows. The results of the excavation suggested that Sedgeford Lane was of some economic importance during the middle ages, but that this area remained open quayside until the 14th century when occupation began. A timber-revetted wharf was established in the 14th-15th century and remained in use until the Purfleet began to be filled in.

2.5.29 Sites 1211-1215: Sedgeford Lane (Clarke and Carter 1977, 172-175). Most of the archaeological evidence for buildings south of Sedgeford Lane came from fairly shallow excavations, linked by deeper trenches for modern services. Observations revealed tenement boundaries (lengths of wall), foundations of medieval cottages and cobbled surfaces, with traces of timber buildings, Buildings were constructed on the surface of a black marsh-like deposit. This almost certainly represents the filled bed of the original wide Purfleet.

2.5.30 Site 1211: Sedgeford Lane (Clarke and Carter 1977, 173). Observations within a cable trench revealed the slight remains of a large building, whose stone walls (Barnack limestone), standing on a plinth incorporated part of a doorway facing onto Sedgeford Lane. This indicates the existence of a important house, possibly corresponding to that evidenced by the standing (until 1967) archway on New Conduit Street on the north bank of the Purfleet. Was this a merchant's house facing its quayside, like those found in King Street and Queen Street, as suggested by Carter (Richmond *et al.* 1982; Wade-Martins 1982)?

2.5.31 Site 1216: Rear of 21 High Street (Clarke and Carter *1977, 461).* Pit with 17th/18th century material.

2.5.32 Site 1217: 21 High Street (Clarke and Carter 1977,175). Observations were made in deep and large stanchion pits, linked by deep cill trenches, and in service trenches. The ground surface was lowered by 1 m. Natural silt and blue clay were seen at 2.4 -2.7 m OD, rising to 3.0 m-3.3 m at the street. All was overlain by deposits of heavily organic silt loam 0.9 m-1.5 m thick, traces of wattle fences and then further silt deposits. Traces of a medieval double-halled building were observed over the silt.

2.5.33 Site 15484: 23 High Street: Pottery found during building work included sherds of 11th/12th -century date, indicating early activity here on one of the two streets of the bishop's new town.

2.5.34 Site 25577: The reported site, of a post-medieval clay-pipe kiln, exposed and left in situ.

2.5.35 Site 28474: Rear of 20 High Street Reused medieval masonry in late wall.

Zone E (Clough Lane Car Park)

2.5.36 The Clough Lane Car Park site lies within the medieval town between the Dominican Friary to the north and the Franciscan Friary to the south. Buildings dating to at least the late 16th century survive to the west of the site on Tower Street.

2.5.37 The King's Lynn survey undertook two archaeological investigations nearby (SMR 1201 and 1202). SMR 1201 was located c.25 m to the south of the site and discovered an undated feature thought to be pre-urban in nature. SMR 1202 consisted of a trench immediately to the north of the site near the former street frontage of Fullerowe (the old name for Clough Lane). A sequence of building remains dating from the 13th to the 18th century was recorded. The street is first mentioned in a document of 1492-3.

2.5.38 Oxford Archaeology carried out a trenched evaluation of the site during the period 1/12/03 to 9/01/04 (OA 2004). Seven trenches representing a 5% sample of the development area were investigated. The evaluation revealed an intact marine sediment sequence underlying all of the car park as well as localised medieval structures and features. The detailed results of this investigation are given below.

2.5.39 OA Trench 100: This trench was positioned in the north west corner of the long stay car park. It revealed alluvial silts cut by two ditches (possibly drainage or small boundary features) of 13th-14th century date; these preceded a cobbled surface of the same date. A well of probable 16th-17th date was partially visible in the north-east corner of the trench. Modern deposits indicate truncation of potential archaeological horizons at 4.10 m OD in the eastern half of the trench with more severe impact caused by a pipe trench to 3.40 m OD in the western half.

2.5.40 OA Trench 101: This trench was positioned slightly to the east of the centre of the short stay car park. It revealed a possible sand bar (saltern mound?) cut by a series of pits and ditches representing 16th century domestic dumping pits and possible boundary plots. The presence of residual medieval pottery at this horizon indicates some earlier activity but this cannot be clearly differentiated from the 16th-century features within this trench. Medieval pottery, particularly Grimston Ware has been seen to be present in later contexts within this trench. This shows the unreliability of dating features purely on the presence of small quantities of medieval pottery.

2.5.41 These features and the upper part of the sequence are truncated by a deposit that appears to be levelling for the construction of 19th-century brick terraces that are recorded on the Ordnance Survey 1st Edition. This truncation occurs at 4 m OD

2.5.42 OA Trench 102: This trench was positioned towards the north-east corner of the short stay car park The earliest deposit to be seen within the trench consisted of undated sands, which may be natural formations or part of saltern mounds. These were overlaid (and cut) by a structure consisting of a compacted gravel filled foundation and associated floor and floor preparation layers. This was seen in the centre of the trench. Its character and a single sherd of pottery retrieved from the within the floor layers suggest a 12th -15th century. Two negative features one of which contained pottery indicating a 16th century date were recorded in the east end of the trench. The sequence of deposits and structures was truncated by activity related to 19th century housing at *c* 4.30 m OD.

2.5.43 OA Trench 103: This trench was positioned in the north-east corner of the short stay car park. It revealed an undated early sequence of sands and alluvial silts overlain by a reclamation/dumping/levelling sequence that may have its origins in the 16th century but could be as late as the 19th-century building activity, which immediately overlies it. The levelling deposits truncate/overlie the alluvial sequence at approximately 4.10 m OD.

2.5.44 OA Trench 104: This trench was positioned in the south-west corner of the long stay car park. It revealed an undated sediment sequence culminating in a thick reed peat deposit that may have formed within a channel. This was cut by a brick culvert of possible 16th -17th century date. A corner of a 17th-century brick structure was built over the culvert in the north end of the trench. Deposits and structures associated with 19th-century brick terrace housing truncated earlier deposits at approximately 3.87 m OD.

2.5.45 OA Trench 105: This trench was positioned towards the south-west corner of the short stay car park. It revealed an underlying sequence of sediment which contained 12th -14th century pottery in the upper strata. This was truncated by deposits and structures associated with 19th-century housing at 3.41 m OD .

2.5.46 OA Trench 106: This trench was positioned centrally along the western edge of the short stay car park. It revealed an underlying sediment sequence. A worked medieval timber object - probably a brace for the legs of a stool - was retrieved from the sediment sequence. This was overlain/cut by part of a probable medieval building (based only on the use of limestone as wall material) which in tun was truncated by a sequence of undated pits. The sequence was truncated by 19th-century housing related contexts at approximately 3.75 m OD.

2.5.47 OA Trench 107: This trench was located in the south-east corner of the short stay car park. It revealed an undated sequence of marine sediments. The upper part of this sequence was cut by a large undated ditch. Deposits associated with 19th-century housing truncated potential archaeological remains at 4.16 m OD.

2.6 Planning background

2.6.1 In 1997 Ove Arup & Partners Consulting Engineers (acting on behalf of Threadneedle Property Fund Management Limited) commissioned an historical and archaeological desk-based assessment from NAU (NAU 97) focussing on the area of the Vancouver Centre in King's Lynn.

2.6.2 The work was commissioned in order to assess the possible impact of development in the area to historic and archaeological remains and inform the (NLA) Senior Landscape Archaeologist in his capacity as advisor to the Local Planning Authority (LPA) King's Lynn and West Norfolk Borough Council. The proposed development is registered with the LPA as Planning Application No. 97/0552.

2.6.3 The Senior Landscape Archaeologist advised that intrusive evaluation was necessary for further information and issued a Brief detailing the requirement (NLA 97). The evaluation was carried out by NAU (NAU 98 - report 294).

2.6.4 For reasons unknown the development proposal was never followed through.

2.6.5 In 2002 new development proposals were submitted by Ashcroft Estates PLC and Broomco 2778 Ltd (planning applications 2/97/0552/O, 2/01/1877/O, 2/02/1188 and 2/02/1187/SA). In conjunction with these applications development of the Clough Lane Car Park into a multi-storey car park was also agreed with the LPA (planning reference 2/03/1801/F).

2.6.6 In response the NLA Development Control Archaeologist issued requirements for further field evaluation (Briefs NLA 2002 a, b, c and d) and conditions requiring archaeological mitigation of the developments were attached the planning permissions.

2.6.7 Oxford Archaeology were appointed by Tropus Project Solutions and thereafter contracted by Alfred McAlpine Capital Projects (on behalf of Ashcroft Estates PLC and Broomco 2778 Ltd) to carry out the evaluation work. The work was carried out to the requirements of the briefs and to the methodologies set out in a project design (OA 2003a). Reports of the investigations were produced and submitted to NLA (OA 2003b, 2004b).

2.6.8 With regard to all the information available the NLA Development Control Archaeologist issued a requirement/brief for mitigation of the archaeological conditions attached to the planning permissions (NLA 2003, 2004) during the development process. In response to the brief OA generated project designs for the works (OA 2004a, 2005).

3 VANCOUVER CENTRE EXCAVATION METHODOLOGY

3.1 Strategy

3.1.1 The strategy for archaeological works on the Vancouver Centre sites comprised the following elements:

- Archaeological supervision of machine stripping - reduction for piling mat and archaeological mapping;
- Detailed open area excavation;
- Watching brief / ground works monitoring/ rapid recording;
- Burial exhumation;
- Piezometer installation and sediment monitoring.

3.2 Machine stripping and mapping

Archaeological supervision of machine stripping - reduction for piling mat and archaeological mapping.

3.2.1 Following demolition and clearance of the upstanding buildings (east and west of Broad Street, north and south of New Conduit Street, Zones A, B, C and D) existing hard standings were broken out. Construction areas were then stripped to the level of impact associated with the base of the piling mat.

3.2.2 Stripping was carried out using 360° tracked-excavators, fitted with toothless buckets under the direction of an experienced archaeologist.

3.2.3 All archaeological features, structures or deposits revealed during the stripping/reduction process were mapped and recorded in plan. These were then digitised and related to construction plans showing ground beam, pile-cap, service and pile locations.

3.2.4 Where archaeological deposits were identified as subject to further construction impacts this was mitigated either by detailed excavation prior to impact or recording during impact dependant on the quality and significance of the deposits.

3.3 Detailed excavation and recording methodology

3.3.1 Detailed hand excavation and recording was carried partly in relation to the results of the machine stripping and mapping exercise (see above) and also within a series of open area excavations.

3.3.2 Although the majority of the impact of the development was caused by pile caps and ground beams, it was agreed with NLA that detailed hand excavation of these impacts alone would result in 'keyhole' excavations that would restrict interpretation of the archaeology.

3.3.3 It was therefore agreed that several open area excavations would be carried out along the Broad Street and New Conduit street frontages. Although these areas were not under direct construction impact, they served to characterise the street frontage archaeology in a way that would not be possible within the spatial limitations of the ground beam and pile-cap locations. These excavations were designated Trenches 18, 19, 20, 21 and 22.

3.4 Burial Exhumations

Quaker Cemetery

3.4.1 The presence of a Quaker cemetery within Zone C was highlighted in NAU 97 and depicted on 1830, 1886 and 1905 OS maps. OA obtained an exhumation licence from Home Office under the terms of the Disused Burial Ground Act. Non-conformist burial registers for the area were obtained from the Family Records Centre. Names and dates of interments and notice of exhumation was advertised in the local press and posted around the development area. Through posting, contact was made with representatives of the Local Quaker Church who were consulted with regard to reburial requirements and invited to visit site during exhumation.

3.4.2 Exhumation was carried out by hand with complete archaeological field records made. Rapid osteological analysis was carried out after excavation, commensurate with the requirement to re-inter at the soonest opportunity and to treat the individuals with due care and respect.

3.4.3 A full report is included in Appendix 9

Baptist Cemetery

3.4.4 During the strip and map exercise in Zone B a second cemetery was uncovered. The area of the cemetery was immediately cordoned off and an application for an exhumation licence was made to the Home Office.

3.4.5 The 1830 OS map shows a Baptist Chapel immediately to the east of the cemetery, however this is located within a built up area with no indication of an attached cemetery. The King's Lynn Baptist Church website contains a summary history of the church which states that the Broad Street Baptist Meeting house was relocated to "some adjoining ground" between 1800 and 1808. This is presumably the 1830 location of the chapel. The documentary source behind this history is presently unknown. Spot dating of ceramics retrieved from the grave fills reinforced the probable association with the Baptist Chapel.

3.4.6 Eighteen inhumations including one sealed iron and wood coffin were disinterred. Exhumation and recording was carried out in the same manner as for the Quaker Cemetery.

3.4.7 A full report is included in Appendix.10

3.5 Watching brief / ground works monitoring/ rapid recording

3.5.1 A watching brief was maintained on all intrusive works associated with the development.

3.6 Piezometer installation and sediment monitoring

3.6.1 As part of the mitigation strategy for construction works a programme of monitoring is being carried out in order to assess the impact of piling on the character of the underlying sediments.

3.6.2 The purpose of this monitoring is to assess whether the development, over a period of time significantly alters the characteristics of the underlying sediments in a way that reduces the preservative qualities of the strata and therefore causes degradation of archaeological remains such as probable/potential waterlogged wooden structures and environmental indicators.

3.6.3 Data gathered from this programme of works may inform advise given on future planning applications in this area.

3.6.4 In order to commission and carry out an appropriate programme of monitoring OA have consulted with Peter Murphy, Dominique De Moulins and Ian Panter (English Heritage Regional Scientific Advisors) and Malcolm Lillie - Lecturer and member of the Wetland Archaeology & Environments Research Centre (WAERC), University of Hull.

3.6.5 The agreed monitoring methodology comprised four boreholes sunk to 4.5 m depth (see Fig.2 for location) by cable percussive methods at locations which will remain accessible after development for monitoring. Dual piezometers were installed in all four boreholes, one with a response zone of 1.5 - 2.5 m and the other with a response zone of 3.5 - 4.5 m depth.

3.6.6 Groundwater samples obtained from the piezometers are tested on-site to determine their temperature, PH, dissolved oxygen content and redox potential.

3.6.7 The monitoring/sampling regime is carried out at two week intervals for the first six months, monthly for the following six months and quarterly for the subsequent year.

3.6.8 On completion of the monitoring period data from the piezometers will be correlated with the piling programme of pile in order to assess the impact of the piles on the underlying strata.

4 CLOUGH LANE CAR PARK EXCAVATION METHODOLOGY

4.1 Strategy

4.1.1 The strategy for archaeological works on the Clough Lane Car Park comprised the following elements:

- Design amendments to the construction;
- Detailed excavation;
- Watching brief .

4.2 Design amendments to the construction

4.2.1 OA generated a 3D model of the site using ARCView©. This model shows archaeological surface levels (interpolated from levels of archaeology revealed in the evaluation) and the pile, pile-cap, ground beam designs as supplied by Hill Cannon the car park design team.

4.2.2 Where the construction impacts penetrated the archaeological levels these were highlighted and returned to Hill Cannon who then redesigned the construction to raise as many of the impacting elements as possible.

4.3 Detailed excavation

4.3.1 After redesign, potential impacts of the development were reduced to a string of pile caps in the south eastern quarter of the site, two crane bases and occasional isolated single pile-cap excavations.

4.3.2 The main area of impact which included one crane base and five pile-cap locations was mitigated by open area detailed excavation.

4.4 Watching brief

4.4.1 A watching brief was maintained on all intrusive works associated with the development.

5 QUANTIFICATION OF THE ARCHIVE

5.1 Stratigraphic

Record type	Quantification
Context records	2648
Matrices	6
Plans	152
Sections	265
Black and white films	49
Colour films	49

5.2 Artefactual

**Summaries quantifications of the assessments are presented below. Full reports can be found in the Appendices.*

5.2.1 ***Pottery*** (Appendix 1)

5.2.2 The assemblage comprises a total of 1,524 sherds of medieval and post-medieval pottery with a total weight of 38,304 g. These come from a total of 268 contexts from the following sites: 37719 KLY, 37720 KLY, 37721 KLY, and 37722 KLY. Approximately one third of the assemblage (585 sherds) has previously been examined and assessed by Paul Blinkhorn and some of his comments are incorporated into the present, though somewhat less detailed, assessment. All the pottery was examined and spot-dated during the present assessment stage.

5.2.3 *Date and Nature of the Assemblage*

5.2.4 It is unlikely that any of the pottery recovered dates much before *c* 1150 and there may not have been any significant activity on the site until the late 12th century. This is evidenced by the presence of a few jugs in green-glazed Developed Stamford ware (Lincs., *c* 1150-1250), a few early-looking vessels in Ely ware (Cambs., mainly 12th-13th century) and handmade globular cooking pots in locally-produced grey sandy wares (mainly 12th-13th century). The bulk of the pottery from the site, however, comprises Grimston ware - a fairly fine, dark grey sandy ware produced at Grimston in west Norfolk. This is present mainly in the form of glazed, often decorated, jugs dating to the 13th and 14th centuries. Regional imports include a fair number of jugs in Scarborough ware (including highly decorated 'knight' jugs, mainly 13th century) and possibly other Yorkshire wares, and at least one or two examples of decorated jugs of similar date from Lyveden in Northamptonshire, Hedingham in Essex, and possibly London. Continental imports include fragments of green-glazed jugs in North French White ware (*c* 1175-1250) and possibly Rouen-type ware (*c* 1175-1350), and green-glazed Saintonge ware (*c* 1250-1400) from south-west France. One or two possible examples of Flemish Highly Decorated Sandy ware ('Aardenburg' ware *c* 1250-1350) were also noted. All the main types, particularly the Grimston jugs, highlight the 13th-14th centuries as the main period of activity on the site.

5.2.5 The 15th and early 16th centuries are also reasonably well represented by late Grimston products, jugs in Bourne 'D' ware (Lincolnshire), local late medieval transitional glazed redwares (LMT), and occasional drinking vessels in Raeren, Siegburg and Langerwehe stonewares from Germany, as well as a chafing dish (food warmer) in late Saintonge ware and a Martincamp flask from Normandy. The 17th, 18th and 19th centuries are also well represented by glazed local red earthenwares, English and German stonewares, Staffordshire slipwares and white stoneware, and finally by the mass-produced Staffordshire products of the late 18th and 19th centuries such as Creamware and transfer-printed whitewares.

5.2.6 The medieval assemblage is clearly domestic in character with eating and drinking being the main activities indicated. Grimston and other jugs dominating the assemblage, followed by smaller numbers of cooking pots and bowls. Less common forms include a Grimston spouted pitcher (12th century), dripping pans (for collecting fat from spit-roasts), curfews (fire-covers), a possible aquamanile (for washing the hands), a possible costrel (flask) and a single example of a hemispherical Stamford ware crucible or lamp (context 30850). The medieval assemblage, overall, is fairly fragmentary though not particularly worn and the profiles of around a dozen vessels can be reconstructed. These include the crucible, just mentioned, a small near-complete Grimston drinking jug (context 814) and a small rounded Grimston jug (context 25407) which has a lead repair or rivet through its lower wall. The range of wares and vessel forms represented on the site is typical of other sites excavated in King's Lynn (Clarke and Carter 1977).

5.2.7 *Ceramic Building Material* (Appendix 2)

5.2.8 The assemblage comprises a total of 1,763 pieces of building material with a total weight of 224.528 kg., or, in other words, nearly a quarter of a tonne. All of this is of medieval and early post-medieval date with much smaller quantities of late post-medieval material - due, in part, to the removal of modern overburden from the sites. This comes from the following sites: 37719 KLY, 37720 KLY, 37721 KLY, 37722 KLY and 40313 KLY. Although the great bulk of this material is, technically speaking, ceramic building material (CBM), the totals here also include a very small amount of non-ceramic building stone and roofing slate.

5.2.9 All the CBM was examined and spot-dated during the present assessment stage. For each site and context the total fragment count and weight were recorded on an Excel spreadsheet (see site archive), followed by a spot-date based solely on the character of the material in question. Comments on the types of CBM present (brick, roofing tile etc.) were routinely recorded and additional comments on the state of preservation, measurable dimensions and physical characteristics were usually recorded where these were thought to be significant.

5.2.10 Because of the conservative nature of CBM the dates arrived at are often very broad and, if poorly preserved, only tentative. In general CBM spot-dates should be regarded as of secondary importance to pottery spot-dates, although there may be situations where CBM dates are all that is available, or where the pottery is clearly residual or intrusive.

5.2.11 *Clay tobacco pipes* (Appendix 3)

5.2.12 The excavations recovered a total of 119 fragments of clay pipe weighing 609 g. These have been spot-dated and a given a basic catalogue. The catalogue records, per context, the quantity of stem, bowl and mouth fragments, the overall sherd count, weight, and comments on condition and any maker's marks or decoration present. The collection is not particularly large or impressive. The largest number of fragments from any one context was 48 (context 202).

5.2.13 The few pieces of note include two early 18th-century pipe bowls with the maker's mark 'IA', who is probably to be identified with the maker Joseph Alderson of Lynn who was active 1708-31. The two pipes may represent earlier and later products by the same maker as the shape of the bowl is slightly different in each case and the initials are surmounted by rosettes on one and crowns on the other. The heel of another pipe, unusually, has milled decoration and two stems from the same context (202) have Dutch-style milled decoration.

5.2.14 *Glass* (Appendix 4)

5.2.15 A small assemblage of glass, totalling one hundred and six fragments from a minimum number of sixteen vessels, as well as window glass, was recovered from the excavations at the site of the Vancouver Centre, King's Lynn.

5.2.16 Whilst the majority of the fragments are relatively late in date, there are a few pieces of medieval window glass from contexts (815), (1106) and (511). Of particular note are a complete rectangular quarry 52 x 39 mm and part of a rectangular boarder piece both from (1106). Although unpainted these can be dated to belonging to the 13th-15th centuries. Window glass from later periods also occurs in a number of contexts, but this is largely highly fragmented and there are no complete quarries or sections.

5.2.17 The earliest vessel, coming from (25014), dates to between 1650-80 and is a large portion of shaft and globe wine bottle the earliest type to be produced. Slightly later is a portion of an onion wine bottle from (25139), whilst late 18th- or 19th-century wine bottles were found in (25452), (202) and (30840). Other vessels that can be identified are a clear phial from (25430), the edge of a square dish (104018) and an unstratified late wine glass base.

5.2.18 The remaining vessels are all later 19th or early 20th century bottles. The final fragment of note is a single small piece of cast and polished plate glass from (905). This type of glass was typically used to make mirrors, although no trace of silvering now remains.

5.2.19 ***Flint*** (Appendix 5)

5.2.20 Four pieces of worked flint were recovered from four separate contexts during an evaluation at King's Lynn, comprising two flakes and two tested nodules. The flake (from context 1415) is possibly naturally struck. It is a small primary removal with no striking platform. The flake from context 25315 is a secondary removal. It has possible use-wear along its right hand edge. The tested nodules from contexts 25377 and 25407 are minimally worked with few removals. They weigh 208 g and 362 g respectively. All four pieces of flint are derived from gravel sources. They are characterised by a thin and abraded cortex and are likely to have been locally found.

5.2.21 ***Worked stone*** (Appendix 6)

5.2.22 A total of 21 pieces of stone were retained during fieldwork at the Vancouver Centre, King's Lynn. They include two fragments of mortars, one probable rotary quern fragment, one whetstone and a number of unworked but imported pieces. The remainder is either unworked or too fragmentary to determine. All the stone was examined with the aid of a x10 magnification hand lens.

5.2.23 Architectural Stone

5.2.24 Two pieces of architectural stone (30010 and 30012) were retrieved from Trench 19. Both were door/window rebates in a shelly white limestone. The pieces were reused. The excavator suggested an ecclesiastical provenance for the material, however there is no reason to suppose that the material did not derive from a secular origin such as a merchants house.

5.2.25 ***Worked bone*** (Appendix 7)

5.2.26 The assemblage from the Vancouver Centre, King's Lynn comprises four needles, a handle, a pin and a piece of bead working debris.

5.2.27 The needles were most likely for making nets, probably for fishing, given the location of the site. They are large with large heads and lend themselves well to coarse work.

5.2.28 The piece of bead/button working debris is common from the medieval period onwards. It is a section of a long bone with holes through it where the bead/button has been drilled out. Other examples have been found at King's Lynn (Clarke and Carter 1977).

5.2.29 Slag (Appendix 8)

5.2.30 Almost 4.5kg of material, initially identified as slag, was examined for this report. The assemblage was examined by eye and categorised on the basis of morphology. Virtually all the slag was undiagnostic, i.e. could not be related to either smelting or smithing. Much could have been produced by other high temperature industries, for example cinder is the lighter portion of vitrified hearth lining. A large proportion of the assemblage appeared to have been produced with coal as the fuel and looks to be post-medieval in date.

5.2.31 Metal objects

5.2.32 A total of 37 metal objects were recovered from the excavations carried out at South West Broad Street (37719) and the North Side of Conduit Street (37722). The assemblage comprises 7 copper alloy objects and 29 iron objects (including 23 nails). The copper alloy objects are corroded and fragile but appear to be stable. The iron is unstable, corroded and flaking. The whole assemblage has been x-rayed (plates 1362-70). The identifiable objects, of which there are few are all late medieval/post-medieval in date.

Copper alloy objects

SF No.	Ctx No.	Object	Material	Description	Length
25008	25459	Coin	Copper alloy	Modern coin.	
25009	25459	Coin	Copper alloy	A very corroded coin, there are no details visible on the x-ray plate	
30014	30506	Coin ?	Copper alloy	Possible coin although there are no details visible on the x-ray plate	23mm
30013	30506	Pin	Copper alloy	A large dress pin with a wire wound head	50mm
25010	15471	Ring	Copper alloy	A small incomplete wire ring	10mm
-	25397	Spoon	Copper alloy	A modern spoon with a moulded handle	86mm
30003	30356	Strip	Copper alloy	A curved rectangular strip slightly tapering along its length. Broken at both ends. Part of a circular perforation visible on one broken end.	28mm

5.2.33 The three coins recovered from the site are all very corroded: SF25008 is definitely modern and the other two have no details visible on the x-ray plate. A large dress pin, SF30013, with a wire wound head would have been used for securing light garments or a head dress and dates from the late medieval/post-medieval period. A small incomplete wire ring, SF25010, is possibly from a wire loop fastener (the twisted ends are missing in this example). These fasteners are also believed to have been used to secure light garments and date from the same period. They are often found associated with assemblages of dress pins and lace tags. A spoon bowl recovered from context 25397 is modern in form.

Iron objects

SF No.	Ctx No.	Object	Material	Description	Length
30012	30378	Knife	Iron	An incomplete whittle tang knife, very corroded and both the blade and tang are incomplete however the x-ray shows evidence of pattern welding.	82mm
30002	20358	Nail	Iron		
	25150	Nail	Iron		
	25316	Nail	Iron		
	25401	Nail	Iron		
	25450	Nail	Iron	A nail with wood attached	
	25452	Nail	Iron		
	30009	Nail	Iron		
30007	30345	Nail	Iron		
30006	30356	Nail	Iron		
30010	30356	Nail	Iron		
30005	30356	Nail	Iron		
30004	30356	Nail	Iron		
30001	30358	Nail	Iron		
30000	30358	Nail	Iron		

S.F. No.	Ctx No.	Object	Material	Description	Length
-	30454	Nail	Iron		
-	30474	Nail	Iron		
-	30569	Nail	Iron		
	30575	Nail	Iron		
	25432	Nails (2)	Iron	Both nails have fragments of wood attached	
	25453	Nails (3)	Iron	All 3 nails have wood attached	
30011	30280	Sheet	Iron	An irregularly shaped fragment of iron sheet	58mm
	30400	Sheet	Iron	An irregularly shaped fragment of iron (although it does have one 90 degree angle surviving) with a circular perforation through the centre	41mm
	30850	Sheet	Iron	2 small irregularly shaped fragments of sheet	
	30849	Strip	Iron	A rectangular strip, slightly tapering along its length and with the remains of a crude hole across one of the broken ends.	145mm
	25139	Vessel	Iron	A large fragment from the rim, neck and shoulder of a cast iron vessel with a robust circular section handle.	

5.2.34 The majority of the iron objects recovered from the excavation are nails, a number of which have traces of wood adhering to them. The only other identifiable objects are the corroded remains of an incomplete whittle tang knife (SF30012) and a large fragment from a cast metal vessel from context 25139. The iron knife is pattern welded, a method by which several rods running the length of the blade are joined together, allowing the blacksmith to combine irons with differing properties. Ideally steel would be chosen to provide hardness at the edge where as wrought iron or mild steel is better for the remainder of the blade because it is more malleable and more resistant to fracture. Pattern welding was used widely in Europe throughout the medieval period and later. The cast metal vessel fragment comprises the everted rim, neck, shoulder and robust angled handle probably from a tripod cauldron (Egan 1998, 1163, fig 131, No.446).

5.3 Environmental

5.3.1 Human bone - Quaker inhumations (Appendix 9)

5.3.2 A total of 30 graves containing the skeletal remains of 34 individuals were excavated from the site of the Friends Burial Ground, King's Lynn. There were 24 earth-cut graves and 6 brick lined shaft graves. Two earth-cut graves contained the remains of three and two individuals respectively.

5.3.3 The skeletal assemblage comprises 15 adult males, 16 adult females, 1 unsexed adult, 1 infant, and 1 adolescent of unknown sex. All the graves were oriented west-east and, save for three earth-cut graves, the individual was buried within a wooden coffin. An exception to this pattern is zinc coffin 30450. The coffin furnishings were basic breastplates, grip plates and handles. The orientation and plain nature of the burials accords with the Quaker doctrine of 'Christian simplicity' whereby they maintained a simple life devoid of the 'Pomps and Glory of the world' so that they could concentrate their attentions to experiencing God's 'love and power' (Stock 1998, 133) in the everyday world. No grave goods were recovered.

5.3.4 Each burial was excavated and recorded in accordance with professional guidelines and the skeletal remains removed for osteological analysis. Disarticulated remains discovered during excavation were retained for reburial with the articulated burials at a later date.

5.3.5 The coffin fittings were also retained for analysis, and then reburied with the skeletal remains.

5.3.6 *Human bone -Early post-medieval inhumation*

5.3.7 An adolescent female (30479) was buried away from the other burials to the south of the Quaker cemetery. The burial was contained within a narrow coffin characteristic of the early post-medieval period and is therefore dealt with separately from the inhumations that are clearly associated with the Quaker cemetery.

5.3.8 Human bone - Baptist inhumations (Appendix 10)

5.3.9 Eighteen burials were excavated within an area identified by 19th-century maps as the location of a Baptist chapel on Broad Street, King's Lynn. The duration of use of the cemetery is not well documented, but appears to date broadly from the early to mid-19th century AD. One triple wood-iron-wood coffin was lifted intact and was reburied without examining the contents. The coffin size suggests the burial of a young child. The remaining 17 skeletons (16 adults and one child) underwent full osteological analysis.

5.3.10 ***Animal bone*** (Appendix 11)

5.3.11 A total of 1769 (36475 g) fragments of bone and teeth were excavated from Medieval and post Medieval features, all of which have been analysed for this assessment, and the re-fitting of broken fragments has reduced the total fragment count to 1487. The animal bone from this excavation has survived in very good condition, with the majority scoring 1 or 2 according to Lyman's grading. The good condition of the animal bones has resulted in 45.8% of the bones being identified to species, with a full list of the species present shown in Tables 2 and 3 in Appendix 13. These show that cattle and sheep/goat were main species to be identified, along with small numbers of pig, cat, dog, horse, rabbit and hare. A small number of domestic and wild bird bones were also recovered. Surface modifications and pathologies could be noted on a number of bones from all sites, and many of the post-cranial elements and mandibles could be measured and aged.

5.3.12 ***Charred and waterlogged plant remains*** (Appendix 12)

5.3.13 Ten samples were selected for the assessment of CPR and eleven for WPR. See the table below for details of feature types and site codes.

Site code	Feature type	Number of samples	Type of plant remains
37719	Hearth	1	CPR
37719	Channel fill	4	CPR
37722	Layer	3	CPR
37722	Hearth	1	CPR
37722	Unknown	1	CPR
37719	Channel fill	1	WPR
37719	Layer	3	WPR
37720	Soil accumulation	2	WPR
37722	Layer	1	WPR
37722	Pit	2	WPR
37722	Fish trap	2	WPR

5.3.14 Five samples were selected for the assessment of CPR from 37719KYL. Four samples were from the sequence of fills of linear feature, ***25158,*** thought to be a channel to the Webster Row (Broad Street) Fleet dating to the 15th to 16th centuries and related to the management of the water systems. Charcoal was abundant in the samples but only low numbers of charred cereal grains and weed seeds were recorded. However WPR were quite abundant and included grape (*Vitis*), elderberry (*Sambucus*), and blackberry (*Rubus*) pips and hazel (*Corylus*) nut shell. Arable weeds were also well represented.

5.3.15 A sample (25014) from a hearth fill (***25395***) contained large numbers of bread wheat (*Triticum aestivum*) grains and some seeds from possible cultivated legumes together with fish bone.

5.3.16 Five samples from site 37722KYL were assessed for CPR and charcoal was recorded in all but sample 30005, from layer ***30252***. Fish bone was noted in all five samples. Occasional cereal grains were noted but they were not abundant.

5.3.17 In one sample (from layer 30252) although only a few CPR were identified in it WPR were frequent and included arable weeds for example corn cockle (*Agrostemma githago*), corn marigold (*Chrysanthemum segetum*), cornflower (*Centaurea cyanus*) and small nettle (*Urtica urens*). There was also evidence of economic plants including straw and hemp (*Cannabis*) and native food plants for example hazel. This assemblage of plant remains suggests that this layer may have been built up from cultivation debris.

5.3.18 The flot of sample 30004 from the 13-century layer 30191, contained large numbers of vitreous like globules, which are usually thought to have originated from a smithy, and confirms that the deposit is either related to industrial activity or accumulated as the result of the disposal of industrial debris.

5.3.19 All samples selected for the assessment of WPR contained some waterlogged plant remains although they were not abundant in the two samples from 37720KYL and sample 205 from layer 70015 (37719KYL). In addition to WPR charred oats and bread wheat grains were recorded in layer 212, a humic medieval soil accumulation from 37720KYL.

5.3.20 The three samples from site 37719KLY all contained quite abundant WPR and in one (sample 25001) from the linear feature, ***25158***, coriander (*Coriandrum*) and culm nodes were recorded. The assemblage of weed seeds included some arable weeds, plants of wet ground, which were more abundant in layer ***25325***, and other plants which occur in a broad range of ecological habitats. Wood fragments were abundant and insects were frequent in two samples (context ***25166*** and ***25388***). The assemblage of plant remains from these samples has the potential to inform about the economy and ecology of the site.

5.3.21 Three samples from site 37720KYL were rich in WPR. They were the sample from a thirteenth century alluvial layer (***30280***), the fill (context ***30450***) a 16th century wooden barrel thought to have been used as a cess pit and the fill (context ***30678***) of a possible fish trap. Insect remains were very frequent in the three samples mentioned above together with wood fragments. Some moss fragments were also recorded. Seeds recorded included arable weeds for example members of the cabbage family (*Brassica*), corn cockle, corn chamomile (*Anthemis cotula*), and wild radish (*Raphanus raphinistrum*), grassland plants including hairy buttercup (*Ranunculus sarduous*) and common sorrel (*Rumex acetosa*), some plants of wet ground and others from broad ecological groupings. It is interesting to note that a seed of parsley water-dropwort (*Oenanthe lachenalli*), a plant found growing today in ditches, marshes and dykes mostly near the coast or in brackish water, was recorded in fill 30678, from the possible fish trap. The assemblage of plant remains from these samples has the potential to inform about the economy and ecology of the site.

5.3.22 *Pollen* (Appendix 13)

5.3.23 Two monolith samples have been assessed for their potential for pollen analysis. The monolith samples are taken from the fill of a 15th-16th century linear feature excavated as part of the Vancouver Centre, King's Lynn development. The linear feature is possibly associated with water management.

5.3.24 Six sub-samples from the monolith samples, which covered the range of contexts within the feature, were assessed. Pollen was present in all samples, although in much greater concentrations in the primary fill of the feature. The later fills have significantly lower pollen within them, but a greater range of pollen taxa, suggesting a change in the source of pollen within the contexts, which may represent changes within the sources, or management, of water through the feature.

5.3.25 *Waterlogged and worked wood* (Appendix 14)

5.3.26 Forty four waterlogged/worked wooden objects were retrieved from the excavations. These included a pegged board (site 37721, context 106007) a pile cut from reused timber (site 37722, context 30315) and the staves of a coopered container. This composite artefact (site 37722, context 30448) is made up from 23 staves but is not a barrel or similar vessel. It did not have a base or head and its converted state is not intended to retain liquids. It may be designed specifically as a lining but it is in any case unusual.

5.3.27 In addition the state of preservation for wood from the evaluation was assessed giving a total of 67 items. Overall the wood was in a generally fair state of preservation. Waterlogged anoxic conditions were maintained in all contexts in which the material survived up to the time of excavation.

5.3.28 Many pieces had suffered from severe abrasion or erosion, obscuring or removing surface information which would once have been there. The absence of woodworm damage suggests that this material was deposited directly into waterlogged contexts but was not immediately buried.

5.3.29 Several samples were taken for dendrochronology.

5.3.30 ***Leather*** (Appendix 15)

5.3.31 A rapid scan was made of the material. The leather was washed and wet when examined and packed in double, self-sealing polythene bags within self-sealing plastic storage boxes. The leather assemblage is clearly cobbling waste, deliberately discarded once any re-usable leather had been salvaged. In addition, waste leather is well represented. Primary waste, that is unusable parts of the tanned hide or skin, and secondary waste, that is waste discarded during the cutting out of pattern pieces during manufacture, were found.

5.3.32 The sole shapes found suggest a 13th century date. Few shoe uppers are present but one nearly complete ankle boot was noted and at least four styles of shoe are represented. The relatively common use of sheep/goatskin was also notable. Context 816 contained a fragment of shoe upper of a style popular in the late 13th- mid 14th century. A single context (812) contained shoe soles that are likely to date to the 15th century.

5.3.33 ***Shell***

5.3.34 A total of 474 fragments of shell were recovered from the site. These included oyster, whelk, cockle and mussel shells.

5.3.35 *Faunal remains from sieving residues* (Appendix.16)

5.3.36 A selection of residues and flots from the processed soil samples were scanned for small bones, following the recognition of fish bones and scales in some of the flots assessed for charred and waterlogged plant remains. The scanned residues and flots generally contained fish remains in an excellent state of preservation. No small mammal, amphibian, reptile or small bird bones were observed.

5.3.37 Unsurprisingly, for an East Anglian port, herring (*Clupea harengus*) was identified in most samples, but small and tiny flatfish bones were also common - an unusual find in a medieval and post-medieval site. Eel (*Anguilla anguilla*), smelt (*Osmerus eperlanus*) and - intriguingly - 3-spined stickleback (*Gasterosteus aculeatus*) bones indicate the exploitation of estuarine and possibly freshwater resources (although the sticklebacks can be found in salt and freshwater). The charring of the 3-spined stickleback bone indicates that it was most likely deposited in hearth fill 30346 as domestic rubbish.

6 SUMMARY OF RESULTS - STRATIGRAPHIC

6.1 Zone A

6.1.1 Machine reduction of Zone A (for pile mat construction) was largely confined to removal of the existing car park and its associated construction layers. This meant that although early post-medieval structure and deposits were revealed they were not thereafter subject to wholesale truncation. Accordingly excavation and recording was limited to cleaning, planning and recording the remains in plan supplemented with recorded sections where pile caps and rafters were constructed through the remains. No medieval remains were encountered.

6.1.2 An area of brick built structures was revealed to the south-west of Zone A. Generally the construction-led excavation horizon only revealed the uppermost parts of surviving walls, however, in the most south-western corner a room was revealed which evidenced compacted chalk and beaten earth floor deposits, a chimney base and doorway. The room measured 7.5 m x 6.75 m and was originally constructed with soft-fired hand-made bricks (later rebuilds and blocking were noted using hard fired and stamped industrial brick. Postholes inset in the brick walls indicate a timber/brick noggin construction. A fragment of rotary quern was retrieved from a floor deposit just to the north of the room. Pottery and clay pipe retrieved from the floor deposits suggest the structure was in use from the 17th-18th century. In relation to map regressions this building may form part of the frontage of Ratton Row (later Softleys Yard) and may have been a bakery or miller's workshop.

6.2 Zone B

6.2.1 Baptist Cemetery

6.2.2 A full report on the Baptist Cemetery is included in Appendix 10.

Trench 21

Phase 1 –Topography (Up to 13th Century)

6.2.3 The earliest phase of activity identified comprised a thick layer of sandy-silt, interpreted as the natural medieval landscape prior to occupation activity. The surface of the deposit undulated and appeared to form crude banks, which sloped eastwards toward the fleet that ran down Broad street. The surface was cut by a number of later features.

Phase 2 – Management of water systems (13th-14th Century)

6.2.4 The earliest features identified comprised a series of four pits/postholes identified on the northern area of the site, and a single posthole and a linear feature in the southern area. Chronologically it appears that the ditch was constructed after the postholes, however, it may be that the features were all in use around the same period.

6.2.5 The linear feature was lined with a thick layer of clay to form a vertical sided, flat based waterproofed ditch or channel and has been interpreted as a channel that would have connected to the Webstar Row (Broad Street) fleet. The fills of the channel indicate that it slowly silted up, before being deliberately backfilled. The clay lining of the ditch and subsequent infills contained ceramics dating to late 13th-14th century as well as sheep/goat and cattle bones. Well-preserved pollen grains were present in all of the ditch fills, but were notably more abundant in the lower strata.

6.2.6 The single posthole is probably contemporary, and may be functionally associated with the channel.

6.2.7 It is likely that the channel would have formed a private watercourse connected to the Webstar Row fleet. The width of the channel is unlikely to have accommodated much more than a small punt-like boat, however, this would have been sufficient to have moved loads to and from larger vessels. It appears possible that the largest of the vessels would have entered the Purfleet and unloaded their wares onto private or the town wharf. Merchandise may then have been transported on smaller vessels up the Webstar Row fleet and finally unloaded at private wharves or quays.

Phase 3 – Dumping (14th -16th Century)

6.2.8 This phase of activity is represented by a series of pits and dump layers containing abundant domestic refuse in the form of ceramics dating to the 14th-15th century as well as sheep/goat, cattle, fowl, pig bone (many showing butchery marks) oyster and whelk shells across the site. There is little evidence for the construction of any building during this phase other than the presence of a single wall on the northern area of the site.

6.2.9 The wall was orientated east-west and may represent a boundary between plots. It was constructed of rough limestone, which sat on a compacted gravel base. Ceramics indicating a 14th-century date were retrieved from the structure's construction cut.

Phase 4 – Development of building plot (17th Century +)

6.2.10 Henry Bell's plan of Kings Lynn (before 1683) shows that by the 17th century the Webstar Road/ Broad Street fleet had been infilled and the street frontage fully developed. Five brick-built wall elements and a possible cellar revealed within the excavation area were associated with this and later phases. The wall elements were fragmentary and appear to have been badly damaged by the demolition works of the 1960-70's Vancouver Centre development.

6.2.11 It is possible that one of the walls forms the external extent of a plot. The fact that it appears to continue across much of the excavation area would suggest that it does form the southern extent of the plot, with a further wall forming the northern extent. If this is the case then the plot would have measured 9.75 m in width. No evidence for the front or the rear of the building was identified.

Trench 22

Phase 1- Marine sediments/dumping, land reclamation, initial occupation (13th-14th Century)

6.2.12 The earliest strata investigated in Trench 22 was a sequence of marine and alluvial sediments overlying a grey sand seen in the southern half of the trench. This sequence was overlain throughout the trench by thin horizontally-banded domestic dumping deposits. Many of the deposits were organically rich and contained ceramics dating to the 13th-14th century as well as varied animal bone and oyster shell. A bone template for button or bead manufacture was recovered from this sequence.

6.2.13 Elements of oak land ties were revealed in the southern half of the trench - within the domestic dumping accumulation - suggesting the presence of a channel to the south. In the northern half of the trench excavation revealed a wattle fence and parallel drainage ditch. The evidence from this phase therefore suggests land reclamation partially as a by-product of dumping but also through drainage and land demarcation.

6.2.14 Phase 2 - Stone structural occupation (13th-14th/14th-20th Century)

6.2.15 Stone structural occupation on the site was evidenced by several limestone walls and mortar floors. Ceramics retrieved from temporary hearths, pits and beam slots resulting from internal structural changes, date to the 13th -14th Century. Of particular note was a Grimston ware cooking pot buried against a wall. This contained a deposit with well-preserved breadwheat, legumes, seeds and fishbone. The pot has been retained unwashed for lipid residue analysis.

6.2.16 The form of the buildings indicated by the structures were not fully coherent due to extensive impact from the 1960's -70's piled construction. It is also likely that the major structural elements of the building(s) remained in use until demolition prior to the 20th century construction of the Vancouver Centre. While in general the artefactual assemblages and deposit sequences terminate in the 13th-14th century, brick built structures, fireplaces and areas of flagstone flooring have been added to the earlier walls. It therefore seems probable that vertical stratigraphic sequence has been sealed by tiled or flagstone flooring (either in the 15th century or later with some degree of truncation) and that this floor layer has subsequently been robbed, possibly prior to demolition of the structure(s).

