C257 ARCHAEOLOGY CENTRAL

Fieldwork Report

Archaeological Excavated Evaluations and Watching Briefs

Pit 4, Pit 11, Trench 14 and 15, Pile Line Pits and SSET/UKPN Utility Diversions, Broadgate Ticket Hall (XSM10)

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Non-technical summary

This report covers two evaluation trenches and four archaeological watching briefs carried out by the Museum of London Archaeology (MOLA) on the site of the future Crossrail Broadgate Ticket Hall, Liverpool Street, London EC2M, within the City of London. The site consists of the proposed utilities corridor and the Broadgate Ticket Hall construction worksite. It incorporates the western end of the roadway of Liverpool Street, and it's north and south pavements. The report was commissioned from MOLA by Crossrail Ltd.

This work follows a previous phase of archaeological evaluation (ending July 2011). While the results of these latest evaluations and watching briefs broadly confirm anticipated findings, they have led to some re-interpretation of previous evaluation results.

Natural terrace gravels were overlaid by weathered natural deposits of alluvial clay, interspersed with occasional bands of gravel. While no prehistoric remains were discovered, evidence has been found for several phases of Roman extra-mural activity from between the c *1st and 3rd centuries, including a ditch, pits, dump layers, and several ground surfaces. The latter may represent several phases of a minor Roman road. However, although disarticulated human bone was again found in Roman contexts, no* in situ *Roman burials have been discovered.*

Residual medieval finds were recovered but no medieval deposits or features have been identified. Moreover, no medieval remains associated with St Mary Bethlehem Hospital have been found. The post-Roman to early post-medieval sequence is characterised by series of marsh deposits. These deposits were sealed across the whole site by early post-medieval reclamation deposits, deliberately laid to consolidate ground for the establishment of Bethlehem Burial Ground.

A total of 87 in situ *post-medieval burials were recorded during this phase, increasing the number of archaeologically excavated* in situ *burials on this site to 327. The burial ground included three phases of burial, including early burials without coffins, a phase of burial in pits, and a final phase of individual mainly coffined inhumations.*

The burial ground was sealed by a horizon formed of disturbed cemetery soil incorporating refuse and possible consolidation dumping, possibly associated with the urbanisation of the area in the mid to late 18th-century. This horizon, together with the backfills of later graves below, contained a large and rare assemblage post-medieval worked animal bone and ivory waste, as well as other industrial waste such as glass slag. This could indicate the type of industries with the local area, with industrial waste dumped while the cemetery was still in use and continued after it was closed.

The site represents a rare chance to explore and define Roman extra-mural activity within this area, with a high potential for Roman remains, including land management, infrastructure and potential burials. The site also offers a rare opportunity to document an important post-medieval cemetery, made even more significant by it's association with the Hospital of St Mary Bethlehem (Bedlam). In addition, 16th to 18th-century burials such as these are a hitherto underrepresented archaeological subject and their excavation will help further our knowledge and understanding of society, life, death and burial during this time. The archaeological results from this phase of work at Liverpool Street will be used by the Crossrail archaeologist to revise and finalise the mitigation strategy for the site.

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1 Introduction

Crossrail is a new cross London rail link project which will provide transport routes in the south-east and across London. The proposed development will include the construction of seven stations within central London which will have interchange with other public transport modes including the London Underground, National Rail and the London Bus service; the development will also include the renewal and/or upgrade of existing stations outside central London. The route itself will link Maidenhead and Heathrow in the west with Shenfield in the north-east and Abbey Wood in the south-east.

As part of these works a new station is required running from Moorgate to Liverpool Street. The Broadgate Ticket Hall worksite (site of a new ticket hall and utilities corridor to the south) consists of an area in the road and pavement of Liverpool Street, to the east of Blomfield Street and to the south and east of the existing ticket hall/sub-station.

The Crossrail mitigation response to archaeology is described in the Crossrail Generic WSI (Crossrail 2009a) and the detailed desk based assessment (DDBA; Crossrail 2008), and can be summarised as follows:

- In the event that intact and important archaeological remains are identified at Crossrail worksites through this process, it may be preferable, where practicable, to preserve these where they are found (ie preservation in situ).
- However, because of the nature of major works projects such as Crossrail, experience of other similar projects suggests that preservation by record is usually the most appropriate method of dealing with archaeological finds.
- Following an extensive Environmental Impact Assessment (EIA) supporting the Crossrail Bill, and the production of site-specific DDBAs, appropriate mitigation measures were scoped and specified in detail in individual project designs (site-specific WSIs – Written Schemes of Investigation) which were prepared in accordance with the principles set out in the Generic WSI, and developed in consultation with the relevant statutory authorities.
- Archaeological information that is gained from fieldwork will be followed by analysis and publication of the results and will be transferred to an approved public receiving body.

This report covers six archaeological investigation tasks carried out at the location of the Broadgate Ticket Hall, Liverpool Street, by C257 Museum of London Archaeology (MOLA), between 13/10/11 to 19/03/12 (see Figure 1). They were supervised by MOLA Senior Archaeologist Robert Hartle, and included the following:

Task	Principal Contractor	Date
• **Evaluation** Pit 4, along the utilities corridor northern pile line	C503 VCUK [Vinci Construction UK Limited]	13/10/11 to 26/10/11
• **General Watching Brief utilities corridor northern pile line**, including Pits 1, 2, 3, 4a, 5, 6, 7, 8, 9, 9a and 10 (preliminary ground reduction, clearance of human remains by exhumation contractor)	C503 VCUK	26/10/11 to 07/02/12
• **General Watching Brief** on Trench 15 within the pavement south of the UBS building (ground works trial pit)	C503 VCUK	11/01/12 to 20/01/12
• **General Watching Brief SSET/UKPN utility diversions** (installation of new utility ducts)	C503 VCUK	11/01/12 to 03/02/12
• **Evaluation** Trench 14, in the N pavement of Liverpool Street	C503 VCUK	10/02/12 to 01/03/12
• **Targeted Watching Brief on utilities corridor northern pile line** Pit 11, along the utilities corridor northern pile line (ground works trial pit)	C503 VCUK	08/02/12 to 19/03/12

Table 1: Fieldwork conducted between 26/10/11 to 19/03/12.

Excavation of Pit 4 was filmed by Channel 4's *Time Team* on the 22nd October 2011 and will be included in a programme to be broadcast in 2012. Excavation of Trench 14 was filmed by ITV and will be included in a programme to be broadcast on the History Channel in 2012.

All grid coordinates in this report are cited as both the National Ordinance Survey and London Survey Grid, and all levels cited as both Ordnance Datum (m OD) and Above Tunnel Datum (m ATD)(ATD = OD +100m).

The event code (sitecode) is **XSM10**.

2 Planning background

The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail (http://www.crossrail.co.uk/railway/getting-approval/environmental-minimum-requirements-including-crossrail-construction-code#.T979khdfFXs). The requirements being progressed follow the principles of Planning Policy Guidance Note 16 (PPG16)(DoE, 1990), and it's replacements Planning Policy Statement 5 (PPS5)(DCLG, 2010) and the National Policy Planning Framework (NPPF)(DCLG, 2012), on archaeology and planning. Accordingly the nominated undertaker or any contractors will be required to implement certain control measures in relation to archaeology before construction work begins.

Schedules 9, 10 and 15 of the Crossrail Bill (2005) concern matters relating to archaeology and the built heritage and allows the dis-application by Crossrail of various planning and legislative provisions including those related to listed building status, conservation areas and scheduled ancient monuments (Schedule 9). Schedule 10 allows certain rights of entry to English Heritage given that Schedule 9 effectively dis-applied their existing rights to the Crossrail project, and Schedule 15 allows Crossrail to bypass any ecclesiastical or other existing legislation relating to burial grounds.

Notwithstanding these disapplications, it is intended that agreements setting out the detail of the works and requiring relevant consultations and approvals of detail and of mitigation arrangements will be entered into by the nominated undertaker with the relevant local planning authorities and English Heritage in relation to listed buildings and with the Department of Culture, Media and Sport (DCMS) and English Heritage in relation to Scheduled Ancient Monuments (SAMs).

3 Origin and scope of the report

This report has been commissioned from Museum of London Archaeology (MOLA) by Crossrail Ltd. The report has been prepared within the terms of the relevant standard specified by the Institute for Archaeologists (IFA, 2001). It considers the significance of the fieldwork results (in local, regional or national terms) and makes appropriate recommendations for any further action, commensurate with the results.

This report will be made available from The London Archaeological Archive and Research Centre (LAARC) in due course.

4 Previous work relevant to archaeology of site

The principal previous Crossrail studies are as follows:

- Crossrail, Assessment of Archaeological Impacts, Technical Report, Part 2 of 6, Central Section, Report Number 1E0318-C1E00-00001, 2005.
- Crossrail, Archaeological Programming Assessment, Report Number 1E0318-

G0E00-00006 (Rev B), 2006

- Crossrail, Archaeology Generic Written Scheme of Investigation, Document Number CRPN-LWS-EN-SY-00001, 2009.
- Crossrail, Archaeological Detailed Desk Based Assessment Liverpool Street Station, Report No CR-SD-LIV-EN-SR-00001, 2008.
- Crossrail, MDC3 Archaeology Updated Baseline Assessment, Document Number 20032008-87MB-YYK5, 2008.
- Crossrail, Archaeological Monitoring of Ground Investigations, Borehole Package 13, September 2009.
- Crossrail, Central Section Project Fieldwork Report Archaeological Evaluation and Watching Brief Broadgate Ticket Hall (XSM10), Document Number C257-XRL-X-XCS-CRG02-50010, 08/11/2011.
- MOLA, Survey Report for Crossrail, July 2011.
- Crossrail, Central Section Project Archaeology Framework C257 Central Package, Summary of LSS85 Archive – Broadgate Excavations, Doc No: C257-MLA-T1-XTC-C101_WS102-00001, Revision 2.0, Feb 2012.

The fieldwork was carried out in accordance with:

- A Crossrail **Site-specific Written Scheme of Investigation** (SS-WSI): Liverpool Street Station, Site-specific Written Scheme of Investigation, Doc. No. C138-MMD-T1-RST-C101-00001 Version 2, 29.04.10, the addendum to the SS-WSI, Doc. No. C138-MMD-T1-RST-C101-00004, Revision 1.0, August 2010.
- The **addendum to the SS-WSI**, Doc. No. C138-MMD-T1-RST-C101-00004, Revision 3.0, July 2011.
- An **Archaeological Method Statement**: MOLA*, C257 Central Method Statement Archaeological Watching Brief, Evaluation, and Sample Excavation Broadgate Ticket Hall (XSM10)*, *Doc No*: C257-MLA-X-RGN-CRG02-50046, Revision 2.0, 16/09/11 to Revision 6.0, 02/03/12. The MOLA method statement prepared in line with the Principal Contractor's method statement.

The Written Scheme of Investigation (WSI) and Method Statements will be available from the LAARC.

5 Geology and topography of site

The geological and topographical setting was covered in detail in the Liverpool Street SS-WSI (Crossrail 2010b) and DDBA (Crossrail 2008), and is summarised below.

The drift geology on this site consists of Taplow terrace sands and gravels of the Thames valley, laid down approximately 128,000 to 280,000 BP (Before Present), within the valley of the River Walbrook, just south of its spring line. The archaeological potential of the Terrace Gravel deposits is considered to be very low. During the recent Crossrail evaluation (Crossrail 2011d), Thames Terrace gravels were reached at between 106.90m ATD and 107.32m ATD, with little change in the level of natural terrace gravel west to east across the southern part of the site, and a slight drop towards the north.

The River Walbrook is a tributary of the Thames and has formed a broad, shallow valley at its headwaters, with anastomosing stream channels crossing the area. The stream channels converged west of the site to form a deeper, steeper channel, here known as the Blomfield Street Stream, running approximately north to south in a position which is now the line of Blomfield Street. The Walbrook is now entirely built over, and has been diverted into underground culverts. Indeed, much of the Walbrook had been covered over and built upon by the time John Stow published his survey of London in 1598.

Streams of the Walbrook have been identified north and west of the Broadgate Ticket Hall site (FIN81, LSS85 and BDC03). A channel examined at the Broad Street Station site (LSS85) ran north-east to south-west across the site and cut down to 106.3m ATD, and it was also clear that the course of the stream had shifted within its valley over time (Dyson et al 1987). The western edge of the Blomfield Street Stream was also tentatively identified in excavations during developments on the western side of Blomfield Street (FIN81). During the 2011 evaluation (Crossrail 2011d), terrace gravels were shown to be overlain by possible alluvial weathered natural deposits of clay, interspersed with occasional bands of gravel. These deposits appeared to be archaeologically sterile and devoid of any anthropogenic disturbance. However, while these deposits may have been deposited by the Walbrook, perhaps seasonal flooding, no clear stream channels belonging to the historic River Walbrook were found.

Sporadic deposits of brickearth have been known to occur in the local area, as recorded at MoLAS site LNA99, overlying the river terrace gravels and sealed by the alluvium. However, no undisturbed brickearth deposits were noted in recent investigations (Crossrail 2009c, 2009d, 2010a and 2011d), indicating that capping brickearth has either been eroded within the flood plain of the Walbrook due to the activity of the river or truncated by Roman activity.

6 Archaeological and Historical Background

The historic background and archaeological potential of the Liverpool Street Broadgate Ticket Hall site is summarised below, and covered in detail in the Liverpool Street SS-WSI (Crossrail 2010b) and DDBA (Crossrail 2008), which are updated by the results of the initial phase of evaluations (Crossrail 2011d), which have been incorporated below.

There has been little evidence for Palaeolithic activity in the local area. Prehistoric activity recorded in archaeological interventions in the area of the Crossrail worksites for Liverpool Street consists of residual material found in later deposits; for example, Neolithic and Bronze Age flints at Moor House (MRL98) and late Iron Age pottery at Riverplate House (RIB87).

The site of the Broadgate Ticket Hall lies *c* 120m north of the Roman and medieval city walls, within the upper Walbrook valley, immediately east of the Blomfield Street tributary of the River Walbrook. Excavations in the nearby area, off Old Broad Street, New Broad Street, Eldon Street and Blomfield Street, have shown evidence for significant Roman extra-mural activity, including the control and management of the River Walbrook with revetment and banking, land-reclamation activity including drainage ditches, burials and domestic and industrial occupation (site codes ADM81, BDC03, BRO90, CAP86, BLM87, NEB87, COLS3, GM122, LSS85, and FIN81). In addition, a Roman road was recently discovered to the west of the site during excavations south of Eldon Street (RIV87, FIB88, ENS03, ELD88 and BDC03). This road was found running west to east toward Bishopsgate, a route that, if it continued, would take it through the northern part of the Broadgate Ticket Hall site.

The construction of the City Wall between *c* AD 180 and 225 was one of many factors which influenced the development of the upper Walbrook valley. Although the stream was conducted through the wall in a conduit, the wall is thought to have significantly impeded the natural drainage of the upper Walbrook, and an area of distinctly marshy land formed in the valley outside the City Wall.

During the last phase of evaluation at this site (Crossrail 2011d), the Roman archaeology was found at a fairly consistent level across the site (at 108.85m ATD, *c* 5m below ground level (bGL)) and was approximately 1m thick. Roman features included dump layers, four east–west aligned ditches, one north–south aligned ditch, a possible beam slot, floor/ground surfaces and pits. Provisional dating places Roman activity within this area from the 1st century to the 3rd century AD.

Later medieval urbanisation north of the City Wall was initially only characterised by ribbon development along Bishopsgate, to the east. As a result, the area within the site remained a marginal area and open land. Recent work associated with the Crossrail development at Finsbury Circus (XRZ10) has located Moorfields Marsh deposits overlying earlier Roman pits (Crossrail 2011b). The last phase of evaluation (Crossrail 2011d) suggested that the post-Roman to early post-medieval period on this site may be characterised as one of abandonment. No Saxon or medieval features or structures were identified. In particular, no medieval remains associated with St Mary Bethlehem Hospital have been found.

In 1568/9, the City established the ‘New Churchyard’, the first of the early modern non-parochial churchyards. The burial ground would later become more commonly known as the ‘Bethlehem Burial Ground’ because of it association with the medieval Bethlehem Hospital (see Figure 21 and Figure 22). The priory and hospital of St Mary (of) Bethlehem had been founded on the western side of Bishopsgate in 1247, on a

site now beneath the present Great Eastern Hotel, and the burial ground was established on 1 acre of land belonging to the hospital. However, the site had not initially be intended for the exclusive use of the hospital but as an 'overflow', relieving pressure on the increasingly crowded burial grounds within the City. In 1563 there had been an outbreak of plague and, consequently, the City had sought to increase burial capacity in case of further epidemics. The extent of the 'New Churchyard' is shown on several historic maps (see Figure 19 to Figure 22). During the mid 19th century, Liverpool Street was widened to incorporate the southern part of the burial ground. Thus, the Broadgate Ticket Hall site is located within the south-western part of the cemetery, in what is now the western half of Liverpool Street's carriageway and pavements.

In 1985, excavations at Broad Street Station (LSS85) immediately north of the site, investigated burials which had survived the construction of the station within the development footprint of Broadgate. The excavation trench was located under what had been the cab ramp immediately in front of the station building itself. Within the main excavation trench over 400 partial or complete burials were encountered at a density of up to 8 per m^3 of ground and 200 more came from further test-pits (Malt & White 1987). More recent utility related excavations have continued to confirm the presents of human remains within the Broadgate Ticket Hall site (LVB06 and XRF09).

The recent first phase of Crossrail evaluation, found a total of 244 *in situ* post-medieval burials within the burial ground at a density of approximately 3.9 bodies per m^3 of ground (Crossrail 2011d).

7 Research objectives and aims

7.1 Objectives of the fieldwork

The overall objectives of the investigation were to establish the nature, extent and state of preservation of any surviving archaeological remains that would be impacted upon by the development.

The task-specific aims and objectives from the Addendum to the WSI (Crossrail 2011a) were:

- The watching brief will refine the extent and significance of the archaeological resource and inform further mitigation measures.

Specifically, the archaeological investigations at the Liverpool Street (Broadgate Ticket Hall) work-site had the potential to recover:

- Archaeological remains of Roman date relating to extra-mural activity, including burials;
- Medieval remains associated with St Mary Bethlehem Hospital;
- Post-medieval rubbish dumps and remains associated with the urbanisation of the area;
- Post-medieval burials within the known burial ground that lies beneath the carriage way of Liverpool Street in the Broadgate Ticket Hall area;
- Waterlain deposits with the potential for organic preservation and palaeoenvironmental remains.

7.2 Research Aims

The original aims and objectives were listed in the SS- WSI Liverpool Street Station (Crossrail 2010b, section 4) and stated that 'Archaeological investigation and mitigation within the Crossrail worksites for Liverpool Street Station have the potential to contribute to the research themes set out below':

Evidence relating to the Walbrook, its tributaries and Moorfields Marsh deposits may provide data relevant to the following themes:

- Understanding London's hydrology, river systems and tributaries and the relationship between rivers and floodplains;
- Understanding how water supply and drainage provision were installed and managed;
- Refining our understanding of the chronology and function of the landward and riverside defences and extramural evidence of defensive or military structures in the Roman period;
- Understanding the relationships between urban settlements and royal villas or religious estates;
- Examining the proposal that there was an ideological polarity between town and anti-town systems: Roman towns did not so much fail as were discarded;

- The end of the Roman occupation: developing explanatory models to explain socio-political change and considering the influence of surviving Roman structures on Saxon development; and;
- Examining the use in any one period of materials from an earlier period (e.g. Saxon use of surviving Roman fabric) and the influence on craftsmanship, manufacture and building techniques.

Evidence relating to the Medieval Bethlehem Hospital precinct and cemetery, bisected by Liverpool Street, may provide data relevant to the following themes:

- Understanding the differences, if any, between burial practices in the city and outlying cemeteries;
- Understanding life expectancy, origins and belief, seen through studying health, diet and disease, and preparing models for future research;
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience; and
- Synthesising data on known religious sites and buildings, their chronology, use and influence locally, regionally and nationally.

Revised and new objectives for future fieldwork are presented in section 13.1.

8 Methodology of site-based and off-site work

8.1 General

All archaeological excavation and recording during the sample excavation was carried out in accordance with the Crossrail Generic and Site Specific WSIs (Crossrail 2009a and 2010b), Addendum (Crossrail 2011a), the Crossrail/MOLA *Method Statement* (Crossrail 2012a) and the *Archaeological Site Manual* (MoL, 1994).