6.3 Zone C

Quaker Cemetery

6.3.1 A full report has been produced for the Quaker cemetery exhumations and is included in Appendix 9.

Trench 18

Phase 1 – Dumping/ Land reclamation (13th Century)

6.3.2 The earliest activity identified comprised a series of layers that were observed at a maximum depth of c 2.50 m below the existing ground surface. The deposits were dumped sands and silts - many containing pig cattle, sheep/goat and domestic fowl bones, oyster, whelk, mussel and cockle shells and ceramics dating to the 13th century .

6.3.3 An interpretative 13th Century map of King's Lynn incorporating information from the Newland Survey *c* 1250 (Parker 71) indicates Tenements on Damgate (Norfolk St), Briggate St (High St) and what is now known as Broad St, however, the area adjacent to the Purfleet was not inhabited during this period. Further evidence to suggest that this area was marginal land during this period is indicated by the presence of alluvial layers (flooding deposits) in the northern area of the site. A sondage was excavated to the north of a substantial wall, which identified two small timbers and a thick alluvial horizon. The deposit contained a large amount of organic material, including animal bone, shell and shoe leather dating to the 13th century. Similar deposits were seen in sections below other walls in this area.

Phase 2 – Evidence for occupation (?late 13th – mid 14th Century)

6.3.4 The earliest features identified in this phase were pits that are cut through the alluvial layers and were in turn sealed by a levelling layer. The pits contained abundant domestic refuse and ceramics dating to the 13th century. These may be dumping pits associated with the construction phase of buildings in this area, rather than associated with established residences. This is based on the quantity of CBM and nails contained within the features.

6.3.5 The presence of an oven/hearth feature in the northern area of the excavation offers stronger evidence for occupation in the area adjacent to Fincham St (New Conduit St). A series of thin deposits were noted across the excavation area indicating that by this phase much of the land had been reclaimed and was suitable for the construction of buildings. A thick sterile levelling deposit was laid in the northern area of the site, possibly to create a rough floor surface, into which an oven/hearth was constructed. The oven contained layers of orange and yellow baked clay. It was roughly oval shaped in plan and measured 1.70 m in length, 0.60 m in width and 0.25 m in depth. A remnant of a wooden floor surface was identified close to the feature, however, it is uncertain if the feature relates to the use of the oven.

6.3.6 No evidence for an occupation structure associated with the oven was found, it is probable that any such building was of timber construction and was subsequently replaced by the stone built structure described below.

Phase 3 – Stone built structures (Late 13th-15th Century)

6.3.7 With the exception of one wall (to be analysed fully at publication stage), it appears that the majority of the stone walls fall into this phase of activity. The outer wall of the structure appears to be associated with further walls representing internal divisions. A further wall here needs more analysis: it would appear that during this phase the eastern external wall of the structure is present. However, this eastern wall is certainly cut into by a subsequent wall (see Phase 4) suggesting that the later building is much wider. A series of floor surfaces were associated with these walls, but were badly damaged by later activity. Very little datable/diagnostic material was present in any of the contexts associated with the stone structures.

6.3.8 The outer wall of the structure was orientated north-south and ran the length of the excavation area. It measured 15 m in length, 0.90 m and 0.40 m high and was constructed using limestone rubble bonded with a lime-based mortar. The wall foundation comprised a series of bands of compacted sandy-gravel. The internal division walls were constructed in a similar manner.

6.3.9 The wall interpreted as the eastern external wall was significant in the fact that its construction was notably different to the other walls identified in the excavation area. The wall and its foundations were constructed solely of limestone rubble that was bonded with a lime mortar. There was no evidence for timber piles or compacted gravel bands. The wall measured *c* 15 m in length, 0.75 m in width and *c* 1.40 m in depth. Clarke and Carter suggest that this form of construction technique comes into use in King's Lynn in *c* 1250-1300.

6.3.10 The development of the building is of great interest, especially as there are significant changes in construction styles. It may be that the wall interpreted as the eastern external wall is actually part of an earlier building, which has been modified and incorporated into the larger and later structure. The most obvious explanation for the development is that the outer walls were constructed to form the superstructure, which would have created a long and wide single building. This is of interest as it has been suggested that many of the medieval buildings were 'L' shaped (Parker 71). The building would have measured *c* 11 m in width. The full length of the building is uncertain at present, however, the probable eastern external wall was seen in the Quaker burial area, suggesting that the building measured 30 m in length. The building is most likely to have faced onto New Conduit Street. A possible entrance way was formed by further walls with the gap measuring 1.30 m in width.

6.3.11 The internal divisions in the building seen to have changed little, but rather appear to be replaced by more substantial elements. Evidence to indicate this takes the form of a line of stakeholes beneath wall one of the internal walls. These suggest that there may have been an earlier wattle dividing wall, which was then replaced by a more substantial internal structure. Little other evidence has survived to indicate any other internal divisions other than the substantial stone and gravel foundations. The three identified rooms comprised a passage way leading to the front of the building, a room facing onto Fincham Street and a further room to the north of one of the internal dividing walls. The passage way would have measured 1.80 m in width and is interpreted as leading from the front of the building into the main area. The room facing onto Fincham Street would have measured 9 m in length and 3.50 m in width (31.50 m^2). The room may have functioned as a business unit facing onto a busy street. Only a small fragment of the northern room was identified during excavation.

Phase 4 – Structural modifications (15th-16th century)

6.3.12 At some point during this phase a further wall was added to the southern end of the structure; this structure is of interest as it is a classic example of the style of construction used elsewhere in medieval King's Lynn. The construction trench was excavated and a series of wooden piles were driven into the base. The next stage comprised compacting layers of gravel into the trench cut. The aim of this process was to create a "free draining foundation along which any excessive load developing at any particular point would be evenly distributed, thereby avoiding cracks in the wall(s) above. The construction style of this wall is similar to that of the dividing walls of the building already established, and may suggest there was an actual replacement of an earlier wall that had developed a fault.

Phase 5 –Adult inhumation (16th-17th century)

6.3.13 An adult inhumation was revealed within the building; it appeared to have cut into one of the internal walls of the building. The body was in a narrow wooden coffin, which suggested an early post-medieval date for the inhumation. This is detailed in the human bone sections of this report.

Trench 19

Phase 1 –Activity on marginal land (13th century)

6.3.14 Activity associated with this phase was identified in four sondages located in the central and eastern area of the site. It comprised areas of dumped stone, a pit, a standing timber, timber fragments and a possible sand bank. These specific features were incorporated in complex sequences of redeposited sands, flood deposits and 'micro-stratified' dumping episodes. Discernible evidence for the medieval topography appeared in the form of a sand bank that was identified in the western sondages. The bank tipped to the east suggesting that a watercourse ran southwards across part of the trench, toward the Purfleet. The exact extent of the creek is uncertain as the full extent of this archaeological horizon was not investigated during this excavation. Butchered cattle bone, oyster shell and pottery indicating a 13th century date were retrieved from this deposit and the peat formation immediately below it.

6.3.15 An area of stone, a pit, a stone lined stakehole and a series of stakes were identified in a sondage in the south-eastern area of the excavation. The features were cut into the dark-grey clay fill of an earlier pit (not illustrated) which in turn was cut into an alluvial deposit. It appears that the features in this area (including a stone pad to the north) are indicative of the use of the marginal land between the reclaimed areas of land and river channels. It is likely that the area of stone was deliberately dumped to create a rough working platform. The stake was probably driven to provide access to some form of water course, which has been filled in at a later date. The function of the group of stakes is uncertain, however, they may have been driven for fishing lines or to trap wildfowl that would have lived along the marginal areas of land.

6.3.16 The evidence from this excavation trench indicates that during the 13th century the immediate landscape to the north of the Purfleet comprised an unstable series of water channels and mud flats prone to flooding and subject to domestic dumping. The activities associated with this phase of activity appear to be focussed on the exploitation of natural resources such as molluscs, fish and wild fowl that may have lived in the fleets. The sand bank may suggest evidence of salt panning, however no structures associated with this process were revealed and the bank could have been formed by fluvial events.

Phase 2 – Reclamation of land (13th century?)

6.3.17 A series of redeposited layers of sand and alternating mixed dump deposits were noted in the eastern half of the excavation. It seems likely that the deposits were dumped here to reclaim the partially silted watercourse - described above - in order to facilitate consolidation, construction and occupation. The dating of this event is problematical as the sands were largely sterile and the largely 13th century ceramic material derived from the mixed dumping layers could be residual.

Phase 3 – Construction and use of stone structure (13th?-16th Century)

6.3.18 The stratigraphic and ceramic data shows that stone built construction in the area begins in the 13th century. This presumably closely post-dates the Newland Survey (*c* 1250) which shows no occupation of the north bank of the Purfleet west of Belvaco's (Baxter) Bridge.

6.3.19 The stone built construction comprised four rough hewn limestone wall bases resting on trench built, compacted gravel band foundations. A further wall was evidenced by the presence of a robber trench overlying a compacted gravel foundation.

6.3.20 The walls formed part of a single building. The extent of the building was not identified during the excavation, however, at least three rooms and a possible back yard area were identified (Rooms 1-3 and Area 1, Fig. 1). It is likely that the building had some longevity and survived (with alterations-see below) until at least the 16th century.

6.3.21 Room 1 measured a minimum of 6.50 m x 5 m (32.5 m^2). This room was significantly wider than the rooms identified in Trench 18, which measured 3 m in width, however, the visible area was a similar size, measuring 31.50 m^2. A sondage within this room revealed a sequence of superimposed floor layers alternating between mortared surfaces and beaten earth deposits. However no artefacts were present in the sequence.

6.3.22 The full extent of Room 2 was not identified during the excavation, nor were any floor surfaces or internal features observed. The wall that formed the western edge of the room had been robbed/demolished down to the gravel foundations. Based on the evidence it appears that the room was badly damaged by the construction and demolition of later buildings. The northern wall of the room was visible: of interest was the presence of two pieces of worked stone inserted into the western limit of the wall and forming a recess.

6.3.23 Room 3 was notable as it appeared that it had a sunken floor. A floor surface was revealed *c* 0.22 m below the main foundation. The depression was filled with a sequence of undated silts and rubble and then overlain by a floor surface, which contained pottery giving an indicative date of mid 14th-early 16th century.

6.3.24 The area adjacent to Rooms 1 and 3 has been interpreted as a probable external area during the life of the building. The area is contained by three walls. There was no evidence for any form of floor surface in the area. The excavated sequence in this area comprised clay dumping (associated with land reclamation and dating to the 13th century) overlain by a series of undated sands, silts and building debris. A mid 15th-16th century barrel latrine is located to the south east corner of the area.

6.3.25 A fragment of a north-south orientated wall was identified in the south-western corner of the excavation. The wall had been cut into by a later pit and was very badly damaged by a modern service run. The function of the wall is uncertain, however it may be the external wall to the 13-15th century structure recorded in Trench 17.

Phase 4 – Building alterations and site redevelopment (Late 16th -19th Century?)

6.3.26 During this phase a number of pits are dug. The largest contained a high percentage of tile fragments. A further series of five pits was identified in the western area of the excavation, to the west. Dating evidence suggest that these pits are associated with alterations to the limestone founded structure in the late 16th century.

6.3.27 The map regressions show that by 1830 dense development of the area has occurred, this is reflected within the trench by several partially surviving brick built structures. Presumably the larger part of this construction phase was truncated by the construction of the Vancouver Centre in the 1960s-70s.

Trench 20

Phase 1 –Topography (Upto13th Century)

6.3.28 Marine sediments and fluvial sands underlay Trench 20 but were not investigated to any significant extent. Where encountered (at the base of excavations) these were sterile of artefacts and obvious indications of human activity.

Phase 2 - Occupation (13th-15th century)

6.3.29 Occupation activity in Trench 20 was evidenced by a sequence of pits in the north west corner of the site. At the centre of this sequence was a large sub-rectangular pit which was wood-lined. The pit appeared to have filled gradually through a process of intermittent flooding and silting and finally purposeful infilling with domestic waste including pig and goat bones (horn cores). Well preserved waterlogged plant and insect remains were retrieved from the lower fills of the feature including parsley water drop wort - a plant commonly associated with coastal or brackish waters.

6.3.30 To the south west of the trench two rough hewn limestone walls formed the corner of a room or building. The walls were roughly aligned north-east -south-west and south east to north-west. Structural phasing was indicated by a hard joint between the two walls, as well as differing mortars and build characteristics.

6.3.31 The south-east - north-west aligned wall incorporated a square well/pit feature. This was filled by a sequence of silts containing nearly 50 butchered and discarded goat horn cores as well as articulated cat bones (representing a single specimen) and pottery indicating a 13th century date for the infilling deposits.

6.3.32 To the north of the trench a complex sequence of small pits, postholes and probable beam-slots were revealed at the base of excavation. Ceramics retrieved from these features indicated a 13th-14th century date.

Phase 3 (16th-17th century)

6.3.33 This phase is represented by a single wall recorded at the northern limit of the site. The wall was constructed with rough hewn limestone. Ceramics giving the phase date were retrieved from the construction cut fill of this structure.

Phase 4 (18th -19th century)

6.3.34 Brick structures, mortar floors, hearths, tile dumps and an extensive slate deposit (suggesting a roof collapse) were present in the eastern half of the trench. These were dated by ceramics, glass and clay pipe.

6.4 Zone D

6.4.1 Recording in Zone D was largely confined to a watching brief action. This was due to the fact that horizontal truncation caused by the construction of the piling mat revealed only modern build up deposits. Similarly the extraction of deeper modern impacts failed to reveal archaeological deposits or remains.

6.4.2 The watching brief therefore focused on recording the isolated archaeological structures and deposits revealed in deeper impacts (i.e grubbing out for pile driving).

6.4.3 During the watching brief the north and south canalisation walls (16th century?) and capping (19th century) of the Purfleet were traced across the site. The location of the 16th century Conduit Street conduit was also recorded in one test pit.

6.5 Zone E

Clough Lane Car park

6.5.1 The location of excavation in the Clough Lane car park was dictated by the extent to which the construction would impact on archaeological levels defined by the results of trial trench evaluation. However medieval and early post-medieval archaeological remains identified in the evaluation were localised and not specifically under threat from the construction. An excavation was carried out in the area where six densely grouped and deep pile caps were to be constructed. The excavation was taken to the depth of the proposed pile caps and cut through visibly sterile marine deposits that underlay this part of the site.

6.5.2 A limestone and brick constructed well base was revealed to the centre of the trench. Ceramics from the construction cut were of a 13th-14th century date, those from the infill were 14th -15th century date, however the use of brick and stratigraphically associated finds show that a 16th -17 th century date is more likely for this structure.

6.5.3 The deposit sequence (and available map regressions) indicate that the site remained largely undeveloped until the 19th century. Closely spaced land drains across the site were dated to the 18th-19th century and suggest that the marshy nature of the site precluded all but small scale and localised occupation until the late post-medieval period.

6.6 Watching Brief All Sites

6.6.1 A watching brief was maintained on all below ground works through out the construction. All archaeological remains revealed by the construction processes were recorded and mapped. These include numerous stretches of brick walls dating from the 16th -19th century as well as brick built chimney bases and fireplaces. These were mainly recorded during the machine excavation for the construction of piling mats and many remain preserved below the construction. More occasionally (in Zones B, C, D and E) limestone structures and stratified medieval deposits were recorded in pile cap and ground beam excavations. The location of the north bank of the Purfleet prior to canalisation was recorded during a service diversion operation in New Conduit Street. The Baptist Cemetery and the full extent of the Quaker cemetery were also identified during the watching brief.

7 STATEMENT OF POTENTIAL

7.1 Stratigraphic

7.1.1 Stratigraphic sequences have been defined internally to each excavation area. These would benefit from reassessment in relation to artefactual evidence. In addition the correlation of stratigraphic units across the site as a whole (particularly between evaluation and excavation) would serve to refine phasing and enable consideration of the archaeological development and formulation of a phased framework in a site wide context. This would enable comparative analysis by phase and elucidate zoning.

7.2 Artefactual

7.2.1 Pottery

7.2.2 The pottery has the potential to inform us about the activities of the occupants of the site during the medieval and early post-medieval periods. It also has the obvious potential to provide a chronological framework for the development of the site. Study of the site records might reveal patterns for the spatial distribution of particular wares and/or vessel forms and thus illuminate the chronological development of different areas of the site. A full catalogue of the material (i.e. quantification by fabric, and preferably by vessel form also) should reveal the relative proportions of different wares in use on the site and thus shed light on trading connections. Vessel quantification should reveal the relative importance of different vessel classes (and hence functions) on the site and thus the importance of specific activities to the occupants of the site. This would also constitute a useful resource of comparative data for any future work on medieval pottery in the region. A search for cross-joining sherds has the potential to shed light on site formation processes and rubbish disposal. A selection of typical vessels - particularly the more complete and/or significant items should be made for illustration and publication in the final report, while other more fragmentary vessels could be paralleled, where possible, in existing publications.

7.2.3 Ceramic Building Material

7.2.4 The ceramic and other building materials have the potential to inform us about the appearance of buildings on the site during the medieval and early post-medieval periods. It also has some potential to provide a chronological framework for structural remains (eg. brick walls) where dates from pottery and other finds may be lacking, although in some cases the reverse may be true.

7.2.5 Although the main types of building materials present - roofing tile and brick - appear to conform to general types already known and published from King's Lynn (Clarke and Carter 1977) there are details within the assemblage, such as variations in tile fabric, which are barely mentioned in earlier reports and yet which may have chronological significance both for this site and for medieval archaeology in King's Lynn generally. The presence of medieval roofing slate is also unmentioned in Clarke and Carter's 1977 study. Although the latter study includes a typology for medieval and post-medieval bricks from the town this contains virtually no mention of brick fabrics or colour, and limits the dimensional classification to brick width and thickness while excluding any mention of length. In this sense the assemblage from the Vancouver Centre literally adds another dimension to the study of bricks from the town.

7.2.6 Two main medieval roof tile fabrics ('gritty' and 'lumpy') became apparent during the course of this assessment. These may be chronologically distinct - the gritty fabric being earlier and the lumpy fabric somewhat later. A study of the stratigraphic records and associated finds should clarify this point. All the main tile fabrics should also be properly described in the published report. A similar investigation should be undertaken for the ridge tiles and also for the roofing slates. The latter are almost certainly medieval but whether earlier or later medieval is still uncertain. The slates are certainly non-local and most likely to be from the South-West Peninsula - confirmation of which would have implications for trade. Illustrations of one or two of the best-preserved slates and ridge tiles would be desirable.

7.2.7 Assessment has generated useful data on a good sample of local bricks. Further analysis of the complete brick assemblage would focus on their dating. Closer comparisons with the 1977 typology should be attempted. As with the roofing materials above, the contexts of the bricks should be examined to see if their dating can be refined or independently confirmed. Statistical data from the recorded bricks - dimensions and perhaps fabric associations - should be examined for trends. Fuller fabric descriptions for selected typical bricks could also be provided either for publication or archive.

7.2.8 Clay tobacco pipes

7.2.9 This material is of low potential and it is probably not worth publishing in any detail. A summary report should be sufficient. If, however, it was judged to be relevant to the overall excavation report, four of the decorated pieces, including the marked bowls, could be illustrated and reported on.

7.2.10 Glass

7.2.11 The assemblage is relatively small in size, and the glass comes from a number of disparate contexts. Given this, and the somewhat uninformative character of the glass, the assemblage can be said to be of low potential and no further work or reporting is recommended. An edited version of this assessment needs to be included in the site report.

7.2.12 Flint

7.2.13 The quantity of worked flint is very small and there is no potential for further analysis.

7.2.14 Worked stone

7.2.15 Two items of the stone assemblage are of interest - the mortar and the whetstone. Further work is required to publish the mortar: to fully record it, determine its lithology and to place it in the typology of mortars already published for King's Lynn. (It needs to be examined by Quarrstone expert Dr Cheryl Allum).

7.2.16 The lithology of the whetstone and associated raw material needs to be identified and placed in a wider context. The frequency of the presence of raw materials on urban sites and of this particular lithology should be investigated as the evidence here suggests the possible presence of a workshop and/or industry which has the potential to inform about activity on the site. This needs to be assessed in the light of the contexts from which the stone has come however, and their spatial and contextual relationships. Presence of imported raw materials needs to be assessed in relation to the presence of other types of artefacts on the site to see whether there is evidence for any other industry.

7.2.17 Architectural Stone

7.2.18 This material has little potential for further work. Illustrations of the material and an identification of the stone should be included in the site report.

7.2.19 Worked bone

7.2.20 This material has no potential for further work. A catalogue and illustrations of the material should be included in the site report.

7.2.21 Slag

7.2.22 This material has no potential for further work. An edited version of the assessment should be included in the site report.

7.2.23 Metal objects

7.2.24 The metalwork assemblage is in poor condition, many of the objects are corroded and unstable. The majority of the objects are either nails or miscellaneous fragments of sheet. The remaining identifiable objects include a pin, a fastener, a knife and a cauldron fragment. The iron knife although of undiagnostic form is pattern welded and could be analysed by a metallurgist to look at the construction of the blade and possibly date the object. The cauldron fragment is large and the form could be reconstructed in an illustration this object would also benefit from metallurgical analysis. The assemblage requires little further work other than catalogue entries for the identifiable objects and a very brief report.

7.3 Environmental

7.3.1 Human bone - Quaker inhumations

7.3.2 Overall, the Quaker burials were in good condition, with 24 (70.6%) in good or excellent condition. One must also take into consideration that of the six poorly preserved skeletons (30443; 30455; 30463; 30513; 30547; 30570) all of their associated grave cuts were truncated and disturbed by modern activity predominantly associated with construction work carried out in the 1960s and 70s. All six contained bricks, mortar, glass and other construction materials. This level of disturbance will have greatly increased bacterial and microbial activity and access by a range of flora and fauna, thereby accelerating the process of decay.

7.3.3 Within this population neither dietary deficiency nor excess are prevalent, and there are few osteological markers for poor living conditions. Overall, the Quakers present an osteological picture of a generally healthy sample, mirroring the historical picture of a thriving middle-class community. Historical information can be used to support this osteological interpretation. For example, the occupations listed for individuals were predominantly mercantile in nature, fitting with middle-class business. Also, the old age of the population denotes good health. Osteological analyses become inaccurate after 45-50 years of age however the burial registers indicate that many people within this population lived well into their seventies and eighties.

7.3.4 The dental data shows us a community of reasonable wealth with access to dental treatment. The skeletal markers of health and life history are with the Quaker burial ground in Kingston-upon-Thames (1664-1814), suggesting that the good health and low-stress lifestyle of this population is characteristic of Quaker communities and not necessary that of the surrounding population. While in some respects the burial practice of Quakers reveals a degree of dissension, proscribed by Quaker doctrine, from that of the Established church, in others it imitates the Anglican tradition, particularly regarding demonstrations of socio-economic status and values.

7.3.5 The Quakers utilising the Friends Burial Ground in Kings Lynn do maintain simplicity in the design and decoration of their coffins and coffin furnishings and maintained equality in terms of intermixing male and female burials, which were accorded the same burial accoutrements. However, there is substantial evidence to suggest there to be a degree of social and economic display and inequality amongst those interring loved ones within this cemetery. This is witnessed in two contexts. Firstly, the segregation of family groups from other members of the community by interring them in brick-lined shaft graves, and secondly, the use of expensive, high quality materials for the coffin and its associated grips, grip plates and breastplates. Such practices display a clear message to others of wealth and a high social status, contradictory to the Quaker doctrine of equality.

7.3.6 osteological analysis has been carried out on this group of inhumations. This is detailed in Appendix 11. No further work is intended.

7.3.7 Human bone -early post -medieval

7.3.8 osteological analysis has been carried out on this inhumation. This is detailed in Appendix 12. No further work is intended.

7.3.9 Human bone - Baptist inhumations

7.3.10 The general bone condition of the assemblage was good to excellent. As a result, metrical analysis, identification of non-metric traits and identification of pathology was possible on all the skeletons. The completeness of many long bones allowed stature estimation in all but two adult skeletons.

7.3.11 Completeness of the bone was more variable, due to differences in the working conditions and methodology over the course of archaeological excavation. Where excavation had taken place in the traditional manner, the integrity of the skeleton was well maintained, and between 90-95% of skeletal elements were recovered. Burials in the eastern extent of the burial ground were less systematically excavated. Many skeletons were disturbed by machining and piling in this area, and a large amount of bone was recovered as charnel. It was possible to re-assemble six of these skeletons (25606-25610 and 25612). A small amount of charnel could not be assigned confidently to any of the other skeletons, and suggests the presence of other disturbed burials on the site.

7.3.12 The graves appeared to have been laid out systematically in three rows. Intercutting of graves only occurred in one instance, with the grave of skeleton 25609 cutting the grave of skeleton 25607, disturbing the right sided elements of the latter. Much of this skeleton was discovered as charnel in pit 25581. The upper levels of the grave of skeleton 25609 were truncated by later building work, the grave being overlaid by a hearth and then by a brick structure (25573). In the process the coffin lid and the skull had been removed, but the rest of the skeleton and the coffin sides and base were left *in situ*. The upper levels of the grave of 25606 were also disturbed by this structure, but the skeleton left largely intact. Pits 25578 and 25581 truncated skeleton 25577, but most of the skeleton could be re-assembled.

7.3.13 The osteology appears to corroborate with piecemeal documentary evidence that the Baptists were predominantly of working class origins, with many engaging in manual labour and sustaining a high incidence of injuries, such as fractures and degenerative joint disease that, at least in part, was probably activity-related. Overall, the Baptists were of smaller stature than the broadly contemporary middle class Quakers buried nearby. The overall longevity of the Baptist population was also lower than the Quaker group, suggesting poorer general health and living conditions.

7.3.14 osteological analysis has been carried out on this group of inhumations. This is detailed in Appendix 12. No further work is intended.

7.3.15 Animal bones

7.3.16 The bones assemblages from all the sites at Kings Lynn, although small, have the potential to reveal information regarding the use of animals during the medieval and post-medieval periods. Age at death may determine animal husbandry techniques, and disposal methods can also be considered. Areas of industrial activity may also be discussed, particularly with regards the large number of goat horn cores recovered from a distinct area of horn working in context 3085 (site 37722). It would be worthwhile looking at the distribution of the remaining bone to determine if there are any other areas of industrial activity or butchery waste dumps.

7.3.17 Charred plant remains

7.3.18 It is recommended that two samples should be analysed for CPR the first from the fill (***25395***) of a hearth from 37719KYL and the second from the humic medieval soil accumulation (context ***212***). These samples have the potential to inform about the economy of the site and possible dietary habits of the population.

7.3.19 Waterlogged plant remains

7.3.20 It is recommended that six samples should be analysed for WPR. These include three from 37719KYL and three from 37722KYL. It is also recommended that the WPR from the five samples from the sequence of fills of the linear feature 25158 and a layer 30252, which were originally processed for CPR should be analysed for WPR and mineralised remains as they have the potential to inform about the use of the feature and possible dietary needs of the residents from this part of the study area in fifteenth to sixteenth centuries.

7.3.21 Insect remains

7.3.22 It is recommended that five samples, which contained abundant insect remains, should be assessed and possibly analysed for insect remains if recommended by the appropriate specialist.

Site code	Context	Sample number	Type of remains
37719KYL	25395	25014	CPR
37720KYL	212	107	CPR
37719KYL	25160	25004	WPR and MPR
37719KYL	25165	25006	WPR
37719KYL	25165	25011	WPR
37719KYL	25164	25012	WPR
37719KYL	25166	25001	WPR
37719KYL	25388	25016	WPR
37719KYL	25325	25015	WPR
37722KYL	30450	30010	WPR
37722KYL	30678	30011	WPR
37722KYL	30252	30005	WPR
37722KYL	30280	30003	WPR
37719KYL	25166	25001	Insects
37719KYL	25388	25016	Insects
37722KYL	30450	30008	Insects
37722KYL	30678	30010	Insects
37722KYL	30280	30003	Insects

7.3.23 The table above lists samples recommended for further analysis of charred and waterlogged remains and the assessment and possible analysis of insect remains from Vancouver Centre, Kings Lynn, Norfolk. CPR = charred plant remains, WPR = waterlogged plant remains and MPR = mineralised plant remains.

7.3.24 Pollen

7.3.25 Pollen is present in all six samples assessed from monolith samples <25002> and <25003>. Pollen concentration is highest in the lowest context of the feature (presumed to represent the primary fill of the feature), and significantly lower in the upper fills. The range of pollen taxa represented in the assessed samples also varies: the primary fill of the feature has the most limited range of taxa; the range of pollen taxa is significantly greater in the upper fills. This suggests that the primary fill represents pollen sourced from close to the feature, but later fills probably represent pollen from wider sources with possible mixing of different ecological communities.

7.3.26 The condition of the pollen within the assessed samples is good, with only a low number of grains rendered unidentifiable. The majority of crumpled grains are still identifiable, and the limited evidence of mechanical (broken grains) or biochemical (corroded grains) damage suggests that the pollen is all contemporary (with little or no reworking of older material), and that the deposit has not been subjected to any period of desiccation.

7.3.27 Waterlogged and worked wood

7.3.28 Several samples have been taken for dendrochronology. Some of these are suitable for dating, others are borderline cases which may not have enough rings to allow them to be dated. However there is nothing to preclude their submission for dating and the potential information would be of great value. There is a small fraction of roundwood present but the number of pieces is so small that any tree ring studies would be of no value.

7.3.29 The degree of abrasion/erosion or drying present on most of the artefacts precludes any studies of toolmarks and woodworking technology.

7.3.30 Some further recording is required as there are some very important pieces here. The pegged board (site 37721, context 106007) and the pile cut from reused timber (site 37722, context 30315) are recommended for detailed record drawing. Both Bale pins (site 37719, contexts 813 and 862) have dried out in storage and the resulting damage is not reversible. Both should be repackaged and retained in stable storage conditions. Finally the staves of the coopered container are of some interest. This composite artefact (site 37722, context 30448) is made up from 23 staves but is not a barrel or similar vessel. It did not have a base or head and its conversion is not intended to retain liquids. It may be designed specifically as a lining but it is in any case unusual and should be drawn and conserved. The remainder of the assemblage may be discarded.

7.3.31 Leather

7.3.32 While the majority of the leather was recovered from one context (862), the total assemblage is almost exclusively cobbling waste. This indicates that both cobbling and shoemaking were being undertaken either by the same workshop/s or by separate workshops disposing of their rubbish in the same locality. The shoe assemblage is directly comparable with that recovered from King's Lynn from excavations conducted between 1963-1970 (Clarke and Carter 1977, 349-366).

7.3.33 Shell

7.3.34 This material has no potential for further work. An edited version of this assessment needs to be included in the site report.

7.3.35 Small faunal remains

7.3.36 The varied nature of the fish remains within the assessed samples is unusual for an East Anglian coastal site. It is therefore recommended that the sample flots and residues marked ++ (Appendix 17) are sorted in their entirety and the fish remains identified and reported. Additionally, sample 3001, although not rich in fish remains, would be worth further consideration since the charring of tiny bones indicates that fish usually considered of no economic value were in fact exploited.

8 RESEARCH AIMS

8.1 Draft Research Proposal

8.1.1 Both of the principal programmes of excavation were undertaken in the light of their own suite of research aims. A summary of those aims is included below. The full details of the research aims are contained within the respective project designs.

Vancouver Centre

8.1.2 The overall aim was to elucidate the development of King's Lynn - the process of transformation from saltmarsh and tidal creek to organised tenements, and the continuing reclamation of land, controlling the erstwhile natural channels.

8.1.3 Particular attention was to be paid to:

- Early exploitation of the salt marsh, , and pre- and proto-urban occupation;
- Early activity, such as fishing and salt-making;
- Tenement layout and sizes, and the nature and development of structures within the tenements;
- Changes in the character of tenement use in the post-medieval period, following the gradual decrease in use of the fleets for shipping from the mid-15th century onwards;
- Trades and industries;
- The state of preservation, form and development of the remains of the hospital which was built east of Broad St in the early 1700s.

8.1.4 It was also emphasised that the archaeological evidence should be analysed within a wider research context, with a view to contributing to the understanding of the origins of the town, the nature of the 13th century extensions, and the role of trade as a urban stimulus.

Clough Lane Car Park

8.1.5 While the construction of St James Chapel in the 12th century indicates an eastern expansion of Kings Lynn from its origins around the locality of St Margaret's Priory, little information is available on the extent and nature of medieval development within the site boundaries. Map regressions of the site show this area of King's Lynn to be largely undeveloped until the 19th century. Is the impression given by this correct?

8.1.6 The specific aims of the project are therefore:

- To define the nature, character and date of medieval occupation;
- To clarify the period during which apparent cessation of development occurred, and shed light on its cause. How far was it because of competition with Newlands, and was it related to the control of the area by the Church?

8.2 Revised Research Aims

8.2.1 Excavation contained two construction impact areas has obvious limitations with regard to the continuity of physical evidence across a large area, but this need not preclude in-depth analysis or reduce the potential to provide greater understanding of research issues.

8.2.2 Provisionally, the archaeological evidence obtained inn these two projects enable all the pre-excavation research aims to be addressed to some degree at least. Additional questions not covered earlier have been prompted by certain discoveries. These include:

- The social/ethical make up of the 19th century town as determined by the two burial grounds and the human bone assemblages. Were the apparent social differences as clear-cut as they appear, and how well does this illuminate the overall social hierarchy of the town?
- The assemblages of artefactual evidence provide opportunities to examine, not just the status of different parts of the town, but also the balance of trade. While most of the commercial trade came through the port, how far was that mirrored in consumables for the population. Did they get their pottery and other consumables from inland or abroad?
- Some good examples of the stratigraphy of the land reclamation have been revealed. Is it possible to say to what degree the reclamation episodes were organised on a large-scale, or were they the product of ad hoc enterprise?
- A number of the pieces of worked wood seem to be linked to craft or industrial activity and clearly warrant closer examination, offering an opportunity to examine more closely the processes employed in these crafts.

8.2.3 The development of King's Lynn as a medieval town carries more than it's fair share of importance. Perhaps more than an inland town, a seaport like this one - whose fortunes waxed and waned in a relatively short space of time, provide a compact context within which to study the possible influences on its development. Much of that understanding to date has derived from documentary sources. It is now possible to test the validity of the conclusions and inferences drawn from the known history. and lend the resultant picture of developing King's Lynn some colour.

9 METHODOLOGY

9.1 Stratigraphic

Excavations

9.1.1 Matrices and digitised plans exist, but the nature of the excavation is such that phasing on a site-wide level needs to be refined through re-examination of the stratigraphic sequences in conjunction with spatial analysis and detailed examination of finds assemblages. Descriptions of groups of features and structures will be generated. Drawing briefs will be prepared.

Watching Brief

9.1.2 The isolated nature of archaeological remains recorded in pile caps and ground beam excavations to some extent negates the value of presenting the data as a narrative. Therefore tense will be tabulated as find spots, giving location, height, date and interpretative data as well as state of preservation post-construction.

9.2 Artefactual

9.2.1 Pottery

9.2.2 The following tasks are required for full analysis of the pottery from the Kings Lynn sites in order to address the research aims:

- Familiarisation with site data/liasing with project manager;
- Background research: including library research and visits to either Norfolk or Cambridge Units and National Medieval Pottery Reference Collection (British Museum) to check fabric reference collections;
- Creation of a site-specific fabric reference collection;
- Pottery Catalogue: to include, per context, per fabric, per vessel, quantification details (sherd count, weight, EVEs), other details as appropriate;
- Statistical analysis of data;
- Production of report;
- Selection of sherds for illustration, vessel reconstruction, and preparation of drawing briefs;
- Produce catalogue of illustrated pieces (approx. 30);
- Illustration of pottery.

9.2.3 Ceramic Building Material

9.2.4 Summary reports on the various categories of CBM will be included in the final publication, with more in depth descriptions and attention to dating where necessary.

9.2.5 Clay tobacco pipes

9.2.6 A summary report needs to be produced based upon the current assessment. No further analysis required.

9.2.7 Glass

9.2.8 A summary report needs to be produced based upon the current assessment. No further analysis required.

9.2.9 Flint

9.2.10 A summary report needs to be produced based upon the current assessment. No further analysis required.

9.2.11 Worked stone

9.2.12 The following tasks will be carried out.

- Publication standard description of mortar and whetstone and closer look at other potential artefacts;
- Investigation of whetstone/ raw material distribution, plus research for comparative evidence;.
- Report writing;
- Drawing briefs plus checking and editing report and illustrations.

9.2.13 Architectural Stone

9.2.14 The material will be illustrated and the provenance of the stone will be identified by a stone specialist.

9.2.15 Worked bone

9.2.16 The assemblage will be catalogued and illustrated for publication.

9.2.17 Metal Objects

9.2.18 The iron knife will be analysed by a metallurgist to look at the construction of the blade and possibly date the object. The cauldron fragment will be reconstructed in an illustration. this object would also benefit from metallurgical analysis. The assemblage requires little further work other than catalogue entries for the identifiable objects and a very brief report.

9.3 Environmental

9.3.1 Human bone

9.3.2 The Human bone reports will be edited for publication, and combined with the relevant literary references.

9.3.3 Animal bone (including small faunal remains)

9.3.4 Analysis of age at death will be carried out in order to determine animal husbandry techniques. Disposal methods will also be considered. Areas of industrial activity will be discussed, particularly with regards the large number of goat horn cores recovered from a distinct area of horn working in context 3085 (site 37722). The distribution of the remaining bone will be analysed in order to determine if there are any other areas of industrial activity or butchery waste dumps.

9.3.5 A further two days will be given to analysing the sieved remains, which may contain more bird small mammal and fish bones. A further four days would be required to write the report, bringing the total to six days. If fish bones are recovered, these will be analysed by a fish bone specialist, along with the fish bones already recovered from the hand collected material.

9.3.6 Charred and waterlogged remains

9.3.7 Two samples will be analysed for CPR the first from the fill (***25395***) of a hearth from 37719KYL and the second from the humic medieval soil accumulation (context ***212***). These samples have the potential to inform about the economy of the site and possible dietary habits of the population.

9.3.8 Pollen

9.3.9 The variation in pollen taxa between contexts may reflect changes in water management, in particular the source of water (e.g. fresh vs. brackish, or a change from standing water to flowing water). Full analysis of the assessed samples will allow this aspect of water management to be explored through variation in pollen sources reflected by the range of pollen taxa represented; the pollen will also indicate the character of environments around the feature. Other environmental proxies (eg diatoms or foraminifera) may be more suitable to explore issues of water sources and the nature of any water within the feature.

9.3.10 Waterlogged and worked wood

9.3.11 The following samples will be submitted for dendro-dating.

ID	Site Code	Context No	Sample No	Notes
14	KLY 37719	1452	102	Dendro sample from timber. Post or possible sill beam for early med building
18	KLY 37719	913	n/a	Dendro sample from timber. Displaced post in early med channel fills
59	KLY 37720	117	111	Dendro sample from board. Re-used boat plank in displaced revetment
60	KLY 37720	119	113	Dendro sample from board. Re-used boat plank in displaced revetment
61	KLY 37720	115	109	Dendro sample from board. Re-used boat plank in displaced revetment

9.3.12 Further detailed recording will be carried out on the pegged board (site 37721, context 106007) the pile cut from reused timber (site 37722, context 30315) and barrel stave group (site 37722, context 30448).

9.3.13 Leather

9.3.14 A summary report needs to be produced based upon the current assessment. No further analysis required.

9.3.15 Shell

9.3.16 A summary report needs to be produced based upon the current assessment. No further analysis required.

9.4 Documentary and historical review

9.4.1 The current understanding of the historical background of Kings Lynn is largely derived from the work of Parker (1971) and Owen (1984). This understanding would benefit from review in the light of the archaeological conclusions drawn from the proposed analysis. This review would be narrowly focussed on individual tenements examined archaeologically (where relevant documentation exists), and on aspects of the broader development of the town.

10 PUBLICATION

10.1.1 It is proposed to publish the results of the archaeological work in the form of an Oxford Archaeology monograph. The following should be seen as an initial framework of the publication. Details of section breakdowns, word counts and illustrations/plates will be finalised during the post-excavation analysis:

10.2 Publication synopsis

Excavations at the Vancouver Centre and Clough Lane Car Park, King's Lynn, Norfolk

By Richard Brown

with contributions by Leigh Allen, Cheryl Allum, Ceridwen Boston, Damian Brown, John Cotter, Ralf Fyfe, Rose Grant, Elizabeth Huckerby, Malcolm Lillie, Diana Mahoney, Rebecca Nicholson, Quita Mould, Julian Munby, Cynthia Poole, Ruth Shaffrey, Fay Worley.

Contents

Chapter 4 ARTEFACTS **15,000 words**

Pottery by J.Cotter

CBM by J.Cotter

Clay pipe by J.Cotter

Worked Stone by Ruth Shaffrey + Dr Cheryl Allum

Architectural Stone by Julian Munby

Worked bone by Rose Grant

Metal Objects by Leigh Allen and Gerry McDonnell

Chapter 5 Environmental evidence **20,000 words**

The Quaker Cemetery by Diana Mahoney

The Baptist Cemetery by Ceridwen Boston

Animal Bone by Fay Worley

Charred Plant Remains by Elizabeth Huckerby

Waterlogged Plant Remains by Elizabeth Huckerby

Pollen by Dr Ralf Fyfe

Waterlogged Wood by Damian Brown

Leather by Quita Mould

Small Faunal Remains by Rebecca Nicholson

Assessment of the long term impact of piling on the underlying sediments by Macolm Lillie

Chapter 5 DISCUSSION **15,000 words**

Discussion of archaeological evidence and its contribution to the understanding of the development of King's Lynn.

Total 80,000 words

Bibliography

Appendices

Index

11 THE ARCHIVE

11.1.1 The site archive will contain all the data collected during the programme of work and preceding evaluation, including records, finds and environmental samples. It will be quantified, ordered, indexed and made internally consistent.

11.1.2 The archive will be assembled in accordance with the guidelines set out in *Management of Archaeological Projects* (English Heritage 1991).

11.1.3 The integrity of the primary field record will be preserved. Security copies in digital or fiche format will be maintained.

11.1.4 Provision has been made for the deposition of the archive and artefacts with the Norfolk Museums Service under accession numbers 37719 KLY/ 37720 KLY/-37722 KLY and 40313KLY. OA will adhere to any requirements regarding the conservation and storage of excavated material and the archive. The archive will be prepared in accordance with the guidelines published in *Guidelines for the preparation of Excavation Archives for long-term storage* (United Kingdom Institute for Conservation, 1990) and *Standards in the Museum care of archaeological collections* (Museum and Galleries Commission, 1994). Deposition will take place after completion of the works.

11.1.5 Details of this project will be input online at the following internet address: ads.ahds.ac.uk/project/oasis.

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Brown, N. and Glazebrook, J. (eds)	2000	*Research and Archaeology. A Framework for the Eastern Counties, 2. Research agenda and strategy* (E. Anglian Archaeol. Occ. Pap. 8).
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APPENDIX 1: THE POTTERY

by John Cotter

Introduction and Methodology

The assemblage comprises a total of 1,524 sherds of medieval and post-medieval pottery with a total weight of 38,304g. These come from a total of 268 contexts from the following sites: 37719 KLY, 37720 KLY, 37721 KLY, and 37722 KLY. Approximately one third of the assemblage (585 sherds) has previously been examined and assessed by Paul Blinkhorn and some of his comments are incorporated into the present, though somewhat less detailed, assessment.

All the pottery was examined and spot-dated during the present assessment stage. For each site and context the total pottery sherd count and weight were recorded on an Excel spreadsheet, followed by the context spot-date which is the date-bracket during which the latest pottery types in the context are estimated to have been produced or were in general circulation. Comments on the presence of datable types were also recorded, usually with mention of vessel form (jugs, bowls etc.) and any other attributes worthy of note (eg. decoration, complete profiles etc.). Residual earlier types were also noted when this was considered worthwhile. Potentially drawable items, in particular, were also highlighted in the comments field and a separate file of annotated sketches of many of these was also compiled and remains in archive.

Date and Nature of the Assemblage

It is unlikely that any of the pottery recovered dates much before c. 1150 and there may not have been any significant activity on the site until the late 12th century. This is evidenced by the presence of a few jugs in green-glazed Developed Stamford ware (Lincs., c. 1150-1250), a few early-looking vessels in Ely ware (Cambs., mainly 12th-13th century) and handmade globular cooking pots in locally-produced grey sandy wares (mainly 12th-13th century). The bulk of the pottery from the site, however, comprises Grimston ware - a fairly fine, dark grey sandy ware produced at Grimston in west Norfolk. This is present mainly in the form of glazed, often decorated, jugs dating to the 13th and 14th centuries and includes characteristic Grimston products such as anthropomorphic jugs - with applied bearded faces and limbs. Regional imports include a fair number of jugs in Scarborough ware (including highly decorated 'knight' jugs, mainly 13th century) and possibly other Yorkshire wares, and at least one or two examples of decorated jugs of similar date from Lyveden in Northamptonshire, Hedingham in Essex, and possibly London. Continental imports include fragments of green-glazed jugs in North French White ware (c. 1175-1250) and possibly Rouen-type ware (c. 1175-1350), and green-glazed Saintonge ware (c. 1250-1400) from south-west France. One or two possible examples of Flemish Highly Decorated Sandy ware ('Aardenburg' ware c. 1250-1350) were also noted. All the main types, particularly the Grimston jugs, highlight the 13th-14th centuries as the main period of activity on the site.

The 15th and early 16th centuries are also reasonably well represented by late Grimston products, jugs in Bourne 'D' ware (Lincolnshire), local late medieval transitional glazed redwares (LMT), and occasional drinking vessels in Raeren, Siegburg and Langerwehe stonewares from Germany, as well as a chafing dish (food warmer) in late Saintonge ware and a Martincamp flask from Normandy. The 17th, 18th and 19th centuries are also well represented by glazed local red earthenwares, English and German stonewares, Staffordshire slipwares and white stoneware, and finally by the mass-produced Staffordshire products of the late 18th and 19th centuries such as Creamware and transfer-printed whitewares.

The medieval assemblage is clearly domestic in character with eating and drinking being the main activities indicated. Grimston and other jugs dominating the assemblage, followed by smaller numbers of cooking pots and bowls. Less common forms include a Grimston spouted pitcher (12th century), dripping pans (for collecting fat from spit-roasts), curfews (fire-covers), a possible aquamanile (for washing the hands), a possible costrel (flask) and a single example of a hemispherical Stamford ware crucible or lamp (context 30850). The medieval assemblage, overall, is fairly fragmentary though not particularly worn and the profiles of around a dozen vessels can be reconstructed. These include the crucible, just mentioned, a small near-complete Grimston drinking jug (context 814) and a small rounded Grimston jug (context 25407) which has a lead repair or rivet through its lower wall. The range of wares and vessel forms represented on the site is typical of other sites excavated in King's Lynn (Clarke and Carter 1977).

Potential of the Material

The pottery has the potential to inform us about the activities of the occupants of the site during the medieval and early post-medieval periods. It also has the obvious potential to provide a chronological framework for the development of the site. Study of the site records might reveal patterns for the spatial distribution of particular wares and/or vessel forms and thus illuminate the chronological development of different areas of the site. A full catalogue of the material (ie. quantification by fabric, and preferably by vessel form also) should reveal the relative proportions of different wares in use on the site and thus shed light on trading connections. Vessel quantification should reveal the relative importance of different vessel classes (and hence functions) on the site and thus the importance of specific activities to the occupants of the site. This would also constitute a useful resource of comparative data for any future work on medieval pottery in the region. A search for cross-joining sherds has the potential to shed light on site formation processes and rubbish disposal. A selection of typical vessels - particularly the more complete and/or significant items should be made for illustration and publication in the final report, while other more fragmentary vessels could be paralleled, where possible, in existing publications.

Bibliography

Clarke, H and Carter, A, 1977 *Excavations in King's Lynn 1963-1970*, Medieval Archaeol Monograph Series, 7.

Recommendations for further work

Illustration

It is recommended that approx. 30 items be selected for illustration (including 3-4 photographs).

Selection of sherds for illustration, vessel reconstruction, and preparation of drawing briefs: 1.5 days

Catalogue of illustrated pieces: 1.5 days

Preparation & Analysis

Familiarisation with site data/liasing with project manager 1 days

Background research: including library research and visits to either Norfolk or Cambridge Units and National Medieval Pottery Reference Collection (British Museum) to check fabric reference collections: 2.5 days

Creation of a site-specific fabric reference collection: 1 days

Pottery Catalogue: to include, per context, per fabric, per vessel, quantification details (sherd count, weight, EVEs), other details as appropriate:	6 days
Statistical analysis of data (with assistance of Ed Biddulph):	1.5 days
Report writing	6 days
Sundry tasks	
To include checking text, checking illustrations, correspondence etc.:	2 days
TOTAL:	**23 days**

APPENDIX 2: CERAMIC BUILDING MATERIAL

By John Cotter

Introduction and Methodology

The assemblage comprises a total of 1,763 pieces of building material with a total weight of 224.528kg., or, in other words, nearly a quarter of a tonne. All of this is of medieval and early post-medieval date with much smaller quantities of late post-medieval material - due, in part, to the removal of modern overburden from the sites. This comes from the following sites: 37719 KLY, 37720 KLY, 37721 KLY, 37722 KLY and 40313 KLY. Although the great bulk of this material is, technically speaking, ceramic building material (CBM), the totals here also include a very small amount of non-ceramic building stone and roofing slate.

All the CBM was examined and spot-dated during the present assessment stage. For each site and context the total fragment count and weight were recorded on an Excel spreadsheet (see site archive), followed by a spot-date based solely on the character of the material in question. Comments on the types of CBM present (brick, roofing tile etc.) were routinely recorded and additional comments on the state of preservation, measurable dimensions and physical characteristics were usually recorded where these were thought to be significant. Because of the conservative nature of CBM the dates arrived at are often very broad and, if poorly preserved, only tentative. In general CBM spot-dates should be regarded as of secondary importance to pottery spot-dates, although there may be situations where CBM dates are all that is available, or where the pottery is clearly residual or intrusive.

The approach to the examination and recording of the material has been influenced by its previous physical separation into two broad categories - complete or nearly complete bricks, and all other CBM (mainly roofing tile but also smaller fragments of brick, miscellaneous CBM and stone). The two categories were therefore recorded on separate spreadsheets. The bricks obviously represent an on-site selection of the most complete and representative bricks encountered, while the CBM assemblage appears to represent a total (or nearly total) sample of all fragments from each context irrespective of fragment size. For this reason, and partly due to the differing nature of the two main material types, the relatively small number of bricks recovered dominates the over-all weight of material recovered, while, conversely, the much greater number of other CBM fragments recovered weighs considerably less than the bricks (Excel Tables A-B). The greatest number of complete bricks recovered (41) was from site 37719 KLY, while the greatest number of other CBM fragments (1,462) was from site 37722 KLY (Excel Table B).

Description of the Material

Roofing tiles and other roof furniture

This comes under the CBM heading in the tables, as opposed to bricks which will be dealt with separately (see below).

Roofing Tiles

Roofing tiles constitute the majority of the 1,683 fragments of non-brick CBM. The majority of these appear to be of medieval date with smaller amounts of late medieval/early post-medieval tiles and a handful of fairly definite post-medieval tiles. They are probably of fairly local manufacture. No complete tiles were recovered although some complete tile widths were found. The medieval and early post-medieval tiles conform to the appearance and dimensions of a nearly complete medieval tile from King's Lynn published by Clarke and Carter (1977, fig. 136.9). The latter is flat, rectangular and measures 240mm long by 160mm wide by 10mm thick. It has a single centrally-punched circular nail hole. Tiles from the present excavations are generally 150-170mm wide with thicknesses varying from 10-16mm.

Many tiles have a greenish-brown or purplish-brown glaze which occurs in a 50-70mm-wide band along the lower outward-facing part of the tile.

Two main roofing tile fabric types were noted during assessment. The two types are obviously related but there may be a chronological distinction between them, although they probably overlap in date. This suggestion however requires further investigation at the analysis stage. The commonest type has a gritty fabric with abundant coarse quartz grits with smaller amounts of flint and coarse cream-coloured, red and brown clay pellets and occasional very coarse flint grits up to 15mm across. The clay matrix also contains abundant fine chalk or calcareous inclusions. They generally have an oxidised orange-brown firing colour with a grey core but some examples have leached yellowish surfaces/margins and occasionally some examples are leached a buff-yellowish colour throughout (many bricks from the excavations exhibit the same surface leaching). Gritty tiles are tentatively dated the 13-16C and are, perhaps, mainly datable to the 13-15C.

The second tile fabric, which is slightly less common, has what can loosely be described as a 'lumpy' fabric or texture. This is similar in general appearance to the gritty tiles except that it contains little or no quartz gritting and thus has a relatively smooth or pasty clay matrix. However it does contain abundant coarse to very coarse pellets of cream-coloured, red and grey clay and often streaks of these throughout the fabric giving a crude marbled effect suggestive of poor clay mixing. Coarse flint grits are also occasionally present. Leached yellowish surfaces are generally commoner on lumpy tiles and glaze appears to be somewhat rarer than on the gritty tiles. Lumpy tiles are sometimes found in small quantities in contexts containing much larger amounts of gritty tiles so they may have originated in the 13-14C. Other indications however would seem to suggest that they mainly date to the 15-16C and possibly continue into the early 17C. Again this suggestion requires further investigation.

A very small quantity of post-medieval roof tiles has been identified. These have a very pasty yellowish/cream fabric and a very regular appearance. They probably date to the 16-19C. A single fragment from a probable pantile of 18-19C date was also identified.

Ridge Tiles

Completing the list of ceramic roof furniture, eight fragments of medieval ridge tiles were identified in both the gritty and lumpy tile fabrics. These all had large splashes of greenish-brown glaze and include several end fragments with circular sockets (presumably one at each end) for the insertion of a ceramic finial. These appear to be of the same type as the socketed ridge tiles with 'spinning top' finials published from earlier excavations in the town (Clarke and Carter 1977, fig. 136.3-6). These are basically plain curved or folded tiles with a slightly raised socket at each end. Context 30446 on site 37722 KLY produced both a socketed ridge tile and what appears to be part of a spinning top finial (catalogued as pottery).

Roofing Slates

These were recorded under the other CBM category. Thirty pieces of grey roofing slate weighing 2.281kg were recovered. These all come from site 37722 KLY and represent a minimum of four separate slates, the major parts of which occur in context 30852. These are of a good quality silvery-grey slate though softer than modern Welsh roofing slate. Their appearance and manufacture is also pre-modern. They are of elongated rectangular form with a squared lower end and a roughly rounded upper end with a single circular nail hole. The most complete example has a surviving length of 262 mm (and was probably not much longer than this), a width of 155 mm and is 5 mm thick. Another piece has a width of 167 mm. Thickness is variable even within the same slate. Other thicknesses of 8 mm and 13 mm were also recorded. The edges of the slates have been crudely chipped to shape. Although contexts containing these slates have generally been dated to the 15-16C, largely on the assumption that the slates themselves are likely to be late medieval or early post-medieval in date, there are slight indications from associated pottery that some of them could be earlier than this. A

more thorough study of the stratigraphic record and associated finds should throw some light on this.

Miscellaneous CBM, fired clay and building stone

Floor tiles

Two fragments of ceramic floor tile were recovered from site 37719 KLY. Context 25007 produced the edge of a plain Flemish-type floor tile with a reddish fabric and a greenish glaze. This is likely to be of 15-16C date. Context 25236 produced the corner of a decorated medieval floor tile. This has a hard red sandy fabric. The design appears to be that of a stamped or impressed hexagon-shaped area with some of its sides contiguous with the edges of the square tile. The upper surface of the tile is covered with a white slip under a clear glaze. It may be 14C Bawsey tile although the context date appears to be 15-16C.

Flagstone

An edge fragment from a possible flagstone in a highly micaceous (imported?) grey sandstone was recovered from the same 15-16C context as the medieval floor tile described above (context 25236 37719 KLY).

Building Stone and Plaster

A fragment of worked stone (206g) was recovered from a possible 16C or early 17C context (30356) on site 37722 KLY. It is of shelly limestone and appears to come from the corner of a squared block or jamb with a rounded corner. A small piece of mortar or render with a facing of white plaster was also found in the same context.

Oast Kiln Bricks

Fragments from two separate late 18C or 19C oast kiln bricks were found in context 25563 on site 37719 KLY. One is a corner fragment 38mm thick in a yellow fabric, the other is an edge fragment 40 mm thick in an orange-red fabric. They are of regular, fairly modern, appearance and pierced with multiple circular sieve-like perforations typical of bricks from the drying floor of an oast kiln for drying and malting barley etc.

Fired Clay Object

Two pieces (220g) from the same fired clay object or lump were recovered from context 30341 site 37722 KLY. The identification of this is very uncertain. The material is something like very soft underfired brickearth, possibly even fired daub. It may come from a hollow polygonal or curved object with a surviving wall thickness of 33mm. The outer surface appears to have been smoothed while the internal surface has abundant coarse organic inclusions/impressions (straw etc). It may come from something like an architectural element or part of an oven or possibly even a bell-mould etc.

Bricks

This section deals with the selection of complete or virtually complete bricks recovered from the sites and which were recorded separately. The small quantities of brick fragments found in the bags of CBM are not considered here. Complete bricks were recorded in some detail (see site archive). Most examples had been allocated a finds number on-site. Measurable dimensions and weight were recorded for each example together with comments, in varying detail, on colour, fabric, general appearance and other characteristics. The spot-dates provided for each brick should be regarded as tentative and are based on the over-all character of each brick as well as its dimensions. Reference to the brick typology for King's Lynn (Clarke and Carter 1977, 441-2, fig. 196) was only made in retrospect but will be integrated at the analysis stage. The 80 pieces examined represent around 75 separate bricks. The majority of these are unfrogged handmade bricks in reddish fabrics with a fair degree of size variation even within bricks of a similar appearance. Most of these would appear to date to the 16C or the 17C.

Smaller numbers of 18C and 19C bricks and at least one 20C brick were also recovered. The earliest spot-dates ascribed here, based on this particular specialist's experience elsewhere in England, are to the 15C (rarely) and the early 16C (fairly common). It may transpire, however, that some of these should be dated earlier as brick use in King's Lynn was a relatively early phenomenon and already fairly common *c.* 1350-1500 (*ibid.*, 441-2). Consideration of the bricks in context along with their association with more datable artefact types should assist in establishing their dates with more accuracy.

Potential of the Material

The ceramic and other building materials have the potential to inform us about the appearance of buildings on the site during the medieval and early post-medieval periods. It also has some potential to provide a chronological framework for structural remains (eg. brick walls) where dates from pottery and other finds may be lacking, although in some cases the reverse may be true.

Although the main types of building materials present - roofing tile and brick - appear to conform to general types already known and published from King's Lynn (Clarke and Carter 1977) there are details within the assemblage, such as variations in tile fabric, which are barely mentioned in earlier reports and yet which may have chronological significance both for this site and for medieval archaeology in King's Lynn generally. The presence of medieval roofing slate is also unmentioned in Clarke and Carter's 1977 study. Although the latter study includes a typology for medieval and post-medieval bricks from the town this contains virtually no mention of brick fabrics or colour, and limits the dimensional classification to brick width and thickness while excluding any mention of length. In this sense the assemblage from the Vancouver Centre literally adds another dimension to the study of bricks from the town.

Two main medieval roof tile fabrics ('gritty' and 'lumpy') became apparent during the course of this assessment. These may be chronologically distinct - the gritty fabric being earlier and the lumpy fabric somewhat later. A study of the stratigraphic records and associated finds should clarify this point. All the main tile fabrics should also be properly described in the published report. A similar investigation should be undertaken for the ridge tiles and also for the roofing slates. The latter are almost certainly medieval but whether earlier or later medieval is still uncertain. The slates are certainly non-local and most likely to be from the South-West Peninsula - confirmation of which would have implications for trade. Illustrations of one or two of the best-preserved slates and ridge tiles would be desirable.

Assessment has generated useful data on a good sample of local bricks. Further analysis of the complete brick assemblage would focus on their dating. Closer comparisons with the 1977 typology should be attempted. As with the roofing materials above, the contexts of the bricks should be examined to see if their dating can be refined or independently confirmed. Statistical data from the recorded bricks - dimensions and perhaps fabric associations - should be examined for trends. Fuller fabric descriptions for selected typical bricks could also be provided either for publication or archive.

Summary reports for all the above categories of building materials should be included in the published report with occasional more in-depth descriptions where necessary.

Bibliography

Clarke, H. & Carter, A. 1977, *Excavations in King's Lynn 1963-1970*, Medieval Archaeol Monograph Series, 7.

Recommendations for further work

Illustration

It is recommended that approx. 6 items be selected for illustration.

Selection of items for illustration and preparation of drawing briefs: 0.5 days

Catalogue of illustrated pieces: 0.5 days

Illustration (Illustrator): 2.5 days

Preparation & Analysis

Familiarisation with site data. Establishing the context and stratigraphic position of items and groups of building material to clarify their relative dating:
2 days

Background research: including library research: 1.5 days

Statistical analysis of brick data and selective fabric description: 2 days

Analysis and selective fabric descriptions of roof tiles and ridge tiles: 1 day

Analysis of medieval roofing slates and miscellaneous building materials: 1 day

Report writing 5 days

Sundry tasks

To include store visits, checking text, checking illustrations, correspondence etc: 2 days

TOTAL: **18 days**

APPENDIX 3: CLAY TOBACCO PIPES

by John Cotter

The excavations recovered a total of 119 fragments of clay pipe weighing 609g. These have been spot-dated and a given a basic catalogue. The catalogue records, per context, the quantity of stem, bowl and mouth fragments, the overall sherd count, weight, and comments on condition and any maker's marks or decoration present. The collection is not particularly large or impressive. The largest number of fragments from any one context was 48 (context 202). The few pieces of note include two early 18th-century pipe bowls with the maker's mark 'IA', who is probably to be identified with the maker Joseph Alderson of Lynn who was active 1708-31. The two pipes may represent earlier and later products by the same maker as the shape of the bowl is slightly different in each case and the initials are surmounted by rosettes on one and crowns on the other. The heel of another pipe, unusually, has milled decoration and two stems from the same context (202) have Dutch-style milled decoration.

It is probably not worth publishing these pipes in any detail. A summary report should be sufficient. If, however, there were sufficient resources and it was judged to be relevant to the overall excavation report, four of the decorated pieces, including the marked bowls, could be illustrated and reported on.

Recommendations

To produce summary report only: 0.5 days.

Or, to produce more detailed report with 4 illustrations: 1 day.

APPENDIX 4: GLASS

by Hugh Wilmot

Introduction

A small assemblage of glass, totalling one hundred and six fragments from a minimum number of sixteen vessels, as well as window glass, was recovered from the excavations at the site of the Vancouver Centre, Kings Lynn (summarised below). The majority is stable, and although some of the window glass is in an advanced stage of devitrification, none merits further specialist treatment or conservation.

The assemblage

Whilst the majority of the fragments are relatively late in date, there are a few pieces of medieval window glass from contexts (815), (1106) and (511). Of particular note are a complete rectangular quarry 52 x 39mm and part of a rectangular boarder piece both from (1106). Although unpainted these can be dated to belonging to the 13th-15th centuries. Window glass from later periods also occurs in a number of contexts, but this is largely highly fragmented and there are no complete quarries or sections.

The earliest vessel, coming from (25014), dates to between 1650-80 and is a large portion of shaft and globe wine bottle the earliest type to be produced. Slightly later is a portion of an onion wine bottle from (25139), whilst late 18th- or 19th-century wine bottles were found in (25452), (202) and (30840). Other vessels that can be identified are a clear phial from (25430), the edge of a square dish (104018) and an unstratified late wine glass base. The remaining vessels are all later 19th or early 20th century bottles. The final fragment of note is a single small piece of cast and polished plate glass from (905). This type of glass was typically used to make mirrors, although no trace of silvering now remains.

Recommendations

The assemblage is relatively small in size, and the glass comes from a number of disparate contexts. Given this, and the somewhat uninformative character of the glass, no further work or reporting is recommended and only a copy of this assessment need be included in the site archive.

Summary of the Glass

Site	Context	No Frags	Description	Date
37719	u/s	1	complete base wine glass	late 18th-19th century
37719	815	4 joining	plain green window	medieval
37719	904	1	clear plate glass, possible section of mirror	16th-18th century
37719	912	3	green bottle	early 20th century
		2	blue/green bottle	late 19th-early 20th century
		5	clear window	20th century
37719	1100	1	green bottle	19th century
		1	window	19th century
37719	1103	5 joining	green tinted window glass	late 17th-early 19th century
37719	1104	7	green tinted window glass	late 17th-early 19th century
37719	1106	7 joining	complete rectangular window quarry 52x39mm	medieval
		1	part of a rectangular window boarder 20mm W	medieval
		20	plain window	16th-18th century
37719	1119	5	plain window	13th-16th century
37719	25014	1	base and body from a shaft & globe wine bottle	1650-1680
		6	neck brown bottle	uncertain
37719	25139	3 joining	base and body from an onion wine bottle	1680-1730
37719	25430	2	neck and base from a clear phial	mid 18th-early 19th century
37719	25432	3	body green bottle	19th century
37719	25452	2	body and base clear bottle	19th century
		1	body blue bottle	19th century
		1	shoulder from wine bottle	19th century
37720	202	1	body from a wine bottle	18th-19th century.
37720	511	9	completely devitrified window	medieval
37721	104018	9	neck and body from a brown bottle	late 19th-early 20th century
		3	body from a clear bottle	late 19th-mid 20th century
		1	edge from a dish?	late 19th-20th century
37722	30840	1	shoulder of wine bottle	late 18th-19th century

APPENDIX 5: FLINT

by Rebecca Devaney

Four pieces of worked flint were recovered from four separate contexts during an evaluation at Kings Lynn (*Table 1*). The flake from context 1415 is possibly naturally struck. It is a small primary removal with no striking platform. The flake from context 25315 is a secondary removal. It has possible use-wear along its right hand edge. The tested nodules from contexts 25377 and 25407 are minimally worked with few removals. They weigh 208 g and 362 g respectively.

All four pieces of flint are derived from gravel sources. They are characterised by a thin and abraded cortex and are likely to have been locally found.

No further work is required.

Table 1. Summary of flint

Context	1415	25315	25377	25407	Total
Flake	1	1			2
Tested nodule/bashed lump			1	1	2
Total	1	1	1	1	4

APPENDIX 6: WORKED STONE

by Ruth Shaffrey

Summary and Quantification

A total of 21 pieces of stone were retained during fieldwork at Vancouver, King's Lynn. They include two fragments of mortars, one probable rotary quern fragment, one whetstone and a number of unworked but imported pieces. The remainder is either unworked or too fragmentary to determine.

Methodology

All the stone was examined with the aid of a x10 magnification hand lens.

Description

The worked stone includes one possible rotary quern fragment, possibly of Millstone Grit, a small fragment which may be from a mortar (fine grained white limestone) and 40% of a mortar. There is also a single whetstone of possible Norwegian Rag (30665) and a number of unworked sherds of the same stone from Zones B, C and E. (25377, 805, 1050, 1616). The latter may suggest that the raw material was being imported and worked at or near the site.

The mortar is made from a shelly limestone which is most like Quarr limestone from the Isle of Wight but might be another type of Binstead limestone. Without comparison to reference material, it is difficult to be absolutely certain. It is not Purbeck marble and does not appear to be Caen stone. The style is of a flat bottomed steep sided mortar with evidence for one rib. The opposing rib would not have survived on this example and the rim does not survive to a sufficient height to determine if there were lugs on the other sides. The rib is continuous from base to surviving upper edge and was not pierced and therefore typical of most British mortars (Dunning 1977, 324).

The date of the use of the mortar can be fairly confidently assigned to the 13th or 14th centuries which was the predominant period of mortar use in England, though there are a small number known from 12th century contexts. The biggest difficulty comes from the long survival of mortar fragments which have previously been found in reuse contexts as late as the 17th century (Biddle and Smith 1990, 891:Table 90). This example, although broken in half, is in reasonable condition which indicates that it was not lying about for long periods of time before reuse but the date of the mortar will need to be carefully assessed in the light of its context of recovery.

Statement of Potential

Two aspects of the stone assemblage are of interest - the mortar and the whetstone with the raw materials. Further work is required to publish the mortar: to fully record it and it place it in the typology of mortars already published for Kings Lynn and to determine its lithology. (It needs to be examined by Quarrstone expert Dr Cheryl Allum). The mortar needs to be compared to material usage in the town and to those examples already identified and the notes already assembled will need to be properly referenced.

The lithology of the whetstone and associated raw material needs to be identified so that their presence can be placed in a regional context. The frequency of the presence of raw materials on urban sites and of this particular lithology should be investigated as the evidence here suggests the possible presence of a workshop / or industry which has the potential to inform about activity on the site. This needs to be assessed in the light of the contexts from which the stone has come however, and their spatial and contextual relationships. Presence of imported raw materials needs to be assessed in relation to the presence of other types of artefacts on the site to see whether there is evidence for any other industry.

Catalogue

Context	Description	Notes	Lithology
100022	Unworked	Chunk of flat stone with all broken edges and no obvious working. Could have been utilised in flooring	Thinly bedded, very micaceous grey sandstone.
101048	Possibly worked but of indeterminate function	Slightly weathered fragment with one possible curved edge. Too weathered to be sure if worked	Yellow brown ferruginous sandstone
101042	Possible quern fragment	Chunk with one worn surface. No distinguishing characteristics survive but it is most likely to be from a rotary quern	medium to coarse grained well cemented and well sorted sandstone, possible Millstone Grit
101048	Possible fragment from mortar	Small fragment. No real distinguishing characteristics, though fragment is slightly curved. Might be from a mortar and is of similar lithology	Fine grained white limestone
100004 (SF 1)	Half a mortar	Flat base internally with remains of one rib. Mortar appears to have been ovoid rather than round	Shelly limestone, possibly Quarr
25377	Unworked	Sherd	Schist, Norwegian rag?
805	Unworked		Schist, Norwegian rag?
1050	Unworked		Schist, Norwegian rag?
30655	Whetstone	Elongate whetstone	Schist, Norwegian rag?
1616	Unworked		Schist, Norwegian rag?

Recommendations

Tasklist

Task	Time (days)
Publication standard description of mortar and whetstone and closer look at other potential artefacts	0.5
Investigation of whetstone/ raw material distribution, plus research for comparative evidence	2
Report writing	2
Drawing briefs plus checking and editing report and illustrations	0.5
TOTAL	5 days
2 illustrations	1(illustrator)
Lithological analysis of Quarrstone and report on its use	2 days (external specialist - Dr Cheryl Allum)

APPENDIX 7: WORKED BONE

Introduction

A total of 7 bone artefacts were recovered from the archaeological excavations at Vancouver Centre, King's Lynn. The table below records the context ,measurements and descriptions of the artefacts.

Object	Context No	Small Find No	Site	Length	Description
Knife handle	U/S		37719kly	79mm	Bone handle made form a section of a large mammal long bone. The handle has a polished circular section with lines of decoration running round it. There are two splits along the length of the handle. Both ends of the handle are open. One end still has the remnants of an iron tool attached.
Needle	Pile B 4a	25001	37719kly	156mm	Bone needle made form a section of large mammal long bone. The shaft of the needle is highly polished. It has bee n carved into a sharp point at one end with a hole drilled through the other flat end for threading. Margeson 1993, 186, fig 137 No 1450.
Needle	Pile E 1	25002	37719kly	124mm	Bone needle made form a large mammal, metapodial, probably horse. This example is more crude and rough than the others from the site. The shaft is polished and the end which would have been sharpened into a point has been broken. The end with the drilled threading hole through it has not been shaped like the others but left in its natural shape. Margeson 1993, 186, fig 137 No 1449
Bead Making Debris	25388	25006	37719kly	52mm	Section of a long bone. Either horse or cow metapodial. Bead manufacturing waste MacGregor 1985 , 101, fig 58.c.
Pin	25390	25007	37719kly	80mm	Bone pin. Bird radius possibly Gull. Worked at one end possibly to form a point.
Needle	30688	30015	37722kly	169mm	Large bone needle made from a section of long bone probably metapodial. The shaft is polished possibly through use. One end has been carved into a point. The flat head at the other end of the needle has a hole drilled through it for threading. Margeson 1993, 186, fig 137 No 1450.
Needle	30803	30016	37722kly	167mm	Bone needle made from a section of long bone probably metapodial. This example is very highly polished and is more finely worked than the other examples in the collection. One end has been worked in to point whilst the head end is not much larger than the rest of the needle shaft. There is a drilled hole in the head for threading the needle. The needle is long and has a slight curve along its length. Margeson 1993, 186, fig 137 No 1447.

Statement of potential

The assemblage from Vancouver centre Kings Lynn comprises four needles, a handle, a pin and a piece of bead working debris.

The needles were most likely for making nets probably for fishing given the location of the site. They are large with large heads and lend themselves well to coarse work.

The piece of Bead/Button working debris is common from the Medieval period onwards. It is a section of a long bone with holes through it where the bead/button has been drilled out. Other examples have been found at King's Lynn (Clarke and Carter 1977).

Further work

Half a days work.

- Full catalogue entries for publication
- Preparation of drawing brief

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Clarke, H and Carter, A, 1977, *' Excavations in Kings Lynn 1963-1970',* London Society for Medieval Archaeology Monograph 7).

MacGregor, A, 1985, *' Bone, Antler, Ivory and Horn. The technology of skeletal materials since the Roman period'*, Croom Helm London and Sydney

Goodhall, I H, 1993, ' Textile manufacture and needlework', in Margeson S 1993, *' Norwich Households, Medieval and Post Medieval finds from Norwich Surrey Excavations 1971-78,* The Norwich Survey/Norfolk Museum services.

APPENDIX 8: SLAG

by Lynne Keys

Almost 4.5 kg of material, initially identified as slag, was examined for this report. At the time of writing no site, contextual or dating information was available. The assemblage was examined by eye and categorised on the basis of morphology. Each slag type within each context for all three sites was weighed; quantification details are given in the table below.

Slag and related debris from the sites at King's Lynn (wt in g)

context	site code	identification	wt	comment
805	37719KLY	undiagnostic	22	
811	37719KLY	vitrified hearth lining	108	
920	37719KLY	undiagnostic	66	
1415	37719KLY	fired ceramic/kiln	243	
502	37720KLY	clinker	7	
511	37720KLY	undiagnostic	3	
30191	37722KLY	undiagnostic	474	very light & clinkery
30237	37722KLY	undiagnostic	92	not ironworking?
30318	37722KLY	undiagnostic	48	
30341	37722KLY	undiagnostic	681	
30345	37722KLY	vitrified hearth lining	62	
30371	37722KLY	cinder	22	
30371	37722KLY	hearth lining	568	
30408	37722KLY	undiagnostic	276	
30450	37722KLY	coal	79	
30633	37722KLY	hearth lining	449	
30633	37722KLY	kiln/furnace material	1217	
30728	37722KLY	cinder	16	
30730	37722KLY	cinder	36	
		total wt. = 4469g		

Virtually all the slag was undiagnostic, i.e. could not be related to either smelting or smithing. Much could have been produced by other high temperature industries, for example cinder is the lighter portion of vitrified hearth lining. A large proportion of the assemblage appeared to have been produced with coal as the fuel and looks to be post-medieval in date.

APPENDIX 9: HUMAN BONE - QUAKER INHUMATIONS

by Diana Mahoney

Introduction

A total of 30 graves containing the skeletal remains of 34 individuals were excavated from the site of the Friends Burial Ground, Kings Lynn. There were 24 earth-cut graves and 6 brick lined shaft graves. Two earth-cut graves contained the remains of three and two individuals respectively.

The skeletal assemblage comprises 15 adult males, 16 adult females, 1 unsexed adult, 1 infant, and 1 adolescent of unknown sex.

All the graves were oriented west-east and, save for three earth-cut graves, the individual was buried within a wooden coffin. An exception to this pattern is zinc coffin 30450. The coffin furnishings were basic breastplates, grip plates and handles. The orientation and plain nature of the burials accords with the Quaker doctrine of 'Christian simplicity' whereby they maintained a simple life devoid of the 'Pomps and Glory of the world' so that they could concentrate their attentions to experiencing God's 'love and power' (Stock 1998,133) in the everyday world. No grave goods were recovered.

Each burial was excavated and recorded in accordance with professional guidelines and the skeletal remains removed for osteological analysis. Disarticulated remains discovered during excavation were retained for reburial with the articulated burials at a later date.

The coffin fittings were also retained for analysis, and then reburied with the skeletal remains.

Methodology

Adults, including adolescents, were aged by a combination of methods, including ageing from the pubic symphysis (Todd 1921; Suchey and Brooks 1990), auricular surface (Lovejoy *et al* 1985), cranial suture closure (Meindl and Lovejoy 1985) and sternal rib ends (Bass 1987). Miles' (1962) dental attrition method was employed tentatively as supporting evidence, as it tends to grossly under-aged skeletons from recent populations, but can be used for intra-population comparison to estimate the age of individuals. Sexing of adults was determined from metric data (Workshop 1980) and sex-specific characteristics of the skull and pelvis (Buikstra and Ubelaker 1994). Stature estimates for adults and adolescents were derived from the application of Trotter's (1970) regression formulae to combined femoral and tibial long bone length measurements.

The infant burial was aged by dental development (Moorrees *et al* 1963), epiphyseal fusion (Bass 1987; Schwarz 1995) and diaphyseal long bone length (Scheuer *et al* 1980; Hoppa 1992). No attempt was made to sex the infant burial, in accordance with accepted osteological practice.

The dental notation employed in the catalogue is as follows:

/ post mortem loss	X ante mortem loss
C caries	A abscess
NP not present	U unerupted
E erupting	PE pulp exposed
k calculus	- alveolus and tooth absent

Table 1: Summary of Quaker burials showing age and sex of individuals and types of graves, presence of coffins and grave goods (n=31 graves)

Grave Cut	Skeleton No	Age Category	Age	Sex	Orientation	Preservation	Completeness	Grave Type	Multi/single	Coffin	Coffin fittings	Grave goods
30437	30439	mature ad	40+	F?	w-e	3	4	shaft	single	yes	yes	no
30441	30443	mature ad	40+	F?	w-e	2	1	shaft	single	yes	yes	no
30445	30447	mature ad	40+	F?	w-e	3	4	shaft	single	yes	yes	no
30449	30451	prime ad	25-45	F?	w-e	2	2	earth cut	single	yes/ zinc	yes	no
30453	30455	prime ad	26-40	F	w-e	2	1	shaft	single	yes	yes	no
30458	30460	mature ad	40+	F	w-e	3	4	earth cut	single	yes	yes	no
30462	30463	mature ad	40+	F	w-e	2	1	earth cut	single	yes	yes	no
30466	30468	ageing ad	45-59	M	w-e	2	2	earth cut	single	yes	yes	no
30474	30476	prime ad	35-40	F	w-e	3	3	shaft	multiple	yes	yes	no
30482	30484	prime ad	35-50	F	w-e	3	2	earth cut	multiple	yes	yes	no
30486	30488	ageing ad	55+	F	w-e	3	3	earth cut	single	yes	yes	no
30490	30492	prime adult	35-39	M	w-e	3	2	earth cut	single	yes	yes	no
30494	30496	ageing adult	50+	M	w-e	3	2	earth cut	single	yes	yes	no
30498	30500	prime adult	35-44	F	w-e	3	3	earth cut	single	yes	yes	no
30470	30503	mature adult	40+	M	w-e	3	4	shaft	multiple	yes	yes	no
30505	30504	mature adult	40+	M	w-e	3	3	earth cut	single	yes	yes	no
30509	30510	adult	17-20+	??	w-e	3	1	earth cut	single	no	no	no
30512	30513	mature adult	??	M	w-e	2	1	earth cut	single	no	no	no
30516	30518	adolescent	15-17	?	w-e	3	4	earth cut	single	no	no	no
30482	30519	mature adult	40-45	F	w-e	3	4	earth cut	multiple	yes	yes	no
30520	30522	mature adult	40+	M?	w-e	3	3	earth cut	single	yes	yes	no
30524	30526	ageing adult	45-59	M	w-e	3	2	earth cut	single	yes	yes	no
30529	30531	prime adult	28-52	M	w-e	3	4	earth cut	single	yes	yes	no
30474	30534	ageing adult	45+	M	w-e	4	4	shaft	multiple	yes	yes	no
30537	30539	prime adult	35-39	F	w-e	3	3	earth cut	single	yes	yes	no
30541	30543	mature adult	40-45	F	w-e	3	1	earth cut	single	yes	yes	no
30545	30547	ageing adult	45-59	F	w-e	2	1	earth cut	single	yes	yes	no
30549	30551	prime adult	30-40	M	w-e	2	3	earth cut	multiple	yes	yes	no
30553	30555	mature	34-54	M	w-e	3	4	earth cut	single	yes	yes	no

		adult										
30549	30557	mature adult	40-50	M	w-e	3	3	earth cut	multiple	yes	yes	no
30559	30561	prime adult	31-45	M	w-e	2	2	earth cut	single	yes	yes	no
30549	30563	young child	4-6	?	w-e	3	1	earth cut	multiple	no	no	no
30567	30565	ageing adult	50-60	M	w-e	4	4	earth cut	single	yes	yes	no
30568	30570	mature adult	45+	F	w-e	2	1	earth cut	single	yes	yes	no

Assemblage Composition

There is almost even numbers of males and females ranging in age from 26 to beyond 50 years. In addition, the remains of one young child aged between four and six years at time of death and an adolescent of indeterminate sex were recovered.

Although the under-representation of young children is not uncommon in archaeological samples, the low number of infant and child burials recovered from this cemetery is perplexing. The most common explanation provided for this is that the more delicate remains of young individuals may not have preserved well enough to be recognised in the excavation procedure. At the Quaker burial ground in Kingston-upon-Thames, several individuals under five survived only as tooth crowns retrieved through dry-sieving grave fills (Start and Kirk 1998,169). However, the burials on this site were very well preserved, and even if the skeletal remains were not readily observed, the actual graves were very easy to distinguish from the natural soil they were cut into, so any infant graves would have been noticed during cleaning of the area.

It could be possible that infants were buried at another site. However, this possibility is undermined by the presence of child grave 30549. Additionally, only two individuals under the age of ten are listed in the burial register, John Dixon (5 years) and Joseph John Burlingham (9 years). This could be interpreted as meaning few infant deaths occurred within this Quaker community during the period of use for this cemetery. If this interpretation is true such reduced infant mortality could be the consequence of the 1803 and 1806 acts of parliament which formed a body of men to clean and light the streets, and the founding of a dispensary in 1813 in Kings Lynn where the poor could obtain free medicines (Lambert 2003). This would help prevent the spread of disease, helping infants remain healthy.

An alternative hypothesis is that infants were interred in graves shallower than their adult counterparts. Supporting evidence for this theory is the heavy truncation of infant grave 30549 to a depth of 0.03 m in an area where graves survived to a depth of 0.11- 0.19m. Such shallow burial, and subsequent truncation could explain the absence of skeletal remains of a child aged 9 years of age.

Preservation

The condition and completeness of the skeletons recovered determine the extent of preservation of this assemblage. In accordance with osteological standard practice, 'preservation' is taken to mean the condition of the bone i.e. how well it has survived the decaying process and external environmental factors, such as soil type and bioturbation. 'Completeness' simply means how much of the skeleton survives. The table below provides a summary of the preservation of this assemblage.

Table 2: Preservation of skeletons recovered from Friends Burial Ground, Kings Lynn.

	Completeness 1 <25%	Completeness 2 26-49%	Completeness 3 50-75%	Completeness 4 76-95%	
Preservation 1 destroyed	0	0	0	0	0
Preservation 2 poor	6	3	1	0	10
Preservation 3 good	3	4	8	7	22
Preservation 4 excellent	0	0	0	2	2
	9	7	9	9	**34**

Overall, these burials were in good condition, with 24 (70.6%) in good or excellent condition. One must also take into consideration that of the six poorly preserved skeletons (30443; 30455; 30463; 30513; 30547; 30570) all of their associated grave cuts were truncated away and disturbed by modern activity predominantly associated with construction work carried out in the 1960s and 70s. All six contained bricks, mortar, glass and other construction materials. This level of disturbance will greatly increase bacterial and microbial activity and access by a range of flora and fauna, thereby accelerating the process of decay.

Stature

Stature measurements were obtained from 14 adults. The average was 1.691 m for males and 1.614 m for females. This provides an overall mean stature estimate of 1.653 m. These stature estimates are comparable with those for Kingston-upon-Thames where the average stature for males and females were 1.687m and 1.603m respectively. One would expect this similarity between populations of similar economic, health and environmental backgrounds. The stature of these two communities is comparable to other late 18th and early 19th century individuals deriving from a predominantly middle class background, such as St Bride's crypt and Christ Church, Spitalfields (Roberts and Cox 2003,308).

The 7.7cm difference between the mean average height of males and females reflects an expected sexual dimorphism.

Skeletal Pathologies

Trauma

Eight individuals demonstrate evidence for trauma.

The neck of the left femur of skeleton 30447 has fractured and collapsed in on itself, rotating the head of the femur superolaterally, foreshortening the neck so the head almost rests against the greater trochanteric fossa. The majority of the bones recovered for this mature female are relatively weightless with very thin and brittle cortical bone, suggesting osteoporosis, which may have been contributory to the fracture.

Skeleton 30476 presented a severe fracture of the left humerus, completely severing the bone in the transverse plain at approximately 110 mm from the distal epiphysis. This fracture has healed irregularly with the healing ends misaligned. The subsequent stabilising callus (new bone formation) has formed irregularly to compensate for the gap resulting in deformation of the diaphysis which is angled laterally at 30°and medially at 25°. A small patch of bone re-growth slightly superior to the epicondyles suggests the presence of a mild fracture more

distal to the main break. The absence of periostitis indicates this was a closed fracture that did not puncture the skin.

The proximal and distal phalanges of the right first digit, or hallux, of skeleton 30534 has a preponderance of osteophytosis more prevalent on the medial edge of the proximal, dorsal surface. There is also bone regrowth on the plantar surface of the distal phalange. The localisation of this osteophytic bone growth and absence elsewhere indicates that they are the result of localised trauma to the big toe.

Mature male 30555 has a compression fracture of the left calcaneus and talus and a middle phalange. The talar articular surfaces have suffered two hairline fractures and the calcaneus has experienced a healed compression fracture that effectively has crushed out the calcaneus supero-inferiorly, flattening it in such a fashion to severely reduce its dimensions. In addition, the heel of the calcaneus was broken and forced anteriorly. The overall impression is that of an injury to the ankle and heel caused by a severe compression, consistent with someone falling from a great height and landing directly on their heel. On the same foot, there is ankylosis of an interphalangeal joint whereby the distal shaft and articular surface of the middle phalange have been crushed into the joint, a rough band of callus overlies this compression fracture which probably occurred as part of the event that caused the injury to the heel. It is possible that such an injury is work-related. During the 19th century shipbuilding was flourishing in Kings Lynn, as were associated industries such as sail making and rope making (Lambert 2003).

Mature female 30519 has a fully healed oblique parry fracture of the distal quarter of the right ulna. These are often interpreted as representing a protective or defensive action such as defending a blow to the head (Roberts and Manchester 1995,77) however, there are no other indicators of violence and this fracture could have just as easily occurred by the arm hitting an inanimate or moving object or other impacting accident. It appears that such accidents were common. A doctor from Kings Lynn, Doctor Richardson, reported that the Lynn hospital had dealt with 344 admissions in 1863, most of which were accident cases, which he deemed unsurprising in a busy port and market town (Perrott 1995a, 37).

Skeleton 30557 experienced a fracture to the proximal third of the right femur, which has subsequently healed. The excellent alignment of the fracture and the well healed callus indicate that this injury was probably a green stick fracture, i.e. an incomplete transverse fracture in young, immature bone which has healed efficiently and quickly, or was exceedingly well supported and splinted. A consequence of this fracture is foreshortening of the right femur by 2.8 cm in comparison to the left, probably causing the man to walk with a limp.

The anterior surface of the proximal left femur of skeleton 30570 just inferior to the trochanters has been fractured but healed without medical attention so there is a noticeable deformation of the diaphysis shape but the wound is smooth and healed with no periostitis in the area. However, the rest of the bone inferior to this trauma displays extensive, but mild, periostitis which has spread to the tibia and fibula. This may represent local infection from associated injuries such as skin laceration or from an adverse reaction of the bone to internal bleeding from the break.

Bilateral remodelling of the ribs was observed in ageing female 30547. When compared to typical male ribs from the same period it is clearly recognisable that the ribs of this individual are severely angled anteriorly ranging from 16° to 42° the further down the ribcage they are situated. Corsets were highly fashionable during the early 19th century, becoming so rigid they 'alarmed medical professionals of the day' (Wilson 2002), a condition further exasperated by the invention of the metallic eyelet during the Napoleonic Wars by a doctor in the French army, which allowed the corsets to be clinched even tighter without damaging the

fabric. The effect caused by these tight lacing corsets is also highlighted in an 18th-century engraving (Maginnis 2004).

Records of an elderly lady (skeleton 7016) recovered from St Georges Crypt, Bloomsbury state that the *'angle of the right and left ribs are abnormally acute. May be due to corset wearing'*. The inscriptions upon the breastplate identified that the lady, Miss Catherine Warren, died in 1834, aged 78 years, placing her within the same period between 1780 and 1835. In addition, a contemporary inhumation of an unnamed prime female (1007) from St Luke's, Islington also exhibits the same angulation of the ribs characterising corset damage (Boyle *et al.* 2005).

Infection

Infections predominantly manifest themselves skeletally in the form of periostitis, which essentially means inflammation of the outer surface of the bone, or periosteum.

Periostitis associated with localised infection is present on the pelvis of skeleton 30468; the olecranon fossa and distal epiphyses of the right humerus of skeleton 30488; the left fibula and hand bones of mature male 30503; the left tibia and fibula of mature male 30522 and left humeral shaft of adult male 30531.

These non-specific infections could have occurred by one of two methods. Firstly, and most commonly, by the transport of bacteria such as streptococci and pneumococci by the bloodstream from some primary infected area, such as the ear, throat, sinus or chest, or, secondarily, from the direct injection of bacteria from the skin surface during a penetrating bone injury. Periostitis from the first mode of transmission appears more commonly in the femur and tibia (Roberts and Manchester 1995,127-9).

Also, on occasion, infection may also spread from a severe and chronic skin lesion down through to deeper tissues, eventually infecting the bone surface itself. In this case of direct spread, the site is usually one in which the soft tissue covering the underlying bone is fairly superficial (Roberts and Manchester 1995,129), such as the anterior surface of the tibia.