The purpose of the evaluation trenches was to provide information on the presence or absence, character, extent, date, preservation, and importance of the archaeological remains predicted to exist at the site, in order to inform future mitigation of potential impacts of the Crossrail works. The selection of trenches for partial excavation was undertaken in conjunction with the Crossrail Archaeologist and Principal Contractor. Accordingly, Pit 4 and Trench 14 were only excavated to the base of the burial ground. However, auger holes were dug in Trench 14 a further two metres below the base of the trench.

The purpose of the Targeted Watching Brief (TWB) in Pit 11 (a geotechnical pit to determine utility locations) was to mitigate the impact upon archaeological remains, by making an adequate record of them during the construction ground works. This area had formerly been excavated to a depth of between 3.00 and 5.00m bGL in Trench 1, Pit 4 and Pit 4A.

The purpose of the General Watching Briefs was to mitigate the impact of the specified development works (see Table 1) upon archaeological remains, by making an adequate record of them during the construction ground works (a mitigation strategy of *preservation by record* in line with Crossrail requirements).

The site finds and records can be found under the site code XSM10 in the MOLA archive. They will be stored there pending a future decision over the longer-term archive deposition and public access process for the wider Crossrail scheme. For the location of archaeological investigations see Figure 1.

8.1.1 Excavation and Recording of Human Remains

It was anticipated that human remains would be present on this site and an application was made to the Ministry of Justice for an exhumation licence. This was forwarded to the Design Archaeologist and Project Archaeologist for distribution to the Principal Contractor and any others who required them. A copy was kept on site with the TCS supervisor:

- Exhumation contractor TCS (T Cribb and Sons) Exhumation Limited received a burial licence for the removal of human remains (Licence number 11-0110, 20 July 2011).
- In a letter of the 21 September 2011, amending the conditions of the above licence, the Ministry of Justice permitted the extension of the burial license to 24 December 2014, that ‘any remains exhumed by TCS Exhumations Limited shall be reinterred, no later than 31 January 2015, at Willows Cemetery, Canvey Island’, and that ‘any remains exhumed by Museum of London Archaeology (MOLA) which are considered, in conjunction with Crossrail Project

Archaeologist, to merit long term retention shall be kept safely, privately and decently by MOLA under the control of a competent member of staff; otherwise they shall be reburied, no later than 31 January 2015, by TCS Exhumations Limited'.

The methodology employed for the excavation of human remains is set out in the sections below [8.2.1], and in more detail in the SS-WSI (Crossrail 2010b) and the MOLA Method Statement (Crossrail 2012a, section 5).

8.2 Excavation methodology (Pit 4 and Trench 14)

Pit 4 and Trench 14 were archaeologically excavated between existing known utilities in the roadway and pavements of Liverpool Street. Modern overburden was removed by the Principal Contractor (groundworks subcontractor Galldris for C503 VCUK) using hand excavation, down to first significant archaeological deposit under supervision of MOLA Senior Archaeologist Robert Hartle. All archaeological remains, including stratified *in situ* burials, were then hand excavated and recorded by MOLA.

A written, drawn and photographic record of all archaeological deposits encountered was made in accordance with the principles set out in the Museum of London site recording manual (MoL, 1994)(see 9.1.1 and 9.1.2).

Within Pit 4, the Crossrail Project Archaeologist determined that archaeological excavation would cease at the base of the cemetery horizon. TCS took possession of Pit 4 after archaeological excavation in order to remove any remaining disarticulated human bone from within the backfill of modern intrusions (utilities). Excavation also ceased at the base of the cemetery horizon in Trench 14, although here auger holes were dug a further two metres below the limit of the trench.

The locations of the trenches, as dug, were recorded by MOLA Geomatics by optical survey. The survey utilised Crossrail London Survey Grid control stations, which were then tied into the OS.

8.2.1 Human Remains

Detailed Excavation Methodology for Human Remains

In the case of post-medieval cemeteries the burials tend to be highly standardised and it was unnecessary to plan both skeleton and coffin. Where they existed, coffins were planned to scale. Skeletons were only planned to scale if there was no coffin. In addition, skeletons were recorded with a sketch on the reverse of the context sheet.

Where skeletons and/or coffins conformed to a standard, it was noted as such on the relevant recording sheet, and only aspects which differed from the norm were described. Coffin fittings (19.7.1) were located on the sketch (or scale plan), as appropriate.

At all stages of archaeological work, human remains encountered were treated with care and respect. An osteologist was available throughout the project to offer advice to staff.

Where *in situ* human remains would be visible to the public, the Principal Contractor provided suitable screening. Additionally, the archaeologists avoided leaving remains exposed overnight wherever possible.

Digital record photographs were taken of selected burials and significant deposits of

disarticulated bone or other features. Human burials were recovered and bagged individually on site in large opaque plastic bags to ensure that the integrity of each burial was retained. Larger skeletons were lifted and placed in archive quality perforated plastic bags each containing two 'tyvek' labels with site code, context number and details.

Excavated remains were retained in secure storage at the Broadgate Ticket Hall (Liverpool Street) worksite prior to transfer to exhumation contractor TCS for processing.

Methodology for Disarticulated Human Remains

All disarticulated human remains recovered during the excavation of Pit 4 and Trench 14 were retained and passed to the Principle Contractor for storage until they could be transferred to the appointed exhumation contractor (TCS Exhumation), who would then rebury the remains in accordance with the terms of the burial licence.

Processing

Where detailed excavation of *in situ* burials was undertaken, the following processing methodology was employed:

- All remains and samples were treated to professional standards and in accordance with United Kingdom Institute for Conservation guidelines.
- Inhumations were washed over a 1mm mesh using a spray hose. Any block lifted remains such as those of neonates, were processed using a flotation tank with a 1 mm mesh to ensure complete recovery.
- The remains were washed and packaged.
- The remains were transferred to a purpose-built facility where they were slowly air dried.
- The remains were then packaged to archive standard under the direction of the Senior Osteological Processor. Human bone was not marked.

Following processing, see above, the following assessment scanning methodology was employed (see 19.8):

- Inhumations were assessed by a MOLA Human Osteologist. Assessment of all stratified deposits of human remains was carried out according to English Heritage Centre for Archaeology Guidelines 2002 and MOLA standards (Powers, unpublished).
- Assessment data was recorded in an Excel worksheet. For each context, the level of preservation and completeness was estimated and a basic catalogue (by body area, not bone, ie skull, dentition, arms, legs etc) was compiled.
- The remains were rapidly scanned to provide basic demographic data. Remains were classified as adult or subadult. Subadults were subdivided into age groups based on the timings of the eruption of the molar teeth. Basic observation on adult sex was made.
- Gross pathological changes were noted using a coding system compatible with that used at analysis.

8.3 Targeted Watching Brief methodology (Pit 11)

The archaeological recording and excavation of the pre-cemetery deposits in utilities corridor northern pile line Pit 11 was conducted as a Targeted Watching Brief.

The C503 Principal Contractor broke out the ground surface and removed the modern overburden down to the first archaeological horizon, using hand excavation, under supervision by the C257 MOLA Supervisor. Exhumation contractor TCS removed *in situ* burials from a small area in the north-east corner of the Pit 11 from 1.40m bGL, an area not covered by previous trenches in this location, before the start of the targeted watching brief.

Beneath the cemetery deposits, low significance archaeological remains (marsh and dump layers) were removed by C503 with MOLA supervision and recording, while moderate/high significance archaeological remains (cut features) were investigated, recorded, and excavated by MOLA (including environmental sampling, see below).

A written, drawn and photographic record of all archaeological deposits encountered was made in accordance with the principles set out in the Museum of London site recording manual (MoL 1994)(see 9.2.1).

The watching brief ceased when natural deposits were encountered and identified.

8.3.1 Environmental archaeology investigation methodology

The sampling strategy for the Liverpool Street sub-site is covered in more detail within the MOLA Method Statement (Crossrail 2012a).

In Pit 11, a Roman pit [980] was selected for environmental sampling. The aim of this sampling was to determine the nature/function of the feature, its relationship to previous features discovered in the area (pit [713] in Trench 1), to evaluate the degree of preservation and range of environmental remains preserved within the fills, and to assess their potential to address the overall site objectives and identify any additional research aims that might also be addressed .

Sampling was undertaken by the archaeologists in the form of 40 litre bulk samples. Samples were then processed and analysed off-site by archaeo-botanical and archaeo-zoological specialists. The initial environmental results from these samples can be found in Appendices 19.9 and 19.10.

The environmental procedures outlined in the *Archaeological Site Manual* (MoL 1994) and *Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage 2002) were followed.

8.4 General Watching Brief Methodology (Trench 15, SSET/UKPN diversion, and utilities corridor northern pile line pits)

The General Watching Briefs consisted of a basic monitoring presence to observe the works carried out either by the Principal Contractor or their sub-contractor without constraint on their working methods. A C257 MOLA Senior Archaeologist monitored all initial ground reduction by means of periodic visits and longer attendance, when required or called to site by the Groundworks Contractor or Principal Contractor when

potential human remains were discovered.

Thereafter, work was conducted under MOLA supervision. Excavation was by hand by the contractors McNicholas (SSET/UKPN diversion) or Galldris (utilities corridor northern pile line pits and Trench 15) and, where human remains were present (utilities corridor northern pile line pits), by TCS Exhumation.

Where *in situ* human remains would be visible to the public while excavated by the exhumation contractor, the Principal Contractor provided suitable screening. Additionally, the archaeologists avoided leaving remains exposed overnight wherever possible. In all cases, any disarticulated human remains were rapidly bagged and removed to secure storage within the Liverpool Street site compound, and then removed from site by TCS.

Human remains excavated by exhumation contractor TCS were not recorded or otherwise dealt with by MOLA. MOLA recorded the levels and extent of these remains, removed any coffin plates, gravestones, or other significant features, if present, or recorded any other significant change in the organisation of the cemetery (see 9.3). A written and drawn record was made in accordance with the principles set out in the Museum of London site recording manual (MoL 1994)(see 9). Trench locations co-ordinates were supplied to MOLA Geomatics by the Principal Contractor.

9 Results and observations including stratigraphic report and quantitative report

Task	Date	Figures	Photos
Excavated Evaluation Pit 4 (9.1.1).	13/10/11 to 26/10/11	Figure 1, Figure 2, Figure 8 and Figure 17	Photo 1 and Photo 2
Excavated Evaluation Trench 14 (9.1.2).	10/02/12 to 01/03/12	Figure 1, Figure 3, Figure 9, Figure 14, and Figure 17	Photo 3 and Photo 4
Targeted Watching Brief on Pit 11 (see 9.2.1).	08/02/12 to 19/03/12	Figure 1, Figure 4, Figure 10, Figure 14, Figure 15, and Figure 16	Photo 5 and Photo 6
General Watching Brief utilities corridor northern pile line (preliminary ground reduction, clearance of human remains by exhumation contractor) Pits 1, 2, 3, 4a, 5, 6, 7, 8, 9, 9a and 10 (9.3.1).	26/10/11 to 07/02/12	Figure 1, Figure 5, Figure 6, Figure 11, Figure 12, Figure 14 to Figure 16, and Figure 18	Photo 7 to *Photo 18*
General Watching Brief SSET/UKPN utility diversions (installation of new utility ducts)(9.3.2)	11/01/12 to 03/02/12	Figure 1, Figure 7 and Figure 18	Photo 20 to Photo 23
General Watching Brief on Trench 15 within the pavement south of the UBS building (see 9.3.3)	11/01/12 to 20/01/12	Figure 1	Photo 24

Table 2: Archaeological investigations

See Figure 1 *for trench locations*

9.1 Excavated Evaluation Trenches

9.1.1 Pit 4

Photo 1: 19th-century brick wall [817] (right) cutting in situ *burials, looking east.*

Pit 4 ***(Figure 1, Figure 2, Figure 8 and Figure 17)***	
Location	Utilities corridor northern pile line. South side of Liverpool Street, in roadway and pavement, east of previous evaluation Trench 1.
Dimensions	2.00m wide (north to south) x 6.00m long (east to west) x 2.70m (deep).
London Survey grid coordinates	83383 36287
OS National grid coordinates	533034 181602
Modern Ground Level	Road surface at 112.32m ATD

Modern subsurface deposits	Road surface 100mm thick, over concrete 500mm thick, above crushed concrete and other modern material 500mm thick.
Level of base of archaeological deposits observed and/or base of trench	Limit of excavation: 109.62m ATD
Natural observed	Not reached
Extent of modern truncation/overburden	Approximately 1.18m to >2.70m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [851] - Grey brown clay silt. 109.83m ATD. Included moderate charcoal flecks and oyster shell.	Ceramic building material (CBM) fragments (brick and peg tile *c* 1450 to 1800).
Pre-cemetery consolidation dump [833] - Light grey brown sandy silt with chalk fragments, oyster shells, and mortar and charcoal flecks., 110.43m ATD.	CBM fragments (brick and peg tile *c* 1450 to 1800).
Light grey brown sandy silt [733] cut by burials. Contained significant amounts of residual disarticulated human bone. 111.07m ATD.	Post-medieval pottery - 1720 to 1750. Medieval pottery (residual) - 1430 to 1500. Peg tile - Post-medieval *c* 1450 to 1800. Floor tile (residual) - 1350 to 1390. Glass bottle fragments - *c* 18th-century. Glass spectacle lens <278> - *c* 18th-century. Clay Tobacco Pipe - 1660 to 1680. A heraldic six petalled seeded and barbed rose copper-alloy mount <272> - 17th to 18th-century. Buckle pin <273> - uncertain date. A coffin handle/grip <285> from [745] – *c* 17th to 18th-century. Two fragments of large ceramic crucibles of post-medieval form. Worked ivory and animal bone waste, including off offcuts and blanks, knife handle blanks, a hair comb, and a possible needle case fragment - 1600 to 1900.

Upper- or post-cemetery horizon [732] - Brown grey clay silt with moderate disarticulated human bone. 111.14m ATD.	Post-medieval pottery - 1750 to 1800. Floor and Wall Tile - 1700 to 1800. Clay Tobacco Pipe - 1730 to 1780. Worked ivory and animal bone waste, including off cuts and blanks - 1600 to 1900.
Red brick wall [817], truncated to a depth of 110.55m ATD. Construction cut [818] and backfill [850].	Brick sample taken - 1800 to 1900.
Interpretation and summary	
Layer [851], approximately medieval to early post-medieval, may represent a gradually accumulated marsh layer, perhaps incorporating occasion refuse dumping. Layer [833] overlay [851] and is probably part of dumping which seems to have been deliberately laid down across the whole site to create stable ground for the establishment of the cemetery (as seen in previous trenches). The cemetery horizon contained 62 articulated burials (see Figure 2 and Figure 17). Between 111.07 and 109.66m ATD (1.25m and 2.66m bGL). Unfortunately, identifying individual grave cuts and fills was impossible until lower in the sequence, where they cut the pre-cemetery layer [833] and marsh [851]. However, the basic sequence of burial was discernable, with burials arranged in parallel rows and in vertical stacks, albeit with frequent intercutting and re-positioning of burials (see Photo 1 (above) and Photo 2 (below)). No other cemetery features, such charnel pits, burial vaults or brick lined graves, were found in this trench. The cemetery was truncated by a brick wall [817] to the south (see Photo 1). This wall truncated the burials, but was itself heavily truncated by a 20th-century utility trench (clay ducts). This wall has been dated to the 19th century from brick samples, and is most likely related to early utilities or part of the cellars of the 19th-century buildings on the south side of Liverpool Street.	

Photo 2: Truncated, intercutting and overlapping burials [801], [803] and [805], looking north.

9.1.2 Trench 14

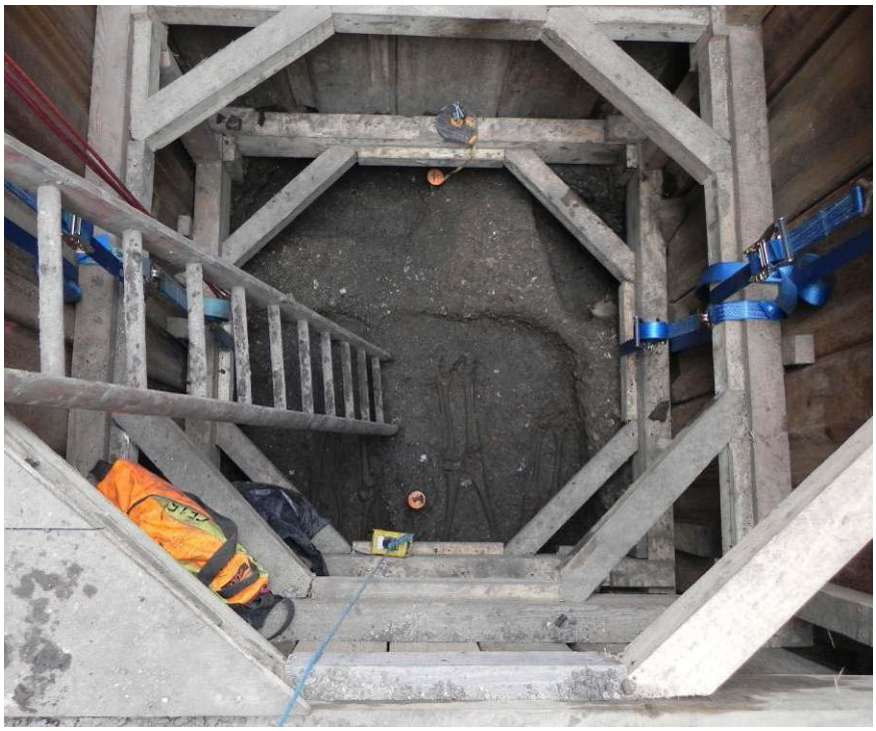

Photo 3: Trench 14 - burial pits, including [946] (bottom), with inhumations, east at top

Trench 14 (*Figure 1, Figure 3, Figure 9, Figure 14, and Figure 17*)	
Location	Northern side of Liverpool Street, within brick-paved roadway south of the UBS building.
Dimensions	1.80m (east to west) x 1.90m (north to south) x 3.20m (deep)
London Survey grid coordinates	83400 36299
OS National grid coordinates	533051 181615
Modern Ground Level	113.30m ATD
Modern subsurface deposits	Brick paving over concrete - 400mm thick Pink gravel beneath the concrete – 1.1m thick

Level of base of archaeological deposits observed and/or base of trench	Excavated to the base of the cemetery horizon at 110.10m ATD. Deposits below this depth examined in auger holes AH1 and AH2 (see below). However, Pit [950] (a probable burial pit) was not fully excavated but dug to 110.00m ATD.
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately 0.80 to 3.00m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [976] - Grey brown clay silt with moderate charcoal flecks and oyster shell. 110.30m ATD.	CBM fragments (brick and peg tile *c* 1450 to 1800).
Pre-cemetery consolidation dump [971] - Light grey brown sandy silt. 110.50m ATD. Contained with mortar and charcoal flecks. Cut by burials [970], [972] and [973].	CBM fragments (brick and peg tile *c* 1450 to 1800).
Early phase of burial. Articulated burials [970], [972] and [973], without coffins. Between 110.39m ATD and 110.10m ATD.	Pottery from grave fill [974], overlaying skeleton [973] – 1480 to 1600.
Consolidation dump [941] - Light yellow grey silty sand with mortar flecks. 110.73m ATD. Overlaying burials [970], [972] and [973] but cut by the pit burial horizon.	CBM fragments (brick and peg tile *c* 1450 to 1800).
Pit burial horizon, including pits [945]/[946], [947]/[948], [949]/[950] and [957]/[958]. Between 110.73m ATD and >110.00m ATD. Cutting the earlier phase of burial and [941] below. Pit burial [950] not bottomed, but dug to 110.00m ATD.	Pottery from fills [945], [947], and [949]: [945] – 1650 to 1700. [947] – Residual medieval pottery (1340 to 1350) and post-medieval pottery (1580 to 1600). [949] – 1580 to 1650.
Light grey brown sandy silt [925] cut by burials. Contained significant amounts of residual disarticulated human bone. 111.30m ATD. Overlaying a pit burial sequence below.	Dated to within the use of the cemetery (1568 to *c* 1730). Residual decorated floor tile of 'Westminster' type with a fleur-de-lis design (<312>)(late 13th or early 14th-century). Clay tobacco pipes – 1680 to 1710.
Upper- or post-cemetery soil [919] - Brown grey clay silt with moderate disarticulated human bone. At 111.80m ATD.	Pottery – 1701 to 1711. Worked ivory and animal bone waste, including off cuts and blanks - 1600 to 1900.

Brick arched wall foundation [1013] within construction cut [1014](fill [1012]). At 112.50m ATD.	Stock bricks *c* 19th-century – no sample could be obtained.