Skeletons 30476 and 30526 appear to have suffered from respiratory disease, as indicated by new bone growth on the visceral surfaces of the mid-thoracic ribs.

Prime male 30551 probably suffered from pulmonary (lung) disease, an infection which has manifest itself skeletally in the guise of small clusters of tiny raised 'islands' of new bone on the visceral surfaces of the ribs. There is insufficient evidence to identify the specific disease affecting the lungs of this individual but it is possibly pneumonia or a fungal infection.

Both these respiratory diseases exhibit new bone growth indicating that the individuals recovered from the infection. Glass making, which also prospered in this region involved crushing and washing ore, smelting and tempering, all of which would have created harmful pollutants (Roberts and Cox 2003:237) may have caused respiratory disease. However, the low prevalence (~8%) may imply that the people of this cemetery are not directly involved in such manufacturing processes, corresponding with their middle class status. This is supported by the documentary records, which list master craftsmen professions of 'watchmaker', 'linen draper' and 'corn chandler' for individuals interred in this location.

Metabolic disorders

The metabolic disorders evidenced within this assemblage are osteoporosis, vitamin D deficiency and anaemia.

The bones of individual 30447 are very light with very thin and brittle cortical bone suggesting osteoporosis, which may be contributory to the fracture of the left femoral neck in this mature female. However, diagnosis of osteoporosis can only be confirmed by radiography (Rogers and Waldron 1995,14).

Prime female skeleton 30484 exhibited bilateral moderate mediolateral and slight anteroposterior bowing of the tibiae, indicating a vitamin D deficiency. However, there is no widening of the major cranial sutures due to endochondrial resorption nor any flaring or widening of the long bone metaphyses, suggesting that if the cause of this 'bowing' was rickets or osteomalacia it was not a severe form.

A deficiency in vitamin D inhibits the body's ability to absorb calcium and subsequently results in soft thin bones, which bow under weight-bearing stresses such as crawling and walking. Although vitamin D is obtainable from some foodstuffs, such as oily fish and animal fat, the majority of vitamin D forms through the exposure of the skin to ultraviolet light. Therefore, the bowing of this individual's legs indicates they received insufficient exposure to sunlight during early childhood.

Vitamin D deficiency related diseases, such as rickets, are documented to be more customary in children of the wealthy, where it was common practice to employ a wet nurse to suckle the baby (Sloan 1996, 44). This usually resulted in early weaning onto gruels high in calories but poor in animal fat, and hence, low in vitamin D (Steinbock 2003, 281-282). Coupled with dressing the infant in swaddling clothes and being kept indoors, these socio-economic factors may well have resulted in rickets.

Anaemia, an insufficiency of red blood cells and haemoglobin for oxygen-carrying needs (Kiple 2003,21), appears to have afflicted infant 30563 who displayed cribra orbitalia i.e. porotic hyperostosis of the orbital roofs resulting from increased activity of the bone marrow as the body attempts to combat the anaemia by raising red blood cell production (Mays 1998,142).

Iron deficiency, which hinders the production of haemoglobin, may be due to a lack of iron in the diet, but can also result from disease, particularly gastro-intestinal infections or parasite infestations. Such infections may lead to anaemia through haemorrhaging (Roberts and Cox 2003,42) and diarrhoea associated with infections like dysentery, causes food to pass through the gut too quickly to allow for absorbtion of vital nutrients, and minerals such as iron. Therefore, it is likely, that this child suffered from an infection, which may have been the cause of their premature death.

Paget's Disease

Paget's disease was observed in two adult male skeletons aged upwards of 40 years (30513, 30522) within this assemblage. The aetiology of this condition is unknown, however, a viral origin (measles? respiratory virus?) has been suspected based on some morphologic and serologic findings (Aufderheide and Rodriguez-Martin 1998,413). Paget's disease seldom appears before the age of 40 and mostly not before 50 years of age, and males are more often involved than females (Ortner and Putscher 1981,309).

Both individuals exhibit marked thickening of the diplöe showing new bone formation with a pumice appearance, of the frontal, parietal and to a lesser extent the occipital bones. 30513 exhibits thickening of the femoral shaft, with a reduction in diameter of the medullary cavity and the pelvic fragments display some thickening. In addition, there is anterolateral bowing of the femur. However, 30522 does not display any of the postcranial indicators of this disease, which may indicate it is in the early stages. It is probable that this disease was in its early stages within this individual and did not produce any non-skeletal symptoms. Aufderheide and Rodriquez-Martin (1998,413-4) identified that 80% of individuals with Paget's disease of bone in a radiographically surveyed adult population are without symptoms, and those that do seek medical attention do so because of bone pain. However, when symptoms have been documented the individuals tend to be lethargic and inhibited, with an increased heart rate and blood flow, leading to very warm skin (Roberts and Manchester 1995,164).

Congenital anomalies.

Mature female 30439 exhibits poor development of the left navicular and first and second cuneiforms in the left foot, resulting in their much smaller size compared to the other bones within the foot. In addition, the tarsals and first toe (hallux) are considerably smaller than bones in the right foot. In contrast, the talus and calcaneus, which make up the articulation with the ankle joint and the heel, have developed 'normally' and there is no wasting or osteophytic activity. This supports the interpretation that the recognised abnormality is a developmental defect and not the result of trauma or disease.

Prime female 30476 shows bilateral deformity of the iliac auricular surface characterised by a convex raised central area of each auricular surface matched with a concavity on the sacral surface with which it articulates. There was no evidence for arthritis, degenerative joint disease or infection implying a congenital origin for this malformation.

The second right rib in prime female 30500 exhibits a bony outgrowth on its superior edge indicating it was fused to the first rib. It is most likely that this is a congenital fusion.

Slight congenital scoliosis (lateral curvature of the spine) was observed in prime female 30539. This was characterised by an S-shaped vertebral column due to wedging of the bodies of T10 to the right and T5 on the left side.

A right cervical rib was recovered from the remains of mature male 30504. This common congenital condition results from the elongation of the transverse process of one of the cervical vertebrae, normally the seventh cervical vertebrae and demonstrates all the features of a true rib such as the head, neck, and body (Aufderheide and Rodriguez-Martin 1998,68).

Neoplastic disease

Mature male 30503 suffered from metastic lesions confined to three lower thoracic vertebrae and the left femoral head, indicating a metastic carcinoma i.e. a malignant skeletal lesion, originating from a primary cancer in some distant organ. The most common carcinoma is prostatic (70% of which metastasize to the spine) and it is largely a disease of the elderly (Aufderheide and Rodriquez-Martin (1998,388).

Skeletal pathology is summarised in Table 3.

Degenerative joint disease (DJD)

Eighteen individuals displayed symptoms of degenerative joint disease. Of these, three displayed degenerative joint disease only, thirteen with spinal degenerative joint disease, four with osteoarthritis, and three combined with both spinal degenerative joint disease and osteoarthritis. Degenerative joint disease is recognisable by porosity, osteophytosis and new bone growth on the joint surfaces. This shows that it was commonest in the knee and sacro-iliac joints, i.e. weight bearing joints that are in constant use.

Spinal degenerative joint disease (SDJD)

Twenty individuals from this assemblage displayed symptoms of spinal degenerative joint disease. Thirteen in association with degenerative joint disease, five with osteoarthritis, and three combined with both degenerative joint disease and osteoarthritis. Spinal degenerative joint disease occurred most notably in the lumbar vertebrae (23 out of 41 cases observed in the different components of the spine).

Osteoarthritis (OA)

Osteoarthritis can be caused by many factors including advancing age, obesity, a genetic predisposition, occupation and high cholesterol diets; it may also be a complication of other

conditions such as a poorly aligned fracture or reduced dislocation (Roberts and Cox 2003,32).

Eburnation, polished areas on joint surfaces, is pathognomic of osteoarthritis (Rogers and Waldron 1995,13) and it is only when this is present that joint disease is classed as osteoarthritis within this report. Within this assemblage, six individuals were diagnosed with osteoarthritis. Two were combined with degenerative joint disease, one with spinal degenerative joint disease, and three with both.

The majority of individuals suffering from osteoarthritis were aged over 40 years at time of death, save for female 30539 who was aged between 35 and 39 years. She suffered from osteoarthritis and degenerative joint disease in the lumbar and sacral vertebrae but this is probably a consequence of her congenital scoliosis. Its main occurrence in the older members of the population is probably due to wear and tear on the ageing joints.

A summary of the distributions of these three conditions is provided in Table 4 below.

A summary of the prevalence of degenerative joint disease, spinal degenerative joint disease and osteoarthritis is shown in Table 5 and Figure 3. The greatest prevalence of each is in the 'ageing adult' category, then in 'mature adult'. In addition, 50% of the 'prime adult' category exhibit symptoms of spinal degenerative joint disease. This is explainable by one of two reasons. Firstly, the individuals may have died at the later end of this age group i.e. nearer to 40 years. Some individuals categorised as 'prime adult' actually have an osteological age range that extends beyond 40 years (i.e. skeleton 30531, who has spinal degenerative joint disease in the upper lumbar vertebrae, could be aged anywhere between 28 and 52 years) but were allocated to the age category most central to this range, but could in fact be older. This may slant the prevalence percentages, especially when combined with the recognition that many osteological techniques under-age post-medieval assemblages.

Secondly, the pathologies may be the consequence of factors not solely related to age. There is a mistaken assumption that degenerative joint disease and associated conditions such as arthritis are a sole consequence of old age and work-related stresses. However, its occurrence in younger individuals may be influenced by genetic susceptibility.

Dental pathology

Dental pathologies are useful indicators of life histories, diet, nutrition, health and oral hygiene. Dental disease predominantly manifests itself as dental caries, dental enamel hypoplasia, ante-mortem tooth loss, periodontal disease, dental abscesses and calculus. The prevalence of each is shown in Table 6.

Calculus

Calculus is mineralization of dental plaque, forming a matrix that adheres to teeth and houses micro-organisms, which can occur on any tooth or root surface. Calculus was observed in 74.24% of the teeth recovered during excavation. Interestingly, although there was a high frequency of its occurrence, it was slight to medium in all cases save for 30522 where it was recorded as 'heavy' in four out of seventeen teeth, of which the other thirteen only showed slight (10) to medium (3) calculus deposition.

Periodontal disease and ante-mortem tooth loss (AMTL)

Accumulation of calculus in the crevices between the tooth and soft tissue and the bone of the jaw is a common cause of periodontal disease. The calculus accumulation causes inflammation of the soft tissues of the jaw (gingivitis), which subsequently transmits to the bone (periodontitis). The consequent resorption of bone and exposure of the tooth roots results in tooth loss.

Table 3: Summary of Skeletal Pathologies excluding Degenerative Joint Disease.

Skeleton No	Age	Sex	Infections	Trauma	Metabolic disorders	Congenital anomalies	Neoplastic
30439	40+	Female?				Poor development of medio-distal tarsals.	
30447	40+	Female?		left femoral neck	osteoporosis?		
30468	35-40	Male	periostitis on pelvis				
30476	35-40	Female	respiratory disease	L. humerus		Deformation of AS of sacro-iliac joint?	
30484	35-50	Female			medio-lateral bowing of tibia		
30488	55+	Female	olecranon fossa, distal epiphyses R. humerus				
30500	35-44	Female				fusion of R 1st + 2nd ribs	
30503	40+	Male	periostitis of L. fibula and handbones				metastic carcinoma
30504	40+	Male				R. cervical rib	
30513	40-50	Male			Paget's disease		
30519	40-45	Female		R. ulna			
30522	40+	Male	periostitis of L. tibia + fibula		Paget's disease		
30526	45-59	Male	respiratory disease				
30531	28-52	Male	periostitis of L. humerus shaft				
30534	45+	Male		Right hallux			
30539	35-39	Female				scoliosis	
30547	45-59	Female		corset damage			
30551	30-40	Male	pulmonary disease				
30555	35-54	Male		compression fracture L. calcaneus + talus; compression fracture of middle phalanx.			
30557	40-50	Male		R. femur			
30563	4-6	??			cribra orbitalia		
30570	45+	Female	periostitis L. femur, tibia, fibula; mild in R. humerus	L. femur			

Table 4: Distribution of joint disease.

Skeleton No	Age	Sex	DJD	SDJD	OA
30531	28-52	Male		L1-L2	
30551	30-40	Male	minor articular facets of ribs, dist femora, L. patella & talus		
30539	35-39	Female		severe sacral and lumbar	spinal OA
30492	35-39	Male	Phalanges of L hand.	Mild T7-T12	
30476	35-40	Female	both knee joints		
30468	35-40	Male	both auricular surfaces of ilium, proximal sternum' intercostal ridges or ribs, right humeral head.	T1-L2	
30561	31-45	Male		articular processes R. L3-L5	
30500	35-44	Female		slight T3-7, L5	
30555	35-54	Male	R. glenoid fossa, L. acetabulum.		
30439	40+	Female ?		T4-T12	
30443	40+	Female ?	acetabulum, femoral heads, osteophytic growth (bunion) left hallux	1 vertebrae	
30447	40+	Female ?		cervical, lumbar	OA hands, right arm,
30463	40+	Female		2 lumbar	
30504	40+	Male	slight L saco-iliac, femoral, knee and hand joints		
30503	40+	Male	widespread in hands, feet and knees	cervical, thoracic	Spine, knees,hands, feet
30522	40+	Male	slight R glenoid fossa, femoral head, metacarpals, knee joints	L3-L5	
30519	40-45	Female	slight distal epiphyses of L& R femora; L 1st metacarpal	C5-C7	
30557	40-50	Male	L. hallux bunion, sacro-lumbar articular facets, R. sacro-iliac joint, L. sterno-clavicular joint.	L1-L5	1st metatarsals,
30526	45-59	Male	costo-sternal articulations (R worse), both hip joints, R. clavicle, R. elbow, hand & feet phalanges.	most thoracic &lumbar, curvature to right.	
30547	45-59	Female	R. ilia articular surface, intercostal grooves of surviving rib frags	slight T6-T8, T10	
30534	45+	Male	distal epiphyses both ulnas & radii, R. humeral head, bilateral glenoid cavities, L. sterno-clavicular joint		both knees, talo-calcaneal joint, R. hallux right first rib fused to manubrium
30496	50+	Male	pelvis	lumbar vertebrae	
30488	55+	Female	Porosity on most surviving articular surfaces	schmorl's nodes, osteophytic lipping T4-5' L2,4,5	right elbow joint
30565	50-60	Male	R. scapho-humeral joint,elbow, wrist, L. elbow, hips & knees.	C2-6, T2-5, L1-5	

Skeleton No	Age	Sex	DJD	SDJD	OA
30570	45+	Female	pelvis, right metacarpals	3 fused thoracic vertebrae	

Table 5: Prevalence of joint disease in the Quaker Assemblage.

Age Category	Total No. in Age Category	Total No. of individuals with DJD	Prevalence %	Total No. of individuals with SDJD	Prevalence %	Total No. of individuals with OA	Prevalence %
Adolescent	2	0	0	0	0	0	0
Prime Adult	10	2	20	5	50	1	10
Mature Adult	14	8	71.43	9	64.29	3	21.43
Ageing	7	7	100	6	85.71	2	28.57

Ante-mortem (before death) tooth loss is recognised in this assemblage by secondary bone growth sealing the alveolar root cavity i.e. a crypt is remodelling, or has remodelled following the loss of a tooth during life (Freeth 2000,231). The prevalence of ante-mortem tooth loss in this assemblage is 53.82 %. This high percentage may be due to high levels of periodontal disease, but may also be due to the natural ageing process, which is likely to be a prominent factor as the documentary evidence provides many ages of death well beyond the late 50s.

Dental abscess

One large abscess was observed superior to the left maxillary first premolar in skeleton 30522. Possibly the abscess may have been caused by the extraction of this tooth. Alternatively, this abscess may have formed through the development of periodontal disease and consequently a periodontal pocket initiated by the accumulation of plaque between the soft tissue of the gum and the tooth. Micro-organisms would have accumulated in the pulp cavity beginning inflammation and the subsequent development of pus, forming the painful abscess.

Dental caries

Dental caries is an infectious disease resulting from the fermentation of food sugars, especially sucrose, in the diet by bacteria that occur on the teeth. If the correct combination of plaque, bacteria and sucrose occurs then the acids produced demineralize the teeth and leave cavities. The occurrence of caries is affected by several factors; environmental (trace elements of food and water), pathogenic agents (the bacteria causing the disease), exogenous factors (diet, oral hygiene) and endogenous factors (shape and structure of the teeth). The prevalence of caries (35.96%) within this assemblage is probably directly related to the increased accessibility to sugar in the early 19th century caused by improved transport and refining methods that reduced its price so that sugar was affordable by middle class people, and not just the most affluent. Between 1748 and 1800, England's annual sugar consumption had increased from 10lb to 20lb per capita (Musgrave and Musgrave 2000,60), bringing with it an increase in tooth disease.

Table 6: Prevalence of dental pathologies within the Quaker assemblage.

Skeleton No	Age	Sex	Dental Caries	DEH	AMTL	Periodontal disease	Dental Abscess	Calculus	Other
30439	40+	F?			15/16				
30447	40+	F?			14/16				molar blocks/Dentures
30451	25-45	F?						slight 3/5	
30455	26-40	F	2/4		14/16	considerable		slight 1/4	
30460	40+	F		2/7	9/21	moderate		slight 4/7	
30463	40+	F			6/6				
30476	35-40	F	1/2			Slight		slight 1/2	
30484	35-50	F						moderate 1/2	
30496	50+	M		7/13		moderate		slight-heavy 12/13	
30500	35-44	F	16/20						
30503	40+	M			11/15				
30504	40+	M	5/16	8/16	7/28	slight-moderate		slight1 6/16	rotated molar
30513	??	M	0/7	0/7	0/16				
30518	15-17	?	2/17	5/17				slight 13/17	
30522	40+	M?	1/21	8/12	2/20	considerable	External draining 1/20	slight-heavy 18/20	
30526	45-59	M			7/10				
30531	28-52	M	1/1		23/32			medium 1/1	
30534	45+	M	3/7	4/7		considerable		medium 7/7	grooves on remaining anterior teeth.
30551	30-40	M	5/5	5/5	17/30	considerable		slight 4/5	
30555	34-54	M	5/14	2/14	3/22	moderate-considerable		slight-medium 15/15	
30557	40-50	M			3/18	slight		slight-medium 12/18	polishing/ filing?
30565	50-60	M			27/32				
30570	45+	F			11/16				
Prevalence			**41/114 35.96%**	**41/98 41.84 %**	**169/314 53.82%**			**98/132 74.24%**	

Although toothbrushes date from the mid 1660s they were largely inaccessible to the majority. This is suggested by 18th and 19th-century examples with gold and silver handles. Toothpaste was not widely used until the late 19th century when the collapsible metal

toothpaste tube that did not affect the paste was invented (Hallam 1990,5). Although, the richer classes had better access to dental care products some may have been more detrimental than beneficial. For example, toothpowders, which were favoured amongst the more affluent members of society, contained highly abrasive materials such as brickdust, china and pumice stone (Hallam 1990,7). Although they may have been effective in whitening the teeth, they would have destroyed the protective enamel, leaving the tooth vulnerable to infection and disease.

Dental enamel hypoplasia (DEH)

Hypoplasias are a consequence of disturbance to the growth of the dental enamel, or, more specifically the organic matrix that subsequently mineralises to form enamel. A wide range of specific causes can lead to enamel defects, including fevers, gut parasites, diarrhoea, rickets, scurvy, measles, allergic reactions, whooping cough, pneumonia, vitamin deficiencies and general malnutrition (Mays 1998,158). In general, during a period of disease or malnutrition less matrix is formed in the part of the crown which happens to be developing at the time, so the enamel is thinner in that area (Goodman and Rose 1990). Such thinning manifests itself in the form of a transverse line or band of depressed enamel on the sides of the tooth crown.

Dental enamel hypoplasias only form during that part of childhood when the enamel of the tooth crown is developing, so they record episodes of disease or poor nutrition occurring during this period alone, i.e. between one and seven years of age (or up to about thirteen if the third molar is included) (Mays 1998,156).

Dental enamel hypoplasia is only present in eight individuals from this assemblage, within which its prevalence was 41.84%. This suggests that the factors contributing to enamel defects are not widespread throughout this community, but have effected eight individuals, who probably suffered from childhood diseases or were wet nursed, causing the same complications as detailed under *metabolic disorders.*

Dental congenital anomalies

The only dental congenital anomaly observed within this assemblage is a rotated molar in skeleton 30504.

Dental interventions.

Mature male 30557 displayed considerable polishing to the labial and distal aspects of the crowns of the mandibular premolars. They may have been filed down to smooth out or eradicate small caries.

On the surviving mandibular anterior teeth of ageing male 30534 there is a continuous groove approximately 4 mm wide. These grooves may have been caused by gold or silver wire or silk ties, which were often used to attach simple molar blocks to the anterior teeth in early dentures (Hallam 1990). This hypothesis is supported by the absence in this individual of all his mandibular molars, and some of his premolars.

A marked ridge of dense bone has developed on the right molar region on the buccal aspect of the mandible in mature female 30447, making the buccal aspect more square. This may suggest prolonged pressure in this area by ill-fitting molar blocks or dentures. No such dental fixtures were recovered but they may have been removed before burial. The evidence for dental prosthetics further indicates that the Quaker community of Kings Lynn experienced a comfortable amount of personal wealth, in spite of the modest appearance of their burials.

The pie chart below diagrammatically represents the prevalence of each type of dental pathology documented above.

Non-metric traits

Non-metric traits are those features of the skeleton whose representation may differ from one individual to the next (Schwarz 1995,258). It is believed that such discontinuous traits are genetic in origin and can, therefore, allow us to identify how closely related individuals, or groups of individuals, are to each other. The table below shows the cranial and post-cranial non-metric traits observed in this population and their rate of occurrence in male and female burials.

It is clear from table 7 that some non-metric traits are predominant within this population, suggesting close kinship links. The most commonly occurring are calcaneus facet form double (9/16); femoral plaque (8/24); exostosis in trochanteric fossa (7/24); scapular acromial articular facet (6/15) and highest nuchal line (5/18).

Sixteen out of a possible thirty-four skulls were unsuitable for non-metric observations to be made, this may be contributable to the smaller number of multiple cranial non-metric traits observed in this population.

By comparing the frequency of occurrence of non-metric traits between the males and females one can measure the biological distance between them and determine how closely related they are. To do such an analysis Start and Kirk (1998,170-171) used the most heritable cranial non-metric traits, in accordance to Sjøvold's 1984 study of a European post medieval sample with known familial relationships. Of the eleven traits they list in their text, eight were observed in this Quaker population. The statistical tests carried out by Start and Kirk (1998) on the Quaker's exhumed from Kingston-upon-Thames revealed that the males and females of the group are not significantly different from, and therefore are closely related to each other. They concluded that this osteological result matched the historical picture of a close knit community within which marriage was encouraged.

I applied a t-test to the Kings Lynn population to compare the occurrence of the selected cranial non-metric traits to see how similar the two sexes within this population are.

For this Quaker population a probability of >5% (t-value 2.666, df 7) was returned, indicating a less than 5% probability that the similarities observed in this population occurred through chance, i.e. a significant result.

This indicates that the males and females interred within this Quaker burial ground are not significantly different from each other, and therefore have a close kinship link, as one would expect in a close-knit community.

Non-metric traits and multiple burials.

One would expect that if the two multiple burials excavated contained family members, that individuals within the same grave would exhibit the same non-metric traits.

The non-metric traits exhibited with the multiple burials are summarised below:

Within shaft grave 30474, prime adult female 30476 and ageing male 30534 shared a parietal foramen. This is only present in three people.

Within earth-cut grave 30482 prime adult female 30484, and mature adult female 30519 shared femoral plaque. It is hard to determine whether they were related because femoral plaque is present in 33.33% of the cemetery population so may be a trait associated with the Quaker's or the population of King's Lynn overall.

Table 7: Summary of non-metric traits observed in Quaker population.

cranial Non-metric trait	male	female	total no	Postcranial Non-metric trait	male	female	total no
Zygomatic facial foramen	1	1	2	Pelvis accessory facet	1	1	2
supraorbital foramen	1	2	3	femur plaque	4	4	8
parietal notch	1	1	2	tibia facet form double	0	1	1
parietal foramen	3	3	3	scapula acromial articular facet	4	2	6
foramen of Huschke	0	1	1	calcaneus facet form double	4	5	9
frontal foramen	1	2	3	third trochanter (femur)	4	1	5
maxillary torus	0	2	2	exostosis in trochanteric fossa	6	1	7
auditory torus	1	2	3	atlas facet form double	2	1	3
highest nuchal line	4	1	5	allen's fossa	1	1	2
accessory lesser palatine foramen	1	0	1	emarginate patella	0	1	1
mandibular torus	1	0	1	vastus notch	2	1	3
mastoid foramen	1	1	2	calcaneus facet form single	3	0	3
lambdoid ossicle	1	1	2	suprascapula foramen/notch	2	0	2
coronal ossicle	1	0	1	poirier's facet	2	0	2
epipteric bone	1	0	1	tibia facet form single	2	1	3
foramen ovale	1	0	1	atlas lateral bridge	0	1	1
ossicle at asterion	1	0	1	femur hypotrochanteric fossa	2	1	3
posterior condylar canal	1	0	1	atlas posterior bridge	1	0	1
palatine torus	1	0	1				
fronto-temporal articulation	0	1	1				
foramen spinosum	0	1	1				

Table 8: A summary of non-metric traits in multiple burials in Quaker cemetery.

Grave No	Grave Type	Skeleton No	Cranial Non-metric traits expressed	Post cranial Non-metric traits expressed
30474	shaft	30476	Parietal foramen, maxillary torus	atlas facet form double, calcaneus facet form double.
		30534	lambdoid oss, coronal oss, epipteric bone, parietal foramen, foramen ovale	suprascapular foramen, acromial articular facet, atlas posterior bridge, femoral plaque, vastus notch, tibia facet form single.
30482	earthcut	30484	no cranial observations possible	femoral plaque, vastus notch, tibia facet form single, tibia facet form double.
		30519	highest nuchal line, parietal foramen.	supra scapula notch, femoral plaque, calcaneus facet form double.
30549	earthcut	30551	ossicle at asterion	no postcranial non metrics observed
		30557	highest nuchal line, parietal foramen.	allen's fossa, femoral plaque, third trochanter, exostosis in trochanteric fossa, calcaneus facet form double.
		30563	no cranial non metrics observed.	no postcranial non metrics observed

Within grave 30549 prime adult male 30551 and mature adult male 30557 shared no cranial non-metrics and none were recorded post-cranially on 30551, even though the skeleton was quite complete, however the bone was in poor condition so identification would have been difficult. Their absence is not conclusive evidence for these individuals not being related.

Non-metric traits and shaft burials.

Within the six shaft graves, the seven individuals did share some non-metric traits, as is summarised in Table 9.

Table 9: A summary of non-metric traits in shaft burials in Quaker cemetery.

Grave No	Grave Type	Skeleton No	Cranial Non-metric traits expressed	Post cranial Non-metric traits expressed
30474	shaft	30476	parietal foramen, maxillary torus	atlas facet form double, calcaneus facet form double.
		30534	lambdoid oss, coronal oss, epipteric bone, parietal foramen, foramen ovale	suprascapular foramen, acromial articular facet, atlas posterior bridge, femoral plaque, vastus notch, tibia facet form single.
30437	shaft	30439	supra orbital foramen	no postcranial traits observed
30441	shaft	30443	no skull recovered	pelvis accessory facet, femoral plaque, tibia facet form double.
30445	shaft	30447	parietal notch, parietal foramen, foramen of huschke,	scapula acromial articular facet, calcaneus facet form double.
30453	shaft	30455	skull too damaged	none observed, poor quality bone.
30470	shaft	30503	highest nuchal line, accessory lesser palatine foramen.	atlas facet form double, calcaneus facet form double.

All three cases of parietal foramina are observed in these shaft burials, two within shaft 30474. The third case comes from grave 30445. These burials are not adjacent suggesting that if they were related in some manner that family members are not buried in specific areas, juxtapose to one another. This was the only cranial trait observed and was present in 60% of the individuals interred in shafts.

This could indicate that the individuals interred in the shaft graves are of a specific kin group of the Quaker population, maybe related to wealth.

The post-cranial traits observed in the shaft graves are as follow: atlas facet form double (2/5 burials, only three in population). Calcaneus facet form double was recorded in three of possible five instances. This is also present in an additional six individuals buried in earth cut graves, indicating that this trait is diagnostic of the wider Quaker, and possibly Kings Lynn, community.

Acromial articular facet was found in two of a possible five burials. This is also observed in an additional four earth-cut burials.

Femoral plaque was observed in two shaft burials, but is present in another six earth cut burials, indicating a wider kin relationship, relating to the larger population.

Unfortunately, the skeletal remains of the individual interred in the zinc coffin were too obscured by sawdust which had adhered itself to the skeletal remains during the process of decay. This is counterproductive to any comparison of non-metric traits with the shaft burials to determine if there are any similarities which would suggest that these were the burials of individuals from a different social or kin group to those interred in the earth-cut graves.

Documentary sources

The burial register for the Friend's Burying Ground in Kings Lynn provides some interesting information, regarding those interred there (see Table 10). Further information about the Quaker society of Kings Lynn can also be inferred from other documentary sources.

Family Groupings

The presence of shaft graves, normally associated with family groups, and the prevalence of specific non-metric traits observed in the osteological analysis both indicate family relationships. This is supported by the documentary evidence, as summarised above, which shows four family groups within this assemblage namely, Broughton, Hallam, Catkin and Bransby.

Broughton

The two Broughton ladies are both named Hannah and were buried twenty two years apart from each other. It was common practice amongst Quakers to assign parental names to their children, suggesting that these two ladies may be mother and daughter.

Hallam

It is highly probable that Mary and Edward Hallam were husband and wife. This is supported by the age gap of eight years, which denotes them to be the same generation. However, it is possible that they are brother and sister, if Mary Hallam never married. However, there is no indication of her being a spinster in the records, as there is for Elizabeth Parkinson, who is categorised as a 'single woman' in the burials register.

Catkin

Daniel Catkin, his three children Miles, Sarah and Daniel, and his brother Myles Catkin are interred within this burial ground. There is no mention of his wife Sarah within the burial records. The children are named after their parents, and Miles is a variation upon the name of his uncle, Myles Catkin. An interesting observation about the Catkins' is the listing of Daniel Catkin Burlingham under the names of Guardians elected in the Kings Lynn Union's general election in 1859 for the Guardians of the Poor (Perrott 1995b,32). This suggests a marriage between a female Catkin and male Burlingham, showing inter-marital relationships between this Catkin family and the relatives of Joseph John Burlingham in subsequent years. It is also interesting to note the passing-on of skills between father and son, both of whom are listed as watchmakers.

Bransby

The two Bransby burials are the interment of the father Samuel Bransby, and his son Sidney, both of whom were corn chandlers. The close proximity of their deaths 9/7/1816 and 23/6/1816 suggests they either contracted a fatal illness or were involved in an ultimately fatal accident. Unfortunately, no skeletal manifestations of either was observed, and no mention is made in the documentary record, leaving the cause of death for these two individuals unclear.

Quakers in Kings Lynn

The Quakers in Kings Lynn held positions of authority and were very much involved in improving the local environment and encouraging education. The most famous were the Gurney family of bankers, whose distinguished daughter was Elizabeth Fry, a Quaker minister who was a successful prison reformer with many contributions included in the Prison Act of 1823.

Table 10: Summary of the information attained from the Burial Register for Friends Burial Ground, Kings Lynn.

Name	date of death	age at death	Occupation	Notes
Higginson, Edward	21/09/1784	81, 11 day		new conduit street
Hallam, Mary	8/11/1785	about 70		
? Robert	31/07/1805	17		
Hunt, Sarah	29/03/1810	30		
Dixon John	26/07/1810	5		
Catkin Miles	11/08/1810	19 yrs 10m		son of Daniel + Sarah
Hallam, Edward	29/03/1802	84		
Broughton, Hannah	22/04/1802	80		
Gales, Ann	23/11/1801			wife of Thomas Gales
Catkin Myles	12/11/1803	63	grocer + draper	
Catkin, Daniel	7/10/1812	74	watchmaker	
Catkin, Sarah	15/12/1813	27		daughter of Dan + Sarah
Parkinson, Elizabeth	22/04/1815	73	single woman	
Palmer, John	2/12/1815	74	linen draper	
Bransby, Sidney	23/06/1816	17	corn chandler	son of Samuel + Maria
Bransby, Samuel	9/7/1816	52	corn chandler	
Frith, Ann	13/04/1817	58		
Holmes Muskitt, Anna	3/3/1818	18		daughter of Robert
Catkin, Daniel	8/4/1/818	47	watchmaker	of Lynn Regis, son of Daniel + Sarah
Burlingham, Joseph John	5/7/1834	9		
Kendall, William	23/07/1797	35		
Cobb, Henry	1/12/1779			dates only
Broughton, Hannah	?/?/ 1780			dates only
Belcham, Mary	9/01/1835			dates only

The 'Quaker Bank House', Gurneys, Birbeck and Cresswell, was located on King's Staithe Quay (Perrott 1995a, 44-45) in Kings Lynn.

The Gurney family of Quaker bankers founded the Athenaeum which opened in Kings Lynn in 1854. This was a community centre, containing, amongst other things, a library and museum, allowing both the working classes and more affluent readers access to reading material and knowledge (Perrott 1995a,11-12).

The Quakers were also heavily involved in education reform, both on a local and national level.

On a more localised scale, the Lancasterian school, established in 1808 for 300 boys supported by voluntary subscriptions and housed in temporary accommodation provided by the Lynn Corporation, was set up in Kings Lynn after a talk by Joseph Lancaster, the Quaker educationalist (Perrott 1995a,29).

The Quakers were also politically active in improving the health service and treatment of the poor. This is evident in the foundation of the West Norfolk and Lynn Hospital by David Gurney in 1834 (Perrott 1995a, 39; Perrott 1995b, 25), and the aforementioned involvement of Daniel Catkin Burlingham and James Burlingham in the provision of Guardians for the Poor.

Burial Practices

Of the 34 individuals excavated from this locality all were supine extended, and all save for four, were oriented west-east. This is befitting contemporaneous Christian burial practices throughout England in the 18th and 19th centuries. However, Quakers are non-conformist Christians, as can be observed through the plain nature of their burials compared with the increasingly elaborate and grandiose coffin furniture common in mainstream Christian burials of this period.

Since the late 17th century it had become customary in Britain to upholster the exterior of the coffin with baize or velvet, and to decorate the side panels and lid with studs, lid motifs and escutcheons. Over the 18th century the decorations became more ornate with the development of innovative methods of incorporating patterns and designs onto coffin furniture. In 1769, Thomas Pickering, a tin-plate manufacturer in Southwark, patented a power-assisted method of raising patterns in sheet iron (Litten 1991,106) which enabled even more elaborate designs to be mass produced, therefore reducing their cost and making them more accessible for common burial.

Increasingly, what were essentially practical components of the coffin began to take on more elaborate decorative functions. Upholstery pins were arranged in more complex patterns and the grips, originally just performing as a means to carry the coffin, and the grip plates to which they were attached became more decorative. The taxonomy of coffin fittings recovered from the crypts at Christ Church Spitalfields, London (Reeve and Adams 1991) is a useful catalogue from which to ascertain the styles characterising this period. As will be seen the elaborate designs favoured by the majority during this period contrasted strongly with those characterising the Quaker furnishings recovered from this site.

Position and orientation of the body.

The idea of resurrection of the body on the Day of Judgement is fundamental to Christian beliefs, whereby the act of burial becomes a symbolic re-enactment of Jesus' death with the hope that the body will rise at some time in the future (Davies 1997,113). As a result, most Christian burials are orientated with their heads to the west so that they will face God in the East when they are resurrected on Judgment Day (Parker Pearson 1999,8). This belief in resurrection also explains the positioning of the body on their back (supine) so the interred Christian can sit up, then stand, already facing east, when the time to arise comes. It has also been documented that, within Christian settings religious leaders, such as priests, have been buried with their head to the east so that when they rise at the time of resurrection they will face their congregation to guide them. This theory could be applied to individual 30526, an ageing male, who was not only facing west, but was also located on the most easterly boundary of the site, so that the other burials would, hypothetically, face towards him.

Table 11: Summary of the burial practices (n=30 graves).

Grave Cut	Skeleton No	Orientation	Position	Grave Type	Multi/single	Coffin	Coffin no	Coffin fittings	Grave goods
30437	30439	w-e	Supine	Shaft	Single	Yes	30438	Yes	No
30441	30443	w-e	Supine	Shaft	Single	Yes	30442	Yes	No
30445	30447	w-e	Supine	Shaft	Single	Yes	30446	Yes	No
30449	30451	w-e	Supine	Earth cut	Single	Yes/ Zinc	30450	Yes	No
30453	30455	w-e	Supine	Shaft	Single	Yes	30454	Yes	shroud pin
30458	30460	w-e	Supine	Earth cut	Single	Yes	30459	Yes	No
30462	30463	w-e	Supine	Earth cut	Single	Yes	30465	Yes	No
30466	30468	w-e	Supine	Earth cut	Single	Yes	30769	Yes	No
30470	30503	w-e	Supine	Shaft	Single	Yes	30473	Yes	No
30474	30476	w-e	Supine	Shaft	Multiple	Yes	30477	Yes	No
30474	30534	w-e	Supine	Shaft	Multiple	Yes	30533	Yes	No
30482	30484	w-e	Supine	Earth cut	Multiple	Yes	30483	Yes	No
30482	30519	w-e	Supine	Earth cut	Multiple	Yes	30528	Yes	No
30486	30488	w-e	Supine	Earth cut	Single	Yes	30487	Yes	No
30490	30492	w-e	Supine	Earth cut	Single	Yes	30491	Yes	No
30494	30496	w-e	Supine	Earth cut	Single	Yes	30495	Yes	No
30498	30500	w-e	Supine	Earth cut	Single	Yes	30499	Yes	No
30505	30504	w-e	Supine	Earth cut	Single	Yes	30507	Yes	No
30509	30510	w-e	Supine	Earth cut	Single	No	n/a	No	No
30512	30513	w-e	Supine	Earth cut	Single	No	n/a	No	No
30516	30518	w-e	Supine	Earth cut	Single	No	n/a	No	No
30520	30522	w-e	Supine	Earth cut	Single	Yes	30522	Yes	No
30524	30526	e-w	Supine	Earth cut	Single	Yes	30525	Yes	No
30529	30531	w-e	Supine	Earth cut	Single	Yes	30530	Yes	No
30537	30539	w-e	Supine	Earth cut	Single	Yes	30538	Yes	No
30541	30543	w-e	Supine	Earth cut	Single	Yes	30544	Yes	No
30545	30547	w-e	Supine	Earth cut	Single	Yes	30546	Yes	No
30549	30551	w-e	Supine	Earth cut	Multiple	Yes	30552	Yes	No
30549	30557	w-e	Supine	Earth cut	Multiple	Yes	30558	Yes	No
30549	30563	w-e	Supine	Earth cut	Multiple	No	n/a	no	No
30553	30555	w-e	Supine	Earth cut	Single	Yes	30556	Yes	No
30559	30561	w-e	Supine	Earth cut	Single	Yes	30562	Yes	No
30567	30565	w-e	Supine	Earth cut	Single	Yes	30566	Yes	No
30568	30570	w-e	Supine	Earth cut	Single	Yes	30569	Yes	No

However, it must be addressed that another three burials were also oriented with the head to the east and were spread throughout the burial ground.

This hypothesis is undermined by Stock's (1998,138) observation that the Quakers believed in the ideal of the resurrection of the dead, but concerning the actual way in which the dead

would be raised and the type of body with which they would be resurrected they felt it unnecessary to discuss, leaving it, instead, to God. Therefore, the grave axis does not need to adhere to the west-east alignment, suggesting that there is no significance associated with east-west oriented graves, just that so long as the grave was east-west aligned it didn't really matter which way the coffin went in, and was probably only influenced by non-religious factors such as uniform layout of the graves. The lack of gravestones before 1850 also meant that the body did not have to be lain in a specific orientation so that the grave marker or 'headstone' was placed at the head-end of the body and had to be aligned with others within the cemetery.

Another factor dismissing the application of this 'leader of the flock' theory is the lack of hierarchy within the Quaker community. It is clear from documentary sources (Stock 1998,130) that there are positions of responsibility held for a maximum of three years which assist in the organisation of the Quaker meetings, but do not accord the individual higher status over others within the community. These positions include that of Clerk, who chairs the meetings for church affairs and Elders, responsible for the spiritual growth of the meeting. Not only are they short-term positions alternated amongst members of the Society, there is overlap in their responsibility so no one individual has sole control over any aspect of a Quaker meeting, and therefore Quaker worship.

Further dismissing this theory is that individual 30526 is buried between two other grave cuts (30537 and 30535), both of whom are orientated west-east, and therefore is not the most easterly grave.

Cemetery layout

The burials were organised linearly north to south across the burial ground. Each grave, save for the examples documented below, respects the space occupied by other graves.

Such respect of pre-existing graves fits with documentary sources that detail the allowance of a plain stone grave marker *'simply to define the position of the grave, with a view to... preventing of its premature re-opening'* (Stock 1998,132). However, this statement derives from an 1850 document, before which, including the duration of the Friend's Burial Ground, all such markers were forbidden. This may explain the noticeable misalignment of the linear patterning of the earth-cut graves, and may explain the presence of inter cutting graves in the northern area of the site, discussed below.

Types of grave.

Six brick-lined shaft graves (BLSG's) were present in this Quaker cemetery, and twenty-four earth-cut graves.

The earth-cut graves are the simplest form of burial, fitting with the concept of 'simplicity' advocated by Quaker doctrine. However, brick-lined shaft graves may represent a more elaborate burial type, and as they are generally associated with family groups, would distinguish between these, suggesting one within a shaft grave to be of higher status than those interred within an earth-cut grave, opposing the Quaker principle that there should be no distinction between rich and poor. As is also apparent at Kingston-upon-Thames.

The opposition to such brick structures is displayed in an excerpt from *Six Weeks Meeting Minutes* vol 14, 132, 16th 8th Month 1774 which states:

'*This meeting being informed that an attempt has lately been made to build a Vault in one of our Burial Grounds belonging to this city (London)...and hereby direct the Grave-diggers of the respective Burial Grounds, that they should not permit, or suffer any Vault, or Arch, to be built, Grave Stone set up, or Tomb erected, in any Burial Ground belonging to this meeting'* (Stock 1998,136).

Nevertheless, brick-built structures have also been found at the Quaker burial ground at London Road, Kingston-upon-Thames, London and 'walled graves' in the Quaker burial ground at Bathford, Bath (Stock 1998,145).

Although, the Quakers within this community appear to be going against their religious doctrine, their shaft burials are still quite basic. The walls consist of a single brick layer and the actual interments were encoffined in wooden coffins, whereas they could have been lead or zinc. These 'walled' burials are significantly more modest than the brick burial vault containing the Barnard family in the Kingston-upon-Thames cemetery. Not only was each member of the Barnard family enclosed within individual cells consisting of brick dividing walls overlain by stone slabs, they were each interred in a lead coffin (Bashford and Pollard 1998,161).

Multiple and intercutting burials.

It is possible that the shaft graves housed several burials but modern construction activity truncated the later ones away. Subsequently, only one shaft grave, 30474, contained multiple burials, and within this, only two interments were recovered prime female 30476 and ageing male 30534.

There are non-metric traits shared between individuals interred in these shaft graves, which are absent from the rest of the cemetery population, suggesting that they are more closely related to each other, than to the rest of the Quakers buried at this locality.

Grave cut 30482 appears to contain the remains of two individuals (30484, a prime adult female, and 30519, a mature adult female).

Three individuals were interred within grave 30549. They are 30551, a prime adult male, 30557 a mature adult male, and 30563, a young child aged 4-6 years. However, it is possible that a later grave was dug for individual 30557. There appears to be a very feint variation in the soil between this and the soil surrounding 30551, with a cutfor the former just respecting the cut for interment of individual 30551. Unfortunately, non-metric trait analysis was inconclusive in determining if there is a relationship between these individuals buried in such close proximity.

The only other instance where there appears to be inter-cutting of graves is where grave 30513 appears to cut the backfill of 30486. However, grave 30486 was heavily truncated by modern activity, which also damaged and displaced the skeletal remains of 30488. Therefore, it was difficult to determine how they related to each other. The skeletal remains are in such poor condition that analysis of non-metric traits is impossible, so any relationship between the individuals interred within the graves is undeterminable.

Coffins

Of the 34 burials, 29 were interred in wooden coffins and one within a coffin made of zinc. Four graves presented no evidence for a coffin.

These coffins appear to be the single-break single flat-lidded type, shaped at the shoulders (Litten 1991,99) distinctive of this period.

The typology of the wooden coffins present are single case, double case and triple case, the later of which is present in two forms. One being a triple-layer wood coffin and the other being a 'triple' case described by Litten (1991:100) as comprising an inner wooden coffin, a lead shell and an outer wooden case. However, in this instance the 'shell' is manufactured out of zinc, not lead.

Within this assemblage, there are ten single cases (three of which are questionable, as they are so poorly preserved); four double cases; one wood triple case and one zinc triple case coffin. Fourteen burials contained evidence for wooden coffins but it was insufficient to establish

which type they were. The decaying process of these coffins was so advanced that all that remained was a dark outline staining the backfill, and occasional wood fragments.