AH1 (*Figure 1*)					
London Survey grid coordinates				83400 36298	
OS National grid coordinates				533051 181614	
Surface Level				110.30m ATD	
Natural observed				Not reached	
Top (m)	**Base (m)**	**Top (m ATD)**	**Base (m ATD)**	**Description**	**Interpretation**
0	0.55	110.30	109.75	[976] - Light to mid grey brown gritty clay silt with flecks of CBM, charcoal and shell.	Medieval to post-medieval marsh deposit
0.55	0.95	109.75	109.35	[998] - Light to mid grey slightly sandy clayey silt.	Possible medieval to post-medieval marsh deposit
0.95	1.15	109.35	109.15	[999] - Mid to dark grey brown silty clay with bands of dark grey humified organics/peat occasionally throughout, grades into below.	Possible medieval to post-medieval marsh deposit
1.15	1.30	109.15	109.00	[1000] - Light grey clay silt with laminations of fine sands and grey silt. Mortar and wood fragments?	Post-Roman marsh deposit?
1.30	1.80	109.00	108.50	[1001] - Mid blue grey sandy clay, with occasional fine sands and gravel.	Roman deposit? Fill?
1.80	2.00	108.50	110.30	[1002] - Wet soft dark brown grey clay, with occasional fine sands and gravel.	Possible Roman or post-Roman marsh

2.00		110.30		[1003] - Augering halted by compacted gravel. This could not be penetrated, but left a grey stain on the tip of the auger.	Possible Roman ground/road surface

AH2 (*Figure 1*)					
London Survey grid coordinates				83400 36299	
OS National grid coordinates				533051 181615	
Surface Level				110.30m ATD	
Natural observed				Not reached	
Top (m)	**Base (m)**	**Top (m OD)**	**Base (m OD)**	**Description**	**Interpretation**
0	0.10	110.30	110.20	[971] - Light to mid grey brown silty clay with building material fragments, occasional animal bone, and charcoal and mortar flecks.	Pre-cemetery consolidation dump deposit
0.10	0.50	110.20	109.80	[976] - Light to mid grey slightly sandy clayey silt.	Medieval to post-medieval marsh deposit
0.50	0.70	109.80	109.60	[1004] - Light to mid grey clay sand with flecks of ceramic building material and shell.	Possible medieval to post-medieval marsh deposit
0.70	1.00	109.60	109.30	[1005] - Light to mid brown grey silty clay with bands of black humified organics/peat occasionally throughout.	Possible medieval to post-medieval marsh deposit

1.00	1.10	109.30	109.20	[1006] - Dark orange brown mottled with black (probably humified organics/peat bands), with occasional shell flecks and rare flecks of quartz sand.	Possible medieval to post-medieval marsh deposit
1.10	1.35	109.20	108.95	[1007] - Sticky brown grey sandy clay.	Post-Roman dump or marsh?
1.35	1.60	108.95	108.70	[1008] - Mid yellow grey sand with occasional fine gravels and organics.	Roman dump or fill?
1.60	1.90	108.70	108.40	[1009] - Soft very sandy clay with moderate gravels.	Roman dump or fill?
1.90	2.10	108.40	108.20	[1010] - Wet soft dark brown grey clay, with occasional fine sands and gravel.	Roman dump or fill?
2.10				[1011] - Augering halted by compacted gravel. This could not be penetrated but left a grey stain on the tip of the auger.	Possible Roman ground surface
Interpretation and summary					

This trench was not fully excavated beyond 110.30m ATD (the base of the cemetery horizon). Deposits beneath this level were examined with a hand auger. Although, no dating evidence was found, the lower deposits in this sequence ([1001], [1002], [1008], [1009] and [1010]) are likely to be Roman. Augering was halted at between 108.30m ATD (AH1 south) and 108.20m (AH2 north) by a hard gravel surface [1003]/[1011] which could not be penetrated. Deposits above *c* 109.00m ATD are most likely post-Roman to post-medieval marsh deposits ([998], [999], [1000], [1004], [1005], [1006] and [1007]).

At the base of the excavated section of the trench, layer [976], approximately medieval to early post-medieval in date, may represent a gradually accumulated marsh layer, containing occasional dumped refuse material. Above [976], there appears to be two layers of consolidation dumping, layer [941] and [971], layers deliberately laid down across the whole site to create stable ground during the establishment of the cemetery (as seen in previous trenches).

In situ burials were found between 110.10m and 111.30m ATD (3.20m and 2.00m bGL). The cemetery horizon contained 24 articulated burials (see Figure 3 and Figure 17) in three distinct phases of burial. The earliest burials were few in number, and were not in coffins. Interestingly, this primary phase of burial appeared to lie between the two layers of consolidation, suggesting that early burials occurred while the site was still being established (pottery from the grave fill [974] of the earliest burial has a date range of 1480 to 1600). Above these early burials was a phase of mass or pit burial (pit burials [946], [948], [950], and [958]). Pit [958] contained 5 burials, with only two of these in coffins, while pit [946] contained 6 burials, none of which were in coffins. No burials were found within cuts [948] or [950]. However, the presence of disarticulated bone alongside the edges of probably *in situ* coffins indicated that these features were likely to also be pit burials. Burials within [948] or [950] are likely to extend beyond the edges of Trench 14 (south and east).

The burials within pits [946] and [958] were separated by layers of soil and not directly laid on each other. This suggests that these pits were gradually filled, and remained open and only partially backfilled between inhumations until they reached full capacity. The pit burials were overlain by a later and final phase of inhumations. This final burial phase appears to be markedly different to the burial pits, with all burials in wooden coffins, arranged in approximate rows and small stacks,. Intercutting and re-positioning of burials was frequent in this phase. Unfortunately, while the basic sequence of burial was discernable in later burials, identifying individual grave cuts and fills was impossible until lower in the sequence, where pit burials [946], [948], [950] and [958] cut the pre-cemetery layers [941] (see Photo 3), and early burials cut pre-cemetery layer [971] and marsh layer [976]. No other cemetery features, such charnel pits, burial vaults or brick lined graves, were found in this trench.

Lastly, an unidentified brick arched foundation [1013] was seen *c* 200mm beyond the southern trench limit during initial groundworks (see Photo 4). Its construction cut [1014] truncated the cemetery horizon. Archaeological investigation of this feature was considerably restricted because it was positioned beyond the trench's southern limit. Only an obstructed visual inspection was possible from the top of the trench at this time, since the feature was only visible during shoring adjustments. However, the construction cut [1014] of this feature extended into the southern part of the trench (see section Figure 9). The foundation was constructed of red and yellow stock brick, and is most likely part of19th-century buildings at the entrance of Broad Street station.

Photo 4: Trench 14 – c *19th-century arched brick foundation beyond the southern limit of the trench, looking south.*

9.2 Targeted Watching Brief

9.2.1 Pit 11

Photo 5: Pit 11 – Roman deposits, including pit [980](bottom), pit [991](centre left) and ditch [988](top left). Previous evaluation Trench 1 is marked by grey gravel (top right). Looking west.

Pit 11 *(Figure 1, Figure 4, Figure 10, Figure 14, Figure 15, and Figure 16*)

Location	Utilities corridor northern pile line, southern edge of Liverpool Street. In the location of parts of three previous trenches (Trench 1 (dug to *c* 5m bGL), Pit 4 and Pit 4a (dug to *c* 3m bGL)).
Dimensions	6.00m (east to west) x 2.50m (north to south) x 6m (Deep)
London Survey grid coordinates	83379 36288
OS National grid coordinates	533030 181604
Modern Ground Level	112.30m ATD
Modern subsurface deposits	Modern ground surface and concrete till *c* 1.40m bGL
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 106.30m ATD
Natural observed	Weathered natural bands of gravel and clays ([993] and [995] (same as [717] and [718] in Trench 1). *c* 107.57m and 107.40m ATD. Undisturbed natural terrace gravels [994] (formerly [720] in Trench 1) began at 107.40m ATD and graded into natural London clay [996] (formerly [522] in Trench 1) at 107.00m ATD. Natural London Clay [996] between 106.75m (west) and 107.00m ATD (east).
Extent of modern truncation/overburden	Approximately 1.40m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Dump deposit [992] (same as [716] in Trench 1) - Purple grey sandy clay. 7.74m OD (107.74m ATD).	No finds.
Dump deposit [985] (same as [715] in Trench 1) - Orange yellow gravelly clay. 8.18m OD (108.18m ATD).	Pottery - AD 140 to 160.
Dump deposit [984] (same as [712] in Trench 1) - Orange grey clay. 8.58m OD (108.58m ATD).	Pottery - AD 250 to 400 (single sherd – ?intrusive). Pottery from [712] was 2nd-century (Crossrail 2011d, section 8.2.1). Building material (imbrex and tegula) – AD 140 to 300.
Pit cut [991] (same as [713] in Trench 1) with fills [989] and [990] (same as [709] and [714] in Trench 1). 108.58m ATD.	[990]: AD 150 to 400 (single sherd – Assemblage could be late 2nd-century to early 3rd-century AD?).

Pit cut [980] with fills [978] and [979]. 108.70m ATD.	[978]: Dated AD 120 to 250 (single sherd). Bulk sample taken {30} (see 19.9 and 19.10) [979]: Pottery – AD 350 to 400 (one sherd – ?intrusive. Remaining fabrics and forms are late 2nd-century AD). Disarticulated human fibula (see 19.8). Roman iron slide lock key, copper-alloy stud, iron nails, and lead patch (see 19.7.3). Bulk sample taken {31} (see 19.9 and 19.10)
Clay dump layer [983] (same as [711] in Trench 1).8.68m OD (108.88m ATD).	No finds.
Ditch cut [988] (same as [710] in Trench 1) - with fills [986] and [987] (same as [707] and [708] in Trench 1). 8.68m OD (108.68m ATD).	[986]: AD 120 to 400 (single sherd).
Dump layer [997] – Mid grey brown silty clay, with occasional small molluscs. 108.90m ATD.	No finds.
?Dump layer, marsh deposit or fill [982] (same as [533] in Trench 1) of dense organic material in dark grey black silt clay with sand lenses. 9.33m OD (109.00m ATD).	No finds.
Marsh deposit [981] (same as [507] in Trench 1 and [851] in Pit 4) – Grey brown clay silt with moderate charcoal flecks, occasional animal bone, small stones and oyster shell. 9.83m OD (109.83m ATD).	CBM fragments (brick and peg tile *c* 1450 to 1800).

Interpretation and summary

Archaeological monitoring within this pit began at 3.00 to 3.30m bGL, as the majority of the area had already been dug to this level previously in Trench 1, Pit 4, and Pit 4a (Crossrail 2011d).

At the base of the trench, natural London Clay [996] was overlain by undisturbed natural terrace gravels [994], which were overlain by weathered natural bands of gravel and clays ([993] and [995]). Although there is no clear evidence for an early Walbrook stream in Pit 11, the heavy clay content in the natural terrace gravels, together with the bands of clayey gravel overlaying it, may suggest alluvial disturbance or deposition, perhaps the overbank flooding of an early Walbrook channel.

Above these layers were two Roman dump layers ([984] over [985]). These were cut by two large (*c* ≥2m square) sub-square pits ([980] and [991]) (see Figure 4, Photo 5 and Photo 6), which contained large amounts of Roman material, including pottery, metal items, and small wood and leather fragments. Environmental samples suggest that these pits were not used as cesspits (see 19.10). They are also not quarry pits because they cut earlier Roman dumps and not brickearth or gravel (see Figure 10). Therefore, since the fills contained domestic waste (see 19.2 and 19.9), these features may have been rubbish pits.

Above the pits was a build up of clays ([983] and [997]), which may be flood deposits and could indicate short period of inactivity. At the western end of the trench, the eastern side of a large ditch [988], aligned north–south, cut this clay and pit [991] below (see Figure 4 and Figure 10). Previous environmental samples from this ditch showed large assemblages of aquatic plants and invertebrates, mainly from aquatic and wetland habitats. This indicated that the ditch was water-filled for much of the year (Crossrail 2011d, section 18.10), suggesting that this feature was perhaps a drainage ditch. However, it is possible that this ditch may be the canalised eastern edge of the Blomfield Street Stream of the Walbrook, given its parallel alignment and close proximately to the hypothesised location of the east bank. Moreover, the tip line of [982] over [997] may actually be a continuation of the cut [988], making this deposit the upper fill of the ditch (see Figure 10). If [982] is a fill of [988], it suggests that the ditch was dug in the Roman period, but did not completely silt up, or be backfilled, until the late medieval or early post-medieval period. Excavation further south, beyond modern truncation and disturbance (see below) would help to clarify stratigraphy and confirm the nature of these features.

Overlaying layer [982] was a medieval to early post-medieval marsh deposit [981], 0.83m thick.

Unfortunately, as in Trench 1, this area was heavily truncated and disturbed by tunnelled modern clay pipes. The pipes cut diagonally through the archaeology, presumably from basements to the south into sewers (current and disused) below to the north. Therefore, the stratigraphy was disturbed and blurred in the areas of this tunnelling and, consequently, occasionally difficult to interpret (see interpretation of [982] above). In addition, these modern truncations may be responsible for what appears to be isolated intrusive material within assemblages from contexts [978], [979] and [984] (see 19.1 and 19.2). However, this may also be the result of having three previous trenches within this location, with trench sheets from previous excavations dragging intrusive material downward.

Photo 6: Pit 11 – Roman pit [980], with fills when partially excavated (primary fill [979] remaining), looking north-east.

9.3 General Watching Briefs

9.3.1 Pile Line

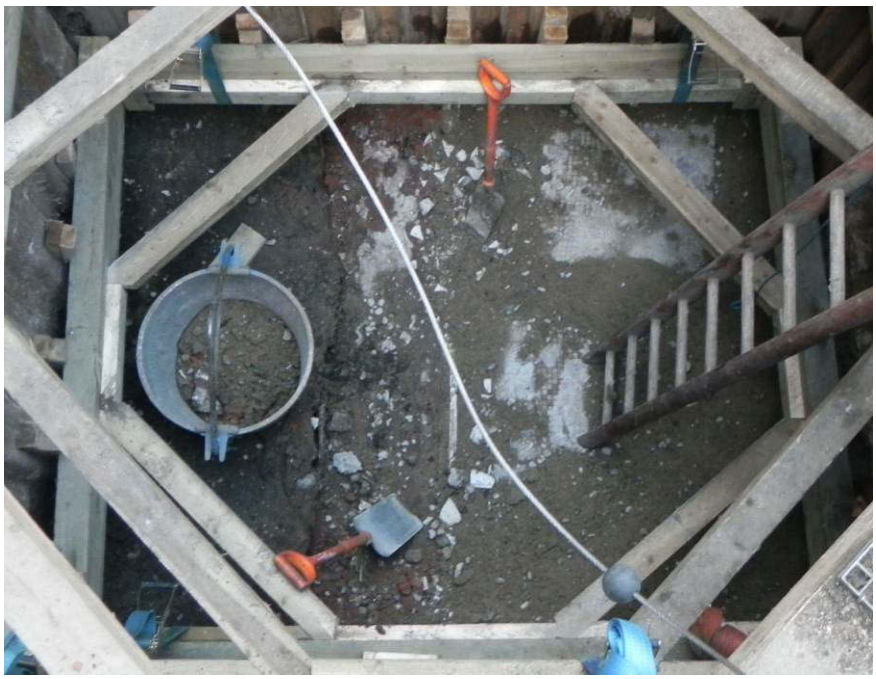

Photo 7: Pit 1 - 20th-century subterranean public toilet block [887], wall left and the surface of tiled floor right, at 109.09m ATD (3.20m bGL) being broken out, west at top.

Pit 1 *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	2.30m (east to west) x 2.80m (north to south) x 4.00 to 5.00m (deep)
London Survey grid coordinates	83368 36293
OS National grid coordinates	533020 181608
Modern Ground Level	112.29m ATD
Modern subsurface deposits	Early 20th-century subterranean public toilet block [887] between 112.79m and 107.29m ATD (0.50m and *c* 5.00m bGL), including wall, floor and concrete foundations. The floor surface of the toilet block was found at 109.09m ATD (3.20m bGL) beneath concrete and rubble backfill.

Level of base of archaeological deposits observed and/or base of trench	Base of trench between 108.29m and 107.29m ATD (4.00m and 5.00m bGL).
Natural observed	Not reached
Extent of modern truncation/overburden	Approximately 1.50m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Peaty marsh [901] - Dark brown and humic, with occasional small stones/pebbles, and frequent small mollusc shells and organic material (twigs, leaves etc). 108.79m ATD (3.50m bGL).	No finds – not excavated
Brick sewer [535], built with shallow frogged red and yellow London stock bricks. As seen in previous evaluation Trenches 1 and 2. Beneath and running parallel to the toilet block wall at 108.38m ATD (3.90m bGL).	Mid to late 19th-century

Interpretation and summary

Within this pit, the majority of the archaeology (including the cemetery horizon) had been truncated and removed by a combination of *c* 19th to 20th-century utility and other undefined modern construction cuts. However, the backfill of these modern features contained occasional human bone fragments.

The archaeology within this trench was largely truncated by modern construction. However, a small area in south-west corner of the pit contained a dark brown organic peaty deposit [901] from 108.79m ATD (3.50m bGL). This possible marsh deposit was not excavated at this time but left *in situ*. Comparison of levels with other trenches suggests it is most likely to be early post-Roman in date.

A disused Victorian (19th-century) brick sewer or culvert [535] was seen in the previous phase of evaluations, and found to be tunnelled east to west across the whole site in an area 1.50m wide, at between approximately 109.00m and 107.00m ATD (*c* 3.5m bGL)(see Figure 1), through natural geology, Roman and lower post-Roman archaeology. In this location the top of the sewer had been broken and removed, and the interior then backfilled with concrete to create a foundation for the wall of the toilet block above. The early 20th-century subterranean toilet block is first seen on the 1913 OS map and last seen on the 1951 OS map. It does not appear on the 1963 OS map and had presumably been closed by this time.

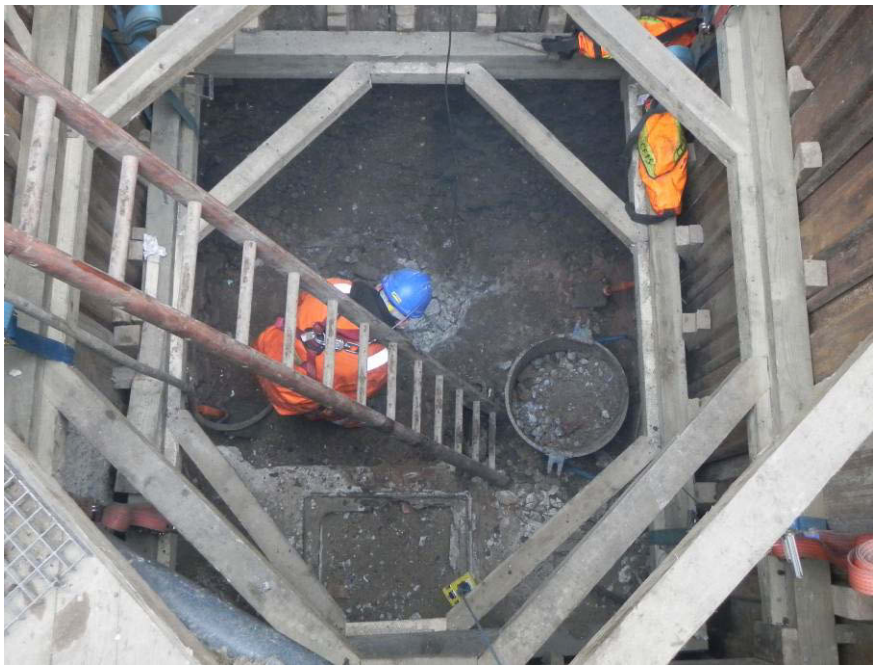

Photo 8: Pit 1 – Concrete wall foundation slab being broken out at 108.59m ATD (3.70m bGL), with a concrete backfilled manhole (centre bottom), archaeological deposit [901] (top right), south at top.

Pit 2 *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	2.30m (east to west) x 2.20m (north to south) x 3.00m (deep)
London Survey grid coordinates	83368 36291
OS National grid coordinates	533019 181606
Modern Ground Level	112.30m ATD
Modern subsurface deposits	Tarmac *c* 80mm thick Concrete *c* 350mm thick Modern gravel made ground and utility backfills *c* 0.60m thick Below this, and to the base of the trench, were intercutting modern construction and utility trench cuts with backfills.
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.30m ATD (3.00m bGL)
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately >3.00m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
No archaeological remains	No finds
Interpretation and summary	
No *in situ* burials or other archaeological deposits were encountered within this pit. All deposits were backfills of re-deposited soil within modern cuts. Thus, the absence of burials within this area is due to extensive modern truncations, including a 19th or 20th-century brick structure along the south side of the trench, possibly associated with the cellars of the buildings on the south side of Liverpool Street. However, the largest of these modern truncations was a utility trench which cut across the south half of the trench and contained numerous clay ducts. This ran west to east across the site and was seen in pile line Pits 2 to 9A, and Pit 11. The base of this truncation was at 109.00m ATD (3.30m bGL).	