Where it is possible to observe, the coffins are constructed with mortice and tenon joints fastening the side panels together, which are then fastened to the base with fixing nails. In two cases evidence for a resin or glue was observed presumably to strengthen and support the mortice and tenon joints. Coffin 30487 lacked any surviving coffin nails, suggesting that carpentry techniques and glue were the only manner in which this coffin was held together whereas coffin 30446 had fixing nails as well as resin or glue suggesting a combination of the two to stabilise this coffin. The joints of this coffin were mitred instead of being mortise and tenon joints. This may be indicative of less skilled, and therefore less costly, coffin manufacture.

Another example of a coffin constructed with less skilled carpentry is 30442 which includes two iron grip bolts and screws which presumably were used to hold the coffin together, instead of skilled carpentry techniques.

The wooden coffins are not only extremely well made, denoting a high standard of workmanship, they are quite substantial, made of wood panels that in some cases are up to 8 inches in width. Although the actual type of wood utilised was unidentifiable the size suggests an expensive species such as oak or elm. The expense of the wood and the high standard of workmanship indicates substantial financial investment into their construction.

The zinc triple coffin (30450) is totally unique within this Quaker burial ground.

Non-lead metallic coffins began to be used in the mid-19th century, being cheaper than wooden coffins, and lighter than a lead equivalent, but still providing a water and airtight container for the corpse. Nonetheless, they never achieved much popularity with the public, and even less so with incumbents of the Church, as they took a long time to decay. Additional charges by the Church for burial within such coffins also contributed to their unpopularity (Litten 1991,92). Therefore, the rarity of such coffins would have made it more expensive in this setting because it would have used more workmanship than a double case wooden coffin and would have had to be bespoke, because few coffin makers had the talent to fashion such an item so an order would have gone out to the local plumber (Litten 1998,11).

There are a number of alternative hypotheses, separate to social display, which could explain why individual 30451 was interred in a zinc coffin inconsistent with the wooden ones characterising this cemetery i.e. disease, body snatching and preservation.

No detailed palaeopathological analysis could be carried out on the individual interred within this zinc coffin because the skeletal remains were obscured by decomposed sawdust and coffin liquor, which had adhered to the bones. However, it is possible that this individual had contracted some ailment that may have been contagious and necessitated, in the eyes of those who buried her, a sealed coffin to prevent spread of the condition.

Smallpox was quite prevalent in England as late as 1863, and this cemetery ceased to be used before compulsory vaccination of infants was introduced in 1853. Also, tuberculosis, cholera, typhus and typhoid were directly affecting the communities in Kings Lynn (Perrott 1995:18), therefore it is feasible that this individual could have contracted some undesirable disease.

Table 12 : Summary of coffin types and preservation.

Grave Cut	Skeleton No	Coffin no	Coffin Type	Nails	Preservation	notes
30437	30439	30438	single	1	good	
30441	30443	30442	single	9	good	
30445	30447	30446	double	yes	good	resin/glued. fixing nails
30449	30451	30450	Triple (zinc)	0	poor	sawdust, outer wooden coffin is just a stain
30453	30455	30454	single?	0	poor	wood fragments recovered.
30458	30460	30459	double	4	good	8'' width of wood.
30462	30463	30465	single	2	poor	base surviving
30466	30468	30469	??	5	poor	very poor condition
30470	30503	30473	single?	1	good	mortice and tenon joint
30474	30476	30477	double	0	good	no mention of nails may be there
30474	30534	30533	triple	Yes (?)	good	screws, mortice & tenon joints.
30482	30484	30483	single?	0	poor	v. damaged.
30482	30519	30528	double	0	good	mortice + tenon joint, sawdust
30486	30488	30487	stain	0	poor	yellow glue/resin where coffin would have been.
30490	30492	30491	?	0	poor	
30494	30496	30495	stain	9	destroyed	
30498	30500	30499	stain	10	poor	
30505	30504	30507	?	6	poor	
30509	30510	n/a		no		
30512	30513	n/a		no		
30516	30518	n/a		no		
30520	30522	30521	stain	Yes	poor	upholstery nai.ls
30524	30526	30525	?	0	good	
30529	30531	30530	?	0	poor	
30537	30539	30538	?	Yes	poor	
30541	30543	30544	single	Yes?	poor	heavily truncated.
30545	30547	30546	?	0	destroyed	
30549	30551	30552	single	Yes	poor	nails at corners
30549	30557	30558	single	4	destroyed	nails in backfill
30549	30563	n/a		no		
30553	30555	30556	stain	4	destroyed	
30559	30561	30562	stain	0	destroyed	
30567	30565	30566	stain	7	poor	some wood fragments
30568	30570	30569	single	1	v poor	

Secondly, this burial ground is in use between 1780 and 1835, a period during which the topic of body snatching was attracting a lot of public attention. In 1795 a professional gang of 15 body snatchers was exposed as the result of the discovery of exhumation in a burial ground in Lambeth, London (Richardson 1988,57) and over time it became more noticeable throughout the country. Body snatching may have become more established in the thoughts of the people of King's Lynn, Norfolk, when the following case became known. In 1827, a party of body snatchers hired a house near the churchyard in Great Yarmouth and operated from there in league with the local gravedigger for two months. Bodies were tightly packed in cases shorter and narrower than coffins to avoid suspicion, and sent by stage-coach via Norwich, to London (Richardson 1988,84). The direct association of such trade with Norfolk may have emphasised to some individuals that this was not a problem confined to London. Consequently, the use of a more substantial metal coffin may have been a manifestation of such fears and was employed to protect the remains of the deceased because this stouter, triple case coffin, would offer greater resistance against the resurrectionists' techniques, even more so than the sturdy wooden coffins, which, with a bit of effort, could be sawn across.

It is possible that the shaft graves were also introduced as a consequence of the threat of body snatching. However, they were probably constructed prior to the major hype that appears to accumulate momentum from the Burke and Hare court case and executions for murdering people to sell their bodies to anatomy schools in 1828-9 and the furore associated with the proposal and passing of the 1832 Anatomy Act. Events that occur over thirty years after the initial interment within this burial ground, and therefore were not contributory to the decision to construct pre-prepared shaft graves for future interments.

Finally, this interment within a zinc coffin may have been undertaken with the intention of prolonging preservation of the physical remains within it. This may be connected to the Christian belief of the body resurrecting on the Day of Judgement as discussed earlier within this text.

Coffin fittings

A summary of the coffin fittings appears in Table 13 below.

Of the 32 coffins observed only 14 displayed coffin furnishings, two of which only had upholstery nails. In fitting with Quaker doctrine the coffin fittings were limited to very plain grips and grip plates and one very fragmented breastplate.

Grips and grip plates

Only three types of grip plate were observed in this assemblage. The grip plates were not recorded in the Christ Church, Spitalfield's, London catalogue, so were allocated new numbers of KL1, KL2 and KL3.

KL1 consists of two simple discs with a common stop and grip socket (Stock 1998,151 fig. 11.11) located on either end of the grip.

Table 13: Summary of coffin fittings

Grave Cut	Coffin no	Grip plate no	Grip plate style	Grip plate material	grip no	grip style	grip material	notes
30437	30438	5	kl2	copper	5	ccs1	copper	-
30441	30442	2	kl2	ormolou	1	ccs1	ormolou	-
30449	30450	4	kl2	ormolou	4	ccs1	ormolou	-
30453	30454	5	kl2	ormolou	5	ccs1	ormolou	-
30462	30465	7	kl1	copper	4	ccs1	copper	-
30470	30473	3	kl2	brass	1	ccs1	copper	-
30470	30502	3	kl2	ormolou	3	ccs1	ormolou	-
30474	30477	2	kl3	brass	2	kl1	brass	
30474	30533	6	kl2	copper	4	ccs	copper	-
30482	30528	3	kl2	copper	3	ccs1	copper	-
30498	30499				3	kl1	brass	frag brass breastplate
30505	30507	4	kl2	brass	4	ccs1	brass	-
30520	30521							upholstery nails fe
30541	30544							upholstery nails fe

KL2 is a slightly more elaborate shape but displays no decoration and KL3 is a simple trapezium shaped brass plate. KL2 was also found at Bathford Quaker burial ground (Stock 1998,150 fig. 11.8) where it was identified that it was originally designed for use in the furniture trade.

Such plain patterning is contradictory to contemporary sites elsewhere. For example, at Spitalfields (Reeve and Adams 1993,86 there were some incidences of undecorated grip plates, but these were not common, and winged cherubs predominated as the major decorative motif. Overall, there were 35 different grip plate designs identified at Spitalfields including winged cherubs, angels with trumpets, and sarcophagi (Cox 1996,102).

The grips from this site were restricted to two simple styles, the first a simple rounded handle with a slightly bulbous thickening in the middle is the same as that classified as CCS1 (Christ Church Spitalfields Grip 1). The second type of grip is unique to this site and is angular in shape and categorised as grip KL1. Elsewhere, at sites such as Spitalfields (Cox 1996,102; Reeve and Adams 1993,87) and St Augustine the Less, Bristol (Boore 1998,80) the grips, as well as the grip plates are highly ornate with decorations with the most ubiquitous design, like the grip plates, is the winged cherub.

Although the grips and grip plates observed in Kings Lynn are simpler in design they were constructed using expensive materials such as ormolu (4/12); copper (5/12) and brass (3/12). Ormolu is derived from the French term *d'or moulu* (ground gold) and is essentially bronze mercurially gilded leaving a layer of gold (Britten 1978,216) an expensive process, which made this product unobtainable to the poor and it essentially had a decorative function mainly used in France, especially on furniture in the 18th century (Fitzgerald 1998,1). Its most predominant use in Britain was in mantel clocks of from 1740 to the 1900's,declining slightly after 1835 (Smith 1975, passim). Within a burial context it is associated with the graves of the most wealthy individuals. The use of ormolu, copper and brass for grips contrasts to

Spitalfields, London (Reeve and Adams 1993,86) and St Martin's, Birmingham (Buteux 2003,128) where the grips were mostly made from iron.

The coffin furnishings at Spitalfields were manufactured from four base materials, brass, lead, iron and tin plate (tin-coated iron sheet) (Reeve and Adams 1993,148). In addition, Litten (1998,8) identifies that a country undertaker would have needed a multitude of copper, brass, lead tin-plate stamped coffin furniture. This suggests that the copper and brass coffin furniture recovered from this Quaker burial ground is quite common, with further examples of copper alloy grip plates recorded for the Quaker cemetery at Bathford (Stock 1998,151).

The use of expensive, high-status metals such as ormolu and brass, which was the preferred choice of the nobility (Litten 1998,15), indicates that those burying their dead in this Quaker cemetery were financially wealthy and spent large sums of money on their burials, although they are plain and basic in appearance.

Interestingly, the four coffins with ormolu coffin furniture are three contained within shaft graves and the zinc-coffin burial.

Two of the three coffins containing brass furnishings are located in shaft graves and the third is an earth-cut grave (30505) located just east to the shaft graves. Of the four coffins possessing copper alloy grip-plates and grips two are within the shaft graves, and two are just to the east in the same alignment as coffin 30507 with the brass grips and grip plates.

Almost no coffin fixtures and furnishings were recovered from the northern area of the site, which contained no shaft burials and predominantly consisted of single case wooden coffins. This may be due to truncation of these features, but is unlikely due to the survival of coffin wood and skeletal remains in these graves. It is possible that these graves belong to poorer individuals within the Quaker society, or different , more strict, approaches to burial over time. Unfortunately, the absence of breastplates and other inscriptions means the burials cannot be connected to the burial records so we cannot determine the chronological development of this site or the identities of the individuals.

Breastplates

The heavily eroded remains of a breastplate were recovered from coffin 30499. This brass plate showed no patterning or engraving and was an unusual shape which was a square with the four corners extracted to leave four concave semi-circles.

Upholstery pins

Upholstery pins were recovered from grave 30520. Unfortunately, the coffin itself survived only as a stain so it is not clear whether these nails were used for fastening an inner coffin lining or upholstery on the outer surface of the coffin. None of the other coffins exhibit evidence for upholstery. The coffins at the Quaker burial site at Bathford had scraps of textile cladding and linings with no evidence for decoration. The number of pins is less than would be expected if they had a decorative function, and no additional decorative furnishings such as eschuteons and lid motifs common to contemporary burials were recovered.

Shroud pin

From these burials the only diagnostic artefact recovered was a shroud pin in coffin 30454. In addition to this shroud pin, there were traces of fabric adhered to the skeletal remains of individual 30534.

Janaway (1998,18) comments on the great variation in dressing corpses in the 18th and 19th centuries. A loose sheet or winding cloth was often placed under the corpse and used to line the open coffin, and later to cover the corpse, often being pinned in place. In addition, crudely made shrouds, often with a ruffle round the neck and down the front, became fashionable in this period. Alternatively, the deceased was sometimes dressed in personal clothing. Although we cannot determine exactly what this individual was dressed in the copper alloy pin, and

absence of any buttons associated with clothing fixtures indicate the presence of a shroud, which were predominantly fastened with woollen or cotton ties (Litten 1991, 81; Janaway 1998,24)

Sawdust

There are a number of ways of interpreting the presence of sawdust within zinc coffin 30450 and wooden coffins 30442 and 30528.

In the 18th century it was common practice to deposit bran and sawdust at the bottom of the coffin to a depth of four inches, and extra wood shavings at the head end. Sometimes rosemary or balm was added to the bran to counteract the smell of decomposition and the sawdust and bran mixture also acted as a sponge for exuded matter (Litten 1991,92). Janaway (1998,23) documents that during nineteenth century burials, after viewing and before the lid being 'closed down'; the remaining space in the coffin was filled with sawdust and/or bran to absorb liquid and odour from the body's decomposition. This could explain the large quantity of sawdust observed within zinc coffin 30450 and its spread all over the anterior surface of the body.

Sawdust is also observed in coffins excavated at the Quaker burial ground in Bathford (Stock 1998,149), indicating its presence to be common to Quaker burial practices.

Gender distribution.

Initially, when one observes the distribution of male and female burials throughout this cemetery, there appears to be a preponderance of female burials in the south contrasting with a male dominated northern half. However, it is probable, that this distribution is biased by the shaft graves. It is probable that the shaft graves were commissioned by wealthy male members of this Quaker community for the inevitable burial of themselves and their family members as and when they passed away.

The wives and daughters may have passed away first and were the first interred into the shaft graves and are the only ones surviving later truncation and disruption, therefore skewing the ratio of males to females within the southern area of the cemetery. This is supported by shaft grave 30474 which retained more than one interment. The earliest burial, and so the one at the bottom, was 30534 a female aged over 45 years, above whom was buried male 30476.

Consequently, when one accounts for this and excludes the five shaft burials containing one single female interment, the balance between males and females re-aligns into a pattern one would expect in a cemetery not segregated by gender.

This fits with the observation in the 1861 book of discipline, that women were accorded the same respect as men and were not to be discouraged from funerals, as was becoming custom in other Christian funerals at this time. Although this detail is acquired from a text after the date at which the Quaker cemetery ceased to be utilised, it voices opinions which were integral to their beliefs and would, therefore, have been long-standing and only necessitated re-emphasis when forced by the introduction of sexually-discriminative funerary behaviours by other Christian groups who deemed women too delicate to stand by the graveside throughout a burial service. To illustrate this situation the burial of the wife of John Bright, a prominent Quaker in Rochdale, Lancashire in 1878 was pictured in the 'Illustrated London News' and it is remarked upon in *The Victorian Undertaker'* that '*the large number of women present at the graveside distinguishes this funeral from an Anglican ceremony'* (May 2003,26).

Contemporary funerals

One of the main points of interest is how funerary practices observed at the Friend's Burial Ground, Kings Lynn, differ from other, non-Quaker, burial practices in England during the late 18th and early 19th century. In order to provide an example to which the Quaker burials

of Kings Lynn can be compared the example of a 'typical early Victorian funeral' provided by Richmond (1999,155) is cited. She refers to a coffin within which is interred a mature female, excavated from the crypt of Glasgow Cathedral in 1992 '*which would have presented quite a colourful spectacle, covered with the best quality black or scarlet velvet, perhaps with grip-plates finished in gilt lacquer and edged in coffin lace to match; it may also have had a decorative and colourful depositum plate in addition to any number or combinations of lid escutcheons. Once installed in the rear of an etched glass-sided hearse, it may also have been covered by a fine quality silk velvet pall with silk 'family ropes' attached to the grips (the hearse itself may have been draped in black velvet). The hearse would then have been drawn along at a stately pace by perhaps four horses plumed with black ostrich feathers, led by two mutes bearing draped staves and escorted by pages and attendants carrying wands and truncheons, all wearing new black silk hatbands. Bringing up the rear would have been two mourning coaches with fours, also draped and plumed'.*

In contrast, the Quakers request that undertakers pay particular attention to a rule in 'Notice to Undertakers' 1844 that *'All Interments in the Burial-Grounds belonging to Friends are to be conducted strictly in accordance with the practice of the Society, and no Mourning-coaches, Pall, Feathers, Black or Covered Coffin, or Coffin with Black Furniture, Scarves, Hat-bands, Staves, Black Mourning-Cloaks or Mutes will be allowed (*Stock 1998,135).

Discussion

Within this population neither dietary deficiency nor excess are prevalent, and there are few osteological markers for poor living conditions. Overall, the Quakers present an osteological picture of a generally healthy sample, mirroring the historical picture of a thriving middle-class community.

Historical information can be used to support this osteological interpretation. For example, the occupations listed for individuals were predominantly mercantile in nature, fitting with middle-class business.

Also, the old age of the population denotes good health. Osteological analyses become inaccurate after 45-50 years of age however the burial registers indicate that many people within this population lived well into their seventies and eighties.

The dental data shows us a community of reasonable wealth with access to dental treatment.

The skeletal markers of health and life history are with the Quaker burial ground in Kingston-upon-Thames (1664-1814), suggesting that the good health and low-stress lifestyle of this population is characteristic of Quaker communities and not necessary that of the surrounding population. While in some respects the burial practice of Quakers reveals a degree of dissension, proscribed by Quaker doctrine, from that of the Established church, in others it imitates the Anglican tradition, particularly regarding demonstrations of socio-economic status and values. The Quakers utilising the Friends Burial Ground in Kings Lynn do maintain simplicity in the design and decoration of their coffins and coffin furnishings and maintained equality in terms of intermixing male and female burials, which were accorded the same burial accoutrements. However, there is substantial evidence to suggest there to be a degree of social and economic display and inequality amongst those interring loved ones within this cemetery. This is witnessed in two contexts. Firstly, the segregation of family groups from other members of the community by interring them in brick-lined shaft graves, and secondly, the use of expensive, high quality materials for the coffin and its associated grips, grip plates and breastplates. Such practices display a clear message to others of wealth and a high social status, contradictory to the Quaker doctrine of equality.

Catalogue:

Skeleton number: 30439

Completeness: 76-95%

Preservation: Good

Age: 40+ years

Sex: Female?

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
x	x	x	/	x	x	x	x	x	x	x	x	x	x	x	x

Dental Pathology: alveolar resorption, AMTL 15/16, many sockets partially infilled suggesting loss just prior to death.

Skeletal Pathology: slight SDJD in T7-T12, neural arches of T5-T6 have fused together, T4-T6 had elongated spinous processes of which the lateral third shared an area of thickening, possibly a healed fracture, poor development of medio-distal tarsals and hallux of left foot (congenital?).

Skeleton number: 30443

Completeness: <25%

Preservation: Poor

Age: 40+ years

Sex: Female?

Dental Inventory: No skull recovered.

Dental Pathology: No skull recovered.

Skeletal Pathology: DJD on acetabulum, femoral heads, pedicle and lamellae of one vertebra. 'Bunion' osteophytic growth on proximal phalanx of hallux of left foot.

Skeleton number: 30447

Completeness: 76-95%

Preservation: Good

Age: 40+ years

Sex: Female?

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	/

Dental Pathology: AMTL 14/16, PMTL 2/16, alveolar resorption, marked bone densification and broadening of alveoloar surface in area of right posterior dentition of mandible, possibly indicating ill-fitting molar blocks/ dentures.

Skeletal Pathology: OA of hands and right arm, SDJD of cervical and lumbar vertebrae, trauma to neck of left femur, possible osteoporosis.

Skeleton number: 30451

Completeness: 25-49%

Preservation: Poor

Age: 25-45 years

Sex: Female?

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	3	2	1	1	2	-	-	-	-	-	-	-
							k	k	k							

Dental Pathology: Slight calculus.

Skeletal Pathology: None observed.

Skeleton number: 30455

Completeness: <25%

Preservation: Poor

Age: 26-40 years

Sex: Female

Dental Inventory:

										R	C	k C				
-	-	-	-	-	-	-	-	-	/	3	4	x	x	-	-	
x	x	x	5	4	/	/	x	x	/	3	-	-	-	-	-	
										R						

Dental Pathology: Slight calculus, considerable periodontal disease and caries

Skeletal Pathology: None observed.

Skeleton number: 30460

Completeness: 76-95%

Preservation: Good

Age: 40+ years

Sex: Female

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x	/
x	x	x	5	4	3	2	1	/	/	3	4	5	/	x	x	
					k	k	k			k						

Dental Pathology: Dental enamel hypoplasia 2/7, slight calculus 4/7, medium periodontal disease in mandible. AMTL 9/21; PMTL 4/21

Skeletal Pathology: None observed (Some marked muscle attachments on nuchal crest, skull base and humerus (esp. deltoid).

Skeleton number: 30463

Completeness: <25%

Preservation: **Poor**

Age: 40+ years

Sex: Female

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	x	x	x	x	x	x	-	-	-	-	-

Dental Pathology: No surviving teeth, AMTL 6/6, alveolar resorption.

Skeletal Pathology: Slight osteophytosis on vertebral bodies of L3-L4.

Skeleton number: 30468

Completeness: 25-49%

Preservation: Poor

Age: 45-59 years

Sex: Male

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	x	x	x	-	-	-	-	-	-	-	-

Dental Pathology: No surviving teeth.

Skeletal Pathology: DJD on both auricular surfaces of ilium and proximal sternum; extensive osteophytic lipping on intercostal ridges of surviving ribs and fovea nuchae of right humeral head, SDJD on vertebral bodies T1-L2, slight periostitis on lateral surface of right ilium denoting localised infection.

Skeleton number: 30476

Completeness: 50-75%

Preservation: Good

Age: 35-40 years

Sex:Female

Dental Inventory:

																C
-	-	-	-	-	-	-	-	1	2	x	x	x	x	x	8	
8	x	x	5	4	/	x	x	x	x	x	4	5	x	x	x	
C	k		R	R							R	R				

Dental Pathology: Flecks of calculus 1/2, slight periodontal disease, caries 1/2

Skeletal Pathology: Broken and healed left humerus, bi-lateral secondary bone growth on anterior surface of ribs, DJD of both knee joints; Deformation of articular surfaces of sacro-iliac joint; Periostitis extending along shafts of both lower limbs.

Skeleton number: 30479

Completeness: 50-75%

Preservation: Good

Age: 15-18 years (adolescent)

Sex: Female

Dental Inventory:

	E															
	8	7	6	5	4	3	/	/	1	2	3	4	5	6	7	/
	8	7	6	5	/	/	2	1	/	2	/	/	/	6	7	8
	E		C											RB		

Dental Pathology: Large caries 1/23. Shovel shaped incisor.

Skeletal Pathology: Mild osteophytosis on vertebrae T5

Skeleton number: 30484

Completeness: 25-45%

Preservation: Good

Age: 35-50 years

Sex: Female

Dental Inventory:

																k
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
	-	-	-	-	-	3	-	-	-	-	/	x	x	x	x	x
						PU										

Dental Pathology: Medium calculus 1/2.

Skeletal Pathology: moderate-severe medio-lateral bilateral bowing of tibia.

Skeleton number: 30488

Completeness: 50-75%

Preservation: Good

Age: 55+ years

Sex: Female

Dental Inventory:

	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	/	x	x	x	x	-	-	-	-	-	-

Dental Pathology: No surviving teeth.

Skeletal Pathology: OA, localised infection possibly abscess on olecranon fossa and distal epiphyses of right humerus. Porosity and slight DJD on most surviving articular surfaces, schmorl's nodes and osteophytic lipping on T4-5 and L2,L4,L5.

Skeleton number: 30492

Completeness: 25-49%

Preservation: Good

Age: 35-39 years

Sex: Male

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dental Pathology: No surviving teeth.

Skeletal Pathology: Mild SDJD and DJD in phalanges of left hand.

Skeleton number: 30496

Completeness: 25-49%

Preservation: Good

Age: 50+ years

Sex: Male

Dental Inventory:

	-	-	-	- k	-	- k	- k	- k	- k	- k	- k	- k	- k	- k		
k					C							C				
	8	/	/	5	/	3	2	1	1	2	3	4	5	/	/	/
	8	-	6	5	4	3	2	1	-	-	-	-	-	-	-	-
			k					k								

Dental Pathology: Slight dental enamel hypoplasia 7/13; calculus 12/13; medium periodontal disease.

Skeletal Pathology: Moderate-severe SDJD in lumbar vertebrae, severe DJD in pelvis, slight thickening of skull, slight periostitis on anterior surface of five left ribs denoting localised respiratory infection.

Skeleton number: 30500

Completeness: 50-75%

Preservation: Good

Age: 35-44 years

Sex: Female

Dental Inventory:

		C		C		C	C	C		C	C	C		C		
/	/	6	5	4	/	2	1	1	/	3	4	5	6	7	/	
/	/	/	/	4	/	/	1	1	2	3	4	5	6	7	/	
-	-	-	-	C -	-	-	C -	C -	-	-	C -	C -	C -	C -	-	

Dental Pathology: Severe caries 16/20.

Skeletal Pathology: Slight SDJD in T3-T7 and L5; possible fusion of right 1st and 2nd ribs.

Skeleton number: 30503

Completeness: 76-95%

Preservation: Good

Age: 40+ years

Sex: Male

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	x	x	/	/	3	/	x	x	x	x	x	x	x	x	x	x
					R											

Dental Pathology: AMTL 11/15; PMTL 3/15.

Skeletal Pathology: SDJD in cervical and thoracic vertebrae; widespread DJD/ OA in hands, feet and knees; Periostitis of left fibula and handbones; possible metastic carcinoma; new bone growth on anterior surfaces of left mid-thoracic ribs; severe osteophytic activity in right hand suggests possible fracture of trapezius.

Skeleton number: 30504

Completeness: 50-75%

Preservation: Good

Age: 40+ years

Sex: Male

Dental Inventory:

C	k			C k	C k	k					k	k	k	C		K
	8	x	x	5	4	3	/	-	-	-	3	4	5	6	x	8
	-	x	x	5	4	/	/	/	/	2	3	4	5	x	7	x
				C k	k					k	k	k	k		k	

Dental Pathology: slight dental enamel hypoplasia 8/16; slight calculus; slight to medium periodontal disease; caries 5/16; rotated molar; AMTL 7/28

Skeletal Pathology: Slight DJD in left sacro-iliac; femoral, knee and hand joints; Right cervical rib.

Skeleton number: 30510

Completeness: <25%

Preservation: Good

Age: Adult

Sex: Undeterminable

Dental Inventory:

Dental Pathology: No skull recovered; No surviving teeth.

Skeletal Pathology: No pathology observed.

Skeleton number: 30513

Completeness: <25%

Preservation: Poor

Age: Mature Adult.

Sex: Male

Dental Inventory:

/	/	/	-	-	-	-	-	-	-	-	-	-	-	/	/	/
/	/	/	-	-	-	2	-	-	2	3	4	-	6	7	8	
						-			-	-	-					

Dental Pathology: No pathology observed.

Skeletal Pathology: Possible Paget's Disease.

Skeleton number: 30518

Completeness: 76-95%

Preservation: Good

Age: 15-17 years

Sex: Undeterminable

Dental Inventory:

				- k		- C k			k	k	k	k				
-	-	-	-	4	-	2	-	-	2	3	4	5	6	-	-	
-	7	/	5	4 k	3 k	2 k	/	/	-	-	4 k	5	6 C k	7 k	8	

Dental Pathology: Dental enamel hypoplasia 5/17; flecks-slight calculus13/17; small caries 2/17.

Skeletal Pathology: No pathology observed.

Skeleton number: 30519

Completeness: 76-95%

Preservation: Good

Age: 40-45 years

Sex: Female

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dental Pathology: No surviving teeth

Skeletal Pathology: Healed Parry fracture in right ulna; OA in vertebrae C5-C7; Slight DJD in distal epiphyses of left and right femora; extensive osteophytosis of distal articular surface of left metacarpal 1.

Skeleton number: 30522

Completeness: 50-75%

Preservation: Good

Age: 40+ years

Sex: Male

Dental Inventory:

	k C	k	k		k	k	k	k	k	k		k	k	k		
-	7	6	5	x	3	2	1	1	2	3	x	5	6	7	-	
-	-	-	-	4	3	2	1	1	2	3	4	-	-	-	8	
				k	k	k	k		k						k	-

Dental Pathology: Dental enamel hypoplasia 8/12; AMTL 2/20; PMTL 3/20; calculus 18/20 (slight (10), medium-heavy (8) ; considerable periodontal disease; alveolar resorption; 1 large caries; external draining dental abscess 1/20.

Skeletal Pathology: Paget's Disease; slight DJD in right glenoid fossa, femoral head, metacarpals and both knee joints; slight-moderate SDJD in L3-L5; Periostitis to left tibia and fibula.

Skeleton number: 30526

Completeness: 25-49%

Preservation: Good

Age: 45-59 years

Sex: Male

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	x	x	x	x	/	/	/	x	x	x	

Dental Pathology: No surviving teeth

Skeletal Pathology: Moderate-severe osteophytosis on many costo-sternal articulations (more severe and prevalent on right side) DJD slight osteophytosis in both hip joints, distal ends of both acromion and lateral epiphysis of right clavicle, olecranon process of right ulna; eburnation of right radius distal epiphysis, osteophytic lipping on both radial heads, proximal and distal articulating surfaces of phalanges exhibit moderate to severe arthritic bone re-modelling and deposition; SDJD prevalent in majority of thracic and lumbar vertebrae ranging from moderate to severe ; slight curvature to the right and distortion of right articulating processes due to weight pressure.

Skeleton number: 30531

Completeness: 76-95%

Preservation: Good

Age: 28-52 years

Sex: Male

Dental Inventory:

x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
x	x	x	x	4	/	/	/	1	/	/	/	/	x	x	x	
								k C								

Dental Pathology: calculus 1/1; dental caries 1/1; AMTL 23/32; PMTL 9/32

Skeletal Pathology: SDJD between L1 and L2; periostisis of left humerus shaft.

Skeleton number: 30534

Completeness: 76-95%

Preservation: Excellent

Age: 45+ years

Sex: Male

Dental Inventory:

x	x	x	x	/	/	x	x	x	x	/	x	x	x	x	x
x	x	x	5	4	3	2	1	/	2	3	-	-	-	-	-
			k C	PEk C	k	k	k		R k	k C					

Dental Pathology: Dental enamel hypoplasia 4/7; medium calculus 7/7 ; considerable periodontal disease in anterior mandible; medium-large caries 3/7; grooves along base of remaining anterior teeth, may denote dental intervention.

Skeletal Pathology: DJD distal epiphyses of both ulnas and radii, right humeral head; bi-lateral glenoid cavities, left sterno-clavicular joint; OA in both knee joints, talo-calcaneal joint, right hallux; Trauma to right hallux; right first rib fused to manubrium. moderate to severe SDJD in T11-L5, slight in C3-T5.

Skeleton number: 30539

Completeness: 50-75%

Preservation: Good

Age: 35-39 years

Sex: Female

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dental Pathology: No skull recovered; No surviving teeth.

Skeletal Pathology: Slight congenital scoliosis with wedging of bodies T10 to the right and T5 to the left with resultant OA and SDJD most severe in sacrum and lumbar vertebrae.

Skeleton number: 30543

Completeness: <25%

Preservation: Good

Age: 40-45 years

Sex: Female

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dental Pathology: Only parts of neurocranium recovered; no surviving teeth.

Skeletal Pathology: No pathology observed.

Skeleton number: 30547

Completeness: <25%

Preservation: Poor

Age: 45-59 years

Sex: Female

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dental Pathology: No surviving teeth.

Skeletal Pathology: Deformed ribs, probably due to corset use. Slight DJD in right iliac auricular surface and intercostal grooves of all surviving rib fragments ; Slight SDJD in T6-T8 and T10.

Skeleton number: 30551

Completeness: 50-75%

Preservation: Poor

Age: 30-40 years

Sex: Male

Dental Inventory:

			Ck	C	Ck	C					Ck					
-	-	x	5	4	3	2	/	/	/	x	4	x	x	x	x	
x	x	x	x	/	x	/	/	x	/	/	x	x	x	x	x	

Dental Pathology: Dental enamel hypoplasia 5/5; Slight calculus 4/5; Considerable periodontal disease; Caries 5/5; AMTL 17/30; PMTL 8/30

Skeletal Pathology: Minor DJD in articular facets of ribs, distal epicondyles of both femora, left patella and left patella; possible pulmonary disease.

Skeleton number: 30555

Completeness: 76-95%

Preservation: Good

Age: 34-54 years

Sex: Male

Dental Inventory:

				R	k		k	k								
-	-	-	-	4	3	/	1	1	-	-	-	-	-	-	-	
8	x	x	5	4	3	2	1	1	2	3	4	5	6	7	x	
K			KC	k	k	k	k	k	k	k	k	kC	kC	kC		

C

Dental Pathology: dental enamel hypoplasia 2/14; calculus 15/15; moderate to considerable periodontal disease; caries 5/14 teeth; AMTL 3/22; PMTL; 2/22

Skeletal Pathology: Slight DJD in right glenoid fossa and left acetabulum; compression fracture of left calcaneus and talus; ankylosis of interphalangeal joint of toe due to compression fracture of middle phalanx.

Skeleton number: 30557

Completeness: 50-75%

Preservation: Good

Age: 40-50 years

Sex: Male

Dental Inventory:

									k	k	R	k	k			
-	-	-	-	-	-	-	-	/	/	3	4	5	6	-	-	
-	-	-	/	x	3	2	1	1	2	3	4	5	x	x	-	
					k	k	k	k	k	k	k	k				

Dental Pathology: PMTL 2/18; AMTL 3/18; Calculus 12/18; Slight periodontal disease; Possible dental intervention on left pm_2.

Skeletal Pathology: SDJD in sacro-lumbar articular facets and sacro-iliac joint, osteophytosis and Schmorl's nodes on L1-L5; OA bilateral 1st metatarsal fused left sterno-clavicular joint; slight DJD in M-P joint on both thumbs, right radio-carpal joint, bi-lateral vertebral articular facets of ribs; healed set fracture of right femur; bunion on left hallux.

Skeleton number: 30561

Completeness: 25-49%

Preservation: Poor

Age: 31-45 years

Sex: Male

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Dental Pathology: No surviving teeth

Skeletal Pathology: Slight OA on posterior surface of left intercondyloid eminence; SDJD on articular processes on right side of l3-L5.

Skeleton number: 30563

Completeness: <25%

Preservation: Good

Age: 4-6 years

Sex: undeterminable

Dental Inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Dental Pathology: No surviving teeth.

Skeletal Pathology: Bi-lateral cribra orbitalia (Active) Stage 4.

Skeleton number: 30565

Completeness: 76-95%

Preservation: Excellent

Age: 50-60 Years

Sex: Male

Dental Inventory:

	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	x	x	x	/	4	3	/	/	x	x	x	x	x	x	x	x

Dental Pathology: 27/ 32 AMTL; 3/32 PMTL.

Skeletal Pathology: SDJD moderate in C2-C6, severe in T2, moderate in T3-T4; slight in T5; moderate L1-L4, severe in L5 DJD

Skeleton number: 30570

Completeness: <25%

Preservation: Poor

Age: 45+ years

Sex: Female

Dental Inventory:

	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	x	x	x	x	x	x	x	x	x	x	x	/	/	/	/	/

Dental Pathology: No surviving teeth; 11/16 AMTL.

Skeletal Pathology: Healed fracture of left femur, with associated periostitis which has spread to tibia and fibula; 3 fused thoracic vertebrae and mild periostitis of right humerus; osteophytosis of pelvis and right metacarpals.

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APPENDIX 10: HUMAN BONE - BAPTIST INHUMATIONS

by Ceridwen Boston

Introduction

Eighteen burials were excavated within an area identified by 19th-century maps as the location of a Baptist chapel on Broad Street, Kings Lynn. The duration of use of the cemetery is not well documented, but appears to date broadly from the early to mid-19th century AD. One triple wood-iron-wood coffin was lifted intact and was reburied without examining the contents. The coffin size suggests the burial of a young child. The remaining 17 skeletons (16 adults and one child) underwent full osteological analysis.

Provenance

A courtyard area immediately west of the Baptist chapel on Broad Street was used as a burial ground in the early to mid-19th century. The full extent of the graveyard to the north and to the south was not ascertained from excavation, but 19th-century maps suggest that the size of the area was restricted within the confines of a small courtyard or open area set between several surrounding buildings. A 1905 map still records the lane and open area behind the building on Broad Street as 'Baptists' Yard'. It seems probable the skeletal assemblage analysed here constitutes the bulk of the total number of individuals originally interred on the site.

The first Baptist church was formed in Kings Lynn in 1689, meeting in the Lynn town hall (Morgan 2005). In 1773, the 'Broad Street Baptist meeting house' was built, but between 1800-1808 was deemed too small and rather unsafe, and a chapel was built on adjoining land at a total cost of £1270. In 1832, a further Baptist building was erected on Broad Street, opposite the chapel, to serve as a Sunday school. By 1835, the number of scholars and teachers was greater than 300. Sunday schools were important vehicles for literacy amongst the working classes, before the State took over education in the 1860s. In the early years of the 19th-century, a number of splits and mergers with other congregations occurred. The decades of the 1840-1860s were a period of great growth in the Baptist congregation of Kings Lynn with the charismatic resident pastor John Wigner baptising over 500 people between the years 1840-56 (Jewson 1957, 87). As a result of this growth, larger premises were required, and in 1841 the Stepney chapel was erected on a piece of ground known as 'the Blackfriars' on the site of a medieval monastery. This became the principal Baptist chapel of the town (Perrott 1995a, 16; Morgan 2005). The building is now the auction rooms for Landles Estate Agents on Blackfriars Road. It is unclear from the historical records when the Broad Street chapel went out of use entirely, but it clearly became of secondary importance, if not defunct from the 1840s. It would appear that the burial assemblage dates broadly between 1773 and 1841, but is more likely to have started from 1800-1808 following the construction of the chapel on the site. The end date for burial is likewise unclear, but it is reasonable to assume that little burial took place after the move to the Stepney chapel in 1841. However, Baptist burial registers dating from 1840-55 appear to include burials from both sites, suggesting a continuity of use of the Broad Street chapel until 1855, when all further Baptist burials took place in the new cemetery in Hardwick Road (probably in response to the introduction of government legislation prohibiting burials within urban churchyards in that year).

Early to middle 19th-century Baptist burial registers reveal that the excavated skeletal assemblage constituted a minority of the total Baptist burial population of Kings Lynn. For example, the burial registers (which included both the Stepney and Broad Street chapel interments) have 224 entries between 1843-1855. The demographics of the recorded

population differ considerably from the Broad Street Baptist assemblage, and will be discussed in more depth below.

Methodology

Adults were aged using a combination of methods, including ageing from the degeneration of the pubic symphysis (Todd 1920 and 1921; Suchey and Brooks 1990), iliac auricular surface (Lovejoy *et al* 1985) and sternal rib ends (Iscan and Loth 1984; Iscan *et al* 1985), and from cranial suture closure (Meindl and Lovejoy 1985). The dental attrition method of Miles' (1962) was not employed, as this tends to grossly under-aged skeletons of post-medieval populations. Subadults were aged by dental development (Moorrees *et al* 1963a and b) and by epiphyseal fusion (Bass 1987; Schwarz 2000).

Sexing of adults was determined from the skull and pelvic morphology (Buikstra and Ubelaker 1994), and from metrical data (Workshop 1980). No attempt was made to sex subadults, in accordance with accepted practice.

The stature of the adults was estimated from combined long bone length measurements, using the regression formulae developed by Trotter (1970). Wherever possible, combined femoral and tibial measurements were used. In the absence of either bone, stature was used using one long bone, preferably from the lower limb, but where this was unfeasible, the upper limb long bones were utilised.

Preservation and completeness

The general bone condition of the assemblage was good to excellent. As a result, metrical analysis, identification of non-metric traits and identification of pathology was possible on all the skeletons. The completeness of many long bones allowed stature estimation in all but two adult skeletons.

Completeness of the bone was more variable, due to differences in the working conditions and methodology over the course of archaeological excavation. Where excavation had taken place in the traditional manner, the integrity of the skeleton was well maintained, and between 90-95% of skeletal elements were recovered. Burials in the eastern extent of the burial ground were less systematically excavated. Many skeletons were disturbed by machining and piling in this area, and a large amount of bone was recovered as charnel. It was possible to re-assemble six of these skeletons (25606-25610 and 25612). A small amount of charnel could not be assigned confidently to any of the other skeletons, and suggests the presence of other disturbed burials on the site.

The graves appeared to have been laid out systematically in three rows. Intercutting of graves only occurred in one instance, with the grave of skeleton 25609 cutting the grave of skeleton 25607, disturbing the right sided elements of the latter. Much of this skeleton was discovered as charnel in pit 25581. The upper levels of the grave of skeleton 25609 were truncated by later building work, the grave being overlaid by a hearth and then by a brick structure (25573). In the process the coffin lid and the skull had been removed, but the rest of the skeleton and the coffin sides and base were left *in situ*. The upper levels of the grave of 25606 were also disturbed by this structure, but the skeleton left largely intact. Pits 25578 and 25581 truncated skeleton 25577, but most of the skeleton could be re-assembled.

Assemblage composition

Age distribution

The skeletal assemblage was composed of 15 adults, 1 older adolescent (aged 17-19 years) and 1 child (aged between five and six years). The triple wood-iron-wood coffin (25562) was child-sized. This is a conspicuous dearth of infant and child burials given the high infant and child mortality rates historically attested for British society in the early Victorian period. Infant mortality rates were considerably higher than in modern western societies. In 1840,

Edwin Chadwick calculated childhood mortality from seven different regions of England from current mortality figures. Although considerable regional variation did exist, he estimated that on average one in five children of the gentry and professional classes would die before reaching adulthood, whereas amongst the children of labourers, servants and artisans the figure was one in two (Rugg 1999, 216-7). Malnutrition, infectious diseases and poor living conditions were the major causes of these early deaths.

Table 1 Summary of the composition, preservation and completeness of the skeletal assemblage (n = 17)

Skeleton No	Age range	Age category	Sex	Stature (cm)	Preservation	Completeness
25429	40-50 y	mature adult	female	156.34	good	90%
25433	35-40 y	mature adult	male	153.61	good	95%
25439	17-19 y	late adolescent	male	171.45	excellent	95%
25444	40-50 y	mature adult	female	161.79	good	95%
25449	25-35 y	prime adult	male	180.94	excellent	95%
25454	50+ y	older adult	male	171.13	good	95%
25460	30-35 y	prime adult	female	163.01	fair	75-80%
25465	30-35 y	prime adult	male	167.42	excellent	95%
25470	30-40 y	prime to mature adult	female	149.53	excellent	95%
25475	40-450y	mature adult	male	169.5	good	95%
25480	5-6 y	older child	unknown		excellent	95%
25606	40-50 y	mature adult	female	161.85	excellent	85-90%
25607	40+ y	mature to older adult	male	168.51	good	60-70%
25608	40-45 y	mature adult	male	170.41	good	80-90%
25609	45-49 y	mature adult	female	165.25	excellent	70-75%
25610	40-450y	mature adult	female	159.8	excellent	65-70%
25612		mature adult	? female	152.02	fair	40-50%
Charnel						
25565 (3)		adult of unknown age	unidentified	159.8	good	10-15%
25576		adult of unknown age	unidentified		good	< 5%

Table 2: Age and sex distribution of the Baptist skeletal assemblage (n = 17)

Age category	Male	? Male	Female	? Female	Unknown	Total
Neonate (0-1 month)	0	0	0	0	0	0
Infant (2m-1 y)	0	0	0	0	0	0
Young child (2-5 y)	0	0	0	0	0	0
Older child (6-12 y)	0	0	0	0	1	1
Adolescent (13-18 y)	1	0	0	0	0	1
Young adult (19-25 y)	0	0	0	0	0	0
Prime adult (26-35 y)	2	0	2	0	0	4
Mature adult (36-45 y)	2	0	5	1	0	8
Older adult (46+ y)	2	0	0	0	0	2
Adult (> 18 y)	0	0	0	1	0	1
Total	7	0	7	2	1	17

Burial registers of the wider Baptist community of Kings Lynn reflect the high child mortality rate described by Chadwick. Here 45.1% of the burial population failed to reach adulthood. Although the proportion of neonates is surprisingly low (3.54%), death in infancy and early childhood was high. Mortality peaked in infants aged 1 month to 2 years (19.9%), but dropped rapidly to 10.18% in the 2-5 year category. Mortality continued to drop in later childhood and adolescence, but rose once again in young and mature adulthood (a pattern usually attributed to greater trauma amongst males and complications of childbirth in females). In older age groups the mortality rate predictably rose again, peaking in the 66-75 year age bracket. Only four individuals (1.76%) survived beyond 75 years, the oldest dying at 85 years of age.