Photo 9: Pit 2 – Galldris excavate 19th and 20th-century utility and construction backfills, looking south-west.

Photo 10: Pit 3 – Pit location, showing excavation of modern overburden with utilities, looking west.

Pit 3 (*(Figure 1, Figure 5, Figure 17 and Figure 18*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	2.30m (east to west) x 2.80m (north to south) x 3m (deep)
London Survey grid coordinates	83372 36290
OS National grid coordinates	533023 181605
Modern Ground Level	112.30m ATD
Modern subsurface deposits	Modern ground surface and concrete over gravel overburden down to *c* 1.50m bGL
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.30m ATD
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately 1.50m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [908] - Dark brown black humic sticky silty clay with frequent small mollusc shells, organic material (twigs, leaves etc), moderate animal bone and occasional oyster shell. 109.50m ATD (2.80m bGL).	No finds.
Pre-cemetery consolidation dump layer [907] - Light grey brown sandy silt with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.60m ATD (1.70m bGL). Cut by *in situ* articulated burials. Between 110.60m and *c* 109.80m ATD (1.70m and *c* 2.50m bGL).	CBM fragments (brick and peg tile *c* 1450 to 1800)
Red brick wall [824] built on mortared rubble over timber baseplate foundation, truncated by modern utility trench to the south. Survived seven courses high. At 110.56m ATD (1.74m bGL). Within probable construction cut [906], which cut deposit [907] below.	Brick samples – 1666 to 1750/1800.
Robber cut [1015]. At 110.56m ATD (1.74m bGL). Truncating the eastern side of wall [824].	No finds.
Demolition layer [823] – Light grey ashy and sandy deposit with frequent inclusions of mortar and moderate fragments of disarticulated human bone, overlaying wall [824] and [907]. 110.80m ATD (1.50m bGL).	CBM fragments (brick and peg tile *c* 1450 to 1800).

Interpretation and summary
Layer [908] was most likely a medieval to early post-medieval marsh deposit. Above this, layer [907] is part of a consolidation layer previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively). A layer deliberately dumped down across the whole site to consolidate ground for the establishment of the cemetery. Only deeper and perhaps earlier burials survived, cut into layer [907]. *In situ* burials were found to have been truncated down to a depth of *c* 1.7m bGL. These were exhumed by TCS under MOLA general watching brief. The construction cut [906] of a late 17th or 18th-century wall [824], combined with the later 19th-century demolition, are likely to account for the truncation of the cemetery in this area. Red brick wall [824] (see Photo 11) is most likely part of a building(s) which stood in the south-west corner of the cemetery from the late 17th or 18th century (see Figure 19to Figure 22) to the 19th-century (see Figure 23). The wall was truncated to the east by a possible robber cut [1015]. An ashy and sandy deposit [823] filled the robber cut as well as covered the wall and deposit [907]. This deposit is most likely associated with early 19th-century demolition.

Photo 11: Pit 3 – Brick wall [824], c *17th to 18th-century, truncated south (modern utility trench) and east (cut [1015]), looking east.*

Pit 4a *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street. Extension of Pit 4, between Pit 4 and previous evaluation Trench 1.
Dimensions	2.00m (east to west) x 2.00m (north to south) x 3.00m (deep)
London Survey grid coordinates	83379 36288
OS National grid coordinates	553030 181603
Modern Ground Level	112.30m ATD
Modern subsurface deposits	Modern ground surface and concrete over gravel overburden down to *c* 1.50m bGL
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.30m ATD (3.00m bGL)
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately 1.50m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [851] - Grey brown clay silt with moderate charcoal flecks and oyster shell. 109.80m ATD.	CBM fragments (brick and peg tile *c* 1450 to 1800).
Pre-cemetery consolidation dump [833] - Light grey brown sandy silt with chalk fragments, oyster shells, and mortar and charcoal flecks. 110.48m ATD.	CBM fragments (brick and peg tile *c* 1450 to 1800).
Light grey brown sandy silt [733] cut by burials. 110.85m ATD. Contained a large quantity of disarticulated human bone.	No finds.
Brown grey clay silt [732] with moderate disarticulated human bone fragments. 111.14m ATD.	CBM fragments (brick and peg tile *c* 1450 to 1800).

Interpretation and summary
This pit was an extension of Pit 4 and revealed the westward continuation of deposits found in that pit. Layer [851] may represent a gradually accumulated approximately medieval to early post-medieval marsh layer. Layer [833] overlay [851], and is probably part of consolidation for the establishment of the cemetery (as seen in previous trenches). Both of these layers were cut by deeper burials. The sequence was sealed by a sandy silt cut by *in situ* articulated burials.

Pit 5 *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	6.00m (east to west) x 2.00m (north to south) x 3.00m (deep)
London Survey grid coordinates	83388 36285
OS National grid coordinates	533040 181601
Modern Ground Level	112.33m ATD
Modern subsurface deposits	Modern ground surface and concrete over gravel overburden till *c* 1.40m bGL
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.33m ATD (3.00m bGL)
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately 1.40m to >3.00m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Pre-cemetery consolidation dump [905] - Light grey brown sandy silt with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.43m ATD (1.90m bGL)	CBM fragments *c* 1450 to 1700.
Light grey brown sandy silt [899] and [905] cut by *in situ* articulated burials.. 110.93m ATD (1.40m bGL).	Dated to within the use of the cemetery (1568 to *c* 1730). Pottery – 1700 to 1750 Worked animal bone waste, including off cuts and blanks - 1600 to 1900.
Interpretation and summary	

Layer [905] is part of consolidation for the establishment of the cemetery, previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively).

This pit revealed isolated surviving areas of cemetery with *in situ* burials, between 110.93 and 109.83m ATD (1.40m and *c* 2.50m bGL), heavily truncated by modern intrusions. The cemetery horizon included burials cut into sandy silt [899] and [905] below.

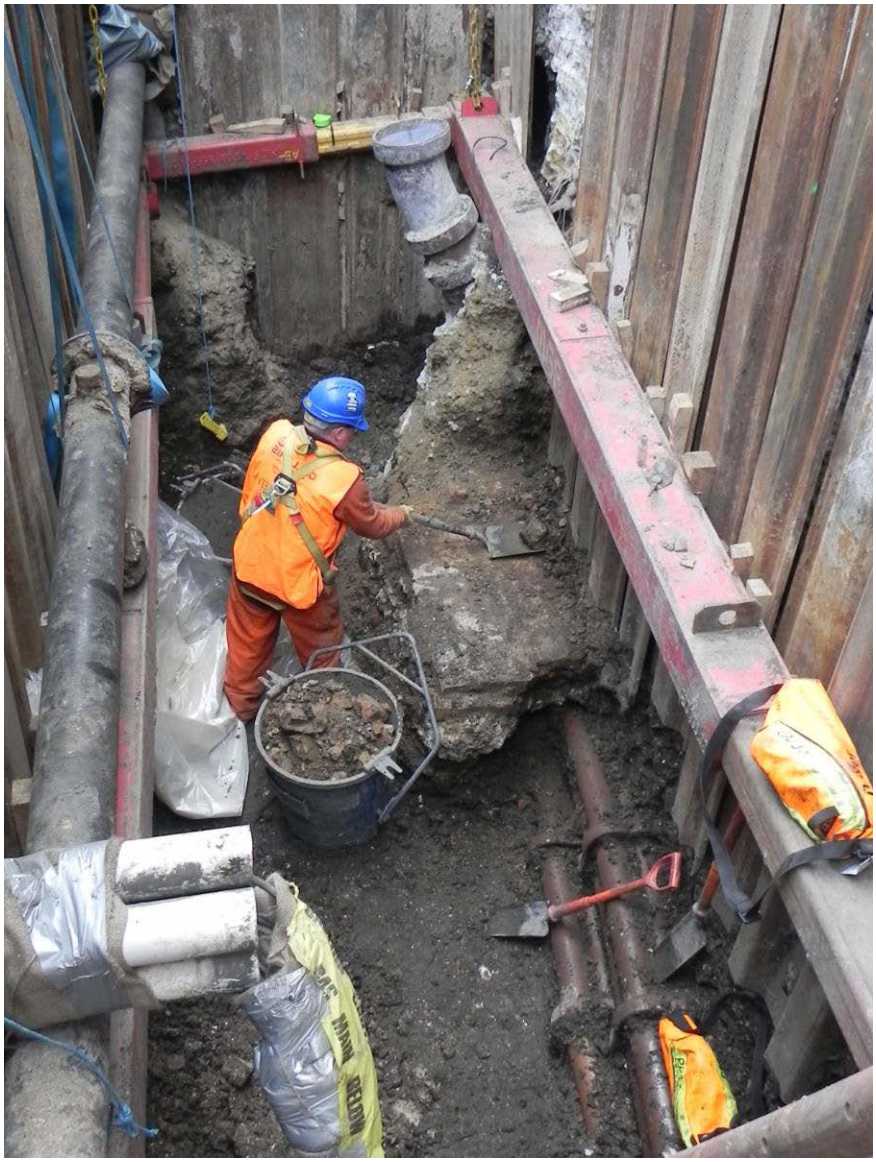

Photo 12: Pit 5 – Excavation nearing completion at approximately 109.43m ATD (2.90m bGL), with modern utilities and related structures, as well as cemetery deposits [899] still to be excavated in the top left and bottom of picture, looking south-east.

Pit 6 *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street. Previous evaluation Trench 2 was located in the north-east corner of this pit.
Dimensions	5.00m (east to west) x 2.80m (north to south) x 3.00 to 3.30m (deep)
London Survey grid coordinates	83394 36284
OS National grid coordinates	533045 181600
Modern Ground Level	112.36m ATD
Modern subsurface deposits	Tarmac *c* 60mm thick Concrete *c* 300mm thick Modern gravel made ground and utility backfills *c* 0.85m thick
Level of base of archaeological deposits observed and/or base of trench	Base of trench between 109.36m and 109.06m ATD (3.00 and 3.30m bGL).
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately 1.20m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [724] - Dark brown black humic sticky clayey silt, with frequent small mollusc shells, organic material (twigs, leaves etc), moderate animal bone and occasional oyster shell. 109.16m ATD (3.20m bGL).	No finds.
Probable *ex situ* timber post [725] (370mm x 310mm x 300mm) – at the base of deposit [723]. 109.56m ATD (2.80m bGL).	Timber retained for specialist examination (see 19.12).
Pre-cemetery consolidation dump [723] – Light red brown sandy silt with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.26m ATD (2.10m bGL).	CBM fragments (brick and peg tile *c* 1450 to 1800).
Light grey brown sandy silt [722] with *in situ* articulated burials. 111.01m ATD (1.35m bGL).	Dated to within the use of the cemetery (1568 to *c* 1730). No finds

Upper- or post-cemetery horizon [721] – Dark brown clay silt with occasional charcoal and mortar flecks, animal bone, oyster shell. 111.16m ATD (1.20m bGL).	No finds.
Interpretation and summary	
Layer [724] is most likely a medieval to early post-medieval marsh deposit. Above this, layer [723] is part of consolidation layer for the establishment of the cemetery, previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively). Building material waste within this layer included an *ex situ* timber [725]. This timber was clearly worked and would have originally been part of a structure (see 19.12). This pit again revealed surviving isolated areas of cemetery with *in situ* burial, truncated by modern intrusions. The cemetery horizon included burials cut into [722] and [723], between 111.01 and 109.86m ATD (1.35m and *c* 2.50m bGL).	

Pit 7 (*Figure 1, Figure 17 and Figure 18*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street. Previous evaluation Trench 2 was located in the north-west corner of this pit.
Dimensions	6.00m (east to west) x 2.00m (north to south) x 3.00m (deep)
London Survey grid coordinates	83400 36283
OS National grid coordinates	533051 181598
Modern Ground Level	112.44m ATD
Modern subsurface deposits	Modern ground surface and concrete over gravel overburden till *c* <1.30m bGL
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.44m ATD (3.00m bGL)
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately between 1.30 and 1.90m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [896] - Mid brown black humic sticky clay silt with frequent oyster shells, organic material (twigs, leaves etc), moderate animal bone. 109.64m ATD (2.80m bGL).	No finds

Pre-cemetery consolidation dump [889]=[897] - Light red brown sandy silt), with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.44m to 110.24m ATD (2.00 to 2.20m bGL).	CBM fragments (brick and peg tile *c* 1450 to 1700).
Pre-cemetery consolidation dump [895] - Dark brown clay silt with occasional charcoal flecks, animal bone, oyster shell and *ex situ* human bone fragments. 111.24m ATD (1.20m bGL).	CBM fragments (brick and peg tile *c* 1450 to 1700).
Horizontally set grave marker (fragmented) [894]. Overlain by [888] and overlaying [895].	Grave marker recovered and retained – dated 1664 (see 19.11).
?Fill or dump layer [888] - Dark brown clay silt with occasional charcoal and mortar flecks, animal bone, oyster shell, and *ex situ* human bone. 111.24m ATD (1.20m bGL).	Clay Tobacco Pipe – 1700 to 1770 (possibly 1716 to 1741) Delft wall tile – 1700 to 1750 Pottery – Residual Medieval, 1270 to 1500 Post-medieval pottery, 1650 to 1680 Worked animal bone waste, including off cuts and blanks - 1600 to 1900.
Light grey brown sandy silt [893] with *in situ* articulated burials. 110.54m ATD (1.90m bGL).	Dated to within the use of the cemetery (1568 to *c* 1730). No finds.
Shaft cut [898] and fill [890]	Pottery - *c* 1807 to 1840 Delft wall tile – 1700 to 1800

Interpretation and summary
Layer [896] is most likely a medieval to early post-medieval marsh deposit. Above this, [895] and [889]/[897] are again part of a consolidation layer for the establishment of the cemetery previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively). Isolated areas of cemetery with *in situ* burial were found within this pit, truncated by modern intrusions. The cemetery horizon included burials cut into [893] and [895]/[889]/[897] below. An *ex situ* grave marker [894] was found within this trench (see 19.11). This is likely to be part of foundation [494] of horizontally set re-used stone found immediately to the west in evaluation Trench 2 (see Figure 6), which included another gravestone (Crossrail 2011d, section 8.2.3). As in Trench 2, there were no burials above the stone but burials did appeared to be positioned up against the area and were not truncated. A robbed out structure may offer an explanation for this stratigraphy. Burials in this location may have been positioned near the wall(s) of a building which was later demolished and robbed out, perhaps after the closure of the cemetery, leaving only a course of foundation stones *in situ* (see Figure 6). If so, the overlaying deposit [888] may be the backfill of a robber cut. Indeed, finds from within [888] suggest a date potentially contemporary with the closure of the cemetery, including a delft wall tile dated to between 1700 to 1750, and a clay pipe dated 1700 to 1770 (possibly 1716 to 1741). Further excavation over a larger area will be needed to clarify the stratigraphy. Close comparisons with historical maps may help to identify walls within this area (see Figure 19 to Figure 23). Grave marker [894] was fragmented and incomplete but the inscription can be read, and it may be possible to trace the deceased through burial records (see Photo 13): IOHN BA(IL?)....(IOHN?) BAIL FA(C?)....AGED 25 WEEKS DYED Y^{E} 13^{D} OF APRILL 1664 Lastly, cut [898] (fill [890]) appears to be a *c* 19th-century or 20th-century shaft, possibly related to truncations seen in evaluation Trenches 1 and 2 (Crossrail 2011d, section 8.2). If so, this may represent a series of shafts dug to access the sewer [535].

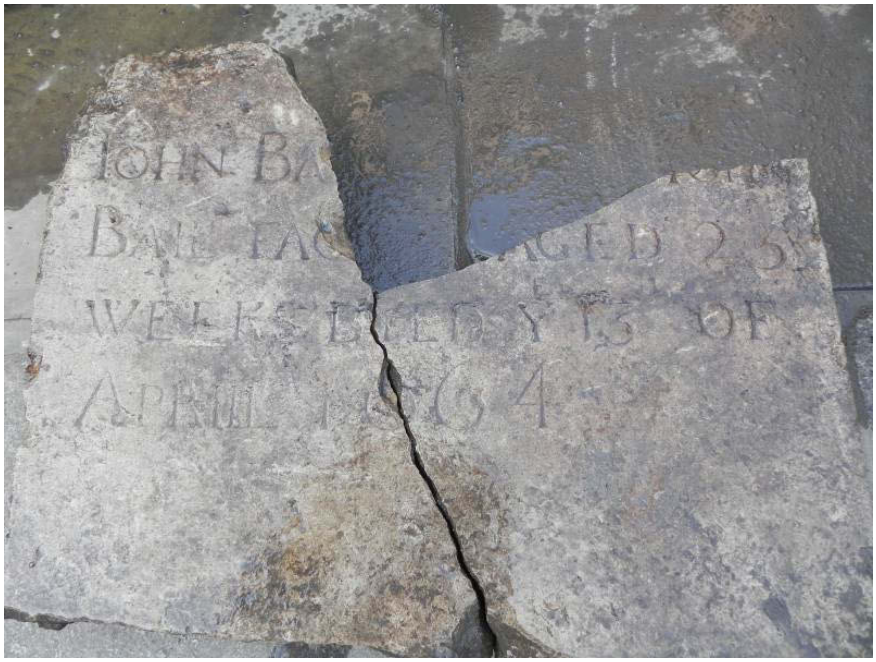

Photo 13: Pit 7 - Grave marker [894].

Pit 8 *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	6.00m (east to west) x 2.00m (north to south) x 3.00m (deep)
London Survey grid coordinates	83406 36281
OS National grid coordinates	533057 181597
Modern Ground Level	112.52m ATD
Modern subsurface deposits	Tarmac *c* 80mm thick Concrete 3.20m thick Gravel made ground/utility trench backfills 0.80m thick
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.52m ATD (3.00m bGL)
Natural observed	Not reached
Extent of modern truncation/overburden	Approximately 1.20m to >3.00m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [903] - Mid brown black humic sticky clay silt with frequent oyster shells, organic material (twigs, leaves etc), and moderate animal bone. 109. 62m ATD (2.90m bGL).	No finds.
Pre-cemetery consolidation dump [902] - Light red brown sandy silt with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.52m ATD (*c* 2.00 bGL).	CBM fragments (brick and peg tile *c* 1450 to 1700).
Light grey brown sandy silt [900] with *in situ* articulated burials, cut into. 111.32 (1.20m bGL).	Dated to within the use of the cemetery (1568 to *c* 1730). Worked animal bone waste, including off cuts and blanks - 1600 to 1900.
Interpretation and summary	
Layer [903] is most likely a medieval to early post-medieval marsh deposit. Layer [902] overlay this and is part of consolidation for the establishment of the cemetery, previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively). Areas of cemetery with *in situ* burial were found within this pit, truncated by modern intrusions, between 111.32 and 110.02m ATD (1.20m and *c* 2.50m bGL). Deeper burials cut into layer [902], although the main cemetery horizon was found above cut into layer [900].	

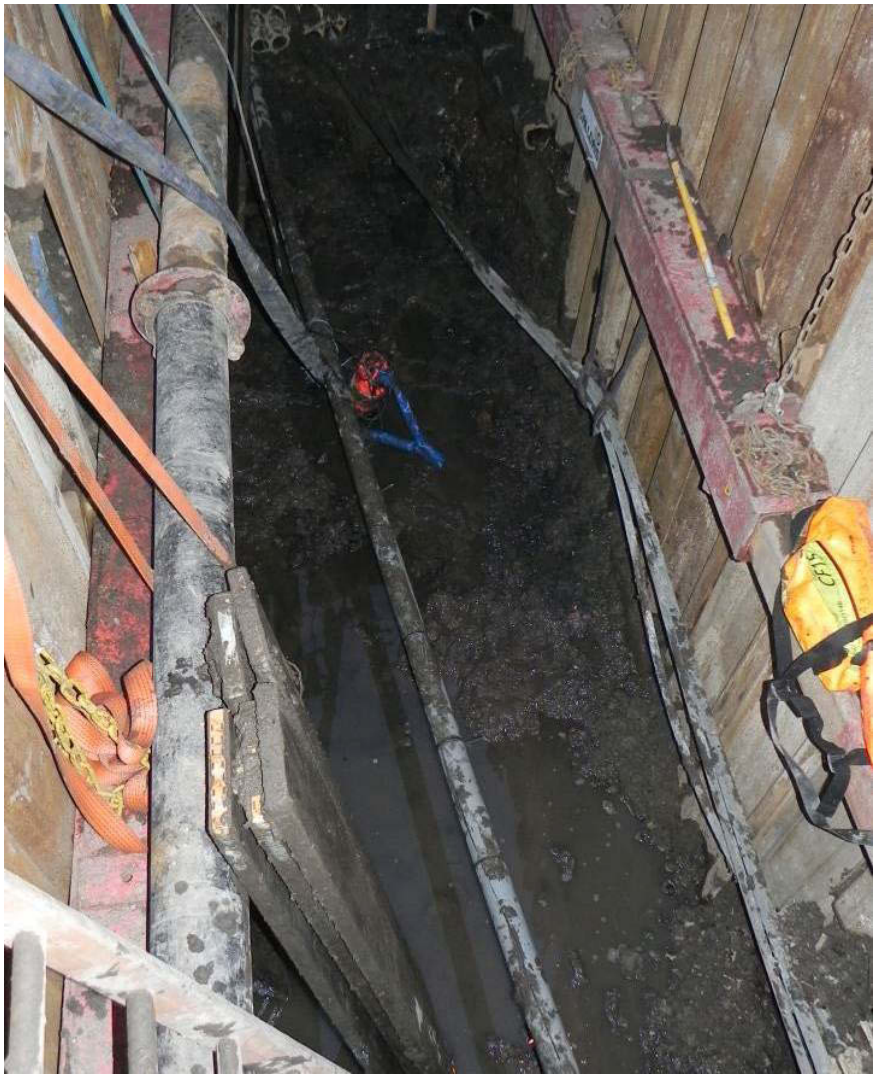

Photo 14: Pit 8 – Excavated by TCS to a depth of 3.00m bGL, into pre-cemetery deposit [903], looking east.

Pit 9 *(Figure 1 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	2.30m (east to west) x 2.80m (north to south) x 3.20m deep
London Survey grid coordinates	83410 36280
OS National grid coordinates	533062 181596
Modern Ground Level	112.60m ATD
Modern subsurface deposits	Modern road surface and overburden over a utility related brick structure.
Level of base of archaeological deposits observed and/or base of trench	Base of trench at 109.40m ATD (3.20m bGL)
Natural observed	Not reached.
Extent of modern truncation/overburden	Base of modern truncation at approximately 2.90m to 3.00m deep.
Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [926] - Mid brown black humic sticky clay silt with frequent oyster shells, organic material (twigs, leaves etc), and moderate animal bone. 09.70m ATD (2.90m bGL).	No finds.
Interpretation and summary	
Layer [926] is most likely a medieval to early post-medieval marsh deposit, truncated by modern features above. A modern utility structure occupied the entire pit except for the western 0.80m, truncating all archaeology to a depth of 109.70m ATD (2.90m bGL). Archaeology was also truncated in the remaining western 0.80m of the pit by the construction cut of this structure, backfilled with sandy clay soil with brick and concrete rubble, gravel and disarticulated human bone, to a depth of 109.60m ATD (3.00m bGL).	

Photo 15: Pit 9 – Excavated to a depth c 3.00m bGL, with modern utility structure brick walls (centre and left) and construction backfill (right), looking south.

Pit 9A (*(Figure 1, Figure 11 and Figure 17*)	
Location	Utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	5.20m (east to west) x 1.40m (north to south) x 3.00m deep
London Survey grid coordinates	83415 36278
OS National grid coordinates	533066 181595
Modern Ground Level	112.67m ATD
Modern subsurface deposits	Tarmac *c* 80mm thick Concrete *c* 350mm thick Gravel made ground and utility trench backfills *c* 1.10m thick The western half of the trench was completely truncated by utility structures and utility trench cuts.
Level of base of archaeological deposits observed and/or base of trench	Base of trench 109.67m ATD (3.00m bGL)
Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately 1.60m to >3.00m deep

Archaeological remains	**Dating Evidence, Finds, and Samples**
Marsh deposit [911] - Mid brown black humic sticky clay silt with frequent oyster shells, organic material (twigs, leaves etc), and moderate animal bone. 109.97m ATD (2.70m bGL).	No finds.
Pre-cemetery consolidation dump [910] - Light red brown sandy silt with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.67m ATD (*c* 2.00 bGL).	CBM fragments (brick and peg tile *c* 1450 to 1700).
Light grey brown sandy silt [909] with *in situ* articulated burials, cut into. 111.07 and (1.60m bGL).	Dated to within the use of the cemetery (1568 to *c* 1730). No finds.
Interpretation and summary	
Layer [911] is most likely a medieval to early post-medieval marsh deposit. Above this, [910] is part of a consolidation layer for the establishment of the cemetery previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively). Areas of cemetery with *in situ* burial were found within this pit, truncated by modern intrusions, between 111.07 and 110.37m ATD (1.60m and *c* 2.30m bGL). Deeper burials cut into layer [910], although the main cemetery horizon was found above within layer [909].	

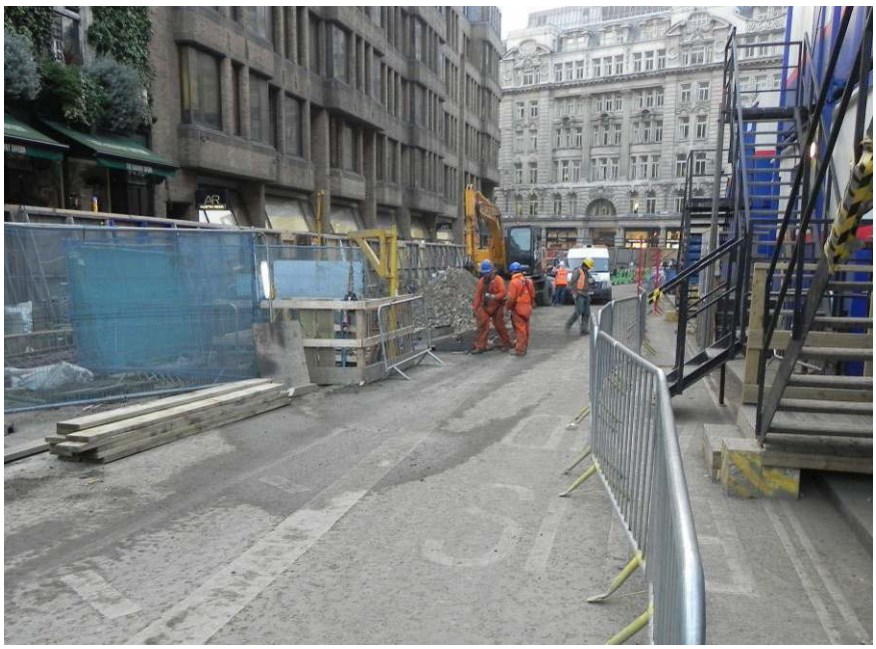

Photo 16: Pit 10 – Liverpool Street compound, Pit 10 centre left, looking west.

Pit 10 (*(Figure 1, Figure 12, Figure 14 to Figure 16, and Figure 17*)	
Location	East end of the utilities corridor northern pile line, southern side of Liverpool Street.
Dimensions	Ground level to 4.00m bGL excavated in an area 1.75m (north to south) x 2.30m (east to west). At 4.00m to 5.70m bGL, the excavated narrowed to *c* 0.90m (north to south) x 1.50m (east to west).
London Survey grid coordinates	83419 36281
OS National grid coordinates	533071 181598
Modern Ground Level	112.91m ATD
Modern subsurface deposits	Tarmac *c* 80mm thick Concrete *c* 320mm thick Gravel made ground and utility trench backfills *c* 1.00m thick
Level of base of archaeological deposits observed and/or base of trench	Base of archaeology between 107.91m (south) and 107.71m ATD (north) (5.00 to 5.20m bGL) (5.00 to 5.20m bGL). Base of trench at 107.21m ATD (5.70m bGL).

Natural observed	Surface of natural orange sandy gravel [924] between 107.91m (south) and 107.71m ATD (north) (5.00 to 5.20m bGL).
Extent of modern truncation/overburden	Approximately 1.80m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
?Fill of a cut feature or marsh deposit [923] – Dark grey black humic peat with frequent small mollusc shells and organic material (twigs, leaves etc). 108.61m ATD (4.30m bGL).	No finds.
?Fill of a cut feature or dump layer [917] – Light grey silty clay with occasional small gravel. 109.01m ATD (3.9m bGL).	Pottery – Roman AD 120 to 250.
?Dump layer or marsh deposit [916] – Mid grey silty clay with occasional organic material (twigs, leaves etc), pebbles and oyster shells. 109.26m ATD (3.65m bGL).	No finds.
Marsh deposit [914] – Dark brown humic marsh peat. Contained occasional animal bone, small stones/pebbles, peg tile fragments, frequent small mollusc shells and organic material (twigs, leaves etc). 109.91m ATD (3.10m bGL).	Leather shoes - mid to late 16th-century 'slip-on' shoes.
Pre-cemetery consolidation dump [913] - Light grey brown sandy silt with chalk fragments, small molluscs, oyster shells, and mortar and charcoal flecks. 110.11m ATD (2.80m bGL).	CBM fragments (brick and peg tile *c* 1450 to 1700).
Light grey brown sandy silt [912] with *in situ* articulated burials. 111.11m ATD (1.80m bGL).	Dated to within the use of the cemetery (1568 to *c* 1730). Worked animal bone waste, including off cuts and blanks - 1600 to 1900.

Interpretation and summary
Natural gravels were sealed by a peaty deposit [923]. Given the small area of excavation it was impossible to determine if this was a horizontal layer, possibly marsh, or a fill within a cut feature. Whilst it was undated, this layer is presumably Roman, given the level of the deposit (108.61m ATD (4.30m bGL)) and the dating of the overlying context [917]. Layer [917] is likely to represent the top of the Roman sequence. If [923] is a fill, [917] could be a secondary fill. Alternatively, it may be a consolidation dump, flood or marsh deposit. Again, the limited area of the pit at this depth restricts interpretation considerably. Layer [916] overlay [917] and is perhaps an early post-Roman marsh. Above this was layer [914], dated by leather shoes to the mid to late 16th-century, which is perhaps a medieval to early post-medieval (pre-cemetery) marsh deposit, which contained dumped refuse material. Layer [913] overlay [914] and is part of a consolidation layer previously identified in evaluation trenches (layers [650], [211] and [277] in Trenches 2, 7 and 13, respectively). A layer deliberately laid down across the whole site to provide stable ground for the establishment of the cemetery. Surviving untruncated areas of cemetery with *in situ* burial were found within this pit, between 111.11 and 109.71m ATD (1.80m and 3.20m bGL), truncated by modern intrusions. Deeper burials cut into layer [902], although the main concentration of burials was found above within layer [900].

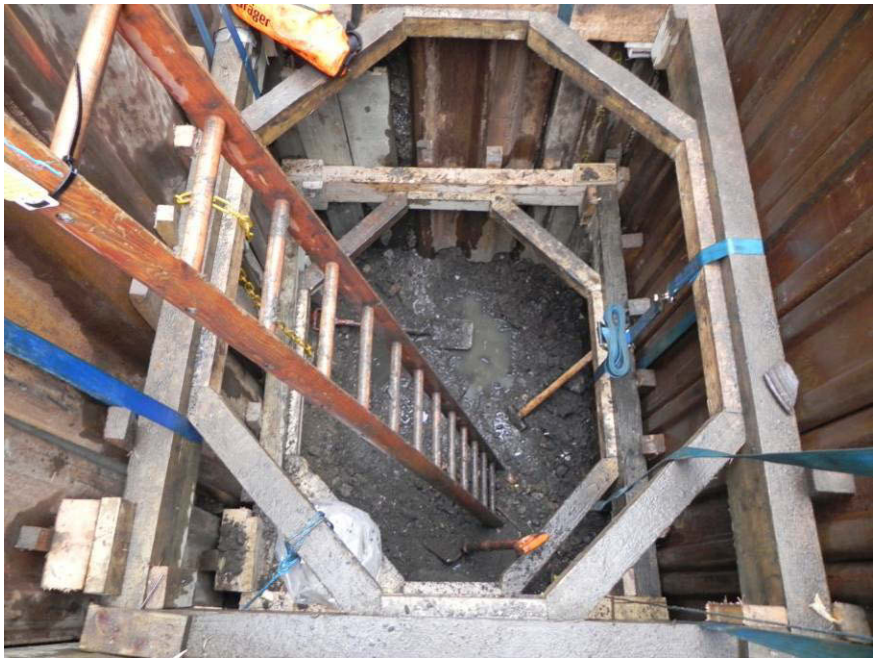

Photo 17: Pit 10 – Excavated to the base of cemetery deposits at 109.71m ATD (3.20m bGL), east at top.

Photo 18: Pit 10 – Excavated into natural gravel [924], showing the base of the pit at 107.21m ATD (5.70m bGL), south at top.

9.3.2 SSET/UKPN Diversion Trench

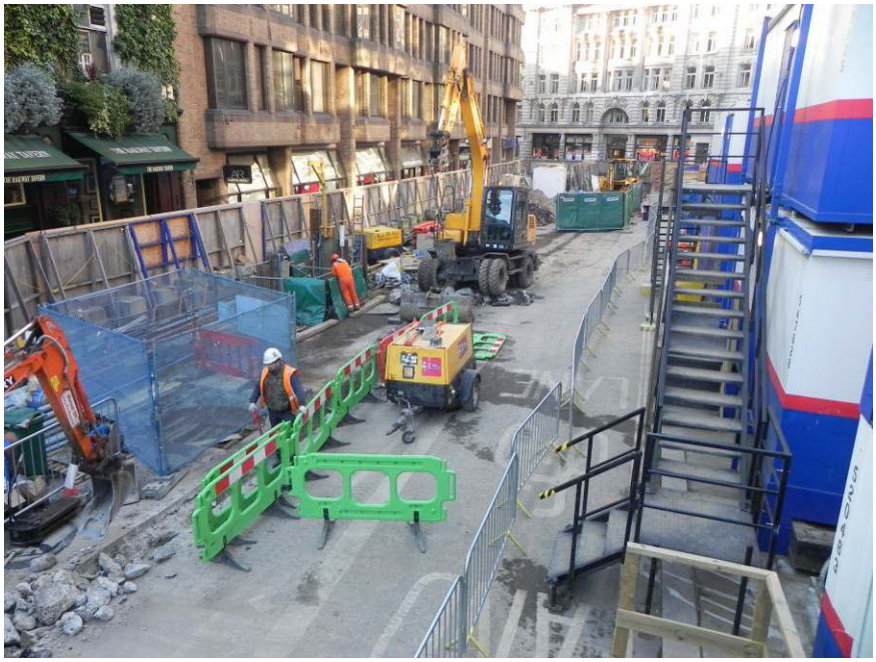

Photo 19: Liverpool Street site, Pile Line GENERAL WATCHING BRIEF Pits 9 and 10 (centre left) and SSET/UKPN Diversion Trench (across the compound east to west, parallel with green barriers), looking west.

SSET/UKPN Diversion Trenches *(Figure 1, Figure 7 and Figure 18)*	
Location	Liverpool Street roadway.
Dimensions	*c* 100m (east to west/long) x 0.60m to 1.40m (north to south/wide) x 0.60m to 1.40m deep.
London Survey grid coordinates	East - 83446 36269 West - 83369 36304 Junction - 83375 36295 South - 83373 36288
OS National grid coordinates	East – 533098 181586 West – 533020 181619 Junction – 533026 181607 South – 533024 181603
Modern Ground Level	Between 112.60m ATD (west) and 113.36m ATD (east)
Modern subsurface deposits	Numerous modern utility trench truncations and backfills.
Level of base of archaeological deposits observed and/or base of trench	Base of trench between 0.60m to 1.40m deep

Natural observed	Not reached.
Extent of modern truncation/overburden	Approximately >0.90m deep
Archaeological remains	**Dating Evidence, Finds, and Samples**
Red brick wall [915] -Truncated by the modern road and utilities. Not fully excavated. Only six courses exposed. At 111.60m ATD (1.00m bGL).	Brick sample: [915] brick – 1550 to 1666.
Upper- or post-cemetery horizon [918] - Mid grey brown sandy silt with occasional animal bone, charcoal flecks, mortar flecks, and disarticulated human bone. 111.60m ATD (1.00m bGL).	Contained frequent brick and tile fragments (brick and peg tile *c* 1450 to 1700).
Upper- or post-cemetery horizon [1016], including animal bone and disarticulated human bone. 111.60m ATD (0.90m bGL).	No finds.
Interpretation and summary	
A truncated section of brick wall [915] was found (see Photo 22) at the western end of the SSET/UKPN Trench (see Figure 7). The construction was similar to walls found during previous investigations (Crossrail 2011d), for example, nearby evaluation Trench 1 (including wall [325] and wall [332]) and Pile Line GENERAL WATCHING BRIEF Pit 3 (wall [824], see Photo 11). It was aligned north to south, parallel to Blomfield Street, and may be the cemetery's original western boundary wall (Figure 19), later perhaps re-used as the boundary wall of the post-cemetery 18th-century properties/gardens (Figure 22 and Figure 23). The opening of the cemetery in 1569 falls within the 1550-1666 date range of the bricks used in wall [915]. Comparisons with historic maps may help clarify locations and alignments. Layer [918] overlay wall [915] at 1.00m bGL and was revealed in an area approximately 5m long at the western end of the trench. It contained large amounts of post-medieval building material and re-deposited, disarticulated, human bone. A similar deposit [1016], was seen within a two metre area west of previous archaeological evaluation Trench 6 (see Photo 20), at 111.60m OD (111.60m ATD) (0.90m bGL). Two human bones were recovered from the surface of this layer. Layers [918] and [1016] may be part of the upper- or post-cemetery horizon found elsewhere on the site (see). All human bone was lifted by MOLA to be securely stored on site for later removal by exhumation contractor TCS.	

Photo 20: SSET/UKPN Diversion Trench – across previously dug evaluation Trench 6 (pink gravel), looking east.

Photo 21: Western section of SSET/UKPN Diversion Trench, looking north-west.

Photo 22: Brick wall [915] in SSET/UKPN Diversion Trench, truncated on the right by utilities, looking west.

Photo 23: Western section of SSET/UKPN Diversion Trench, looking south.

9.3.3 Trench 15

Photo 24: Trench 15 – Excavated by Galldris to c *112.80m ATD (1.2m bGL), concrete walls top and right, looking north.*

Trench 15 *(Figure 1*)	
Location	Pavement north of Liverpool Street, in front of the UBS building.
Dimensions	1.60m x 1.60m x 1.20m deep, extended in an area 2.10m x 0.70m the north-east corner.
London Survey grid coordinates	83413 36304
OS National grid coordinates	533064 181620
Modern Ground Level	114.00m ATD
Modern subsurface deposits	Modern floor slabs and concrete overlay modern orange sandy gravel (construction backfill). Three concrete walls were visible within the sides of the trench, north, east and south. Sheet piles were also present, presumably from the construction related to the 1980s Broadgate development.
Level of base of archaeological deposits observed and/or base of trench	No archaeological remains
Natural observed	Not reached
Extent of modern truncation/overburden	The entire trench

Archaeological remains	**Dating Evidence, Finds, and Samples**
No archaeological remains	No finds
Interpretation and summary	
Modern ground surfaces and concrete overlay concrete walls and sheet piles within modern orange sandy gravel backfill. The concrete wall to the east is believed to be part of the LU substation (see Photo 24). No archaeological remains were exposed within this area at this depth.	

10 Assessment of results against original expectations and review of evaluation strategy

The draft revised GLAAS guidelines (English Heritage, 2009) require an Assessment of results against original expectations (these no longer mention the criteria for assessing national importance).

Corporation of London guidelines (CoL 2004) also require an 'Assessment of results against original expectations (using criteria for assessing national importance of; period, relative completeness, condition, rarity, and group value) and review of evaluation strategy.

10.1 Reliability of results

The results of these investigations are generally consistent and show similar archaeological sequences to the initial phase of evaluation trenches (Crossrail 2011d). The internal consistency of these results indicates that confidence can be placed in them as a representative sample of the Broadgate Ticket Hall site.

It was not possible to evaluate a larger proportion of this site at this time, as it lies in an active roadway (Liverpool Street) with underlying utilities. Furthermore, the eastern extent of the site was not evaluated due to the proximity of LU assets.