The above pattern is typical of poorer Victorian burial populations, and does tally with what is known of the social classes from which the Baptists were drawn. Burial registers and historical accounts suggest a considerable mix of social class. Whilst more worldly and successful Baptists dominate accounts of Baptist history (eg Jewson 1957), a large proportion of believers were amongst the poor. However, social mobility was a common feature. Like other non-Conformists such as the Methodists, many Baptists were taught reading and/or writing in Sunday schools in order to read the Bible. Literacy also offered considerable worldly advantages in a society where illiteracy amongst the working classes was commonplace. Coupled with a Puritan work ethic, many of humble origins did better themselves becoming skilled artisans, traders and businessmen. The burials registers of the Broad Street and Stepney chapels record the families of captains, ship owners and artisans. However, the occupations of the vast majority were not recorded.

The age composition drawn from the burial registers does differ considerably from that of the skeletal assemblage excavated at the Vancouver Centre (Figure 2). Infants and young adults are completely absent, children are under-represented and death of old age appears considerably earlier than in the documented population. It is unclear why there is such an under-representation of subadults in the Baptist burial ground. Judging from contemporary maps the area of excavation appears to have taken in the bulk of the burial ground, although outlying burials along the margins of the site are always possible. It is equally possible that a liminal area was set aside for the burial of infants and very young children, although the two known child graves were interspersed between the adults.

Archaeologically, the dearth of subadult remains is often explained in terms of poorer preservation and recognition of these smaller bones during excavation. This is unlikely to be true of most of the area of this site, as grave cuts were clearly identifiable, the coffin wood of most coffins was well preserved and highly visible, and the skeleton of the one subadult recovered (25480) was in excellent condition. Given the greater truncation in the eastern area of the site, it is possible that smaller child burials were missed, but this is unlikely to have amounted to many individuals. The young must have been buried elsewhere, for example in the Stepney chapel churchyard. In the Victorian period, considerable effort was made to bury family members together. The absence of neonates and young adults in the Broad Street assemblage suggests that mothers and babies dying of complications of childbirth were buried together at another site.

The age at death in older age categories appeared to be more advanced in the burial register population than in the osteological assemblage. This difference probably does not reflect a true age difference between the populations, but rather the limitations of osteological methodology, which tends to under-estimate the age older adults considerably (Witkin unpublished).

Sex distribution

Of the 16 adults, seven were identified as male, seven as female, two as possible females. The late adolescent skeleton 25439 was identified as male, and has been included amongst the

adults above. The sexing of subadults was not attempted, in accordance with accepted osteological practice. The slight preponderance of females over males is unlikely to be significant, given the size of the assemblage, the uncertainty over the extent of the total burial ground, and hence the completeness of the skeletal assemblage.

Stature

Due to the good bone preservation, it was possible to estimate stature of all adults from long bone length. The mean stature for men (n = 7) was calculated as 169.07 cm (range 1.53-1.81 m) or 5 foot 6½ inches, and for females (n = 9) as 159.55 cm (range 1.52-1.66 m) or 5 foot 3 inches.

Stature is determined by an interplay of inherited and environmental factors. Whilst we all have a maximum genetic potential to reach a certain adult stature, physical and emotional stressors during childhood and adolescence may prevent us achieving this potential. If stressors, such as malnutrition, infection or chronic illness, are too severe or prolonged for the growing body to 'catch-up' growth later, the individual will become permanently stunted. Thus, stature has been used as a rough yardstick to indicate the overall health of individuals and of populations, provided the genetic component of populations do not change (as would happen, for example, with an influx of peoples of different average stature). The only child (25480) in the skeletal assemblage was aged between five and six years from his/her dental development, but showed the diaphyseal long bone lengths more typical of a 3-4 year old. It is apparent that the growth of this child was interupted or slowed for a prolonged period before death, to the extent that he/she did not have sufficient physical reserves to catch up on lost growth. Although no specific cause of death could be identified on the skeleton, this growth stunting implies that ill health was a chronic condition in this individual, and not a sudden agent (such as an acute infection) that caused his/her death.

Table 3: Comparative data on stature estimation in 10 later post-medieval urban populations in England (figures taken from Roberts and Cox (2003, 308) and unpublished Oxford Archaeology reports of St George's church, Bloomsbury, St Luke's church, Islington, and the Quaker burial ground, King's Lynn). MC = middle class, and WC = working class

Burial ground	Male (Mean)	Male (Range)	Female (Mean)	Female (Range)	Social class
King's Lynn Baptists	1.69 m	1.53- 1.81 m	1.60 m	1.52- 1.66 m	Largely WC
King's Lynn Quakers	1.70 m	1.60-1.79 m	1.61 m	1.59-1.64 m	MC
St.Lukes,Islington (named and unnamed)	1.70 m	1.49 m-1.94 m	1.58 m	1.39 m-1.74 m	Mixed WC and MC
Newcastle Infirmary	1.71 m	1.60 m-1.83 m	1.60 m	1.50 m-1.76 m	WC
St Bartholomew's, Penn	1.75 m	1.45 m-1.85 m	1.60 m	1.42 m-1.83 m	MC
St Nicholas', Sevenoaks	1.73 m	1.62 m-1.83 m	1.61 m	1.49 m-1.72 m	MC
St George's, Bloomsbury	1.72 m	1.52 m- 185 m	1.60 m	1.49 m-172 m	MC
Christ Church Spitalfields	1.68 m	1.67 m-1.70 m	1.56 m	1.54 m-1.59 m	MC
Cross Bones, Southwark	1.69 m	1.53 m-1.80 m	1.58 m	1.42 m-1.72 m	WC
Kingston-upon-Thames, London	1.69 m	1.54 m-1.90 m	1.60 m	1.40 m-1.75 m	MC

When comparing the mean stature with other broadly contemporary burial sites in England (Table 3 above), it is interesting to note that average male stature of the King's Lynn Baptist assemblage falls slightly below the mean stature of the predominantly middle class assemblages of St Luke's church, Islington; St Bartholomew's church, Penn; St Nicholas'

church, Sevenoaks, and the working class assemblage of the Newcastle Infirmary, Newcastle-upon-Tyne. Male stature is comparable to the pauper assemblage of the Cross Bones burial ground, Southwark, and the largely middle class Quaker cemetery at Kingston-upon-Thames, London. Mean female stature showed less variation between the different assemblages. The mean stature of the King's Lynn Baptist females is the same as four of the above-mentioned assemblages, but greater than Christ Church, Spitalfields, and the Cross Bones burial assemblage, Southwark. Interestingly, average male and female stature of the Quakers burial assemblage from King's Lynn was greater than the Baptists by one cm, suggesting that although broadly contemporary and resident in the same small town, the Quakers enjoyed better general health than the Baptists. This probably relates to differences in higher social status of the former group.

Skeletal pathology

Pathological lesions were observed on all skeletons, with the exception of 25460. A high prevalence of disease was common in many post-medieval towns and cities. Migration of the urban poor to urban areas created a large impoverished under-class whose access to adequate housing, sanitation and nutrition was limited. Such conditions were a fertile breeding ground for infectious diseases, such as tuberculosis, smallpox, typhus, typhoid and cholera. Epidemics swept through Kings Lynn and the rest of the country periodically, with the 1854 cholera epidemic being particularly disastrous. Sanitation in Kings Lynn was rudimentary and the fleets, such as the Purfleet running through the town centre, became a dumping ground for effluent and acted as open sewers, Long decried for its stench and threat to public health, it was not until the 1860s that the Purfleet was drained, canalised and eventually covered over, and proper sanitation and water installed (Perrott 1995b, 9-10). Like the Quaker assemblage, the Baptists were characterised by a high prevalence of trauma (particularly fractures). Degenerative joint disease was also common, particularly given the relative youth of this population. It is likely that these two pathologies were occupationally induced, not surprising in a town where much of commerce revolved around shipping. Detailed descriptions of pathologies mentioned in the text below may be found in the catalogue at the end of the report.

Congenital disorders

The older adolescent/young adult male (skeleton 25439) showed slight kyphosis of the mid- to lower thoracic spine. Kyphosis is an abnormal curvature of the spinal column in the sagittal or anterio-posterior plane. The condition is colloquially known as a hunchback. In skeleton 25439, anterior wedging of the vertebral bodies of T6 to T11 caused an exaggerated posterior curvature of the spine (a slight kyphosis). These vertebral bodies and those of T12-L2 show moderate Schmorl's nodes, probably secondary to an uneven weight distribution across the vertebral bodies. Two left and two right mid-thoracic ribs had altered curvature of the shaft, probably also as a result of theabnormal spinal alignment. There is no osteological indication of an underlying condition (such as Pott's disease) to account for the kyphosis, so it is assumed to be congenital in origin.

In skeleton 25612, the left proximal humerus is abnormally shaped, with the greater tubercle greatly reduced. There was also slight flattening of the humeral head. This anomaly was probably congenital in origin. Slight eburnation of the anterio-lateral aspect of the left proximal joint surface, and slight to moderate lipping of the inferior margin was present. This osteoarthritis was probably secondary to the anomalous morphology of the bone. The right humerus was normal.

Infection

Non-specific infection was present on the long bones of three individuals (skeletons 25433, 25454, and 25608), a prevalence of 17.64% of the total population. This is only slightly higher than the rate of 14.7% in the Kings Lynn Quaker assemblage (Mahoney this volume).

In the vast majority of archaeological skeletons, the specific bacteria responsible for bone infection cannot be identified, and the pathology is referred to as 'non-specific' infection. Depending on the depth of penetration of the infection into the bone tissue, these lesions are categorised as periostitis, osteitis and osteomyelitis. Bone tissue response to infection involves both resorption and proliferation. Inflammation of the periostium, or periostitis, manifests osteologically as new bone formation on the surface of the bone. Penetration of infection deeper into the compact bone stimulates further osteoclastic activity, leading to noticeable thickening and sometimes, distortion of the bone. This is known as osteitis. Where the infection penetrates into the marrow cavity, resorption causes pitting and thinning of the cortical bone and an enlarged marrow cavity. The pressure of accumulated pus of this abscess may cause this debris to burst through the thinned cortical bone, creating a smooth-sided sinus or cloaca (Roberts and Manchester 1995, 126). The pus is then discharged into the overlying soft tissue, spreading the infection further afield. This infection is known as osteomyelitis, and is the most severe form of bone infection. The capacity of the body's immune system to mount a defence against this infection is severely hampered by the relatively small blood supply to bone tissue. Even today, in an era of sophisticated medical care and antibiotic treatment, osteomyelitis remains one of the most difficult infections to treat clinically.

In two individuals (skeletons 25433 and 25454) severe osteitis was present bilaterally on the tibial and fibular shafts. In skeleton 25454 (an elderly male), there was moderate to severe thickening of the anterio-medial aspect of the distal third of the right tibial shaft due to a large well-healed plaque. The right fibular shaft showed more severe infection with considerable thickening of the entire lateral aspect of the bone, most markedly the distal third where major distortion of the bone was present. The new bone was partly healed at the time of death, with large areas of smooth bone interspersed with sharp spicules and striated bone. The left tibia and fibula also displayed marked bone infection. The character of the lesions closely resembled the left lower leg bones, being marked, largely healed and similarly located on the long bone shafts, most severe on the distal portions. There was a small depressed area on the lateral malleolus of the left fibula surrounded by largely healed new bone. This depression appears to be a healed sinus into the marrow cavity, indicating osteomyelitis of the bone had been present. In skeleton 25433 (a mature adult male), no such sinus was observed, but the skeletal distribution, severity and evidence of healing was very similar. The above two cases are interesting in that the lesions were bilateral, suggesting a systemic causation of this infection. However, they did not resemble classic sabre shins, associated with syphilis.

The lower leg bones, particularly the tibiae, are by far the most common location of periostitis. This is perhaps not surprising, when one considers the lack of soft tissue overlying this bone, particularly on the anterior aspect, and the greater exposure of the lower leg to traumatic insults. In addition, severe peripheral vascular disease (common in the elderly, those with arterosclerosis and diabetes mellitus) often result in arterial and venous ulcers of the feet and lower legs that are notoriously slow to heal, and are vulnerable to secondary infection. Spread of infection to the fibulae did occur in the above two cases. The lesions were either fully or largely healed, showing lamellar and smooth bony plaques.

In skeleton 25608, the medial aspect of the proximal left tibial shaft shows largely healed periostitis, with a 10 x 3 cm area of largely smooth new bone overlying the original bone surface. This lesion was located just distal to the severely displaced tibial eminence. It is highly probable that this infection was a secondary complication of soft tissue trauma occurring when the knee was badly damaged in adolescence.

Chronic respiratory disease

Four individuals (skeletons 25449, 25465, 25470 and 25606) showed new bone formation on the visceral surfaces of the ribs (18.75%). In skeleton 25449, these lesions were florid and associated with lytic lesions of the sternum, clavicles and sacrum. This disorder was diagnosed as tuberculosis and will be considered separately in the section below.

Respiratory disease was commonplace in the medieval period and became even more of a cause for ill health following rapid urbanisation in the later post-medieval period. From the 18th century, industrialisation led to a vast influx of rural poor into the cities. Living conditions amongst the slums of the urban working classes were poor with overcrowding in homes that were poorly heated and poorly ventilated, malnutrition and poor general hygiene being the norm. Long hours worked in factories or workshops with air-borne dust and chemicals also had a deleterious effect on respiratory health. One respiratory disease that thrived in these conditions was pulmonary tuberculosis, which became markedly more prevalent from the 17th century onwards, and by the 19th century reached epidemic proportions. Whilst Kings Lynn would not have approached the scale of airborne pollution prevalent in the great industrial cities of this period, many industries had harmful effects on the respiratory health of practitioners. For example, glass making (a major industry in 18th- and 19th-century Kings Lynn), exposed workers to harmful chemicals during the smelting and blowing processes (Roberts and Cox 2003, 237), whilst sail and rope making would have involved the inhalation of dust and fibrous particles.

The vast majority of respiratory diseases leave no trace on the skeleton. However, where a lesion (such as a bulla or abscess) is closely associated with the ribs, resorption or new bone proliferation on the visceral surface of the rib may occur (Roberts *et al* 1998, 56). Traditionally, such lesions were associated with tuberculosis (TB) but Roberts *et al* (1998), concluded that no differential diagnosis was possible without the presence of tubercular lesions in other parts of the skeleton. Acute lobar pneumonia, brochiectasis (eg in chronic obstructive pulmonary disease, such as asthma, chronic bronchitis and emphysema), and less likely, metastatic carcinoma, non-specific osteomyelitis and syphilis may all be possible causes.

Tuberculosis

TB is caused by the bacterium *Mycobacterium tuberculosis*, which most commonly invades lung tissue, but may also be found in the bones, the skin (where it was known as scrofula or the King's Evil), the gastrointestinal tract and the central nervous system (where it may cause tubercular meningitis). The bacteria may lie dormant in the body tissues for many years, but may become active when the host's immunity is compromised, as occurs when an individual is diseased or malnourished.

Archaeological evidence of tuberculosis (TB) afflicting humans dates back at least to the Neolithic period, but in Europe it was from the 16th century that TB increased noticeably amongst urban populations, causing 20% of all recorded deaths at that time, the greatest concentration being in London (Johnston 2003, 339). This trend continued through the post-medieval period. Like most infectious diseases, TB was principally but by no means exclusively, a disease of poverty and urbanisation. Spread by droplet infection, the overcrowded and poorly ventilated housing and workplace conditions of these groups greatly facilitated its transmission amongst the urban poor. Greater vulnerability to the disease was noted in some occupation groups, with female textile factory workers exhibiting the highest TB rates of all occupational groups (Johnston 2003, 340). By the early 19th century, autopsies undertaken on the most indigent dwellers of cities such as Paris and London revealed that close to 100% of all cadavers examined had developed tubercular lesions at some time in their lives, although many had died of other causes (*ibid*). Deaths from pulmonary tuberculosis or consumption (based on the Bills of Mortality of the 18th and 19th centuries) afflicted an estimated 400-500: 1,000,000 people, making it the most common cause of death in this period (Roberts and Cox 2003, 338).

In approximately 90% of cases, tuberculosis leaves no trace on the skeleton, and hence, osteological prevalence of the disease drastically under-represents the true pathology rates of this disease. It is probable that the true rate of pulmonary tuberculosis was much higher in the Baptist assemblage. Where bony lesions do occur, the most common locations are on the

visceral surfaces of the ribs (but this is not specific to tuberculosis), the vertebrae (in 25-50% of cases), and the hip and knee joints (Roberts and Manchester 1995, 141).

Osteological evidence of tuberculosis was found in one individual, a prime adult male (skeleton 25449). Florid new bone overlay the surfaces of at least eight right ribs (ribs 4-12) and 16 other rib fragments. Lesions were located at the costal rib ends, the rib angle, the tubercle and neck of the ribs, in one case extending the entire length of the rib. The ribs on the left side were unaffected, suggesting pulmonary tuberculosis affected the left lung only. Some lesions showed partial healing but the majority were active at the time of death. Smooth-walled lytic lesions were observed on the dorsal surface of the manubrium and the superior half of the sternal body, the resorption of the bone creating a honey-comb appearance. Similar lesions were observed on the anterior surface of the sacrum affecting S2 and 3. The lesions were purely lytic. Interestingly the vertebrae were not affected, and it is probable that TB spread to the sacrum from soft tissues of the abdomen or pelvis. Given the florid active appearance of the lesions, it is highly probable that this disease was the cause of death of this man.

Trauma

Like the Quaker skeletal assemblage, there was a higher than expected prevalence of trauma, including several severe fractures. The reason for this characteristic is not well understood but is likely to relate to occupational accidents, such as falls. Shipping was a dominant industry in King's Lynn at this time, and it is probable that falls onto the deck, and accidents during the loading and unloading of vessels were the cause of many of the fractures observed in these two assemblages.

Seven skeletons showed evidence of trauma (25429, 25454, 25465, 25475, 25608, 25609, and 25610).

Fractures

Crush injury to the big toe is apparent in male skeleton 25475. The distal phalange of the hallux was misshapen and malaligned laterally. Such an injury may be caused by dropping a heavy object onto the foot.

Skeleton 25475 (a mature adult male) had healed fractures of four rib shafts on the left side. Rib fractures are most commonly caused by assault, but may have been caused by falling onto the left side. The left fibula of this skeleton also displayed a well healed and well-aligned fracture of the distal quarter of the shaft. The type of fracture is not unequivocal due to marked callous deposition, but it appears to be an oblique fracture. The excellence of the bone reduction reveals that this individual received effective medical care and that splinting of the limb was successfully applied.

Two mature adult females (skeletons 25429 and 25609) also presented with fractures. The former had a healed fracture to the left patella, the fracture line partly healed but clearly visible on the dorsal aspect, extending superio-inferiorly the length of the lateral articular surface. A large osteophyte outgrowth on the superior and lateral aspects Associated with the fracture. Slight corresponding lipping of the epicondyles was present on the left femur.

Skeleton 25609 had a very unusual fracture of the acromium of the right scapula. There was non-union of the blade and the process of the acromium, with profuse new bone growth around the fracture producing a pseudoarthrosis. The injury would have impeded elevation of the right arm and shoulders. It is clear from the non-union of this fracture that this woman did not immobilise her arm and shoulder following injury as there is no indication that the bones had begun to knit. The injury must have occurred some time before death as the new bone growth was profuse, but was still active at the time of her death. The bone was very light in weight, consistent with the osteoporosis observed in other elements of the skeleton.

Dislocation of tibial epiphysis

Mature adult male skeleton 25680 showed a severe dislocation of the left tibial plateau medially. The medial epicondyle appears to have been fractured and displaced medially and inferiorly, and was angled inferiorly at a 45° angle to its original horizontal plane. Considerable new bone growth was evident in this area, the majority being well healed. The lateral epicondyle had also been displaced medially, and showed new bone growth such that the lateral condylar surface was enlarged. Osteophytosis of the lateral tibial plateau had developed an additional joint surface (2.4 x 2.4 cm), which articulated with the lateral femoral condyle. Slight eburnation of this surface was present. The overall appearance was that the entire tibial plateau had been wrenched medio-laterally, with the tibial eminence displaced 1.5 cm medial to its normal anatomical position.

The left femoral condyle showed corresponding changes to the altered position of the tibial joint surface. The lateral condyle showed the development of a bony bridge extending horizontally across the joint surface, effectively reducing the range of motion of the knee joint considerably. A similar bony bridge was present on the medial condyle. The altered articulation of the tibia and femur would have resulted in the medial rotation of the lower leg and foot, leading to a abnormal gait. There was no secondary bony changes to the pelvis or spine, but the fourth and fifth metatarsals of the left foot show marked thickening of the shafts, and muscle attachments of these bones were marked. These changes were probably a response to the abnormal gait and addtional weight-bearing imposed on these two bones.

Clearly, the injury was of long-standing and is most likely to have occurred in late adolescence before the proximal tibial epiphysis had fused. However, there was no shortening of the limb, as would be expected if this injury had occurred in childhood or early adolescence. Considerable new bone growth overlay the periostium on the medial aspect of the proximal tibial shaft, suggesting considerable soft tissue damage also had also occurred.

Calcified haematoma

A calcified haematoma was present on the anterio-medial aspect of the proximal shaft of the right tibia of skeleton 25454. The lesion measured 6.7 x 3.2 cm and was raised approximately 3-4 mm above the normal surface of the bone. The limit was clearly defined and the bone was well healed, indicating that the injury had taken place a considerable time before death. A haematoma or collection of blood may follow an injury where breakage of blood vessels causes localised bleeding into the tissues, but does not drain readily. In most cases, the haematoma is unproblematic and is gradually resorbed by the body, but in others it may act as a reservoir of infection and develop into an abscess. Occasionally, a haematoma may ossify, leaving a distinctive lesion. The anterio-medial aspect of the tibia is a common site for such injuries, as the there is little soft tissue overlying the bone. It is probable that the lower leg of skeleton 25454 was severely hit by a blunt object.

Osteochondritis dissecans

The capitulum of the right humerus of skeleton 25465 showed a small (1.2 x 0.9 cm), broadly circular area of bone loss, being slightly depressed below the level of the rest of the joint surface. Within the lesion healed new bone growth was evident, indicating that this injury had occurred a considerable time before death.

Osteochondritis dissecans is a fairly common osteological disorder found on the joint surfaces of the major long bones. Physically active young males (such as athletes) are most often affected in the first two decades of life. This disease is due to a significant localised obliteration of the blood supply, causing necrosis of small areas of joint tissue (Roberts and Manchester 1995, 87). Repeated, low-grade, chronic trauma or micro-trauma is thought to play a role in this injury to the blood vessels. The necrotic bone plaque breaks off from the joint surface and may remain loose in the joint, causing chronic pain and often precipitating

osteoarthritic changes. Alternatively, the fragment may re-attach in its original position or be resorbed, and no further symptoms will be experienced. There was no evidence of secondary arthritic changes in skeleton 25465.

Parturition scar

Mature adult female 25610 displayed one parturition scar on her left posterior superior symphysis pubis. Such scars were thought to indicate ligament distension during pregnancy and labour, and was sometimes used to indicate parity. More recent work has cast doubt on these assumptions noting that 'parturition scars' may occasionally be observed in males, and may reflect a much wider range of bio-mechanical influences associated with the role of the pelvis in transmitting weight from the trunk to the lower limbs, the size and shape of the pelvis and body, and locomotion (Cox 2000, 131-141).

Degenerative joint disease

Degenerative joint disease (DJD) was present in 11 adult skeletons of the Baptist assemblage (68.75%). Degenerative changes in the vertebrae (known as spinal degenerative joint disease (SDJD)) were noted in nine adults (56.25%). Detailed description of the location and manifestation of these bony changes may be found in the catalogue.

Degenerative changes manifest skeletally as the deposition and/or resorption of bone of the joint surface. Deposition of new bone (or osteophytosis) on or around the joint surface occurs as a compensatory attempt by the body to spread the load by increasing the joint surface area. Where osteophytosis becomes severe, the new bone may cause the joints to fuse together or ankylose. This is most commonly found in the vertebral bodies. When the cartilage overlying the bone at joints is destroyed, the bone may become very dense or sclerotic. Friction between the two bones may cause polishing or eburnation. Bone resorption often occurs concurrently with deposition. Macroscopically, this manifests as porosity of the joint surface. Infiltration of these pores by synovial fluid may cause subchondral cysts to develop, readily visible by radiography, but less obvious to the naked eye (Roberts and Manchester 1995, 112-114). Where eburnation and/or two other degenerative bony changes are present, this is known as osteoarthritis.

Degenerative changes to the upper arm appear fairly common in the Baptist assemblage with shoulder, wrist and finger elements most affected. Slight to moderate DJD affected the shoulder joint of five individuals (skeletons 25429, 25433, 25606 and 25607, 25601 and 25612), with slight to moderate osteoarthritis of the left humeral head of skeleton 26512 being the most severe example. Slight to moderate osteophytosis of the elbow joint affected skeletons 25433, 25465, 25475 and 25607, whilst DJD or ostearthritis was evident on the carpals of the wrist joint and fingers of 25454, 25608 and 25609. There does not appear to be any association between sex and the manifestation of this DJD. Nor does handedness appear particular influential.

Table 4 Summary of the skeletal pathology (n = 16). Abbreviations: + = slight; ++ = moderate; +++ = severe; OA = osteoarthritis

Skeleton	Age	Sex	Congenital	Infection	Trauma	DJD	SDJD	Metabolic	Neoplastic
25429	40-50 y	female			fractured L patella, compression fracture T8	L and R hips, R glenoid fossa, L & R patellae, marked osteophytosis and macroporosity of L and R sacro-iliac joints	T3-8 fused bodies, kyphosis, scoliosis, marked osteophytosis and mild porosity T9-L5 (OA); severe eburnation of S1		
25433	35-40 y	male		periostitis L and R tibiae, L and R fibulae		Slight lipping shoulder joints & elbows, knees	T7-10, L4-5: moderate osteophytosis	? rickets	
25439	17-19 y	male	slight kyphosis T6-11 T12-L2 bodies wedged, Schmorl's nodes						
25444	40-50 y	female					Schmorl's nodes on T10-L5		
25449	25-35 y	male		TB of sternum, clavicles and sacrum, florid R rib lesions				Cribra orbitalia Type 3, partly healed	
25454	50+ y	male		periostitis/ osteomyelitis of L and R tibiae and fibulae (moderate to severe)	calcified haematoma R tibia	L and R 1st metacarpal and proximal phalange: slight to moderate lipping, OA; eburnation & osteophytosis of all thumb joints and L triquetral; R femur & acetabulum: severe OA- profuse osteophytosis and eburnation; R 1st metatarsals: eburnation and lipping			
25465	30-35 y	male		L mid-thoracic rib -new bone	crooked R hallux; osteochondritis dissecans	L patella: slight lipping, R olecranon slight lipping	T5-L4: slight osteophytosis; T7-L3: moderate Schmorl's nodes		
25470	30-40 y	female		L mid-thoracic rib x 1: active new bone on visceral surface					
25475	40-45 y	male	R 1st metacarpal: prominent bone spur on lateral distal shaft- ? trauma, ? DJD, ? neoplastic		L ribs x 4: well healed fractures; L distal fibula: well healed fracture; ? crushed L distal phalange	OA: L and R humeral head- eburnation, lipping; L and distal epicondyles and olecranon- slight lipping; L and R epicondyles of femora, tibia & patellae: slight lipping; L tarsals: moderate lipping			

Skeleton	Age	Sex	Congenital	Infection	Trauma	DJD	SDJD	Metabolic	Neoplastic
25480	5-6 y	unknown						markedly stunted growth (chronic or episodic infection and/or malnutrition)	
Skeleton	Age	Sex	Congenital	Infection	Trauma	DJD	SDJD	Metabolic	Neoplastic
25606	40-50y	female		6 x R rib fragments; partially healed new bone		R acromial process: moderate macroporosity & slight osteophytosis	wedging of vertebral bodies, slight kyphosis; Sacro-vertebral joint: severe osteophytes	cribra orbitalia type 2, healed; ? osteoporosis	
25607	40+ y	male				R acetabulum: lipping , R femoral head: lipping slight; R Auricular surface: bony rim- ? fusing; L scapula: macroporosity ++; L olecranon: lipping +	C1-7: OA- osteophytosis, eburnation, porosity		
25608	40-45 y	male			L tibia: displacement of tibial epiphysis	R scaphoid: lipping ++	C5: & 7 : OA of bodies- osteophytosis ++, porosity ++, eburnation +; L4-S1: osteophytosis ++- +++ of articular facets	cribra orbitalia type 2 healed	
25609	45-49 y	female			Mid-shaft of R acromium process fracture: marked thickening & new bone +++, ? pseudoarthrosis	L acetabulum & proximal femur: severe OA osteophytosis ++, porosity +, eburnation ++, subchondral cysts; R hip moderate OA; L 3rd distal metacarpal joint: eburnation +, osteophytosis ++; L & R patellae: eburnation & osteophytosis ++, R femoral epicondyle: lipping +; L & R finger joints: osteoporosis +-++	T1-T5: osteophytosis ++ - +++ of articular facets; L2-L5 bodies & L articular facets: osteophytosis +-+++, porosity +, marked anterio-posterior wedging of L4 & 5		
25610	40-45y	female			L pubis: parturition scar x1	Sacral body: osteophytosis +++; macroporosity, eburnation +++; R clavicle: osteophytosis & porosity of distal joint	OA of C5, T4 & 5: osteophytosis & porosity +; T11-L5: osteophytosis & porosity ++ - +++		Parietals: button osteoma x 2
25612	mature adult	? female	? congenital malformation of L humeral head			OA of L humeral head: lipping + - ++, eburnation +	T1-7: osteophytosis of articular facets + - ++		

The hip joint was affected by DJD in four individuals (skeletons 25429, 25454, 25607 and 25609). In skeleton 25609 (a 45-49 years old female) these changes were marked with profound osteophytosis of the left acetabulum and femoral head, marked eburnation of much of both joint surfaces, and numerous large subchondral cysts apparent beneath the joint surface of the femoral head. Less profound osteoarthririts was observed in the right hip joint. In general, the bone density of this well-preserved skeleton seemed light and porous, suggesting that the underlying cause of these degenerative changes was osteoporosis. DJD was also observed in the joints of the wrist, knees and spine of this individual.

The vertebrae are the most common location for DJD, affecting nine adults. In addition to the osteophytosis, porosity and eburnation described above, Schmorl's nodes are another skeletal indicator of degenerative changes of the spine. Schmorl's nodes are depressed areas on the anterior and superior aspects of the vertebral bodies where the intervertebral disc contents have herniated and have exerted pressure on the vertebral body. In modern humans, Schmorl's nodes are very common in individuals aged 45 years and more, and are generally held to have few clinical effects (Aufderheide and Rodriguez-Martin 1998, 96), although recent work does suggest that back pain frequently does accompany modern sufferers. Schmorl's nodes were noted on the vertebral bodies of skeletons 25444 and 25465, affecting the mid-thoracic to lumbar spine.

Skeleton 25429 (a 40-50 year old female) showed marked osteoarthritis of the spinal column with ankylosis of T3-T8, a compression fracture of the body of T8 creating both a slight kyphosis and scoliosis. Marked osteophtyosis and slight porosity was observed on the bodies of T9 to L5 and severe eburnation of the vertebral articular surface of S1. Marked osteophytosis and macroporosity was present in the sacro-iliac joint bilaterally.

Degenerative joint disease (DJD) is by far the most common joint disease found in skeletal populations, and the Baptist assemblage was no exception. DJD is an umbrella term that includes a number of degenerative joint diseases (including osteoarthritis, rheumatoid arthritis, and psoriatic arthritis) that do not manifest specifically enough to allow for a differential diagnosis. DJD occurs where there is damage to a joint through over-use (repetitive activity-related trauma) or through general wear and tear of the joint through life. These bone changes are often progressive and hence, correlate closely to the age-at-death of the individual, and on a palaeodemographic level, prevalence relates to the age-distribution of the population under study. In the fairly young Baptist population, the high prevalence of DJD suggests that at least some of these changes were activity-induced, probably relating to shifting or carrying heavy loads, and other strenuous manual labour. Historically, the Baptists are known to have been predominantly working class in origin, and the high prevalence of DJD and rugosity of many of the skeletons (including females) is consistent with this picture.

Metabolic disorders

Iron-deficiency anaemia

Cribra orbitalia was present on three skeletons (25449, 25606 and 25609). All three individuals were adults (one female and two males). Lesions were completely healed in the latter two, were rated as type 2 in severity, whilst lesions were more marked (type 3) and only partly healed in skeleton 25449, the youngest of the three. Porotic hyperostosis was not present on the cranial vault of any of the three skeletons.

Cribra orbitalia is widely thought to occur in response to a deficiency of iron during childhood, most commonly the result of inadequate dietary intake of iron, and/or as a result of severe intestinal

parasite infestation (Stuart-Macadam 1991, 101). Iron is a central component of haemoglobin, the molecule necessary for the transportation of oxygen in the red blood cells of the blood. Red blood cells are produced within the red bone marrow of a number of bones of the body, which include the diplöe of the cranial vault, the sternum and the pelvis. In childhood, the diplöe are particularly important, but become a secondary site of red blood cell production later in life. In iron deficiency anaemia, the body attempts to compensate for low serum iron levels by hypertrophy of these bones. In children, this manifests osteologically as an increased porosity and thickening of the diplöe of the cranial vault (known as porotic hyperostosis) and of the orbital sockets (*cribra orbitalia). Cribra orbitalia* is often used as a generic indicator of physical stress in childhood. Progressive bone remodelling in adulthood causes healing and complete obscuring of these childhood lesions. Thus, it is not surprising that the individual with the least evidence of healing (skeleton 25447) is the youngest of the three sufferers.

Rickets

One adult male skeleton (25433) showed bony changes consistent with childhood vitamin D deficiency or rickets. Marked bowing of the tibial shafts was present bilaterally. There was also slight anterio-posterior bowing of the femoral shafts, although this was too slight to be diagnostic of this condition. Rickets is a deficiency disease caused by a lack of vitamin D. Vitamin D is central to the absorption of dietary calcium. A deficiency results in soft, thin bones. Weight-bearing during crawling and walking in childhood cause the long bone shafts of the arms and legs to bow. This was not observed on the arm bones of skeleton 25433, so it appears that rickets occurred later than 1-1.5 years. Although vitamin D may be obtained in foodstuffs such as oily fish and animal fat, the majority of vitamin D is formed by the exposure of the skin to ultraviolet radiation. The presence of rickets usually indicates an individual who had not received sufficient exposure to sunlight in early childhood.

Rickets was fairly uncommon in pre-industrial and rural agrarian societies (Ortner and Putschar 1981, 274), but became widespread in the industrial cities of the later medieval period. The smog that blanketed the great manufacturing centres (including London) for much of the year served to block out a great deal of sunlight. Long hours of child labour in factories and mines also ensured that many working class children were not exposed to sufficient daylight necessary for the adequate production of vitamin D. In 1773, Fordyce (quoted in Roberts and Cox 2003, 309) estimated that 20,000 poor children in London were afflicted with this disease. The scale of the disease was still vast in the mid-19th century, with a third of all admissions to Great Ormond Street Hospital in London being diagnosed as rachitic. In Kings Lynn, such severe pollution is unlikely given the lower intensity of industry, but social practices such as long hours of child labour or keeping children covered and kept indoors may be sufficient to cause the disease.

However, rickets was not necessarily the sole preserve of the poor. The 17th century physician Francis Glisson (the first to describe rickets in precise clinical detail) observed that it was a disease of children of the wealthy classes, where it was common practice not to be suckled by one's natural mother, but by a wet nurse (Sloan 1996; 44). This practice usually resulted in early weaning onto gruels high in calories but poor in animal fat, and hence, low in vitamin D (Steinbock 2003; 281-282). This social practice, coupled with keeping the young child indoors for long periods, resulted in a child from a privileged background developing the disease.

Osteoporosis

Osteoporosis was present in skeleton 25606, a 40-50 year old female, with marked porosity of trabecular bone of vertebral bodies, and very low weight of these elements. Osteoporosis is a proportional decrease of both the bone mineral and the bone matrix, leading to bone which is light

and brittle, and liable to fracture after minimal trauma (Steinbock 2003, 236). There are two types of osteoporosis: type 1 or post-menopausal osteoporosis (affecting women over 50 years of age), and commonly the underlying condition in vertebral crush fractures and fractures of the distal radius; and type 2 or senile osteoporosis, which affects both males and females over the age of 60 years equally, and predisposes individuals to vertebral wedge fractures and fractures of the femoral neck. A drop in oestrogen levels following the menopause accounts for 10-20% loss of total bone mass in modern women *(ibid)*. This often serves to aggravate a pre-existing negative calcium balance caused by a poor dietary calcium intake and/or the net bone calcium lost during the reproductive years through multiple pregnancies and prolonged breastfeeding *(ibid)*. An older female, skeleton 25606 does fall into the high risk category for this disorder. She also suffered from osteoarthritis of the spinal column, most severe in the mid-to-lower thoracic vertebrae. Wedge fractures in the medio-lateral plane were present on L1 and L5, the former wedging to the right and the latter to the left. The individual would have been left with a slight scoliosis of the spine, and chronic back pain. It is probable that these crush fractures were a result of the friability of the vertebral bodies due to osteoporosis.

The prevalence of this disorder in the adult Baptist assemblage was 6.25%. Given the difficulty in macroscopic identification of osteoporosis, it is highly probable that the true prevalence was very much higher in this population.

Neoplasms

One small button or ivory osteoma was present on the left and one on the right parietal bones of the cranial vault of skeleton 25610. Each had a diameter of approximately 0.4 cm and were slightly raised above the ectocranial surface. Button osteomas are small circular benign tumours of no clinical significance (Roberts and Manchester 1995, 188). They are more commonly found in males, and frequency rises after the fourth decade of life (Aufderheide and Rodriguez-Martin 1998, 375). Skeleton 25610 was a 40-45 year old woman, and hence, matches the age but not sex profile of this condition.

Dental pathology

All the skeletons of the Kings Lynn Baptist assemblage had extant dentition, or extant maxillae and/or mandibles where ante-mortem tooth loss was complete. The deciduous and permanent dentition of subadult 25480 was not included in prevalence calculations as the deciduous dentition is different in structure to permanent dentition, and the permanent dentition was not fully developed.

Dental pathology, such as periodontal disease, calculus, caries, abscesses and ante-mortem tooth loss (AMTL), is most commonly caused by the consumption of carbohydrates (particularly refined simple sugars) and by poor oral hygiene practices. In the post-medieval period, consumption of cane sugar gradually increased. In the 16th- and 17th-centuries, sugar was an expensive and high status luxury available only to the most wealthy. However, the development of sugar plantations in the West Indies in the 17th- and 18th-centuries generated an easily available and affordable supply to markets in Europe. Sugar prices dropped dramatically from the mid-17th to mid-18th centuries, whilst the amount of sugar imported between 1700 and 1748 doubled. Annual consumption per capita rose from 4 lb in 1700, to 10 lb in 1748, as high as 20 lb in 1800 (the last being due to the widespread adoption of tea drinking amongst the upper and middle classes) (Musgrave and Musgrave 2000, 59-60). As sugar became more affordable, consumption continued to spread down the social classes, until by the latter half of the 19th century it was available to all but the most indigent. By this time, the annual sugar consumption per capita ranged between 11.74 lb and 30.45 lb (Roberts and Cox 2003). This consumption was to have profound effects on dental health with massive increases in dental decay and ante-mortem tooth loss..

Oral hygiene in the 19th century was rudimentary or non-existent, and also would have played a major role in the high levels of dental disease of this period. Whilst toothbrushes were known from the 18th century, their use was very restricted. Oral hygiene consisted principally of using abrasive or caustic tooth powders or tinctures to whiten the teeth.

Table 5 Summary of dental pathology in adults from ten post-medieval sites in England

Skeleton assemblages	Ante-mortem tooth loss	Dental abscesses	Calculus	Caries	Dental enamel Hypoplasia	Dental Fillings
Kings Lynn Baptists	33.2% (135/407)	1.47% (6/407)	85.4% (181/212)	18.7% (39/212	60.7% (119/196)	0.47% (1/212)
Kings Lynn Quakers	53.82% (169/314)	0.32% (1/314)	74.2% (98/132)	36.0% (41/114)	41.84% (41/98)	0%
St Luke's, Islington (named)	35.35% (1726/4883)	1.78% (87/4883)	46.33% (1042/2249)	9.74% (219/2249)	10.27% (231/2249)	0.27% (6/2249)
Newcastle Infirmary, Newcastle	19.3% (604/3123)	0.9% (29/3123)	55.85% (718/1287)	11% (146/1327)	17% (219/1287)	0.0%
St Bartholomew's, Wolverhampton	38.40% (1671/4349)	0.07% (3/4334)	Data not available	8.10% (166/2047)	Data not available	0.0%
St Nicholas, Sevenoaks, Kent	37.95% (529/1394)	0.41% (5/1394)	Data not available	14.08% (113/803)	Data not available	Data not available
Christ Church, Spital-fields, London	19.91% (324/1627)	Data not available	Data not available	19.11% (311/1627)	Data not available	0.24% (4/1627)
London Road, Kingston, London	34.61% (1436/4149)	0.07% (3/4149)	Data not available	5.40% (210/3858)	Data not available	Data not available
Cross Bones Southwark, London	17.30% (211/1216)	2.30% 28/1216	Data not available	26% (161/621)	29% (adults)	Data not available
St Georges, Bloomsbury (named)	40.99% (669/1632)	2.82% (46/1632)	70.85% (592/844)	13.39% (110/844)	16.35% (138/844)	0.83% (7/844)

(Hillam 1990; Roberts and Cox 2003, 324). Tooth cleaning for other than cosmetic reasons was virtually unknown. Dental disease was so widespread, that many individuals had their teeth extracted prophylactically (often as a 21st present) to save them from years of toothache in later years.

Dental calculus

Plaque is composed of oral micro-organisms that become imbedded within a matrix of protein, saliva and food residues that accumulate on the teeth after eating. Carbohydrates, particularly simple sugars, accelerate this process (Hillson 1996, 254-55). Plaque may become mineralised, forming calculus, the hard immovable deposit on the teeth colloquially known as tartar. There are two types of calculus: supra-gingival calculus, which is situated above the gum line, and sub-gingival calculus which extends beneath the gum line on exposed roots. Deposits are most heavy on teeth nearest the saliva glands (Roberts and Manchester 1995, 55). Regular brushing of the teeth will remove most plaque deposits, thus preventing calculus formation.

The calculus rate in the Baptist assemblage was recorded per tooth present, and the size and position on the crown was noted, using guidelines set out by Brothwell (1981). However, such a detailed presentation of this data is beyond the scope of this report. Calculus was recorded on 85.4% teeth and all but two individuals with surviving tooth crowns. Although this is a high prevalence compared to other sites of this period (Table 5), the severity of the calculus deposits were overall not marked, scored as heavy in only two individuals, medium in two and slight or flecks in the remainder. The high prevalence of the disease reflects the poor oral hygiene of this population.

Periodontal disease

Peridontal disease is the inflammation of the soft tissues of the mouth, namely the gums, and/or the peridontal ligament and alveolar bone (Levin 2003, 245). Retraction of the gums exposes the vulnerable root of the tooth to attack by acidic plaques, commonly resulting in caries, abscesses and ante-mortem tooth loss. The main predisposing factor for periodontal disease is calculus build-up in the dental pockets. Peridontal disease is strongly associated with increasing age in both modern and archaeological populations. However, aetiology of this disease is multi-factoral, with genetic predisposition, environment, diet and oral hygiene all playing a role

The disease may express itself as either horizontal or vertical bone loss. In the former, more than one tooth is affected, often involving the whole dental arcade, with all alveolar walls being lost uniformly. This is by far the more common form of peridontal disease. In vertical bone loss, the lesion is localised around one or two teeth. This bony resorption around the tooth is irregular, and generally occurs without horizontal bone loss (Hillson 1996, 263-65).

Periodontal disease was recorded by subdividing the jaws into four quadrants, which were scored independently. The severity of the disease was scored as slight, medium or considerable, using the universally accepted standards set out by Brothwell (1981). In the Baptists, peridontal disease was present in 12 individuals (75%). It ranged in severity from slight (n = 3), through moderate (n = 4) to considerable (n = 5).

Caries

Destruction of the tooth enamel results in the formation of caries, which is irreversible and frequently results in toothache, abscess formation and ultimately, ante-mortem tooth loss. Refined sugar was probably responsible for considerable decay in this population. Thirty-nine carious cavities were recorded, a mean of 2.44 caries per person. The prevalence per tooth (18.7%). This

rate is higher than all but two sites listed in Table 5 above. It is broadly comparable with the middle class assemblage of Christ Church Spitalfields (Molleson and Cox 1993) and lower than the pauper assemblage of the Cross Bones burial ground, Southwark, London (Brickley and Miles 1999, 34).