The location of the Walbrook channel was not determined during this evaluation. While ditch [988] may be the canalised eastern edge of the Blomfield Street Walbrook stream (see 12.3 and 12.4), this also remains unclear and unconfirmed. Likewise, although evidence suggests that a hypothesised Roman road (see 6) may run west to east across the northern area of the site (see 12.3), the presence and route of the road remains unconfirmed.

The Broadgate Ticket Hall site has an area of approximately 1500m^2, and within this, the estimated total area of surviving cemetery is estimated to be *c* 1000m^2. The following table list the proportion of the site where the cemetery has been archaeologically evaluated:

Task	Area	Percentage of surviving cemetery	Percentage of site
Previous excavated evaluation trenches (Trenches 1, 2, 7 and 13)	*c* 50m^2	*c* 5%	*c* 3.3%
Previous evaluation trenches (Trenches 6 and 9)	*c* 22m^2	*c* 2.2%	*c* 1.47%
Excavated evaluations (Pit 4 and Trench 14)	*c* 15.6 m^2	*c* 1.56%	*c* 1.04%
Totals	***c* 87.6 m^2**	**8.76%**	**5.81%**

Table 3 Total area and percentage of the cemetery/site covered by archaeological evaluation

The western edge of the Bethlem burial ground has been tentatively identified in the SSET/UKPN Diversion Trench. However, this wall was only partially exposed during a watching brief. Whether this the western boundary of the burial ground will not be determined until it is within a larger area of excavation, allowing a full examination of its position within a wider stratigraphic sequence.

10.2 Research aims

The original research objectives (see 7) were met as follows; information was recovered on:

- *Archaeological remains of Roman date relating to extra-mural activity, including burials.*

  Roman extra-mural activity was found on site, including dump layers cut or overlain by features of late 1st to 3rd-century date, including rubbish pits, further dump layers, a ditch (or possibly a canalised stream channel) and ground surfaces (possibly a road). An *ex situ* human bone was present in one Roman context, but no *in situ* burials were discovered.

- *Medieval remains associated with St Mary Bethlehem Hospital.*

  Residual medieval finds were recovered, but no medieval occupation deposits or features have been identified. No medieval remains associated with St Mary Bethlehem Hospital have been found.

- *Post-medieval rubbish dumps and remains associated with the urbanisation of the area.*

  Post-Roman Moorfields Marsh deposits were sealed across the whole site by early post-medieval reclamation deposits, laid to consolidate ground for the establishment of Bethlehem Burial Ground. The burial ground was sealed by a horizon formed of disturbed cemetery soil with refuse and possible consolidation dumping, possibly associated with the urbanisation of the area in the mid to late 18th-century. Brick and stone structures (walls and foundations) found during this phase of evaluation are most likely the remains of buildings seen on 17th to 19th-

century maps.

- *Post-medieval burials within the known burial ground that lies beneath the carriage way of Liverpool Street in the Broadgate Ticket Hall area.*

  There were a total of 87 *in situ* post-medieval burials recorded during this phase, increasing the number of archaeologically excavated *in situ* burials on this site to 327. The burials ground included three phases of burial, including early burials without coffins, a phase of multiple burial in pits, and a final phase of mainly coffined inhumations. No other cemetery features, such charnel pits, burial vaults or brick lined graves, were found in this phase of evaluation.

- *Waterlain deposits with the potential for organic preservation and palaeoenvironmental remains.*

  Roman cut features, such as pits and ditches, and post-Roman marsh deposits have shown a high potential for organic preservation and palaeoenvironmental remains, both during these investigations (see 19.10) and the previous phase of evaluation (Crossrail 2011d).

For revised and new objectives for further fieldwork based on evaluation results see section 13.1.

11 Statement of potential archaeology

11.1 Known remains, demonstrated to be present on the site:

- Roman features including pits, a ditch (possibly the canalised eastern edge of the Roman Walbrook stream), a sequence of ground surfaces (potentially phases of road) and consolidation/reclamation dumps, representing undefined activities. Although no *in situ* Roman burials have been located, disarticulated human remains have been found within Roman contexts;
- The post-Roman to early post-medieval Moorfields Marsh deposits, incorporating refuse dumping.
- Early post-medieval reclamation deposits overlaying the Moorfields Marsh, to consolidate ground for the establishment of Bethlehem burial ground.
- Post-medieval remains in the form of both disarticulated human remains and *in situ* burials relating to the Bethlehem burial ground.
- An important assemblage of post-medieval worked animal bone.
- Post-medieval urbanisation and development, including 17th to 18th-century buildings.

11.2 Potential for further remains:

- Low potential for prehistoric activity, which is likely to be limited to stray finds and isolated truncated features.
- High potential for further types of Roman remains (possibly in the form of land

reclamation, road(s), Walbrook stream channel(s) and burial);

- Low potential for archaeological remains of Saxon date, owing to the presence of the Moorfields Marsh;
- Moderate potential for medieval activity, such as drainage ditches or rubbish, cess or quarry pits;

11.3 Importance of Resources

The importance of the excavated remains has been assessed using professional judgement, informed, where applicable, by the criteria for assessing the national importance of monuments (DCMS 2010, Annex 1).

While archaeological excavations within the extra-mural area north of the Roman city are not uncommon, this site offers an opportunity to investigate this individual locality, which is a relatively unexplored area situated north of the Roman City Wall, between known Roman burial grounds and roads. The Roman remains represent possible land reclamation activities, refuse disposal and potential infrastructure features. The Roman remains have obvious group value with recent Crossrail sites at Finsbury Circus, Moorgate, and Blomfield Street, as well as a large number of earlier archaeological sites in the area, notably near by Finsbury Circus, Eldon Street (RIV87, FIB88, ENS03, ELD88 and BDC03), New Broad Street (NEB87) and Riverplate House (RIV87). The Roman remains are therefore considered to be of low to moderate importance, although potentially moderate if the identifications of the road and Walbrook are confirmed in further fieldwork.

The medieval to post-medieval marsh and later reclamation dumps represent more consistent activity across the evaluated area and are of local interest. However, these remains are considered to be of low importance.

The ground within the Crossrail Broadgate Ticket Hall worksite is likely to contain the last surviving remains from within the original footprint of the cemetery. A cemetery made even more significant by its association with the Hospital of St Mary Bethlehem (Bedlam). Evaluation has shown that large areas of the Bethlem burial ground still survive intact with good levels of bone preservation. As a hitherto archaeologically underrepresented subject, the excavation of these early 16th to 18th-century burials will help further our knowledge and understanding of society and burial during a time when the city and population was greatly expanding. There is limited supporting historical documentation, including registers and maps, although the majority of documentation only survives from the 17th-century and later (see Figure 20 and Figure 21). Where the identification of individuals is available (see 19.11), it may be possible to trace them. Given the incomplete nature of the historical records, this makes these finite remains an important and valuable archaeological resource. Any further fieldwork will allow an opportunity for full archaeological investigation. The remains of the burial ground not only have group value with those excavated from the same cemetery immediately north (LSS85, Malt & White 1987), but also with other post-medieval burial grounds, such as St Botolph, Billingsgate (BIG82) and St Brides Lower Cemetery, 75 to 82 Farringdon Street (FAO90). This evaluation may be compared and contrasted to these other investigations to provide information about historic burial practices across London and beyond.

The development of properties on the site after the closure of the cemetery is well documented (see Figure 21 and Figure 23). Remains of these structures are of low importance and of only local interest. The post-medieval worked animal bone waste

assemblage is of at least moderate importance and could potentially be of national interest (see 19.7). Such a large quantity of well preserved post-medieval worked animal bone waste is not a common archaeological resource (see 19.7). This assemblage remains the largest group of this type from post-medieval London, and the total number of fragments recovered from the site outnumbers all other post-medieval bone-working assemblages from London recorded on the MOLA ORACLE database combined. The 19th-century sewer [535] is of constructed with typical materials and is of a typical form. Although apparently unknown to modern utility companies, this structure belongs to a well-documented period, and is of low importance.

Overall, the remains are of **moderate** importance, in particular the post-medieval burials and worked bone assemblage. The Roman remains are of low to moderate importance, although potentially moderate if the identifications of the road and Walbrook are confirmed in further fieldwork. All other remains are considered to be of low importance.

12 Conclusions

12.1 Geology

The natural geology was only reached within Pits 11 and 10 during this phase of investigation. No other trench was excavated to the base of the archaeological sequence during this phase.

In Pit 11, at the eastern end of the site, the levels and character of the natural deposits were consistent with those found previously in Trench 1 (Crossrail 2011d). At the base of the trench, London Clay [996] was found at 107.00m ATD, overlain by natural clayey terrace gravels [994] at between 107.30 and 107.40m ATD. In Pit 10, at the western end of the site, terrace gravels [924] were found at between 107.91m to 107.71m ATD (5.00 to 5.20m bGL). To date, this is the westernmost area to fully excavated to natural, and the highest area of terrace gravel yet found. Previous evaluation results suggested little change in the level of natural terrace gravel west to east across the south of the site (Crossrail 2011d). However, levels of terrace gravel in Pit 10 would suggest a gradual downward slope east to west over the wider area. Such a slope would support the hypothesised location of the Blomfield Street Stream at, or possibly within, the western edge of the site.

However, terrace gravel may have been truncated in Pit 10 by undefined Roman activity. The archaeological deposits immediately above natural gravel were of indeterminate character (see 9.3.1). If natural gravels have been truncated in this area then the true gradient of the east to west slope may be greater. Unfortunately, it is impossible to come to any decisive conclusions from this data, given the limited areas and locations seen in evaluation.

In Pit 11, terrace gravel was overlain by weathered natural bands of clayey gravel and clays ([993] and [995]). Although there was no clear evidence for any Walbrook stream channels, the heavy clay content in the natural terrace gravels, together with the bands of clayey gravel overlaying it, may suggest alluvial or flood deposition, perhaps indicating the presence of an early Walbrook channel nearby toward the

west.

The absence of undisturbed brickearth is consistent with previous results and with other local sites (see 5). Any capping brickearth may have been eroded within the flood plain of the Walbrook due to the activity of the river or truncated by later Roman activity.

12.2 Prehistoric remains

No prehistoric remains were found during these investigations. If originally present, any pre-historic features or deposits must have been entirely truncated by Roman activity. However, there remains a low potential for prehistoric features or deposits in the remaining unexcavated areas of the site.

12.3 Roman remains

(see Figure 4, Figure 9, Figure 10, Figure 12 and Figure 14 to Figure 16)

Pit 10 and Pit 11 were the only areas excavated to the Roman sequence during this phase of investigation. The surface of Roman archaeology was fairly level across the site (at 109.01m ATD (3.9m bGL) to the east in Pit 10, and at 108.90m ATD (*c* 5m bGL) to the west in Pit 11) and was approximately 1.3m thick. However, while Trench 14 was not excavated beyond the cemetery deposits, auger holes were dug beyond this to levels consistent with the Roman sequence found in recent evaluation trenches (the nearest being Trench 13, *c* 5m to the south-east) and the Broadgate excavation (LSS85, Dyson et al 1987)(*c* 109.00m to 108.00m ATD).

Despite the site's location being within the general area of the northern cemetery of the Roman City, no *in situ* Roman burials were discovered. However, a disarticulated human bone was found in Roman pit fill [979] (see 19.8.3). It is possible the bone is residual material from a disturbed burial in the area, for example, washed into the pit by flooding.

In Pit 10, the natural gravels were sealed by a peaty deposit [923]. However, given the small area of excavation, it was impossible to determine the nature of this deposits, whether it was a horizontal layer or the fill within a cut, for example. While no finds were found, this layer is probably Roman, given depth of the deposit and overlaying context [917], dated by pottery to AD 120 to 250. If [923] is a fill, [917] could be a secondary fill. Alternatively, it may be a consolidation dump or a flood deposit. Layer [917] may represent the top of the Roman sequence (see Figure 12).

The Roman deposits and features found previously in evaluation Trench 1 (Crossrail 2011d) continued south and east into Pit 11. Two Roman dump layers ([984] over [985]) sealed natural deposits and may represent early attempts at reclamation. These dumps layers were cut by pits [980] and [991]. Analysis of environmental samples suggest that these pits (see Photo 5 and Photo 6) were not used as cesspits (see 19.10). They are also unlikely to be quarry pits as they did not cut gravels or brickearth (see Figure 10). Therefore, since the fills contained significant amounts of domestic waste (see 19.2 and 19.9), these features are most likely to be rubbish pits. Unfortunately, it is impossible to determine the source of the refuse within the fills, for example, whether the refuse is from local occupation or was brought out of the City for extra-mural disposal. The primary fill of pit [980], also included large amounts of plant epidermis, from stems or roots, as well as a large assemblage of waterlogged seeds. The latter came mainly from aquatic or wetland plants, suggesting that

marshy habitats existed close by (see 19.10). Above these pits was build up of possible waterlain flood deposits (clays [983] and [997]), which could indicate a short period of inactivity.

These layers were cut by the eastern side of a cut feature [988], aligned north to south, truncating these layers at the western end of the trench (see Figure 4 and Figure 10). This feature appears to be a ditch, although it could be the edge of a canalised channel. It is difficult to establish whether this ditch completely silted up during the Roman period or remained at least partially open into the late medieval to early post-medieval period (see 9.2.1 and Figure 10). Thus, currently, both the character and stratigraphy of this feature is unclear and excavation further south, beyond truncations caused by modern tunnelled pipes, would help to clarify this relationship.

In Trench 14, augering was halted when a hard surface [1003]/[1011] was encountered which could not be penetrated. This is likely to be a continuation of metalled and compacted gravel ground surface [311], which was found in Trench 13 to the south-east at 108.50m ATD. If so, this metalled surface would extend over an area approximately 5m or more south to north. This has prompted closer analysis and comparison with previous excavations in the local area, in particular, the character and route of the hypothesised Roman road (see 6), and has lead to significant re-interpretations of previous evaluation results (Crossrail 2011d).

Both Trenches 13 and 14 are located within the path of the hypothesized Roman road (see 6 and Figure 1), based on the most recent conjectured route of the road based on the Eldon Street excavations to the north-west (Harwood et al, in prep 2012). Previously, in evaluation Trench 13, Roman features had been interpreted as attempts at land drainage and consolidation, since the thickness of the gravels and the character of the underlying deposits had not been considered consistent with Roman road construction techniques. However, sections of the Roman road found in the excavations south of Eldon Street (RIV87, FIB88, ENS03, ELD88 and BDC03) were of a similar character. Indeed, the latest interpretations of this road see it not as an intrinsic part of the road network, but more likely a local track leading across extra-mural open ground (Harwood et al, in prep 2012). In addition, the road found south of Eldon Street was found to be of several phases, and dated broadly to the same period as features within Trench 13 (*c* mid 2nd to mid 3rd century AD).

Test Pit 7 (TP7), an area fully excavated during the Broadgate excavations of 1985 to 86 (LSS85), would also appear to lie within the conjectured route of the road (see Figure 1). Crucially, the extra-mural Roman road south of Eldon Street leading to Bishopsgate was only discovered and confirmed after the LSS85 excavation (from sites RIV87, FIB88, ENS03, ELD88 and BDC03; Harwood et al, in prep 2012). Consequently, Roman features found in LSS85 TP7 may require re-examination. In TP7, compacted layers of gravels, clay and building material were interpreted as phases of banking to the eastern bank of the Walbrook (located in the west of the trench)(Dyson et al 1987). However, these phases, at between 108.40m and 108.90m ATD, are consistent with the levels of compacted gravels found in Trenches 13 and 14, as is the dating (AD 180 to 300). Thus, this banking may not only represent attempts at the revetment of the Walbrook, but also where the road meets the eastern bank of the river.

Although no dating evidence was found, the deposits sealing surface [1003]/[1011] (contexts [1003]/[1011]([1001], [1002], [1008], [1009] and [1010]) are likely to be Roman in date as they correspond to levels of the Roman sequence in Trench 13 and LSS85 (to the south-east and north-west)(*c* 109.00m to 108.00m ATD)(see

Figure 9). The discrepancy of result in these potential Roman deposits is most likely due to the presence of cut features, for example, ditches or pits. Conversely, horizontal banded stratigraphy alone would most likely produce consistent results over such a short distance (1.06m between auger holes, south to north).

12.3.1 Updated Provisional Phasing and associations, incorporating previous evaluation results with re-interpretation

The current evidence is still not sufficient to provide more than tentative provisional phasing across the site. Unfortunately, site wide interpretations are still greatly limited by the small size and localised nature of the evaluation trenches, combined with the provisional nature of the dating evidence. In particular, interpretation and dating of the Roman sequence in Pit 10 is currently limited and problematic, with little evidence available for the dating or identification of potential Roman deposits. Based on available evidence, deposit [923] may be of a 1st or early 2nd-century date, overlain by layer [917], dated by pottery to *c* 2nd-century. Layer [917] which may represent the top of the Roman sequence (see Figure 12).

Dating evidence is also occasionally problematic elsewhere due to modern truncations. For example, in Pit 11 there was isolated probable intrusive material within assemblages from contexts [978], [979] and [984](see 9.2.1, 19.1 and 19.2). This likely the result of there being three previous trenches within this location. For example, with trench sheets from previous excavations dragging intrusive material downward. If intrusive, this material may have produced an incorrect later date for these contexts (see 9.2.1). A more precise date for these contexts may be possible with further excavation.

However, a basic comparison of trench sections, including those from the previous and latest phases of investigation, tentatively suggests some potential associations, based on current interpretations, corresponding sequences, dating and levels (see Figure 14, Figure 15 and Figure 16).

Interestingly, no Roman feature or deposit on the site has yet to be dated to later than the 3rd-century. This may suggest a Roman presence focus of Roman activity within the area during the late 2nd to mid 3rd centuries. This supports the theory that the construction of the City Wall between *c* AD 180 and 225 significantly impeded the natural drainage of the upper Walbrook and created an area of distinctly marshy land in the valley outside the city wall, which discouraged activity in this area thereafter.

The sequence within Pit 11 represents several phases of activity and is consistent with that found within previous evaluation Trench 1. Early *c* 1st to 2nd century Roman dump layers ([984] over [985]) overlay natural and were cut by two pits ([980] and [991])(see Figure 10), which contained large amounts of Roman material, including leather fragments. Above this, a build up of clays ([983] and [997]) could indicate short period of inactivity. Finally, the eastern side of a north-south aligned ditch [988] or possible canalised channel, truncated [997] at the west end of the trench.

Within Trench 13, there was evidence for at least three phases of Roman activity, approximately late 1st to mid 3rd-century, beginning immediately above the weathered natural clay. Re-interpretation of results may suggest several phases of Roman road, including later re-surfacing (see Figure 13), between *c* 2nd to mid 3rd-century. Firstly, ditch [310] alongside gravel surface [311] could represent the southern edge of an initial road with road-side ditch. The road then became covered with flood deposits and/or trample and the ditch silted up, necessitating a re-cut [308]

of the original ditch [310]. This re-cut itself then silted up and an another build up of clay [303/305] formed over it. Features [302], a possible beam slot or gully, is then cut into this clay, with a possible floor surface to the north [304]. This was then sealed metalled gravel ground surface [300]. Fortunately, [300] has a *terminus ante quem* in the form of a silver denarius of Severus Alexander, dating AD 228 to 230. This surface may be a final re-metalling/re-surfacing, perhaps widening the road or shifting it's position southward slightly. The gentle southward slope of ground surface [300] may be the southern camber of the road. The levels and angle of this slope, could suggest an association with ditch [240] in Trench 7 (Crossrail 2011d). If associated, ditch [240] could be the road side ditch for this last phase of the road (See Figure 16).

Generally, it will not possible to confirm stratigraphic relationships within and across the trenches until further excavation is conducted across the whole site, providing further dating evidence and linking stratigraphic information.

Provisional Phase	Tr 1/Pit 11	Tr 2	Tr 7	Tr 13	Tr 14 (Auger holes 1 and 2)	Pit 10
Late 1st to mid 2nd century AD ? (Figure 14)	**Reclamation/consolidation dumps** [985]/[716](pot AD 120 to 160), [715] (pot 140 to 160) and [984]/[712] with disarticulated human bone. Cut by two large **pits** [980] and [991]/[713] (pot 140 to 300)	?Re-deposited, **brickearth** [704] (pot 120 to 160). Overlain by **metalled gravel surface** [703] (pot 120 to 160)	**Reclamation/consolidation dump** [242]	**Ditch** [310] & re-cut [308], possibly road side ditch? With adjacent **metalled gravel surface (Road?)**[312]	**?Metalled gravel surface (Road?)** [1003]/[1011], if a continuation of [312] (undated, roughly level with [312])	**Deposit** [923], possible fill of cut feature (undated, overlain by [917])
2nd century AD ? (Figure 15)	Build up of clay [983]/[711]. Large N-S **ditch or canalised channel?** [988]/[710] (pot 120 to 400)	**Reclamation/consolidation dumps** [702] (pot 150 to 200), [699], and [694]	**Reclamation/consolidation dumps** [231] (pot 120 to 160) & [241] (pot 120 to 160)	Build up of clay [303/305] Cut by a gully or **beam slot** [302] (pot 150 to 300) Adjacent **floor surface** [304]	Unknown	**Deposit** [923], possible fill of cut feature (undated, overlain by [917])
3rd century AD ? (Figure 16)	Large N-S **ditch or canalised channel?** [988]/[710] (pot 120 to 400)	Shallow cut feature [696] etc. Truncated by pit [701], and **?ditch** [698] (pot 120 to 160). = [229]?	**Drainage ditch** [240] (pot 150 to 300), possibly road side ditch? Later **dump or flood deposit** [230] (pot 120 to 160) Later **drainage ditch** [229] (pot 150 to 400; CBM 120 to 250). = [698]? Sealed by **dump or flood deposit layer** [213] (pot 140 to 160; CBM 140 to 300).	**Metalled gravel surface (Road?)**[300] (coin 228 to 230; Pot 150 to 250; CBM 140 to 300)	Unknown	**?Dump or flood deposit** [917] (pot 120 to 250)

Table 4 Provisional Phasing of selected features (only significant spot dates shown)

12.4 Medieval remains

As with the previous phase of evaluation results (Crossrail 2011d), the post-Roman period can be characterised as one of abandonment. No Saxon or medieval features or structures were present. In particular, there were no medieval remains associated with St Mary Bethlehem Hospital have been found.

Deposits above *c* 109.00m ATD in Trench 14 auger holes 1 and 2 are also most likely post-Roman to post-medieval marsh deposits ([998], [999], [1000], [1004], [1005], [1006] and [1007]), although no dating evidence was found. The following contexts may be grouped as post-Roman probable marsh deposits: [851], [981], [976], [908], [724], [896], [903], (911), [914] and ?[916] in Pit 4, Pit 11, Trench 14, Pit 3, Pit 6, Pit 7, Pit 8, Pit 9A, and Pit 10, respectively. This horizon was between 109.01m and 109.91m ATD in the east (Pit 10), and between 108.88m and 109.83m ATD in the west (Pit 11), or 0.90m thick in the east and 1.03m thick in the west. It is possible that these deposits becomes thinner toward the potential edge of the Moorfields Marsh beyond the eastern limit of the site. Alternatively, these results may represent nothing more than localised undulation. Unfortunately, this is impossible to determine given the limited areas and locations seen in evaluation.

This marsh horizon contained medieval to early post-medieval artefacts and refuse, although it is currently difficult to determine if this represents a continuum of medieval to post-medieval deposition, or is post-medieval with residual medieval artefacts. However, the high organic nature of these deposits suggest that the land of the post-Roman to the post-medieval period was marshy semi-terrestrial ground, with seasonal flooding and ponds or pooling, which was frequently used as waste ground. Interestingly, no cut features, such as drainage ditches or pits, have been dated to the post-Roman and pre-cemetery period. However, it is possible that ditch [988], at the top of the Roman sequence in Pit 11, may prove to have remained open into the post-Roman period (see Figure 10). These relationships can not be fully understood until further stratigraphic information is available. Nevertheless, the apparent absence of drainage supports the hypothesis that the land remained waterlogged or at least semi-terrestrial through the post-Roman to early post-medieval periods.

12.5 Post-medieval remains

(see Figure 1, Figure 17, and Figure 18)

12.5.1 Pre-cemetery

The previous phase of evaluation results (Crossrail 2011d) were confirmed, with medieval and earlier deposits sealed across the whole site by a rapidly-deposited post-medieval dump(s). Contexts [833], [941]/[971], [907], [905], [723], [889]/[887], [902], [910] and [913], in Pit 4, Trench 14, Pit 3, 5, 6, 7, 8, 9a and 10, respectively.

These layers were deliberately laid down to raise and consolidate the ground, presumably to prevent flooding and to establish the cemetery. This horizon was previously seen as contexts [211], [277], [493] and [650] within Trenches 7, 13, 1 and 2 respectively, *c* 0.3 to 0.6m thick at between 110.42m to 110.83m ATD (*c* 2m to 1.9 bGL). Spot dating of pottery and building material waste within all of these contexts confirms an early post-medieval date consistent with the opening of the cemetery in 1568/9. The frequent inclusion of charcoal, mortar and building material, including

brick, tile and a structural timber fragment (see 19.12), may suggest that a significant part of this consolidation was formed of construction debris or demolition material brought to be dumped at the site from sources within the City.

12.5.2 Bethlehem Burial Ground

During this second phase of evaluation, surviving areas of the cemetery were recorded and the burials excavated archaeologically within Pit 4 and Trench 14 (see 9.1 and Figure 17). A total of 86 *in situ* post-medieval burials were archaeologically excavated in Pit 4 and Trench 14 (see Table 5 and 10.1). Excavation along the pile line by the exhumation contractor TCS during MOLA general watching brief has cleared the area of all *in situ* burials. Articulated *in situ* burials were found between 109.66m and 111.30m ATD (2.66m and 1.25m bGL)(see Table 5). No other cemetery features, such charnel pits, burial vaults or brick lined graves, were found in either excavated trenches or during the watching briefs.

12.5.2.1 Coffins

Where the shape remained recognisable, all coffins appeared to be the standard 'kite' shape (widest around the shoulder area and tapering to both head and feet). Unfortunately, coffin survival was generally poor. The majority of coffins appear to have been of plain wood, which in most cases survived as little more than fibrous traces. No textiles survived from coffin coverings or linings. Unfortunately, while the remains were sufficient to acknowledge the presence of coffin plates in Pit 4, all were too badly corroded and fragmented to read any inscriptions or identify recognisable forms. No coffin plate fragments were found in Trench 14. In both Pit 4 and Trench 14, some of the later coffins also had grips and grip plates, although only one survived as more than rusted fragments (coffin handle/grip <285> from [745] (see 19.7)). The form of this handle and grip is not directly paralleled amongst the major assemblages of coffin fittings from Christchurch, Spitalfields, or the Quaker cemetery at Kingston upon Thames, but the general style is appropriate for a 17th to 18th-century date. Further comparisons with London post-medieval cemetery sites may find closer parallels and a tighter date (see 19.7.2).

12.5.2.2 Burial practice

In both excavated evaluation trenches (Pit 4 and Trench 14), the earliest burials were without coffins and were relatively few in number. These burials were most likely in shrouds. Later burial practice appears to be markedly different, with wooden coffins, arranged in distinct rows and stacks, aligned, according to convention, west to east. Stacks rarely included more than three burials. These results are consistent with previous evaluation results (Crossrail 2011d). In Trench 14 after an initial lower phase of burials, there was a phase of mass or 'pit burial' (see Figure 3 and Photo 3). This contrasts with Pit 4 and the previous phase of evaluation. Of the 11 inhumations within these pits only two were within coffins.

No burials were found within cuts [948] or [950]. However, these cuts are likely to be pit burials, given the presence of disarticulated bone and the edges of possible *in situ* coffins within the fills. Burials within these pits are likely to lay on or beyond the limits of excavation (south and east). The burials within pits [946] and [958] were separated by layers of soil and not directly laid on each other, perhaps suggesting that these pits may have remained open and only been partially backfilled between inhumations

until they reached full capacity, and not that all bodies were buried at the same time. Pit burial in Trench 14 was overlain by a later and final phase of coffined inhumations, buried individually or in small stacks.

12.5.2.3 Cemetery management

In both Pit 4 and Trench 14, intercutting of graves was frequent in the last burial phase. While the basic sequence of burial was discernable in both trenches, intercutting left many skeletons badly truncated, with displaced bone and coffin fragments reburied in the backfill of new graves. Unfortunately, as a consequence of the intense intercutting, identifying individual grave cuts and fills was impossible until lower in the sequence, where they cut the distinctive pre-cemetery layers. The primary phase of burial in Trench 14 was located between two layers of pre-cemetery dumping, suggesting that early burials occurred while the site was still being established (see 9.1.2).

There is little evidence of plots or patterns of zoning, based on, for example, age, gender, or social status. However, the presence of an additional phase of pit burial (see 12.5.2.2) within the northern area of the compound (Trench 14) may suggest a particular method of burial and an area of the cemetery for those who could not afford coffin burial. Alternatively, rather than being a cost saving method, this phase of burial may represent a period of high mortality when more rapid and efficient burial was required. A comparable pit burial phase was found during the 1985 excavation (LSS85, Malt & White 1987), immediately to the north-west, and a pit burial [263] was found within the north-east corner of evaluation Trench 13, *c* 5 metres to the south-east of Trench 14.

The pit burial in Trench 13 may mark the southern extent of the pit burial practice, which the results to date tentatively suggest was confined to the northern part of the Bethlehem burial ground. Analysis of spatial patterning within the cemetery is limited at this time by the size and isolated nature of the trenches. Genuine patterns, if present, may only be discernable after full excavation. Therefore, no firm conclusions can be based on the two phases of evaluation results, and future fieldwork should attempt to address this question (see 13.1).

A section of brick wall [915] (truncated by modern utilities) was found at the western end of the SSET/UKPN trench (see Photo 22). Wall [915] was aligned approximately north to south, parallel to Blomfield Street. This wall may be the cemetery's original western boundary wall, later perhaps re-used as the boundary wall of the post-cemetery 18th-century properties (see Figure 7, Figure 20 to Figure 23). Indeed, the opening of the cemetery in 1569 does fall within the date range of the bricks used in wall [915](1550 to 1666). Comparisons to contemporary maps may help clarify locations and alignments.

Trench No	*In situ* bodies	Disarticulated - minimum number of individuals (MNI)	Notes	Trench - Length/m	Trench - Width/m	Trench - Depth/m	Level at top of in situ burials/m ATD	Level at base of *in situ* burials/m ATD	Volume burials/m^3	Density of *in situ* burials/ bodies per m^3	Maximum Thickness of burials/m
T1	64	127		4.31	2.96	5.16	110.88	109.46	18.12	3.53	1.42
T2	66	261		6.45	2.83	5.63	111.19	109.83	24.83	2.66	1.36
T5	0	0	No burials or bone	3.41	2.33	4.90	N/A	N/A	N/A	N/A	N/A
T6	19	26	Burials identified at surface only	4.24	2.35	1.41	111.52	N/A	N/A	N/A	N/A
T7	63	158	9 burials identified at surface	4.10	2.20	4.95	111.22	110.09	10.19	6.18	1.13
T9	7	26	Burials identified at surface only	2.15	2.15	1.81	111.12	N/A	N/A	N/A	N/A
T13	22	48		2.30	2.15	6.10	111.46	110.02	7.12	3.09	1.44
T14	24	N/A		1.90	1.90	3.20	111.30	110.10	4.33	5.54	1.20
Pit 3	N/A	N/A		2.80	2.30	3.00	110.60	109.80	N/A	N/A	0.80
Pit 4	62	N/A		6.00	2.00	2.66	111.07	109.66	16.92	3.66	1.41
Pit 4a	N/A	N/A		2.00	2.00	3.00	110.85	109.66	N/A	N/A	1.19
Pit 5	N/A	N/A		6.00	2.00	3.00	110.93	109.83	N/A	N/A	1.10
Pit 6	N/A	N/A		5.00	2.80	3.30	111.01	109.86	N/A	N/A	1.15
Pit 7	N/A	N/A		6.00	2.00	3.00	110.54	109.94	N/A	N/A	0.60
Pit 8	N/A	N/A		6.00	2.00	3.00	111.32	110.02	N/A	N/A	1.30
Pit 9A	N/A	N/A		5.20	1.40	3.00	111.07	110.37	N/A	N/A	0.70
Pit 10	N/A	N/A		2.30	1.75	5.70	111.11	109.71	N/A	N/A	1.40
Pit 11	N/A	N/A		6.00	2.50	6.00	110.90	109.90	N/A	N/A	1.00
Totals	**327**	**646**									
Averages							**111.06**	**109.88**		**4.11**	**1.16**
	= Fully excavated evaluation trenches										
	= Burials removed by C503 exhumation contractor TCS, under C257 MOLA General Watching Brief										

Table 5: Burial ground data

12.5.3 17th to 18th-century structural remains

(see Figure 5, Figure 6, and Figure 18 to Figure 23)

Burial within the cemetery certainly continued to at least 1714, the date of the latest datable burial (Jenkes family vault (LSS85), Malt & White 1987). Unfortunately, the precise date of the burial ground's closure remains unknown. It also remains unclear if the closure of the cemetery was a swift single event, or a more gradual encroachment involving decommissioning and development.

Post-medieval structures found during this phase of evaluation are almost certainly the remains of buildings seen on 17th to 19th-century maps. Faithorne and Newcourt's map of 1658 (see Figure 19), followed by Ogilby and Morgan's map of 1676 (see Figure 20), are the first to show buildings within the grounds of the cemetery. These may be directly associated with the cemetery, perhaps entrances or administrative buildings. Almost the entire periphery of the area to appears to have been built upon by 1746. However, it is unclear if these buildings skirt the cemetery or are built within it. The open space between the buildings is still labelled 'Bethlem Burying Ground' (see Figure 21). It is not until 1799 that this area is labelled 'gardens' (see Figure 22). It would seem that the buildings first seen on Rocque's map are present on the site until their demolition prior to the new layout of Liverpool Street in the 19th century (see Figure 23).

Red brick wall [824] in pile line Pit 3 (see Photo 11), is perhaps part of a building(s) in the south-west of the site, seen on maps from 1676 (see Figure 20). It is likely to be associated with walls found in previous evaluation Trench 1 (including wall [325] and wall [332])(see Figure 5). The wall is dated 1666 to 1750 by brick samples and, like the walls in Trench 1, its construction cut lower burials (perhaps earlier 16th to 17th-century burials).

An *ex situ* grave marker [894] found within Pit 7 (see 9.3.1, 19.11 and Photo 13) is likely to be part of horizontally set re-used stones [494], a possible wall foundation, found immediately west in evaluation Trench 2 (see Figure 6). However, further excavation over a larger area will be needed to clarify the character and stratigraphy of this potential structure. A robbed out structure may offer a working hypothesis. No *in situ* burials were found above these stones and these were modern truncations to account for this absence. Therefore, burials in this location may have been positioned near the wall(s) of a *c* 17th or 18th-century building (dated by the gravestone and marker used in the foundation), which was then demolished and robbed out after the closure of the cemetery, leaving only a course of foundation stones *in situ* (see Figure 6). If so, deposit [888] may be the backfill of a robber cut. Indeed, finds from within [888] suggest a date roughly contemporary with the closure of the cemetery, including a delft wall tile dated to between 1700 to 1750, and a clay pipe dated 1700 to 1770 (possibly 1716 to 1741).

Contexts [918], [1016] (SSET/UKPN trench), [732] (Pit 4 and 4a) and [919] (Trench 14) were the only other potentially post-cemetery deposits found during this phase of excavation. Modern truncation had reduced the archaeology down to *in situ* burials or beyond in all other locations. Deposits [918], [1016], [723] and [919] are most likely part of the post-cemetery horizon found during the previous phase of evaluation (in Trenches 9, 7, 6, and 13 ([1], [3], [20], [216] - 111.87 to 111.50m ATD(*c* 0.9 to 1.2m bGL), respectively)). These deposits are likely to be at least partially formed from burial cuts and their backfills. However, given the higher concentrations of building debris and refuse material, this horizon may have been be subjected to post-

cemetery dumping and disturbance, incorporating some re-deposited cemetery soil.

There is clear evidence that domestic waste was dumped on the site during and after the use of the cemetery, including a wide range of post-medieval pottery (see 19.3), and other individual items of note, including a heraldic mount and a possible spectacle lens (see 19.7). As in the previous phase of evaluation, this post-cemetery horizon also continued to contain worked animal bone and ivory waste. However, much of this material was again also worked into the cemetery horizon within grave fills, indicating that the site had became a place for dumping rubbish even before the burial ground closed. The post-medieval bone-working waste is of particular interest and offers excellent potential for exploring the post-medieval economy of the area. The assemblage can provide insights into the processes of post-medieval bone-working technology and attesting to the range of material being produced, with certain or probable products including needle cases, curtain rings/collars and knife handles (see 19.7).

Evidence for other industries within the local area is slight but unequivocal. For example, fragments of a glass working crucible and glass slag waste may be derived from the glasshouse in Broad Street recorded by Pepys in 1660 (see 19.5). There is also copper-alloy casting evidence which may also originate from industrial activity somewhere in the local area (see 19.7).

12.6 19th-century remains

(see Figure 1)

There is little evidence of 19th-century archaeology on this site. A potential early 19th-century demolition horizon was seen in Pit 3 (see 9.3), presumably formed during the removal of 17th to 18th-century buildings and the establishment of the existing street layout. A disused 19th-century brick sewer or culvert [535] was found in Pit 1 (see Figure 1). This is part of a sewer found within previous excavated trenches (Trenches 1 and 2), found to be tunnelled east to west across the whole site in an area *c* 2m high x 1.5m wide, at between approximately 9.00m to 7.00m OD (109.00m and 107.00m ATD)(*c* 3.5m bGL), through natural geology, Roman, and base of the post-Roman sequences. Brick samples have also confirmed a 19th-century date for red brick wall [817], which cut the cemetery horizon in Pit 4. Thus, this wall was most likely a retaining structure associated with utilities, or perhaps a wall associated with the cellars of the building on the south side of Liverpool Street (see 9.1.1).

13 Recommendations for appropriate mitigation strategy

The phase of work has again demonstrated that there is good survival of Roman remains at a consistent level and thickness, and that there is little modern truncation. However, the features discovered during the evaluation have yet to be fully exposed and thereby understood, while site-wide associations and phasing remain tentative and provisional (see 12.3.1). For example, evidence from Trench 14 compared with previous Trenches 7, 13 and TP7 (LSS85), may indicate the presence of several phases of Roman road over a significant area within the north of the site, crossing approximately north-west to south-east. However, the current evidence is not sufficient to present this as anything more than a working hypothesis. In addition, the discovery of two rubbish pits in close proximity (Pit 11/Trench 1, see 9.2.1) in the south-west corner of the site may suggest a concentration of such features in that area. Further excavation will help to and define the nature of activity in this extra-mural area and help resolve these uncertainties. Furthermore, additional excavation may also provide evidence of the Walbrook stream channels, particularly the Blomfield Street Stream, which is yet to be located but is potentially in the western area of the site.

Early 16th to 18th-century burials are a hitherto archaeologically underrepresented subject, and their continued excavation on this site will help further our knowledge and understanding of society and burial during a time when the city and population was greatly expanding. While the preservation of coffins and coffin furniture was generally poor and consistent across the site, there were occasional examples of moderate preservation. Any well-preserved coffins with readable name plates, perhaps buried within brick lined graves or vaults, would provide valuable information. In addition, further excavation and analysis may also reveal new information on burial practices of this period, for example the positioning of burials, zoning and general cemetery management. Current evidence indicates a more complicated cemetery sequence with a broader range of burial practices in the northern half of the site, an area also known to contain burial vaults (Malt & White 1987).

Further excavation is also likely to reveal more *c* 17th to 18th-century structural remains, in particular, within the south and south-west parts of the site, where buildings can be seen on maps from the mid 17th-century onwards (see Figure 19 to Figure 23). Indeed, ten of the eleven post-medieval brick structures so far revealed have been found in these areas. While, analysis of historical maps may help clarify locations and alignments, the exact nature, date or relationships of these structures may only be confirmed with further excavation. In particular, further excavation is required around the location of wall [915] in order to confirm that it is the cemetery's original western boundary wall.

It would also be valuable to learn more about the post-medieval worked animal bone waste found deposited within and across the entire the cemetery and post-cemetery horizons. This is a rare archaeological resource and is likely to be of national interest (see 19.7). Adding to this assemblage through further excavation will only increase the potential for analysis.

These investigations have further clarified areas of modern truncation, along and beneath the southern kerb line of the Liverpool Street, and the pavement south of the UBS building. Trench 15 confirms extensive modern truncation within the area of the

Broadgate development. Conversely, Trench 14 was positioned within an area thought to have been previously dug during the Broadgate development excavation of 1985 to 1986 (Test Pit 9 (TP9), LSS85). However, current excavation has confirmed this individual location to be undisturbed with *in situ* archaeology (including the burial ground)(see Figure 17), albeit with modern truncations to the immediate south and east, extending 2m to >3m bGL (see 9.1.2).