Ante-mortem tooth loss (AMTL)

Although teeth were sometimes drawn electively, in anticipation of the agonies of toothache in later life, or lost as a result of trauma, most teeth were lost as a result of periodontal disease and caries. AMTL is diet-related but also age-related, and hence, it is no surprise that the older members of the population suffered higher rates of tooth loss. In the Baptist population, 135 teeth were lost ante-mortem. This is an average of 8.4 teeth per individual. Comparisons with AMTL rates in other late Georgian/early Victorian assemblages reveal that the Kings Lynn Baptists had a prevalence (33.2%) slightly lower than four other populations (all predominantly middle class). The Quaker assemblage shows a markedly higher prevalence (53.82%). This may in part be true of the older overall age of this population. Similarly, the lower prevalence of AMTL in the Cross Bones, Southwark, and Newcastle Infirmary burial grounds, is probably largely due to the younger age-at-death of these poorer populations.

Dental abscesses

Severe dental disease may result in infection tracking down to root canal or around the root to the apex, resulting in a dental abscess. In untreated cases, the pressure of the inflammation and accumulated pus forces a path through the alveolar bone, leaving behind a smooth-sided lesion or cloaca in the jaw. Clinically, dental abscesses cause considerable pain to the sufferer, but often ease somewhat following the creation of this cloaca through which the pressure within the bone is relieved. In this assemblage, a prevalence of 1.47% was present. In one case, the infection had caused the loss of the tooth.

Dental enamel hypoplasia

Dental enamel hypoplasia (DEH) manifests on the buccal surface of the tooth crowns as pits, horizontal lines or lines of pits. These features are the result of a thinning of the enamel caused by an interruption or slowing of the normal deposition of enamel during crown formation (Goodman and Rose 1990). DEH is induced by a number of metabolic insults, such as nutritional deficiency, weaning and bouts of childhood diseases lasting more than three weeks (Aufderheide and Rodriguez-Martin 1998; 405; Hillson 1996, 165-66). Unlike bone, enamel does not remodel during life, and so remains as a permanent indicator of such a stress episode in the first six or seven years of life.

Although the prevalence for DEH was very high in the Baptist assemblage (60.7%), the majority of the hypoplasia lines were very faint, indicating only transient or mild episodes of disease or malnutrition. In only one individual were the lines marked, but none showed profound enamel thinning. In the main, it is unlikely that the stressors responsible for these lesions were severe enough to inflict permanent damage on the individuals concerned. Common childhood infections may well account for many of these lines.

Dental interventions

One individual (25433) had a grey metal filling in a carious lesion. During the 18th and 19th centuries, the cheapest material used for fillings was either tin or lead. From the beginning of the 19th century, various forms of amalgams became available. These were based on heavy metals, such as mercury, that was mixed with copper or silver filed from coins (British Dental Association museum display). Pellets of the amalgam were placed in the cavity and tamped down

with a hot instrument. Gold fillings were the most suitable material but also the most expensive. A typical dentist's fees of 1781 advertised gold fillings at 7 shillings sixpence, whilst lead fillings cost 5 shillings each (Wilson 1985, 38). The material composing the filling from skeleton 25433 is uncertain, but is likely to be tin or a lead amalgam. The low proportion of fillings, and the lack overall of dental work in this assemblage suggested that few could afford the high cost of such procedures. No dentures were found within the coffins of the Baptists, as were found in many middle class burials of this period (eg St George's church, Bloomsbury (Boston and Witkin in progress); Christ Church, Spitalfields (Molleson and Cox 1993) and St Martin's church, Birmingham (Bateaux 2004). Nor was any squaring and thickening of the alveolar bone noted on the mandibles of the Kings Lynn Baptists to suggest the wearing of ill-fitting dentures (particularly denture blocks).

Non-metric traits

All 16 adult skeletons were examined for non-metric traits. These are summarised in Table 6 below. Non-metric traits are minor variations of phenotypic expression, that occur in any tissue of the body, but which, in archaeological populations, are observed on the bone. These traits are too minor to influence the biological success of the individual. Non-metric traits have been used to indicate genetic relationships between individuals. However, their value has been questioned, as many traits may be environmentally produced (for example, muscle pull of bone during strenuous exercise may cause a trait such as plaques and exostosis of the femoral head to develop). Gruneberg (cited in Tyrrell 2000, 290) also postulates that the expression of a genetically inherent trait requires certain environmental factors to coalesce and overcome a certain threshold before the trait may be expressed. These factors do cast doubt on the value of non-metrical traits as indicators of familial relationships. Sjovold's 1984 study of a European post-medieval sample with known familial relationships indicated that overall, cranial non-metric traits have been determined as more heritable than post-cranial traits (cited in Start and Kirk 1998, 171).

Whilst many non-metric traits listed in Table 6 are common in most populations, several more uncommon traits were noted in the Baptist assemblage. Cranial ossicles were present on the skulls of seven skeletons (25429, 25433, 25439, 25449, 25610 and 25612), the most common being lambdoid ossicles (n = 6 or 37.5%). Skeletons 25433, 25439, 25449 and 25608 also displayed the much rarer trait of an ossicle at asterion (25%). Only skeleton 25439 had epipteric bones. These traits are deemed very heritable. Interestingly, all individuals with ossicles were buried within the northern half of the burial ground, loosely suggesting familial relationships between these individuals. Skeletons 25439 and 25449 shared wormian bones and an ossicle at asterion, but the metopism and epipteric bones found on the cranium of the latter was unique in this assemblage.

Supraorbital foramen and notches were found in five skeletons (25465, 25470, 25607, 25608 and 25610). Spatially, the distribution of skeletons with these traits show two distinct clusters within the burial ground (the first three in one group, and the last two adjacent burials in adjacent graves).

Unusual non-metric traits of the cervical vertebrae, such as lobed and double articular facets of the atlas (n = 6), lateral, transverse and posterior bridges of the atlas and C5-7 (n = 5) were present in fairly large numbers. In the burial ground, skeletons with lobed and double atlas articular facets were spatially tightly clustered in the southern area. This was true also for anomalies of the cervical vertebrae mentioned above, with the exception of skeleton 25449.

By far the most common non-metric trait to be observed was a double facet of the talal articular surface of the calcaneus (n = 8; 50%). The spatial distribution of skeletons with this trait was more scattered across the burial ground. Interestingly, this trait was also common amongst the

Kings Lynn Quaker assemblage (a crude prevalence of 27.2%). This suggests that rather than being restricted to discrete family groups, double facetted calcanei were a widely shared trait amongst the population of Kings Lynn, and may suggest a regional clustering of this characteristic. This does not appear to be the case for other more heritable traits within the two assemblages.

Although the expression and heritability of non-metric traits is by no means clear cut, the spatial distribution of skeletons sharing certain traits within the Baptist burial ground does suggests a clustering of two to three family groups.

Table 6 Summary of non-metric traits present in adults (n = 16)

Non-metric traits	Skeletons																Total
	25429	25433	25439	25444	25449	25454	25460	25465	25470	25475	25606	25607	25608	25609	25610	25612	
Metopism			present														1 6.3%
Lambdoid ossicle	1 x L and R		L and R and lambda		1 x L								1 x small L		1 x R	L and R x 1	6 37.5%
Ossicle at asterion		L and R	L		1 x L								R				4 25%
Epipteric bone			L and R														1 6.3%
Parietal notch bone									L				L				2 12.5%
Parietal foramen											L and R		L and R				2 12.5%
Mastoid foramen					L and R							L and R					2 12.5%
Supra-orbital notch/foramen								L and R	L and R			L and R	L and R		R		5 31.3%
Auditory torus					L and R						Slight L and R		Slight L and R				3 18.8%
Anterior ethmoid foramen								L and R			L and R						2 12.5%
Posterior ethmoid foramen								L and R			L and R						2 12.5%
Zygomatic facial foramen															L and R		1 6.3%

Non-metric traits	Skeletons																Total
Highest nuchal line								present							present		2 12.5%
Foramen of Huscke			patent	patent											patent		3 18.8%
Double foramen spinosum								L and R									1 6.3%
Double condylar facet						lobed							L and R			L	3 18.8%
Precondylar tubercle						slight	slight	slight	slight		slight		slight				6 37.5%
Non-metric traits	Skeletons																Total
	25429	25433	25439	25444	25449	25454	25460	25465	25470	25475	25606	25607	25608	25609	25610	25612	
Transverse bridge cervicals								atlas - L side			C5 and C6						2 12.5%
Lateral bridge cervicals					C5-C7												1 6.3%
Posterior bridge cervicals												atlas- L only		Atlas- L and R			2 12.5%
Double facet of atlas						L and R		lobed	L double R lobed		L and R lobed	L and R lobed		L and R lobed			6 37.5%
Supra-scapular notch						L and R			L	L and R							3 18.8%
Acromial facet of scapula						L and R			L and R	L and R	L and R	L		L and R	L		7 43.8%
Sternal aperture		medium															1 6.3%

Non-metric traits	Skeletons																Total
Sixth sacral segment											present						1 6.3%
Accessory facet of pelvis											L and R						1 6.3%
Plaque on femoral head						L	L and R	L and R	L	L		L and R	L and R				7 43.8%
Exostosis of trochanterisc fossa						L and R											1 6.3%
Third trochanter									Small R								1 6.3%
Double talal facet of calcaneus	L and R			L and R	L and R	L	L and R	L and R	L and R lobed			L					8 50%

Burial practices

Spatial distribution and grave orientation

The full extent of the burial ground was not established during excavation but judging from maps of the period, it is unlikely that it extended much beyond the limits of excavation. The graves appeared to have been laid out in three parallel north-south rows of five to seven graves. All the graves were orientated on a west-east axis. However, the orientation of the coffins and skeletons within the graves did not favour the west-east alignment so pervasive in Roman Catholic and Church of England cemeteries. Of the 15 inhumations where burial orientation was recorded, 7 were orientated west-east, whilst 8 were east-west. It would appear that Baptist burials respected the east-west grave.

Table 7 Summary of burial position and coffins (n = 18)

Skeleton No.	Body orientation	Body position	Coffin	Coffin fixing nails	Coffin dimensions	Breast plate	Grip	Grip plate	Upholstery studs
25429	W-E	Supine	wood	x 22, iron	1.75 x 0.5				
25433	E-W	Supine	Wood	Iron	1.7 x 0.45				
25439	W-E	Supine	Wood	Iron					
25444	E-W	Supine	Wood	Iron	1.75 x 0.50		x 2, iron	x 2, iron, corroded	
25449	W-E	Supine	Wood	Iron	2 x 0,66				
25454	W-E	Supine	Wood	Iron	2 x 0.55	iron, corroded	x 1, iron	x 1, iron	
25460	W-E	Supine	Wood	Iron	2 x 0.5	iron, ? CCS 38			
25465	E-W	Supine	Wood	Nil	1.77 x 0.55				
25470	E-W	Supine	Wood	Iron	1.75 x 0.52				
25475	W-E	Supine	Wood	Iron	1.85 x 0.53	iron, ? CCS 38			
25480	W-E	Supine	Wood	Iron	1.08 x 0.36				
25562	Unknown	Coffin not opened	Wood-lead-wood	Iron	1.2 x 0.43	Iron, type unknown	x 6, iron	x 6 iron, corroded	iron, corroded
25606	E-W	Supine	Wood	Iron					
25607	E-W	Supine	Wood						
25608	E-W	Supine	Wood			? iron, corroded			
25609	E-W	Supine	Wood						
25610	E-W	Supine	Wood						
25612	Unknown	Unknown							

alignment found in most Christian burials, but whether the body faced the east or the west appears to have been immaterial to this sect.

Although no grave markers were recovered, the regular spacing and the lack of intercutting of graves indicates that originally grave positions were marked above ground. There is a single case of intercutting of one grave by another: 25583 truncated grave 25584, disturbing the right arm and torso of skeleton 25607. The easternmost row of graves suffered most from later truncation, with graves 25586 and 25587 being cut by later pits. The upper fill of grave 25582, the coffin lid and sides, and skull of skeleton 25606 were truncated by the construction of a hearth (25573), which itself was overlaid by a brick wall. Due to piling activities and indiscriminate earth-moving during the recent development, the easternmost row of graves also suffered considerable truncation and disturbance.

Coffins and coffin fittings

In most Christian denominations in Britain from the late 17th century onwards, it became customary to cover the coffin with upholstery of baize or velvet, and to decorate the lid and side panels of coffins with studs and metal coffin fittings. By 1700-20, the funeral furnishing trade was a firmly established business, providing fittings for all classes of people and at various costs, depending on the status and wealth of the deceased (Litten 1991). The financial investment in funerary panoply grew over the course of the 18th century, reaching its zenith in the 1840s. Even amongst the poor, the importance of providing a decent burial was keenly felt (May 2000). However, for those that could afford it, the coffin itself was just one aspect of the elaborate mourning and funerary practices surrounding the death of a loved one in this period. Funerals of the wealthy frequently involved processions of black draped hearses, black plumed horses, mutes and chief mourners, a complex symbolism surrounding appropriate mourning dress, grand memoria, and of course the heavily decorated coffin itself. Greater simplicity in funerary practice re-asserted itself in the 1840s, when such mourning displays began to be regarded as vulgarly ostentatious and in poor taste.

The Broad Street Baptist burials date broadly to a time when funerary ritual and coffin decoration in Britain were at their peak. However, such outward displays of mourning were conspicuous in their absence from all but one coffin (25562) from the cemetery. This probably reflects the Baptists' theological emphasis on eschewing worldly values and possessions in pursuit of more spiritual goals. It is also in keeping with the largely working class character of the Baptists of this period. With the exception of coffin 25562, all coffins were simple single-break, single-thickness wooden coffins. The species of wood was not investigated, but most coffins of this period were constructed of elm, being valued for its water resistant property (Litten 1991). Coffins were constructed of wooden planks held together by a combination of iron fixing nails and mortice-and-tenon joints. The bases of a number of coffins were constructed of two planks slotted together with such joints, an inexpensive alternative to a coffin base comprising a single wider plank. Coffin 25450 was one such coffin. In addition, the sides of the coffin were joined to the base by mortice-and-tenon joints and fixed in place by iron nails.

Coffin 25562 was the only triple layered coffin found on the site, being composed of an inner wooden coffin encased within an iron shell and overlaid by a wooden outer case. The last was very decayed, and it was impossible to discern the pattern of the iron upholstery studs of the outer case, although fragments of rows of such iron studs were still present. There was no evidence of *departum* plates or lid motifs. An iron grip and grip plate were attached to the head and the foot of the coffin, and two grip and grip plates were in situ on the long sides of this child-sized coffin. Due to the marked corrosion of these fittings, it was impossible to discern any decorative detail. The use of iron rather than the more ubiquitous lead is unusual, and reflects a fairly short-lived tradition of metallic coffins in the 1830-60s (Litten 1991, 85-86).

There were few coffin fittings in the assemblage. Four coffins (25455, 25459, 25474 and 25589) had extant iron breastplates that were too corroded to be legible. Thus, no individualscould be identified by name. The breastplate of coffin 25459 was best preserved, the design appearing to correspond to Type 38 in the Christ Church Spitalfields taxonomy (Reeve and Adams 1993). The breastplate of coffin 25474 was less well preserved but showed similar motifs of a shield surrounded by stylised foliage. The morphology and design of the large iron breastplate of coffin 25455 was obscured by corrosion. Heavily corroded fragments of iron plate that overlay the ribs and pelvis of skeleton 25606 are also likely to be remnants of a breastplate or lid motif..

Iron grips and grip plates were present on three coffins (25443, 25455 and 25562), the fittings of the former two coffins being restricted to fittings on the head and foot ends. All these fittings were too corroded for the style to be discerned.

Shrouds and coffin interiors

Although the wood of a number of the coffins was fair to well preserved, there was no survival of textile of coffin lining or shrouds. Their presence is hinted at by shroud fastenings, such as copper alloy shroud pins associated with skeleton 25470, a cartwheel button found with skeleton 25470 and copper alloy staining on the crania of skeletons 25606 and 25607.

The bases of a number of coffins were overlaid by a layer of decayed sawdust. Bran and sawdust were commonly placed beneath the corpse, and covered by the textile lining of the coffin interior (most commonly of cambric). This sawdust acted in part as a quasi-mattress and also as an absorber of body fluids emanating from the corpse. Interestingly, within two graves (25447 and 25469) a layer of sawdust was discovered below the base of the coffin as well as within it. The base of coffin 25469 also rested upon two transversely laid wooden slats. The two graves were the deepest of the group and at the time of excavation were waterlogged. The excellent preservation of the bases of the coffins suggests that this waterlogged state was of long standing. It seems probable that the presence both of the slats and the sawdust were an attempt to soak up seeping ground water during the funerary rituals at the grave-side.

Grave goods

In keeping with widely held Christian burial tradition, grave goods were non-existent in all but one case. Within the wooden coffin, placed to the right of the skull of skeleton 25460 were two copper alloy coins stacked one on top of the other. The reason for this unusual practice is unclear and presumably it was of personal significance to this woman and/or her mourners.

Conclusion

The Broad Street Baptist skeletal assemblage was extremely well preserved and as a result, many insights could be gained into the demographic profile and general health of this small group. The osteology appears to corroborate with piecemeal documentary evidence that the Baptists were predominantly of working class origins, with many engaging in manual labour and sustaining a high incidence of injuries, such as fractures and degenerative joint disease that, at least in part, was probably activity-related. Overall, the Baptists were of smaller stature than the broadly contemporary middle class Quakers buried nearby. The overall longevity of the Baptist population was also lower than the Quaker group, suggesting poorer general health and living conditions.

Little is known archaeologically of non-Conformist burial practices of the 18th- and 19th-centuries, and to date excavation has been largely restricted to Quaker burials (eg. Bashford and Pollard 1998). The small burial group of Baptists discussed in this report offers fresh insights into the burial traditions of this little understood Non-Conformist sect. In keeping with their doctrines of simplicity and avoidance of worldly display, the coffins of this

assemblage were conspicuous in their simplicity, and are in marked contrast to the contemporary fashion for florid, extravagant coffins and processions so characteristic of late Georgian/early Victorian funerary traditions of the Catholic Church, the Church of England and indeed, other non-Conformists of this period.

Catalogue

In the interests of brevity a number of abbreviations have been used in the text of the catalogue below. These are as follows:

L left	Dental inventory:
R right	X ante-mortem tooth loss
AMTL ante-mortem tooth loss	/ post-mortem tooth loss
DEH dental enamel hypoplasia	C caries
DJD degenerative joint disease	A dental abscess
OA osteoarthritis	k calculus
SDJD spinal degenerative joint disease	R root only
C1-7 cervical vertebra 1 to 5	U unerupted
T1-12 thoracic vertebra 1 to 12	PE partially erupted
L1-5 lumbar vertebra 1 to 5	

Skeleton number: 25429

Completeness: 90%

Preservation: good

Age: 40-50 y

Sex: female

Stature: 156.34 ± 3.55 cm

Dental inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-

Dental pathology : AMTL 12/12, marked alveolar bone resorption; abscess 0/12

Skeletal pathology: fractured L patella, compression fracture to T8; DJD: L and R acetabulae and femoral heads, R glenoid fossa, L and R patellae; marked osteoarthritis: L and R sacro-iliac joints, T4-S1; SDJD: T3-8 fused, kyphosis and scoliosis

Non-metric traits present: L and R lambdoid ossicles; L and R double talar facet of calcaneus

Skeleton number: 25433

Completeness: 95%

Preservation: good

Age: 35-40 y

Sex: male

Stature: 153.61 ± 4.05 cm

Dental inventory:

	k								k			k	k			
									C			C	C			
	8	X	X	X	X	X	X	/	1	/	X	4	5	X	X	X
	X	X	X	5	4	3	X	X	X	X	X	X	X	X	-	-
						C										
				k	k	k										

Dental pathology: caries 4/7; abscess 0/30;AMTL 21/30; DEH 1/5, calculus 7/7, heavy on R side, slight to moderate on L; slight to considerable periodontal disease

Dental intervention: filing of carious crown of R mandibular canine

Skeletal pathology: periostitis L and R tibiae and fibulae; DJD: slight lipping of L and R shoulder and elbow joints and knee joints; SDJD: T7-10 and L4-5: moderate osteophytosis; possible rickets: medio-lateral bowing of L and R tibiae

Non-metric traits present: Patent sternal aperture; L and R metatarsal additional facet on lateral aspect of proximal shaft adjacent to normal carpo-metacarpal joint surface; L and R ossicle at asterion

Skeleton number: 25439

Completeness: 95%

Preservation: excellent

Age: 17-19 y

Sex: male

Stature: 171.45 ± 2.99 cm

Dental inventory:

			k	k					k		k	k	k	k		
	PE															PE
	8	7	6	/	4	3	2	1	1	2	3	4	5	6	7	8
	8	7	6	5	4	3	2	1	1	2	3	/	/	6	/	8
	PE															PE
					k	k	k	k	k	k	k			k		

Dental pathology: caries 0/28; abscesses 0/32; AMTL 0/32; DEH 27/28, slight calculus 15/24; slight peridontal disease R maxilla

Skeletal pathology: Slight congenital kyphosis with wedging of T6-11 and T12-L2, Schmorl's nodes; slightly abnormal curvature to two L and two R mid-thoracic ribs

Non-metric traits present: ossicle at lambda; metopism; L and R lambdoid ossicles; L and R epipteric bone; ossicle at R asterion; patent Foramen of Huschke

Skeleton number: 25444

Completeness: 95%

Preservation: good

Age: 40-50 y

Sex: female

Stature: 161.79 ± 3.72 cm

Dental inventory:

k	k	k			k								k	k	
C														C	
8	7	6	/	/	3	/	/	-	-	-	-	/	6	7	/
8	7	6	5	4	/	2	/	/	2	3	4	5	6	7	8
k	k	k	k	k		k			k		k	k	k	k	k

Dental pathology: caries 2/19; abscess 0/28; AMTL 0/28 flecks to slight calculus 17/18; slight to moderate peridontal disease overall good dental health; DEH 6/19

Skeletal pathology: SDJD: Schmorl's nodes on T10-L5

Non-metric traits present: patent Foramen of Huschke; double talal facet of calcaneus

Skeleton number: 25449

Completeness: 95%

Preservation: excellent

Age: 25-35 y

Sex: male

Stature: 180.94 ± 2.99 cm

Dental inventory:

k		k	k	k	k	k		k	k	k	k		k		
		C												A	
8	7	6	5	4	3	2	/	1	2	3	4	5	6	7	8
8	7	6	/	/	3	2	1	1	2	3	4	/	6	7	8
k	k	k			k	k	k	k	k	k	k			k	k

Dental pathology: AMTL 0/32; abscess 1/32; caries 1/28; slight to moderate calculus 23/28; peridontal disease considerable; DEH 10/28, marked; anterior mandibular crowding , prominent anterior maxillary teeth causing overbite

Skeletal pathology: Tuberculosis: florid rib lesions, lytic lesions of sternum, clavicles, sacrum; Cribra orbitalia Type 3 partly healed

Non-metric traits present: 1 x L lambdoid ossicle; L ossicle at asterion; small L and R auditory torus; patent L and R mastoid foramen; lateral bridge on R side of C5, L side of C7, and L and R sides of C6; double talal facet of L and R calcaneae

Skeleton number 25454

Completeness: near complete (95%)

Preservation: good

Age: 50+ years (older adult)

Sex: male

Stature: 171.13±3.27 cm

Dental inventory:

				A				k C								
/	/	X	X	X	-	/	X	2	/	X	X	X	X	X	X	
X	X	X	5 C k	4 C	/	/	X	/	/	3 C A k	4 C k	5 C k	6 C k	X	X	

Dental pathology: Caries 7/7; abscess 2/31; AMTL 16/31; minor DEH 3/5; calculus 6/6 flecks to medium; considerable peridontal disease

Dental treatment: Distal occlussal surface of R mandibular second premolar filed down (? treatment of caries)

Skeletal pathology: OA: C4, C6-7, T4-T12, L2-4, ankylosis of bodies of T7-8, ankylosis of inferior/superior articulating facets of L3-4; Schmorl's nodes T6, T9 and T12; severe osteophytosis, sub-chondral cysts and marked eburnation of R femoral head and R acetabulum; moderate porosity and osteophytosis L and R medial and lateral articular surfaces of clavicles and L acromial facet; marked eburnation and osteophytosis of R 1st distal finger phalange; lipping and moderate eburnation of pisiform surface of L triquetral; moderate osteophytosis and eburnation/striations of M-P surface of R 1st metatarsal; slight eburnation and osteophytosis of L 1st M-P joint of L 1st metatarsal; DJD: slight lipping of L and R humeri, olecranal and distal radial surfaces of ulnae, tubercles of ribs, L and R first M-C and M-P joints, L femoral head, and M-P surface of L 1st proximal foot phalange; Ossified haematoma: proximal antero-medial R tibial shaft- well healed; Periostitis/osteitis: entire length of lateral R fibular shaft, marked thickening of distal third, partly healed; periostitis: mid-third of L tibial shaft markedly thickened by partly healed new bone growth; non-specific osteomyelitis of L fibula: marked thickening of distal third of shaft, largely healed sinus.

Non-metric traits present: L condylar facet lobed; slight precondylar tubercle present; double facet of atlas; L and R supra-scapular notch and acromial articular facets present; L and R extosis in trochanteric fossa; plaque on L femoral head; L double talal facet of calcaneus

Skeleton number 25460

Completeness: 70-75%

Preservation: fair

Age: 30-35 years (prime adult)

Sex: female

Stature: 163.01±3.55 cm

Dental inventory:

													k C			
-	-	-	-	-	X	X	1	1	X	3	X	X	6	-	-	
X	X	X	5 C k	/	3 C	2 k	/	1 k	2 k	/	4 C k	5 k	/	X	X	

Dental Pathology: Caries 4/11; abscess 0/25; AMTL 10/25; slight to medium calculus 7/11; slight DEH 10/11; slight peridontal disease

Dental treatment: L 1st maxillary molar: marked U-shaped horizontal groove mid-crown exposing underlying dentine -? Groove for ligature attachment for molar block denture

Skeletal pathology: Nil noted

Non-metric traits: L & R plaque on femoral heads; L & R double talal facet of calcaneus; slight precondylar tubercle

Skeleton number: 25465

Completeness: near complete (95%)

Preservation: excellent

Age: 30-35 years (prime adult)

Sex: male

Stature: 167.42±2.99 cm

Dental inventory:

	C	A		R							C		C			
X	7	X	/	4	/	/	/	/	2	3	X	5	X	7	X	
X	7	6	5	4	3	2	1	1	2	3	4	5	X	7	X	
	PE															

Dental Pathology: Caries 3/19; abscesses 1/32; AMTL 8/32; flecks to medium calculus 17/18; slight to moderate peridontal disease; slight DEH 13/18; impacted R second mandibular molar (partially erupted)

Skeletal Pathology: possible rickets: slight medio-lateral bowing of tibial shafts and flaring epiphysises; DJD: slight lipping of L patella articular surfaces, and of olecranon of R ulna; SDJD: slight osteophtosis of bodies of T5-L4, slight to moderate Schmorl's nodes T9-L1 and L3; Lateral displacement of R hallus at M-P and I-P joints with associated osteophytosis of joints-? due to wearing tight or pointed shoes; Osteochondritis dissecans: healed lesion on capitulum of R humerus

Non-metric traits present: highest nuchal line present; slight precondylar tubercle; L & R supra-orbital notch; patent L & R foramen spinosum; patent L & R anterior and posterior ethmoid foramina; lobed L superior articular facet of atlas; L posterior bridge of atlas; plaque on L femoral head

Skeleton number: 25470

Completeness: near complete (95%)

Preservation: excellent

Age: 30-40 years (prime adult)

Sex: female

Stature: 149.53±3.55 cm

Dental inventory:

							k	k		k		k		k	k	
										C		C				
-	-	X	/	X	/	/	1	1	X	3	X	5	X	7	8	
X	X	X	5	4	3	2	/	/	2	3	4	/	X	7	8	
														C	C	
			k	k	k	k			k	k	k			k	k	

Dental Pathology : Caries 4/15; abscess 0/30; AMTL 9/30, marked resorption of alveolar bone of molar region of R mandible; slight to heavy calculus 15/15; slight to considerable peridontal disease; slight DEH 8/12; dental crowding of central maxillary incisors, distal rotation of crown of R mandibular 1st premolar

Skeletal pathology: Respiratory infection: active woven bone on visceral surface of one L mid-thoracic rib shaft fragment; SDJD: very minor osteophytosis of bodies of C1, T3-T9 and L4, and of inferior/superior articular facets of T11-L5; slight Schmorl's node on T11

Non-metric traits present: L and R supra-orbital notch; slight precondylar tubercle; L parietal notch bone; L supra-scapular notch; L and R acromial facets; L double and R lobed superior articular facet of atlas;

Skeleton number: 25475

Completeness: near complete (95%)

Preservation: good

Age: 4-45 years

Sex: male

Stature: 169.5±2.99 cm

Dental inventory:

k	k	k	k	k	k	k	k		k	k	k	k	k	k	k
C	C													C	CC
8	7	6	5	4	3	2	1	/	2	3	4	5	6	7	8
X	X	X	5	4	3	2	1	1	2	3	4	5	X	X	X
			C								C	R			
			k	k	k	k	k	k	k	k	k				

Dental Pathology: Caries 7/24; abscess 0/32; AMTL 6/32; flecks to moderate calculus 24/24; DEH 8/13; R maxillary pipe notch

Skeletal pathology: Rib fractures: marked thickening of midshaft of 4 L ribs, callous largely healed; L distal L fibular shaft: well healed and well aligned ? oblique fracture; L 1st distal foot phalange: gross malalignment of phalange, displaced laterally- ? due to tight shoes, or crush injury; OA: L and R humeral heads: slight lipping of condyles, slight eburnation on L head; DJD: Slight lipping of articular surfaces of L and R distal epicondyles, L and R olecranon, L and R distal and proximal surfaces of tibiae, patellae, 1st cuneiform surface of L navicular, and L and R 1st and 2nd cuneiforms; moderate lipping of talar and navicular surfaces of L calcaneus, calcaneal and cuneiform surfaces of L navicular; R 1st metacarpal: bony spur on lateral aspect of distal shaft

Non-metric traits present: L and R acromial articular facets; plaque to L femoral head; small R third trochanter of femur; L and R talal articular facet of calcaneus lobed

Skeleton number: 25480

Completeness: near complete (95%)

Preservation: excellent

Age: 5-6 years (older child)

Sex: unknown

Dental inventory: Deciduous dentition

		CC							?C		
	e	d	/	-	-	-	-	-	d	e	
	e	d	c	b	a	a	b	c	d	e	
		C									

Permanent dentiton

PE	U			U	U	U	U	U	U	PE	
6	5			1	1	2	3	4	5	6	
6	5			1	1			4		6	7
PE	U			U	U			U		PE	U

Dental Pathology: caries 4/13 (deciduous teeth); DEH 0/13 (permanent teeth). All permanent teeth not yet erupted

Skeletal pathology: Diaphyseal bone lengths show severe stunting (aged to 3.5 years)

Skeleton number: 25606

Completeness: 80-85%

Preservation: excellent

Age: 40-50 years (mature to older adult)

Sex: female

Stature: 153.9±3.72 cm

Dental inventory:

		k	k	k	k		k		k	k			k	k	
	PE				C										PE
	8 /	6	5	4	3	2	1	/	2	3	/	/	6	7	8
8	7	6	5	4	3	2	/	/	2	3	4	5	X	7	8
	C								C			C		C	
									A						
k	k	k	k	k	k	k			k	k	k			k	k

Dental Pathology: Caries 4/25; abscess 1/32; AMTL 1/32; flecks to medium calculus 21/23 ; slight peridontal disease; DEH 12/24 (marked on anterior dentition); severe crowding of maxillary and mandibular anterior dentition

Skeletal pathology: ***Cribra orbitalia*** type 2 (healed); **Chronic respiratory infection**: 6 R rib shafts have largely healed new bone growth on visceral surfaces, in one lesion is active; **DJD**: R acromial process of scapula: moderate osteophytosis and slight osteophytosis; **OA**: Sacro-iliac joints show marked osteophytosis and macroporosity (more severe on R) and accessory facets; Compression fracture of L1 and L5 (wedging of bodies) with marked eburnation, osteophytosis and porosity of inferior articular facet of L5; slight porosity and osteophytosis on bodies of T10-L5; **Osteoporosis** of vertebrae L1 and L5

Non-metric traits present: patent L and R parietal foramina; very slight L and R auditory tori; precondylar tubercle; L and R supra-orbital notch; patent L and R anterior and posterior ethmoid foramina; slight mandibular torus; L and R acromial facets; L and R superior articular facets of atlas lobed; C5: R transverse foramen bipartite; C6: L and R transverse foramina lobed; sixth segment of sacrum (% lumbar vertebrae present); L and R accessory facets to pelvi and sacrum

Skeleton number 25607

Completeness: 70-75% complete

Preservation: good

Age: 40+ years

Sex: male

Stature: 161.85±3.27 cm

Dental inventory:

	k	k	k	k	k		k	k	k		k	k			
		A													
-	7	6	5	4	3	2	1	1	2	3	4	5	/	-	-
-	/	X	X	4	3	2	1	1	2	3	4	5	X	7	-
				k	k	k	k	k	k	k		k		k	

Dental Pathology: AMTL 3/27; abscess 1/27; caries 0/22; DEH 14/22; slight calculus 19/22; slight to medium peridontal disease; possible agenesis of 3rd molars

Skeletal pathology: **DJD**: slight lipping olecranon surface of L ulna; Lscapula: moderate pitting of acromial process; slight to moderate lipping of L glenoid fossa; L distal clavicle: porosity; slight lipping of distal R humerus; L and R ribs: slight to moderate osteophytosis of tubercles; L 1st rib sternal articular surface: extensive osteophytosis and rugosity; 3 mm thick lipping of R acetabulum, and new bone growth in centre of joint surface; L auricualr surface of pelvis: pronounced bony rim and marked granular surface- sacro-iliac joint in process of fusing; **SDJD**: C5-T1 bodies: slight to moderate osteophytosis moderate porosity on C5-C7.

Non-metric traits present: L and R supra-orbital notches; patent R mastoid foramen; L acromial facet; L and R lobed superior articular facets of atlas; L posterior bridge of atlas; plaque on L and R femoral heads

Skeleton number 25608

Completeness: 80-90%

Preservation: good

Age: 40-45 years

Sex: male

Stature: 170.41± 3.27 cm

Dental inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
X	X	6	5	/	3	2	1	1	/	3	4	5	6	X	X	
												C	C C			
		k	k		k	k	k	k		k	k	k	k			

Dental Pathology: AMTL 4/16; abscess 0/16; caries 3/10; calculus 10/10 (marked on lingual surface; considerable peridontal disease; DEH 6/10, marked

Skeletal pathology: L and R eye sockets: ***Cribra orbitalia*** type 2 well healed; **severe dislocation** of tibial plateau of L tibia, such that medial condyle displaced antero-distally and medial condyle is angled inferiorly at 45° to normal horizontal plane. Corresponding changes on condyles of L femur to accommodate medial shift; Periostitis: well healed new bone growth on medial aspect of proximal half of proximal tibial shaft; **DJD**: slight to moderate lipping of ulnar articulating surface of R scaphoid; **SDJD**: moderate osteophytosis and porosity on bodies of C5 and C7, eburnation on C7; moderate to severe osteophytosis of superior and inferior articular facets of L4-S1

Non-metric traits present: Carabelli cusps on 1st molars; small L lambdoid ossicle; L parietal notch bone; R ossicle at asterion; L and R parietal foramina; slight L and R auditory torii; L and R supra-orbital foramina; L and R double condylar facets; small precondylar tubercle; plaque to L and R femoral heads; double talal facet to L calcaneus

Skeleton number 25609

Completeness: 70-75% (lower legs and feet missing); uncertain if skull of older woman is skull of this skeleton)

Preservation: excellent

Age: 45-49 years

Sex: female

Stature: 158.8±4.45 cm

Dental inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
X	X	X	5	X	X	X	1	X	X	X	X	X	X	X	X	
			R				R									

Dental Pathology: AMTL 14/16; abscess 0/16; marked resoption of alveolar bone

Dental treatment: root of one tooth filed smooth (? dental treatment)

Skeletal pathology: **OA**: L femoral head showing extensive osteophytosis around and upon the articular surface, marked porosity and sub-chondral cysts, severe eburnation; R femoral head: moderate osteophytosis around and upon articular surface, tiny areas of eburnation; L acetabulum: extensive osteophytosis around joint surface, effectively deepening socket by 1.2 cm; macroporosity; marked eburnation on half of joint surface. L and R patellae: marked osteophytosis and slight eburnation of lateral articular surfaces; eburnation more severe on R with scoring in infero-superior plane; L 3rd metacarpal distal joint surface and proximal articular surface, marked osteophytosis and small areas of eburnation; **DJD**: L femur: slight to moderate lipping of anterior aspect of distal articular surface; L humeral head: slight lipping; L olecranon: slight lipping of joint surface; one proximal and one distal finger phalange: slight osteophytosis of proximal joint surface; L and R 1st metacarpals: slight to moderate osteophytosis of diatal and proximal joint surfaces; distal 1st finger phalange: moderate osteophytosis; **Osteoporosis**: L femoral head very light in weight and porous; R acetabulum: slight to moderate lipping of joint surface; **Fractures:** R acromium process: complete transverse fracture and arthrodesis of process midway along length, marked thickening of process with mixture of healed and active new bone; L4 and L5 bodies: marked posterior wedging of bodies (compression fractures), slight porosity and osteophytosis of bodies, and severe osteophytosis and moderate eburnation of L and R superior and inferior articular facets (more marked on R); moderate osteophytosis and eburnation of R superior articular facets of T1-T2, and inferior facets of T3-5 (more marked on R).

Non-metric traits present: R superior articular facet of atlas lobed; incomplete L and R posterior bridge of atlas; possible L and R emarginate patellae; L and R acromial articular facets

Skeleton number 25610

Completeness: 60-65% (lower legs, feet and hands missing)

Preservation: excellent

Age: 40-45 years

Sex: female

Stature: 159.8±3.72 cm

Dental inventory:

												k				
-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Dental Pathology: Caries 0/1; abscess 0/16; AMTL 16/16; calculus 0/1; DEH two marked lines 1/1

Skeletal pathology: **Button osteoma**: one on L and R parietal bones; **SDJD/ OA**: slight to moderate osteophytosis of bodies of C3-5, T4-5, T9; slight osteophytosis in T9 and T12, moderate porosity in T5 and T11; moderate to marked porosity and osteophytosis in bodies of L1-4 with slight eburnation in L2 and 3; moderate to severe porosity and osteophytosis of superior and inferior articular facets of L4-5; considerable osteophytosis, eburnation and porosity of vertebral articular surfaces of S1; DJD/ OA: moderate osteophytosis and porosity of distal clavicular joint surface; L and R ribs: slight to moderate osteophytosis around tubercles.

Non-metric traits present: highest nuchal line; one R lambdoid ossicle; L and R zygomatic facial foramina; L patent Foramen of Huschke; R supra-orbital notch; L acromial articular facet present

Skeleton number 25612

Completeness: 30-40 % (no lower legs or feet present)

Preservation: good

Age: 40-50 years

Sex: possible female

Stature: 150.5±4.45cm

Dental inventory:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
X	X	X	X	X	/	X	X	X	X	X	X	X	X	X	X	

Dental Pathology: AMTL 0/15; abscess 0/16

Skeletal pathology: **Birth trauma**: L symphysis pubis: one parturition scar; **DJD**: R glenoid fossa: slight to moderate lipping; marked porosity of R temporal-mandibular joint

Non-metric traits present: L and R lambdoid ossicles x 1; L condylar facet double

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APPENDIX 11: ANIMAL BONE

by Emma-Jayne Evans

Introduction

This report encompasses animal bones recovered from four areas of excavation site at the Vancouver Centre, King's Lynn. A total of 1769 (36475 g) fragments of bone and teeth were excavated from Medieval and post Medieval features, all of which have been analysed for this assessment, and the re-fitting of broken fragments has reduced the total fragment count to 1487.

Methodology

Identification of the bone was undertaken at Oxford Archaeology with access to the reference collection and published guides. All the animal remains were counted and weighed, and where possible identified to species, element, side and zone (Serjeantson 1996). Also, fusion data, butchery marks, gnawing, burning and pathological changes were noted when present. Ribs and vertebrae were only recorded to species when they were substantially complete and could accurately be identified, or were from an identifiable articulated skeleton in which there could be no doubt as to their species. Undiagnostic bones were recorded as small (small mammal size), medium (sheep size) or large (cattle size). The separation of sheep and goat bones was undertaken using the criteria of Boessneck (1969) and Prummel and Frisch (1986), in addition to the use of the reference material housed at OA. Where distinctions could not be made, the bone was recorded as sheep/goat (s/g).

The condition of the bone was graded using the criteria stipulated by Lyman (1996), grade 0 being the best preserved bone and grade 5 indicating that the bone had suffered such structural and attritional damage as to make it unrecognisable.

The quantification of species was carried out using the total fragment count, in which the total number of fragments of bone and teeth was calculated, and this figure broken down to the total number of fragments identifiable to each species.

Tooth eruption and wear stages were measured using a combination of Halstead (1985) and Grant (1982), and fusion data was analysed according to Silver (1969). Measurements of adult, that is, fully fused bones were taken according to the methods of von den Driesch (1976), with asterisked (*) measurements indicating bones that were reconstructed or had slight abrasion of the surface.

Results

The animal bone from this excavation has survived in very good condition, with the majority scoring 1 or 2 according to Lyman's grading, as shown in Table 1 below.

Table 1. Condition of animal bone from Kings Lynn

	Condition		
Site	1	2	3
37719	61.1%	37.3%	1.6%
37720	50.7%	48.9%	0.4%
37721	20.0%	78.0%	2.0%

37722	60.2%	39.2%	0.6%

The good condition of the animal bones has resulted in 45.8% of the bones being identified to species, with a full list of the species present shown in Tables 2 and 3 below.

Table 2. Animals identified to species

Site	Cattle	Sheep/ goat	Goat	Sheep	Pig	Cat	Dog	Horse	Rabbit	Hare	Unid	Total
37719	69	62	1		19	2	16	8	5	1	293	476
37720	116	66	1	15	13	7	8		1		271	498
37721	17	13		1	4						62	97
37722	28	35	57	1	11	16	1				180	329
Total	230	176	59	17	47	25	25	8	6	1	806	1400

Table3. Birds identified to species

Site	Domestic fowl	Goose	Duck	Swan	Bird	Total
37719	12	13	2	1	8	36
37720	1	7	1		6	15
37721	1				2	3
37722	15	7			11	33
Total	29	27	3	1	27	87

The good condition of the bone has allowed for surface modifications and pathologies to be noted on a number of bones from all sites, and many of the post-cranial elements and mandibles could be measured and aged, as shown in Table 4 below.

Site	Butchery marks	Measured	Tooth wear	Gnawing marks	Pathologies	Burning
37719	69	67	14	5	5	-
37720	67	62	14	7	-	-
37721	10	6	2	2	-	-
37722	81	39	8	2	1	1
Total	227	174	38	16	6	1

The bones assemblages from all the sites at Kings Lynn, although small, have the potential to reveal information regarding the use of animals during the medieval and post-medieval periods. Age at death may determine animal husbandry techniques, and disposal methods can also be considered. Areas of industrial activity may also be discussed, particularly with regards the large number of goat horn cores recovered from a distinct area of horn working in context 3085 (site 37722). It would be worthwhile looking at the distribution of the remaining bone to determine if there are any other areas of industrial activity or butchery waste dumps.

It is recommended that a further two days be given to analysing the sieved remains from Kings Lynn, which may contain more bird small mammal and fish bones. A further four days would be required to write the report, bringing the total to six days. If fish bones are recovered, these must be analysed by a fish bone specialist, along with the fish bones already recovered from the hand collected material. The time for this work must be allocated by the fish specialist that will do the work.

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APPENDIX 12: CHARRED AND WATERLOGGED PLANT REMAINS

By Elizabeth Huckerby and Sandra Bonsall

Introduction

Oxford Archaeology carried out a programme of work comprising archaeological evaluation, strip and map, excavation and watching brief during the demolition and redevelopement of the Vancouver Centre, Kings Lynn during the period of February 2003 and March 2005. During this work bulk samples were taken from different feature types and periods for environmental assessment and analysis and of these 10 have been assessed for charred plant remains (CPR) and 11 for waterlogged plant remains (WPR) at Oxford Archaeology North.

Quantification

Ten samples were selected for the assessment of CPR and eleven for WPR. See table 1 for details of feature types and site codes.

Site code	Feature type	Number of samples	Type of plant remains
37719	Hearth	1	CPR
37719	Channel fill	4	CPR
37722	Layer	3	CPR
37722	Hearth	1	CPR
37722	Unknown	1	CPR
37719	Channel fill	1	WPR
37719	Layer	3	WPR
37720	Soil accumulation	2	WPR
37722	Layer	1	WPR
37722	Pit	2	WPR
37722	Fish trap	2	WPR

Table 1 showing feature type and number of environmental samples assessed for plant remains at Vancouver Centre, Kings Lynn, Norfolk

Methodology

The samples selected for the assessment of CPR were between 10 and 40 litres in volume. They were processed using a modified Siraf flotation machine, the flots were collected onto a 250µm mesh, air-dried and examined under a binocular microscope. The presence of any cereal grains, cereal chaff, weed seeds and molluscs was quantified, plus other material such as coal and clinker was noted. The presence of modern contaminants such as roots insect eggs and modern seeds was also noted. The results are shown in Table 2, which also summarizes the potential for further analysis of each sample. The remains are quantified on a scale of 1-4 where: 1 is rare (up to 5 items); 2 is frequent (5-25); 3 is common (25-100) and 4 is abundant (>100).

Waterlogged plant remains

One litre subsamples from each of the eleven samples, selected for the assessment of waterlogged plant remains, were hand flotted and the flots collected on a 250 micron mesh and retained in water. The presence of plant remains, insects, molluscs, bone and other material such as coal was recorded as present (+) or abundant (++). The results are shown in Table 3.

Plant nomenclature of both WPR and CPR follows Stace (1991)

Results and discussion

Charred plant remains see Table 2

37719KYL CPR

Five samples were selected for the assessment of CPR from 37719KYL. Four samples were from the sequence of fills of linear feature, ***25158,*** thought to be a channel to the Webster Row (Broad Street) Fleet dating to the fifteenth to sixteenth centuries and related to the management of the water systems. Charcoal was abundant in the samples but only low numbers of charred cereal grains and weed seeds were recorded. However WPR were quite abundant and included grape (*Vitis*), elderberry (*Sambucus*), and blackberry (*Rubus*) pips and hazel (*Corylus*) nut shell. Arable weeds were also well represented. This plant assemblage suggests that some human excrement may have been incorporated in the fills of this channel and further analysis will inform about the dietary habits of the residents in the fifteenth to sixteenth centuries.

A sample (25014) from a hearth fill (***25395***) contained large numbers of bread wheat (*Triticum aestivum*) grains and some seeds from possible cultivated legumes together with fish bone.

37722KYL.

Five samples from this site were assessed for CPR and charcoal was recorded in all but sample 30005, from layer ***30252***. Fish bone was noted in all five samples. Occasional cereal grains were noted but they were not abundant.

In one sample, that from a layer ***30252***, although only a few CPR were identified in it WPR were frequent and included arable weeds for example corn cockle (*Agrostemma githago*), corn marigold (*Chrysanthemum segetum*), cornflower (*Centaurea cyanus*) and small nettle (*Urtica urens*). There was also evidence of economic plants including straw and hemp (*Cannabis*) and native food plants for example hazel. This assemblage of plant remains suggests that this layer may have been built up from cultivation debris.

The flot of sample (30004) from the 13th-century layer (***30191***) contained large numbers of vitreous like globules, which are usually thought to have originated from a smithy, and confirms that the deposit is either related to industrial activity or accumulated as the result of the disposal of industrial debris.

Waterlogged plant remains see Table 3.

All samples selected for the assessment of WPR contained some waterlogged plant remains although they were not abundant in the two samples from 37720KYL and sample 205 from layer ***70015*** from 37719KYL. In addition to WPR charred oats and bread wheat grains were recorded in layer **212**, a humic medieval soil accumulation from 37720KYL.

37719KYL

The three samples from this site all contained quite abundant WPR and in one (sample 25001) from the linear feature, ***25158,*** coriander (*Coriandrum*) and culm nodes were recorded. The assemblage of weed seeds included some arable weeds, plants of wet ground, which were more abundant in layer ***25325***, and other plants which occur in a broad range of ecological habitats. Wood fragments were abundant and insects were frequent in two samples (context ***25166*** and ***25388***). The assemblage of plant remains from these samples has the potential to inform about the economy and ecology of the site.

37720KYL.

Three samples from this site were rich in WPR. They were the sample from a thirteenth century alluvial layer (***30280***), the fill (context ***30450***) a sixteenth century wooden barrel thought to have been used as a cess pit and the fill (context ***30678***) of a possible fish trap. Insect remains were very frequent in the three samples mentioned above together with wood fragments. Some moss fragments were also recorded. Seeds recorded included arable weeds for example members of the cabbage family (*Brassica*), corn cockle, corn chamomile (*Anthemis cotula*), and wild radish (*Raphanus raphinistrum*), grassland plants including hairy buttercup (*Ranunculus sarduous*) and common sorrel (*Rumex acetosa*), some plants of wet ground and others from broad ecological groupings. It is interesting to note that a seed of parsley water-dropwort (*Oenanthe lachenalli*), a plant found growing today in ditches, marshes and dykes mostly near the coast or in brackish water, was recorded in fill **30678**, from the possible fish trap. The assemblage of plant remains from these samples has the potential to inform about the economy and ecology of the site.

Recommendations for further analysis See Table 4

Charred plant remains

It is recommended that two samples should be analysed for CPR the first from the fill (***25395***) of a hearth from 37719KYL and the second from the humic medieval soil accumulation (context ***212***). These samples have the potential to inform about the economy of the site and possible dietary habits of the population.

Waterlogged plant remains

It is recommended that six samples should be analysed for WPR. These include three from 37719KYL and three from 37722KYL. It is also recommended that the WPR from the five samples from the sequence of fills of the linear feature **25158** and a layer **30252,** which were originally processed for CPR should be analysed for WPR and mineralised remains as they have the potential to inform about the use of the feature and possible dietary needs of the residents from this part of the study area in fifteenth to sixteenth centuries.

Insect remains

It is recommended that five samples, which contained abundant insect remains should be assessed and possibly analysed for insect remains if recommended by the appropriate specialist.

Site code	Context	Sample number	Type of remains
37719KYL	25395	25014	CPR
37720KYL	212	107	CPR
37719KYL	25160	25004	WPR and MPR
37719KYL	25165	25006	WPR
37719KYL	25165	25011	WPR
37719KYL	25164	25012	WPR
37719KYL	25166	25001	WPR
37719KYL	25388	25016	WPR
37719KYL	25325	25015	WPR
37722KYL	30450	30010	WPR
37722KYL	30678	30011	WPR
37722KYL	30252	30005	WPR
37722KYL	30280	30003	WPR
37719KYL	25166	25001	Insects
37719KYL	25388	25016	Insects
37722KYL	30450	30008	Insects
37722KYL	30678	30010	Insects
37722KYL	30280	30003	Insects

Table 4 samples recommended for further analysis of charred and waterlogged remains and the assessment and possible analysis of insect remains from Vancouver Centre, Kings Lynn, Norfolk. CPR = charred plant remains, WPR = waterlogged plant remains and MPR = mineralised plant remains.

Costings

Charred plant remains

Processing of additional material from context ***212*** 0.25 day OA technician.

Analysis of 2 CPR samples

2 days of Senior Environmental Specialist (Elizabeth Huckerby)

Waterlogged plant remains

Analysis of 11 WPR samples, this includes 5 samples originally processed for CPR

9 days of Senior Environmental Specialist (Elizabeth Huckerby or Dana Challinor)

Insect remains

Assessment and analysis, if recommended, of 5 samples for insect remains.

Table 2 assessment of charred plant remains from Vancouver Centre, Kings Lynn, Norfolk. Plant remains scored on a scale of 1-4 where 1 is rare (1-5 items) and 4 is abundant (more than 100 items)Key CPR = charred plant remains. WPR = waterlogged plant remains.

Site code	Sample	Context	Feature	Sample vol (litres)	Plot description	Plant remains	Potential
37719	25014	25395	Hearth	20	1000ml. Coal (4), Burnt fuel (coal) (4), Charred fish bone Fish bone.	CPR Cereal (4) Triticum (including bread wheat), weeds, (2) legumes, WPR weeds (1) including Sambucus nigra, Rumex acetosa	High
37719	25004	25160	Channel	20	Small, Wood (4), Charcoal (4)	WPR seeds (4), including Rubus fructicosus, Cyperaceae, Stellaria. graminea, Raphanus pod, Ranunculus repens-type, Persicaria lapathifolia, Chrysanthemum segetum, Chenopodium album, Corylus avellana, Ranunculus arvensis, Vitis and Lychnis.	High for WPR
37719	25006	25165	Channel	20	Small, Charcoal (4).	CPR weed seeds (2), including Rumex acetosa, Ranunculus repens-type, WPR seeds (4), including Rubus fructicosus, Chenopodium album, Cyperaceae, Ranunculus sarduous, Brassica and Vitis.	High for WPR
37719	25011	25165	Channel	20	50ml. Charcoal (4).	CPR weeds (2), including small grasses, Stellaria media and Plantago lanceolata, WPR seeds (3) including Juncus, Chenopodium album, Eleocharis, Vitis, and Hyocyamus, and Solanum sp.	High for WPR
37719	25012	25164	Fill of a channel	20	100ml. Charcoal (4), Sand (4), mollusc fragments (4) Fish bone (1).	CPR cereals (1) including Triticum (bread wheat), weeds (2) including Brassica and small grasses, avellana, WPR weeds (4), including Sambucus nigra, Resida luteola, Rumex acetosella, Chenopodium album, Rubus fructicosus, Corylus and Alisma plantago aquatica	High for WPR
37722	30005	30252	Layer	40	100ml. Charcoal (4), and insects	CPR Cereal (1), weeds (1) including Prunella, WPR weeds (3) including Persicaria lapathifolia, Rumex acetosella, Ranunculus repens-type, Chrysanthemum segetum, Polygonum aviculare, Persicaria maculosa, Corylus avellana, Stellaria. media, Urtica urens, Prunella, Cannabis sativia, Agrostemma, Centaurea cyanus, and straw	High for WPR
37722	30001	30346	Hearth	20	50ml. Charcoal (4), Fish bone (1), Sand (4) molluscs (4)	CPR Cereal (1) Triticum (bread wheat), weeds (1) including Bromus	None
37722	30009	30585	Layer	10	50ml. Charcoal (4), Fish bone (1), Sand inc. shells (4), Wood (2)	CPR cereals (1), weeds (2) including Bromus and small grasses, WPR weeds (2) including Cyperaceae, Chenopodium, and Stellaria graminea	None
37722	30004	30191	Layer	40	550ml. Charcoal (4), Fish bone (1), Sand, molluscs (3) and industrial globules from smithy working (4).	CPR Cereal (1), weeds (1) including Cyperaceae, WPR weeds (2) including Urtica urens, Rubus fructicosus, and Rumex acetosella	None
37722	30002	30291	Unknown	20	50ml. Charcoal (1), Fish bone (1), Sand (4) and molluscs.	CPR Cereal (1), weeds including Ranunculus repens-type WPR (1), Culm nodes	none

APPENDIX 13: POLLEN

by Ralf Fyfe

Project background

Location

Two monolith samples (sample numbers <25002>, <25003>) were recovered from a 15th-16th century linear feature (25158/25258) interpreted as a possible channel connected to the Webstar Row (Broad Street) fleet, during the excavation of Trench 21, Area C, Vancouver Centre, Kings Lynn.

Objectives

The objective of the project was to carry out an assessment of pollen within the monolith samples, paying attention to the abundance of pollen within the monolith samples, the preservation condition of the pollen, and recommendations for further analysis on the existing samples.

Archive

Samples prepared for pollen assessment have been retained within the Department of Geography at the University of Exeter. The monolith samples are returned to Oxford Archaeology

Methodology

Six 1 cm^3 sub-samples were taken from the monoliths to assess the condition and abundance throughout the full depth of the feature. The monolith samples covered three separate contexts (25166, 25165, 25164); the sub-sampling was undertaken such that each context was represented in at least one assessed samples (Table 1).

Table 1. Depths of samples assessed for pollen

Monolith sample number	Depth of sub-sample for assessment*	Context number for sample
25002	54-55	25166
	38-39	25165
	22-23	25165
	06-07	25164
25003	26-27	25164
	2-3	25164

*depths are given from top of each monolith sample.

Samples for pollen assessment were prepared using standard procedures (see Moore *et al.*, 1991). An exotic marker was added to facilitate calculation of pollen abundance (Stockmarr, 1971). Samples were screened through sieves, to retain the 10-106 micron fraction. Silicates were digested using hydroflouric acid, and non-pollen organics using an acetolysis digestion. The remaining material was mounted in silicon oil for assessment.

100 pollen grains were assessed from each level. Grains were identified using the keys in Moore *et al.* (1991) and Andrew (1981), and the Exeter University reference collection. The number of grains assessed for each level is too low for statistically significant pollen percentages to be calculated; pollen taxa recorded as presented as presence data. Condition of grains was assessed following the guidelines in Cushing (1967) and percentages of grains crumpled/broken/corroded was calculated.

Results

The results of assessment are given in Table 2. Pollen data is given as taxa recorded during the assessment of each sample, the percentage of damaged grains is shown at the foot of Table 2, along with the pollen concentration in each sub-sample assessed.

Table 2: Pollen taxa, condition and concentration from assessed samples, Kings Lynn.

Monolith:	25002				25003	
Depth:	54-55	38-39	22-23	6-7	26-27	2-3
Context:	25166	25165	25165	25164	25164	25164
TREES						
Alnus		+	+	+	+	
Betula		+		+		
Corylus		+	+	+	+	+
Pinus		+	+	+	+	+
Prunus type			+			
Quercus		+	+	+	+	
Salix					+	
SHRUBS						
Ericaceae undiff.			+	+	+	
Calluna vulgaris		+	+	+	+	+
GRASSES and SEDGES						
Poaceae <35 µm	+	+	+	+	+	+
Hordeum type	+	+	+	+	+	+
Avena/Triticum type	+	+		+	+	+
Cyperaceae			+	+		+
HERBS						
Apiaceae		+	+	+	+	+
Asteraceae	+	+	+		+	
Brassicaceae	+	+	+	+	+	+
Carduceae						+

Caryophyllaceae		+				
Centaurea nigra		+		+	+	+
Centaurea cyanus		+	+		+	+
Chenopodiaceae			+	+	+	+
Crassula type		+				
Lactuceae		+	+	+	+	+
Plantago lanceolata		+	+			+
Rosaceae undiff.			+		+	
SPORES						
Polypodium			+	+	+	+
Pterdium			+	+		+
Pteropsida (monolete) undiff.		+	+	+	+	+
Sphagnum		+	+	+	+	+
% Unidentified	1	3	8	4	4	4
CONDITION						
% CRUMPLED	31	19	15	10	6	5
% BROKEN	-	3	7	-	-	1
% CORRODED	-	-	3	-	-	2
POLLEN CONC (grains cm^{-3})	100610	14375	8673	8347	9466	6230

Potential

Pollen is present in all six samples assessed from monolith samples <25002> and <25003>. Pollen concentration is highest in the lowest context of the feature (presumed to represent the primary fill of the feature), and significantly lower in the upper fills. The range of pollen taxa represented in the assessed samples also varies: the primary fill of the feature has the most limited range of taxa; the range of pollen taxa is significantly greater in the upper fills. This suggests that the primary fill represents pollen sourced from close to the feature, but later fills probably represent pollen from wider sources with possible mixing of different ecological communities.

The condition of the pollen within the assessed samples is good, with only a low number of grains rendered unidentifiable. The majority of crumpled grains are still identifiable, and the limited evidence of mechanical (broken grains) or biochemical (corroded grains) damage suggests that the pollen is all contemporary (with little or no reworking of older material), and that the deposit has not been subjected to any period of desiccation.

Recommendations

The variation in pollen taxa between contexts may reflect changes in water management, in particular the source of water (e.g. fresh vs. brackish, or a change from standing water to flowing water). Full analysis of the assessed samples will allow this aspect of water management to be explored through variation in pollen sources reflected by the range of pollen taxa represented; the pollen will also indicate the character of environments around the feature. Other environmental proxies (e.g. diatoms or foraminifera) may be more suitable to explore issues of water sources and the nature of any water within the feature.

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APPENDIX 14: WATERLOGGED WOOD

By S J Allen

Objectives

This report aims to meet the requirements of MAP2, Phase 3, Assessment of Potential for Analysis, (English Heritage, 1991). The work carried out has been the cleaning and examination of the finds submitted. This report is an identification of the finds where possible and an assessment of their condition. An evaluation of the potential of each group of material for further investigation is included, with recommendations for long term stabilisation. No analysis of the assemblage or the artefacts have yet been undertaken and any conclusions at this stage are provisional.

Procedures

The objects were delivered to the Wet Wood Laboratory wet packed. Most pieces had been double bagged, either in two black plastic bin liners secured with drafting tape or in self seal plastic bags. Some objects had been wrapped in transparent food wrap or 'cling film'. A small minority had been left in open plastic bags secured with plastic coated wire ties. Some of the larger timbers and those in the bags secured with wire ties had pierced or torn liners resulting in some drying and desiccation of the contents.

'Cling film' and similar wrapping material is unsuitable for wrapping waterlogged finds as it is a porous medium and allows moisture to evaporate over time. It must be noted that all pieces wrapped in this way had dried or dessicated surfaces, which may have resulted in the loss of any information originally present. Had these pieces been left in long term storage, they would have disintegrated.

Each object was in turn removed from its packaging, washed under cold running water to remove adhering burial deposits and returned to its packaging after examination and species identification. Some of the recommended pieces below have been temporarily rewrapped and the pieces whose packaging was inadequate have also been temporarily repacked to avoid further damage. The limited budget for this phase of the work did not allow for such work and it is only because of the importance of some of these pieces that this repackaging was done.

Much of the wood had adhering burial deposits on their surfaces which required cleaning before they could be assessed. In some cases, more than one piece of wood had been wrapped in the same bag with the same context number and consequently, there were many more pieces to be examined than the basic list of material sent would suggest.

Condition:

Overall the wood was in a generally fair state of preservation. Waterlogged anoxic conditions were maintained in all contexts in which the material survived up to the time of excavation.

Many pieces had suffered from severe abrasion or erosion, obscuring or removing surface information which would once have been there. The absence of woodworm damage suggests that this material was deposited directly into waterlogged contexts but was not immediately buried.

Listing and Recommendations:

The recorded data has been placed in a Microsoft Access database which includes the currently recorded information from the artefacts and their labels. No additional information from the site records has been added. It is therefore a provisional statement for assessment purposes only. All species identifications follow Schweingruber (1982).

Several pieces in the assemblage are samples taken for dendrochronology. Some of these are suitable for dating, others are borderline cases which may not have enough rings to allow them to be dated. However there is nothing to preclude their submission for dating and the potential information would be of great value. There is a small fraction of roundwood present but the number of pieces is so small that any tree ring studies would be of no value.

The degree of abrasion/erosion or drying present on most of the artefacts precludes any studies of toolmarks and woodworking technology.

Some further recording is required as there are some very important pieces here. The pegged board (site 37721, context 106007) and the pile cut from reused timber (site 37722, context 30315) are recommended for record drawing. Both Bale pins (site 37719, contexts 813 and 862) have dried out in storage and the resulting damage is not reversible. Both should be repackaged and retained in stable storage conditions. Finally the staves of the coopered container are of some interest. This composite artefact (site 37722, context 30448) is made up from 23 staves but is not a barrel or similar vessel. It did not have a base or head and its conversion is not intended to retain liquids. It may be designed specifically as a lining but it is in any case unusual and should be drawn. The remainder of the assemblage requires no further recording from the woodworking technology viewpoint and unless required for other purposes, may be discarded.

ID	Site Code	Context No	Small Finds No	Sample No	Conversion	Species id	No of Rings	Length	Width	Thickness	Diameter	Notes
01	KLY 37719	25141	25003	n/a	boxed heart	Quercus spp.	n/a	678	154	132	n/a	Length of timber. Single blind mortice let into face at one end. Both ends badly damaged and ?truncated by modern machine damage. Abraded surfaces.
04	KLY 37719	25417	25014	n/a	roundwood	Alnus spp.	n/a	384	n/a	n/a	128	Length of roundwood, some bark present. Eroded surfaces, rotted heart at one end, other end truncated by modern saw cut.
06	KLY 37719	25418	25012	n/a	roundwood	Quercus spp.	n/a	827	n/a	n/a	140	Secton of branch wood with two major side branches trimmed away. No surviving bark. One end broken and missing, other partially hewn away. Abraded surfaces.
07	KLY 37719	25421	25003	n/a	roundwood	Quercus spp.	n/a	862	n/a	n/a	84	Section of forked branch wood, no bark present. Thickest limb 82 dia, hewn end. Thinner limb 56 dia, broken end. Surfaces worn and eroded.
08	KLY 37719	822	n/a	200	radially faced	Quercus spp.	n/a	759	112	63	n/a	Length of timber. One face crudely hewn towards one end to form a blunt chisel tip. Axe signature present>98 w. Good condition.
12	KLY 37719	25420	25001	n/a	radially faced	Quercus spp.	n/a	588	79	63	n/a	Offcut. One face broken away and missing for approx. half of length at an edge to edge through auger hole. All surfaces abraded.
13	KLY 37719	70057	n/a	n/a	halved	Quercus spp.	n/a	252	122	71	n/a	Section of halved roundwood, no bark present. One end cross cut with axe. Surfaces abraded.
14	KLY 37719	1452	n/a	102	quartered	Quercus spp.	n/a	49	102	91	n/a	Dendro sample from timber.
18	KLY 37719	913	n/a	n/a	boxed heart	Quercus spp.	n/a	75	137	135	n/a	Dendro sample from timber.
57	KLY 37719	862	111	n/a	radially faced	?Acer campestre L.	n/a	107	06	04	n/a	Bale pin. Irregular whittled cross section, tip missing. Dried out and dessicated but otherwise in good condition.
58	KLY 37719	813	n/a	n/a	radially faced	Pinus sylvestris L.	n/a	143	06	06	n/a	Bale pin. Irregular whittled cross section with bifaced head end. Dried out and dessicated but otherwise in good condition.
63	KLY 37719	1321	n/a	101	tangentially faced	Pinus sylvestris L.	n/a	86	64	18	n/a	Heartwood chipping.
64	KLY 37719	784	n/a	n/a	radially faced	Pinus sylvestris L.	n/a	134	37	02	n/a	Four non refitting fragments of very thin board. Dimensions for largest piece.
65	KLY	804	n/a	101	tangentially	Quercus spp.	n/a	24	118	58	n/a	Dendro sample from timber.

ID	Site Code	Context No	Small Finds No	Sample No	Conversion	Species id	No of Rings	Length	Width	Thickness	Diameter	Notes
	37719				faced							
66	KLY 37719	70014	n/a	n/a	radially faced	Quercus spp.	n/a	95	50	18	n/a	Offcut from reworking of timber. Partial through auger hole in face. Irregular cross section. Abraded surfaces.
67	KLY 37719	25167	n/a	n/a	radially faced	Quercus spp.	n/a	168	62	47	n/a	Pile point. Four hewn facets cut to create sub rectangularcross section tip. Shaft of pile broken away and missing. Surfaces abraded.
09	KLY 37720	121	n/a	115	radially faced	Quercus spp.	n/a	993	92	72	n/a	Length of timber. Irregular cross section, one end ?cut at steep angle but badly damaged. Abraded surfaces.
10	KLY 37720	122	n/a	116	roundwood	Quercus spp.	n/a	641	n/a	n/a	68	Roundwood stake point, partial bark present. Two hewn facets at one end cut to create bifaced tip. Other end has two hewn facets and a cleft face cut to create sub triangular cross section end. Surfaces abraded, in three refitting sections.
11	KLY 37720	226	n/a	110	radially faced	Quercus spp.	n/a	706	161	20	n/a	Board from clinker-built boat. One edge cut back at angle and bevelled. Three complete and two partial auger holes along bevelled edge. Two partial through auger holes and partial nail hole along opposing badly damaged edge. Abraded surfaces.
15	KLY 37720	118	n/a	112	radially faced.	Quercus spp.	n/a	916	161	15	n/a	Board from clinker-built boat. One curving edge trimmed to taper towards end. 3 partial ?eroded nail holes along curved edge, also 5 through nail holes. 4 partial auger holes along opposite edge. One through auger hole through face. Abraded surfaces
59	KLY 37720	177	n/a	111	radially faced	Quercus spp.	n/a	43	169	24	n/a	Dendro sample from board.
60	KLY 37720	119	n/a	113	radially fcaed	Quercus spp.	n/a	36	98	19	n/a	Dendro sample from board.
61	KLY 37720	115	n/a	109	radially faced	Quercus spp.	n/a	34	102	17	n/a	Dendro sample from board.
62	KLY 37720	120	n/a	114	radially fcaed	Pinus sylvestris L.	n/a	40	48	32	n/a	Dendro sample from board.
19	KLY 37721	106007	n/a	n/a	radially faced	Quercus spp.	n/a	318	62	12	n/a	Thin board with single through auger hole through afce at each end. One hole houses remains of radially faced Quercus spp. wedged peg. Fe nail hole towards one edge. Drying.

ID	Site Code	Context No	Small Finds No	Sample No	Conversion	Species id	No of Rings	Length	Width	Thickness	Diameter	Notes
02	KLY 37722	30315	n/a	n/a	box quartered	Quercus spp.	n/a	803	105	102	n/a	Pile point cut from reused timber. Four hewn facets cut to create sub rectangular cross section tip. Parent timber has two rebates let into diametrically opposite corners. Small blind mortice let into one edge. Abraded surfaces.
03	KLY 37722	30319	n/a	n/a	tangentially faced	Pinus sylvestris L.	n/a	680	190	37	n/a	Pointed board cut from reused timber. one edge hewn to create sub rectangular cross section tip. One face of parent board is axe dresses and heavily charred. Charring truncated by hewing of tip.
05	KLY 37722	30353	n/a	n/a	boxed heart	Quercus spp.	n/a	568	132	86	n/a	Pile point cut from reused timber. Four hewn facets cut to create sub rectangular cross section tip. All surfaces heavily charred except where reworked for pile facets.
16	KLY 37722	30380	n/a	n/a	radially faced	Quercius spp.	n/a	311	62	38	n/a	?stake point. Two opposing hewn facets at one end cut to start (broken and missing) tip. Surfaces rotted and eroded.
17	KLY 37722	30313	n/a	n/a	radially faced	Quercus spp.	n/a	412	62	62	n/a	Pile point. Four hewn facets cut to create sub rectangular cross section tip. One facet and part of shaft heavily charred. Much of surfaces rotted and abraded.
20	KLY 37722	30448	1 of 17	n/a	tangentially faced	Quercus spp.	n/a	119	105	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing. Parts of two 23 and 15 dia. halved Fraxinus excelsior L. roundwood hoops adhering to outer face laid edge to edge.
21	KLY 37722	30448	1 of 17	n/a	tangentially faced	Quercus spp.	n/a	100	71	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
22	KLY 37722	30448	2 of 17	n/a	tangentially faced	Quercus spp.	n/a	176	97	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
23	KLY 37722	30448	3 of 17	n/a	tangentially faced	Quercus spp.	n/a	189	59	19	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
24	KLY 37722	30448	4 of 17	n/a	tangentially faced	Quercus spp.	n/a	194	73	22	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
25	KLY 37722	30448	5 of 17	n/a	radially faced	Quercus spp.	n/a	211	86	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
26	KLY 37722	30448	6 of 17	n/a	tangentially faced	Quercus spp.	n/a	237	72	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.

ID	Site Code	Context No	Small Finds No	Sample No	Conversion	Species id	No of Rings	Length	Width	Thickness	Diameter	Notes
27	KLY 37722	30448	7 of 17	n/a	tangentially faced	Quercus spp.	n/a	260	81	22	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Saw marks on inner face. Upper end broken away and missing.
28	KLY 37722	30448	7 of 17	n/a	tangentially faced	Quercus spp.	n/a	318	88	19	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
29	KLY 37722	30448	8 of 17	n/a	tangentially faced	Quercus spp.	n/a	303	94	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Saw marks on inner face. Upper end broken away and missing.
30	KLY 37722	30448	9 of 17	n/a	tangentially faced	Quercus spp.	n/a	387	57	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. In two refitting sections. Upper end broken away and missing.
31	KLY 37722	30448	10 of 17	n/a	tangentially faced	Quercus spp.	n/a	380	87	21	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Saw marks on inner face. In two refitting sections. Upper end broken away and missing.
32	KLY 37722	30448	10 of 17	n/a	tangentially faced	Quercus spp.	n/a	374	100	19	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
33	KLY 37722	30448	11 of 17	n/a	tangentially faced	Quercus spp.	n/a	339	59	22	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
34	KLY 37722	30448	12 of 17	n/a	tangentially faced	Quercus spp.	n/a	349	85	22	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
35	KLY 37722	30448	12 of 17	n/a	tangentially faced	Quercus spp.	n/a	333	70	23	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
36	KLY 37722	30448	13 of 17	n/a	tangentially faced	Quercus spp.	n/a	203	63	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
37	KLY 37722	30448	14 of 17	n/a	tangentially faced	Quercus spp.	n/a	319	60	23	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
38	KLY 37722	30448	14 of 17	n/a	tangentially faced	Quercus spp.	n/a	242	90	20	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
39	KLY 37722	30448	15 of 17	n/a	tangentially faced	Quercus spp.	n/a	191	85	22	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.

ID	Site Code	Context No	Small Finds No	Sample No	Conversion	Species id	No of Rings	Length	Width	Thickness	Diameter	Notes
40	KLY 37722	30448	15 of 17	n/a	tangentially faced	Quercus spp.	n/a	171	76	19	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. Upper end broken away and missing.
41	KLY 37722	10038	n/a	n/a	radially faced	Quercus spp.	n/a	227	71	24	n/a	Offcut. Partial through auger hole in face truncated by broken edge. Abraded surfaces.
42	KLY 37722	30448	16 of 17	n/a	tangentially faced	Quercus spp.	n/a	226	64	12	n/a	Stave from coopered container. Slightly tapered, no bevel, howel or croze groove. Planed edges. In two refitting sections. Eroded and decayed. Upper end broken away and missing.
43	KLY 37722	30448	17 of 17	n/a	tangentially faced	Fraxinus excelsior L.	6	n/a	33	15	n/a	Hoops from coopered container. Halved roundwood, no bark present. Spring cut. No joints, binding or fixings evident. In 31 fragments, no refitting tried.
44	KLY 37722	30558	n/a	n/a	tangentially faced	Pinus sylvestris L.	n/a	186	77	25	n/a	Section of stave. Both ends broken, eroded surfaces.
45	KLY 37722	10013	n/a	n/a	tangentially faced	Pinus sylvestris L.	n/a	452	86	26	n/a	Pointed stave, ?cut from reused timber. Both edges hewn at steep angle to create sub rectangular cross section tip. Single through auger hole in face towards one edge. Abraded surfaces.
46	KLY 37722	10013	n/a	n/a	radially faced	Quercus spp.	n/a	340	56	35	n/a	Stave. Two opposing faces hewn to create bifaced tip. Single through nail hole in face near to tip. Surfaces abraded, otherwise very good condition.
47	KLY 37722	10013	n/a	n/a	radially faced	Quercus spp.	n/a	215	40	22	n/a	Stake point, irregular cross section. Much damaged by drying and dessication.
48	KLY 37722	10051	n/a	n/a	radially faced	Quercus spp.	n/a	326	81	27	n/a	Stave. One edge cut back at angle to create tip. End of tip broken and missing. Surfaces abraded.
49	KLY 37722	70056	n/a	n/a	halved	Quercus spp.	n/a	267	93	48	n/a	?Stake or post tip. No bark present. Two adjacent facets cut to create taper towards blunt tip cut square to axis of timber. Possible remains of auger hole cut across one edge. Abraded surfaces.
50	KLY 37722	30280	n/a	n/a	roundwood	Alnus spp.	n/a	260	n/a	n/a	20	Roundwood stake point, bark present. Eight hewn facets cut to create octagonal cross section tip. Abraded surfaces. In two refitting sections.
51	KLY 37722	30280	n/a	n/a	roundwood	Alnus spp.	n/a	196	n/a	n/a	20	Roundwood stake point, bark present. Two hewn facets cut to create sub triangular cross section tip. Much surface damage. In two refitting sections.

ID	Site Code	Context No	Small Finds No	Sample No	Conversion	Species id	No of Rings	Length	Width	Thickness	Diameter	Notes
52	KLY 37722	30280	n/a	n/a	tangentially faced	Pinus sylvestris l.	n/a	164	34	09	n/a	Offcut. Abraded surfaces.
53	KLY 37722	30022	n/a	n/a	radially faced	Quercus spp.	n/a	100	21	20	n/a	Part of peg. Sub rectangular cross section, one end broken and missing. Abraded surfaces.
54	KLY 37722	30022	n/a	n/a	tangentially faced	Quercus spp.	n/a	91	24	15	n/a	Offcut or crude peg. Sub rectangular cross section, one end with single hewn facet cut to create tip. Abraded surfaces.
55	KLY 37722	16100	n/a	1001	roundwood	Salix spp.	n/a	209	n/a	n/a	12	Section of roundwood, bark present. In four refitting sections.
56	KLY 37722	16100	n/a	1001	radially faced	Pinus sylvestris L.	n/a	41	37	10	n/a	Heartwood chipping. Abraded surfaces.

APPENDIX 15: LEATHER

By Quita Mould

Methodology

The following summary is the result of a rapid scan of the material on 14/07/2005. The leather was washed and wet when examined and packed in double, self-sealing polythene bags within a self-sealing plastic storage box (Box L12).

Quantification: 30022: 2 items 30280: 3 items

Summary

A small group of shoe leather was recovered from two contexts 30022 and 30280. The leather comprised a large, worn, and repaired turnshoe sole for the left foot, a forepart clump repair piece and fragments torn from shoe uppers of calfskin. The shoe parts are of medieval date; the shape of the sole suggests a 12th-13th century date. The upper fragments have no diagnostic features. There is no reason to think that the group varies significantly from the leather recovered from other excavations in the area.

Recommendations for further work

A basic record of the material has been made and no further work is necessary. It will be useful to consider this material along with the leather recovered from other OAU excavations at the Vancouver Centre and include the basic record in the dataset.

Basic record

30022

Bag 1: Leather forepart clump repair, made straight with an oval toe, appears unused. Tunnel stitching around the edge on the flesh side. Leather cattle hide 3mm thick. Length 91mm, width 73mm

Bag 1: Leather scrap fragment likely to be broken from a shoe upper (similar leather to upper fragments from 30280 below). No diagnostic features. Leather calfskin 1.5mm thick. Length 41mm, width 31mm

30280

Bag 1: Leather sub-rectangular fragment, likely to be scrap from a shoe upper. Much folded with cut and torn edges, including two cut edges meeting at a right angle corner and a gently curved cut edge. No diagnostic features. Leather calfskin 2mm thick. Length 145mm, width 78mm.

Bag 2: Leather upper fragment with a straight butted edge/flesh seam, stitch length 4mm, all other edges torn. Similar leather to the above. Leather calfskin 2mm thick. Length 100mm, width 70mm

Bag 3: Leather near complete turnshoe sole for the left foot. Worn away at the toe and exterior toe joint of the tread and broken away at the exterior seat. Oval toe, petal-shaped tread, medium to wide waist and wide seat. Forepart is swayed slightly inward. Edge/flesh seam, stitch length 9mm with large stitch holes, much broken away in places. Holes worn through at the seat appear to be very heavily worn tunnel stitching from repair. Some heavily worn tunnel stitching also present at the tread. Leather cattle hide. Length 296mm, width tread 98+mm, waist 62mm, seat c73mm (estimated). Adult size 10(42).

APPENDIX 16: SMALL FAUNAL REMAINS

By Rebecca A. Nicholson

Introduction

A selection of residues and flots from the processed soil samples were scanned for small bones, following the recognition of fish bones and scales in some of the flots assessed for charred and waterlogged plant remains. Where residues contained more than about 1/4 litre of material, only a fraction was considered for this assessment.

Results

The scanned residues and flots generally contained fish remains in an excellent state of preservation. The identified taxa are listed in Table 1, where samples which would justify further residue sorting and analysis are identified as + or ++ (fish bones present or frequent). No small mammal, amphibian, reptile or small bird bones were observed.

Discussion

Unsurprisingly, for an East Anglian port, herring (*Clupea harengus*) was identified in most samples, but small and tiny flatfish bones were also common - an unusual find in a medieval and post-medieval site. Eel (*Anguilla anguilla*), smelt (*Osmerus eperlanus*) and - intriguingly - 3-spined stickleback (*Gasterosteus aculeatus*) bones indicate the exploitation of estuarine and possibly freshwater resources (although the sticklebacks can be found in salt and freshwater). The charring of the 3-spined stickleback bone indicates that it was most likely deposited in hearth fill 30346 as domestic rubbish.

Conclusions and Recommendations

The varied nature of the fish remains within the assessed samples is unusual for an East Anglian coastal site. It is therefore recommended that the sample flots and residues marked ++ are sorted in their entirety and the fish remains identified and reported. Additionally, sample 3001, although not rich in fish remains, would be worth further consideration since the charring of tiny bones indicates that fish usually considered of no economic value were in fact exploited.

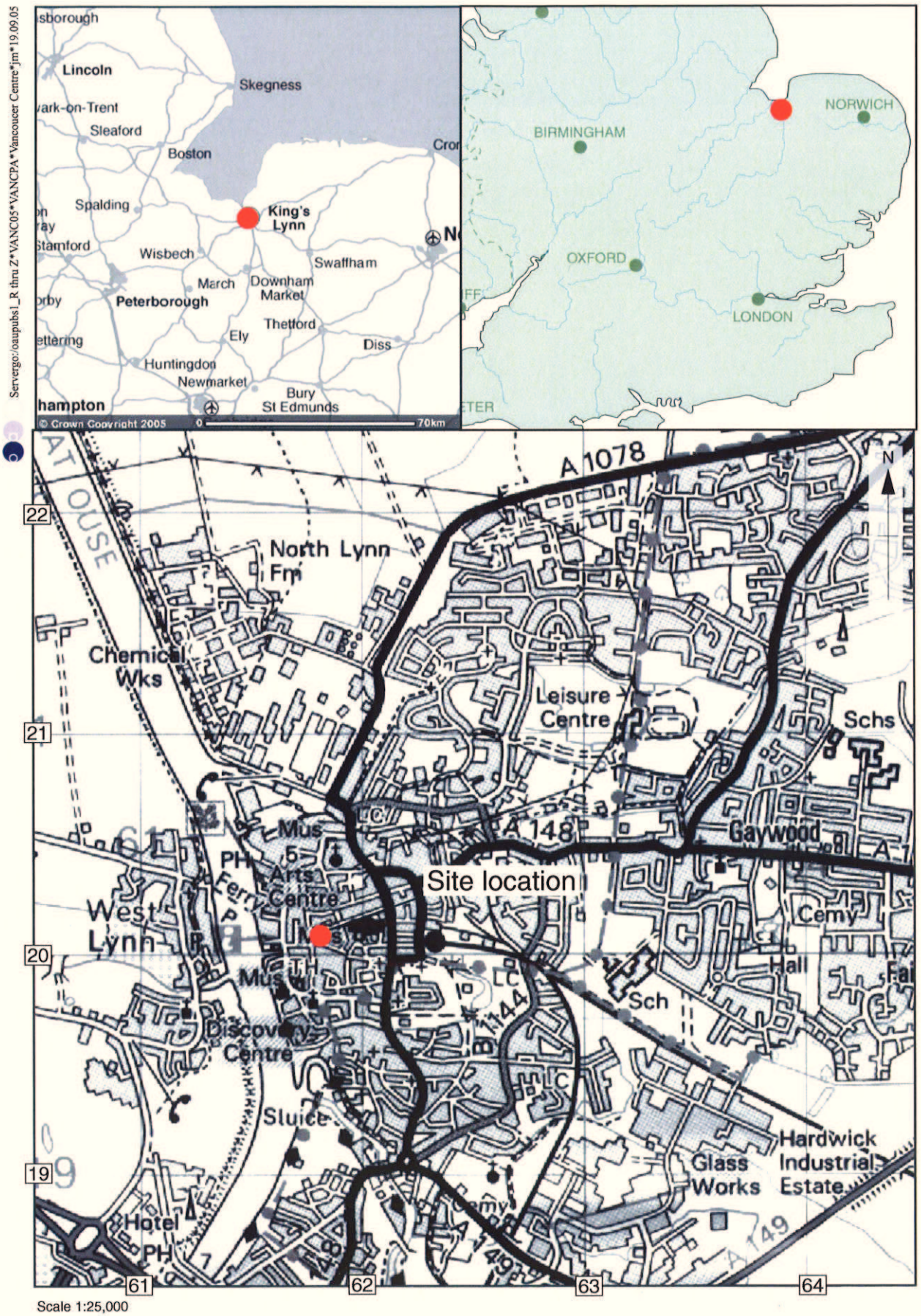
Costs

1 day to sort 5 sample residues and flots from those originally processed for CPR

and 1 days of fish bone specialist (rate for Rebecca Nicholson)

Table 1.

Site Code	Context	Description	Sample	Percent Assessed	Taxa Identified
37719 KLY	25395	Hearth	25014	50% of CPR flot	Juvenile herring/sprat and flatfish. +
37722 KLY	30191	Layer	30004	10% of CPR flot	Herring, small flatfish and small Gadidae ++
37719 KLY	25164	Fill of channel	25012	All CPR flot All 4-2mm fraction of CPR residue	Herring, small flatfish and small Gadidae +
37719 KLY	25165	Channel	25011	10% of 4-2mm fraction, 10% of <2mm fraction of CPR residue	Herring and juvenile flatfish. ++
37719 KLY	312		103	10% of <2mm fraction of CPR residue	Herring, young herring/sprat, tiny flatfish, eel, ?mullet ++
37722 KLY	30252	Layer	30005	50% of 2-4mm CPR residue	Herring, small and medium Gadidae, eel, small flatfish, smelt ++
37722 KLY	30346	Hearth	30001	30% of 2-4mm CPR residue	Mainly scrappy indet. fish bone. Inc. charred 3-spined stickleback spine. +
37719 KLY	25325	Layer	25015	100% of WPR residue	Small residue, only 2 frags of fish bone +
37719KLY	25360		25013	100% of CPR flot	1 frag. Fish bone, indet. +



Scale 1:25,000

Figure 1: Site location

Figure 2: Post Excavation Assessment and Piezometer locations

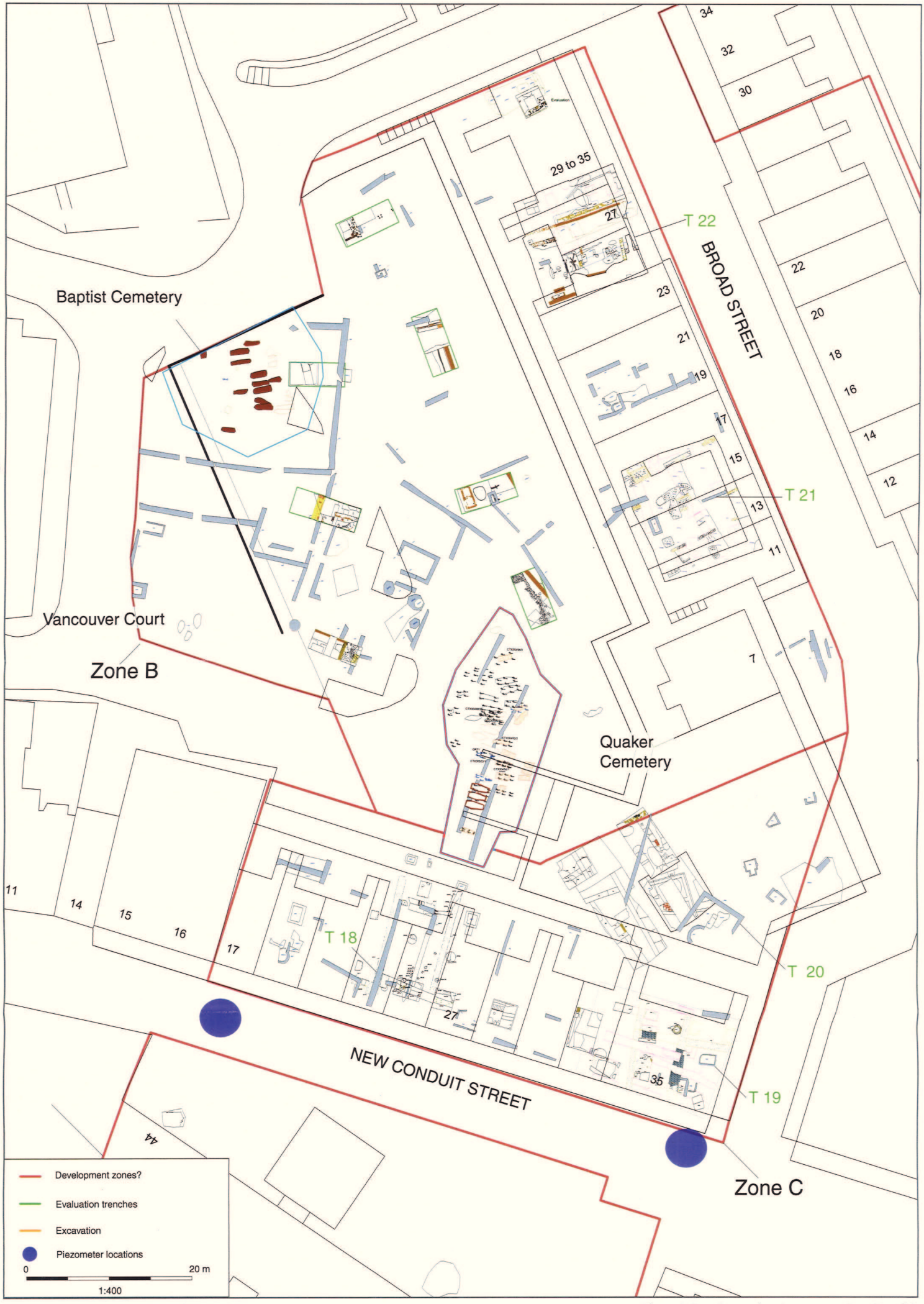


Figure 3: Post Excavation Assessment, Zone B and C

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