Also, modern truncation by a utility trench along the south side of the pits along the pile line (including Pit 2 to Pit 9A and Pit 11) accounted for 35 to 40% of the area within those pits to a depth of up to *c* 3.30m bGL (see Figure 2, Figure 8 and Figure 10). This truncation continued southward beyond the limit of all the investigation along the pile line. Thus, the full extent of this modern feature is unknown and the survival of archaeological remains to the south remains unclear.

The Project Archaeologist will produce recommendations for further work and refine the mitigation strategy for Crossrail works at Liverpool Street.

13.1 Revised and new objectives for further fieldwork

13.1.1 Roman and medieval

- Identify the location(s) of the River Walbrook in its various phases (or if it lies west of the site), any crossing points, including any waterlain deposits with potential for organic preservation and palaeoenvironmental remains.
- Determine if the ditch found in Pit 11/Trench 1 is the canalised eastern edge of the Blomfield Street Walbrook channel, and whether this feature was open into the post-Roman period.
- Characterise and understand the nature, layout, and dates of the different phases of Roman extra-mural activity and land use, including potential occupation in the form and date of any buildings, as well as the function and date of drainage features and how they relate to the Walbrook and Moorfields Marsh.
- Determine if the hypothesised Roman road lies within the site and, if so, how it relates to other Roman activity within the area.
- Determine if there are Roman burials within the site area.
- Determine the character, extent and date of the Moorfields Marsh in this area. Do the thin marsh deposits represent a continuum of medieval to post-medieval deposition, or post-medieval with residual medieval artefacts?
- Identify evidence for activities in the area of the marsh, or in the surrounding area, represented by dumping of refuse in/on it.
- Clarify if there were any attempts to reclaim the marsh, eg by drainage (ditches etc) and dumping (land raising and consolidation) before the post-medieval period.

13.1.2 Relating to the Bethlehem cemetery:

- Characterise and date the sequence of post-medieval dumping and reclamation associated with the establishment of the cemetery.
- Characterise and refine the sequence and dating of burials, in particular the date

at which the cemetery went out of use;

- Characterise burial practice and how it changes spatially and chronologically, and identify any indications of organisation/management and zoning;
- In particular, are multiple or pit burials confined to the northern part of the site around Trenches 13 and 14, and the 1985 excavations?;
- Can gravestones or marker/ledger slabs provide evidence which will identify individuals, and can these be correlated with documentary sources?

13.1.3 Other post-medieval

- What is the date and taphonomy of deposition of the important worked bone assemblage? For example, are these finds residual in the post-cemetery deposits, or does it represent continued deposition during and after the use of the cemetery? Also, what is the spatial and chronological division (see 19.7) of the different types of bone artefact across the site?
- Identify evidence for activities and industries in the surrounding area, represented by waste materials within dumps and the cemetery sequence.
- Characterise and date structural remains relating to 18th and 19th-century urbanisation and development;

14 Publication and dissemination proposals

Excavation and watching brief results will initially be disseminated via this report; the supporting site archive of records, including digital data and by incorporation into the wider predictive deposit modelling for the Crossrail scheme. Any publication proposals will be considered by the Project Archaeologist in relation to later fieldwork of the Liverpool Street site, and also the wider context of archaeological potential and results within the Crossrail scheme.

15 Archive deposition

The site archive containing original records will be stored temporarily with MOLA pending a future decision over the longer-term archive deposition and public access process for the wider Crossrail project.

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18 NMR OASIS archaeological report form

OASIS ID: molas1-124320

Project details

Project name	Crossrail Broadgate Ticket Hall
Short description of the project	Following previous work in 2011, a second phase of evaluation trenches and watching briefs carried out in the roadway and on the pavements of Liverpool Street revealed natural terrace gravels overlain by weathered natural clays. These were sealed by Roman dump layers, in turn cut or overlain by features of late 1st to 3rd-c date, including a ditch, pits, further dump layers, and ground surfaces (possibly a road). An ex situ human bone was present in one Roman context, but no in situ burials were discovered. The Roman sequence was overlain by marsh, containing medieval to early 16th-c finds, which was sealed by consolidation for the Bethlehem Burial Ground (1568 to c 1720). A 16th to 17th-century brick foundation may be part of the cemetery boundary. A total of 86 in situ burials were recorded and excavated within the cemetery, which was sealed by further consolidation. The latter contained a large and unusual assemblage of worked animal bone and ivory waste, as well as other industrial debris such as glass slag. A brick foundation cut this horizon and is likely to be part of 18th-century buidlings. In all of the trenches, modern make up and ground surfaces completed the sequence.
Project dates	Start: 13-10-2011 End: 19-03-2012
Previous/future work	Yes / Yes
Any associated project reference codes	XSM10 - Sitecode
Any associated project reference codes	molas1-111282 - OASIS form ID
Type of project	Field evaluation
Site status	Area of Archaeological Importance (AAI)
Current Land use	Transport and Utilities 1 - Highways and road transport
Monument type	ROAD Roman
Monument type	DITCHES Roman
Monument type	RUBBISH PITS Roman
Monument type	CEMETERY Post Medieval
Significant Finds	KEY (LOCKING) Roman

Methods & techniques	'Augering','Environmental Sampling','Targeted Trenches','Test Pits'
Development type	Rail links/railway-related infrastructure (including Channel Tunnel)
Prompt	Crossrail Act 2008
Position in the planning process	After full determination (eg. As a condition)

Project location

Country	England
Site location	GREATER LONDON CITY OF LONDON CITY OF LONDON Liverpool Street (Broadgate)
Postcode	EC2M 7NH
Study area	750.00 Square metres
Site coordinates	533028 181610 533028 00 00 N 181610 00 00 E Point
Site coordinates	533054 181603 533054 00 00 N 181603 00 00 E Point
Height OD / Depth	Min: 7.30m Max: 7.91m

Project creators

Name of Organisation	MOL Archaeology
Project brief originator	Crossrail
Project design originator	Crossrail
Project director/manager	Nicholas Elsden
Project supervisor	Robert Hartle
Type of sponsor/funding body	Developer
Name of sponsor/funding body	Crossrail

Project archives

Physical Archive recipient	LAARC
Physical Contents	'Animal Bones','Ceramics','Environmental','Glass','Human Bones','Industrial','Leather','Metal','Worked bone','Worked stone/lithics'
Digital Archive recipient	LAARC
Digital Contents	'Stratigraphic'
Digital Media available	'Images raster / digital photography','Survey','Text'
Paper Archive recipient	LAARC
Paper Media available	'Context sheet','Correspondence','Drawing','Matrices','Photograph','Plan','Report','Section','Survey'

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	C257 ARCHAEOLOGY CENTRAL Fieldwork Report Archaeological Eval and WBs Pit 4, Pit 11, Tr14 and 15, Pile Line Pits and Utility Diversions, Broadgate Ticket Hall (XSM10)
Author(s)/Editor(s)	Hartle, R./Elsden, N.
Date	2012
Issuer or publisher	Museum of London Archaeology
Place of issue or publication	London
Description	A4 Report

Entered by	Robert Hartle (rhartle@mola.org.uk)
Entered on	26 April 2012

19 Appendices:

19.1 Building materials

Ian M Betts

Introduction

A total of 24 fragments of building material were recovered from this phase of XSM10 (contexts [732], [733], [817], [824], [888], [890], [915], [925], [978], [979] and [984](Table 6)). These comprise four pieces of decorated tin-glazed 'delft' wall tile, two medieval floor tiles, six brick samples, a small fragment of post-medieval brick and 11 fragments of Roman roofing tile and brick.

The building material from XSM10 has been fully recorded and the information added to the Oracle database.

Context	Fabric	Type	Date
[732]	2196	Floor tile	1700 to 1800
[732]	3067	Wall tile	
[733]	2894	Floor tile	1350 to 1390
[817]	3032	Brick	1800 to 1900
[824]	3032 near 3033, 3033	Brick	1666 to 1750/1800
[888]	3067	Delft wall tile	1700 to 1750
[890]	3086	Delft wall tile	1700 to 1800
[915]	3033, 3042	Brick	1550 to 1666/1700
[925]		Floor Tile	
[978]	3032	Brick	1666 to 1900
	2815	Imbrex	AD 140 to 300
	3226	Tegula	AD 70 to 100
[979]	2454	Imbrex	AD 50 to 160
	2815	Brick, tegula, imbrex	AD 50 to 160
[984]	2815	Imbrex	AD 140 to 300
	3001	Tegula	

Table 6 Building material summary

Roman

The Roman assemblage from Pit 11 is small but not without interest. In context [979], there is a cream tile from the Eccles area of north-west Kent (fabric 2454) dating to

AD 50 to 80. In context [978], a red slightly sandy tile from another north Kent tilery dating to AD 70 to 100 (fabric 3226) and a greyish-cream coloured tile dating to AD 140 to 300 from an unknown production site. The latter is part of the calcareous group which have a wide distribution along the south coast of England (Betts and Foot 1994, 27, fig 4), Kent and Essex.

The remaining red tiles (fabric group 2815) were probably made in London or at tileries location on the outskirts of London sometime in the period AD 50 to 160.

Post-medieval

Brick

The frogged sharp edged bricks from context [817] are probably 19th-century in date.

The brick samples from context [824] are heavily covered by a pale grey mortar with occasional black coal/charcoal inclusions. This would suggest a pre-1666 date, although one of the bricks (fabric 3033) may be a pre-Fire example which has been reused. The other is probably mid 17th to mid 18th-century in date.

The bricks from context [915] lack diagnostic dating features but, based on their size, are probably 1550 to 1666 in date. The difference in fabric suggests they may originate from two different London brickyards.

A small fragment of London-made post-1666 brick (fabric 3032) was found in context [978]. This is probably intrusive as the remaining building material is of Roman date.

Floor tile

Part of a mid to late 14th-century decorated Penn floor tile was found in context [733] <284>. The tile is worn but would appear to be Eames (1980) design 1846. It probably came from the floor of a parish church or monastic building

A later decorated tin-glazed floor tile was found in context [732] <282>. This is similar to Betts and Weinstein (2011, 108 to 109) designs 104 to 105. The tile, which probably came from the floor of a wealthy individuals property, was probably made at Pickleherring, Southwark around *c* 1618 to 1650.

Context [925] produced a decorated floor tile of 'Westminster' type with a fleur-de-lis design (<312>). The complete design is illustrated by Betts (2002, 56) where it is classified as W78. 'Westminster' floor tiles, which are known to have been made in London, were widely used in parish churches and monastic buildings. Tiles with design W78 have been found at a number of locations in London including Bermondsey Abbey, St John's priory and Westminster Abbey

The XSM10 tile is one of series of smaller size 'Westminster' floor tiles which may date to the later 13th or early years of the 14th century. Tiles belonging to the smaller 'Westminster' group (although not W78) are believed to have been used at the royal palace at Kings Langley, Hertfordshire in 1279 to 1281 (Betts 2002, 24).

Delft wall tile

From context [732] <283> is the top of a blue on white tin-glazed wall tile showing a landscape scene set in a twin circular border. It is difficult to give a precise date, but it is probably a London-made tile of the 18th century. It was probably used in a

fireplace surround.

The delft tile from context [888] <288> shows the bottom right corner of a landscape scene with buildings. The landscape, which is painted in blue on white, is set in an octagonal powdered purple border with blue on white fleur-de-lis corners. Part of a similar tile was found at King Edward Street, London (Betts and Weinstein 2010, 149, no. 302) whilst Pluis (1997, 544, C.02.00.16) show a complete Dutch tile with a similar combination of corner and border design. The XSM10 example is also Dutch and dates to around 1700 to 1750. Few tiles of this type seem to have been used in London.

The blue on white delft tile from context [890] <287> is unusual in having parts of the design outlined in black and pale black. The careful use of highlighting suggests it could be an 18th-century Dutch biblical tile. The presence of what appears to be hammer suggests the biblical scene depicted could be 'The building of the Tower of Babel (Genesis 11). Horne (1989, 77, no. 448) shows what would be a different version of the scene on a London-made tile of 1740 to 1760.

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Pluis, J, 1997 *The Dutch tile: designs and names*, Leiden

19.2 Roman Pottery

Amy Thorp

19.2.1 Introduction

The pottery was spot-dated and recorded in accordance with current MOL archaeology procedure, using standard fabric, form and decoration codes. The data was entered onto the Oracle database, including quantification by sherd count, estimated number of vessels and weight in grams.

19.2.2 Pit 11

A total of 207 sherds (3888g) of Roman pottery were recovered from six contexts. The condition of the pottery is variable with a high degree of fragmentation and frequent burning/sooting.

Comments on the individual contexts are given below:

[978] Dated AD 120 to 250 on a single sherd of a black-burnished-style ware bowl or dish with curvilinear decoration (BBS 4/5 CL).

[979] Dated AD 350 to 400 by one sherd of Portchester ware D (PORD). This is the largest assemblage totalling 137 sherds. It should be noted that the material is variable in size and mixed in date. The sherd of PORD is the only late Roman fabric present in the group; the remaining fabrics and forms present would be late 2nd-century AD. Sherds of an east Gaulish samian Dragendorff form 31 dish (SAMEG 5DR31), an unsourced white-slipped ware ring-necked flagon with cupped mouth (RWS 1B7-9), and several black-burnished ware forms are particularly indicative of this date range. The proportion of samian wares (29 sherds) is relatively high and includes a sherd from an Oswald and Pryce, pl 55, no 13 cup (6OP55/13) a rarer form. One sherd of presumably intrusive medieval pottery was also recovered from this context. Given that the pottery dating to the 2nd century AD (136 sherds) is the largest component of this assemblage, it is likely that the single late Roman and medieval sherds are both intrusive. However, this will need to be confirmed by analysis of the stratigraphic position of this feature.

[984] Dated AD 250 to 400 by a single sherd of Alice Holt/Farnham ware (AHFA). The remaining sherds are of a similar date to the earlier material from context [979]. Given that the pottery dating to the 2nd century AD is the largest component of this assemblage, it is likely that the single late Roman sherd is intrusive.

[985] Dated AD 140 to 160 by a combination of samian wares and Highgate Wood ware C (HWC).

[986] Dated AD 120 to 400 by a single sherd of black-burnished-style ware (BBS).

[990] Dated AD 150 to 400 by a single sherd of Nene valley colour-coated ware (NVCC). This is the second largest group present with a total of 40 sherds. The sherd of NVCC is the only late Roman fabric present. However, sherds from several east Gaulish samian (SAMEG) vessels and a single sherd from a black-burnished-style ware jar with open acute lattice decoration (BBS 2 OAL) suggest the assemblage could be late 2nd-century to early 3rd-century AD.

Recommendations

No further work is recommended for this material.

19.2.3 Pile Line GENERAL WATCHING BRIEF (Pit 10)

Four sherds of pottery were recovered from [917]. The context is dated by a single sherd of a central Gaulish samian possible Dragendorff form 37 bowl (SAMCG ?4DR37) to between AD 120 to 250. The three remaining sherds are two further sherds of samian ware (from earlier production centres) and one sherd from an amphorae.

19.3 Post-Roman pottery

Lyn Blackmore

19.3.1 Pit 4

Introduction

The post-Roman pottery assemblage from Pit 4 amounts to 82 sherds (76 ENV, 3.416kg) from contexts [723], [732] and [733]. The sherds were examined macroscopically and using a binocular microscope (x 20), and recorded on paper and computer using standard Museum of London codes for fabrics, forms and decoration. The numerical data comprises sherd count, estimated number of vessels and weight. A few finds merit illustration. The data can be accessed on the Oracle database and also in an excel spreadsheet.

The medieval wares

One sherd of mature Valencian lustreware, from Spain ([733]) was recorded as being medieval, although it is of late 15th- or possibly early 16th-century date. The decoration comprises an open design with floral motifs in blue; the lustre decoration that would have filled the intervening spaces has completely vanished.

The post-medieval wares

Post-medieval wares are present in all three contexts. Tin-glazed wares, mainly forms that would be used at the table, are the most common category by sherd and vessel count (23 fragments, 21 ENV). It is likely that most are from factories along the south bank (Britton 1987; Noël Hume 1977; Tyler et al 2008). A range of different decorative styles is represented, with two possible 16th-century wares, a fairly even mix of 17th-century and 18th-century wares. The former comprise a handle fragment from a Malling-type jug with blue glaze from [733] and part of an albarello from [732] could be earlier, perhaps from the Aldgate pottery at Holy Trinity Priory (Blackmore

2005, 237 to 242, 246 to 247).

The 17th-century wares include five sherds (5 ENV) with blue and white or polychrome decoration (TGW D, 1630 to 1680), and one sherd has with Chinaman in grasses decoration (TGW F, 1670 to 1690). Three sherds are from a fluted bowl with 'Lambeth polychrome decoration (TGW G, 1701 to 1711), while one has blue on blue decoration (TGW H, 1680 to 1800); four other sherds recorded as TGW also have typical 18th-century style decoration. Vessels with a plain white glaze (TGW C; 7 sherds, 7 ENV) were produced from *c* 1630 to 1846 and so are difficult to date precisely but most sherds probably date to after *c* 1650; they derive from two porringers, a bowl, a plate and a chamber pot.

Coarse redwares from London area are the second most common category, with a total of 22 sherds (19 ENV); they comprise 6 sherds of early post-medieval redware (PMRE, *c* 1480 to 1600), 12 sherds of post-medieval redware (PMR, *c* 1580 to 1900) and three of London-area early post-medieval slipped redware (PMSR/G/Y, *c* 1480 to 1650). Also present is one sherd of calcareous redware, probably from Essex (PMREC, *c* 1480 to 1600). Most sherds are from heavy duty vessels, mainly associated with the storage, preparing, cooking and serving of food. Of note are a very large angled rod handle, probably from a cauldron, and the rim of a dripping dish with incised wavy line decoration around the rim, both from [733] (to draw). Two sherds appear to be from a distillation bottle, or cucurbit, although the beaded rim form is unusual (also [733]; draw?). In addition there are two sherds (2 ENV) of fine post-medieval redware from Essex (PMFR, 1580 to 1700).

In third place are Surrey-Hampshire border wares (13 sherds, 12 ENV), of which seven sherds (6 ENV) are from dishes, a bowl, a drinking jug, a skillet and a tripod pipkin in the white fabric (BORDG/O/Y) and the remainder are from dishes and mugs in the redware equivalent (RBOR), the latter including the complete base and lower body of a rounded mug and part of a dish with painted slip decoration (RBORSL).

Other English ware types comprise two sherds of Staffordshire ware, one with combed slip decoration (STSL), the other with a brown glaze (STMO), and five of English stoneware, including the rim of a Midlands purple ware (MPUR) butterpot and part of a London stoneware (LONS) flagon with thumbed rat tail handle; both are from [733], which also contained a sherd of drab stoneware (DRAB, 1720 to 1750). The most unusual piece is the rim of a teapot in a very fine dark purple-brown fabric; this has been recorded as red stoneware (REST), but could be a Chinese import. This should be verified prior to any publication of the finds.

Definite imports amount to 14 sherds (14 ENV). As usual most are German stonewares, mainly from Frechen (8 sherds), but with three from Raeren. Other imports comprise part of an 18th-century German Selzer bottle (for mineral water) from [732] and part of a 16th-century Italian tin-glazed vase/altar vase with polychrome decoration ([733]).

Discussion

Some of the pottery could date from either the Dissolution period or the later 16th century, but all is residual, being mixed with later wares. The largest group is from [733] (53 sherds, 51 ENV 2.115kg), which is dated to after 1720 by the presence of drab stoneware, while [732], which contained 25 sherds (23 ENV), is dated to after 1750 by the Selzer bottle. As a whole the assemblage is typical for London, although the possible sherd of Chinese brown stoneware is a rare find.

19.3.2 Trench 14

Introduction

The post-Roman pottery assemblage from Trench 14 amounts to 88 sherds (75 ENV, 3.912kg) from six contexts ([919], [925], [945], [947], [949] and [974]. The sherds were examined macroscopically and using a binocular microscope (x 20), and recorded on paper and computer using standard Museum of London codes for fabrics, forms and decoration. The numerical data comprises sherd count, estimated number of vessels and weight. No finds merit illustration. The data can be accessed on the Oracle database and also in an excel spreadsheet.

The medieval wares

One residual sherd from a London-type ware jug in the highly decorated style (date range *c* 1240 to 1350) and two sherds of coarse Surrey-Hampshire border ware were found in [947] (total 80g). One of the latter is from the handle of a jug or cistern, indicating a date of after 1340 for this find.

The post-medieval wares

Post-medieval wares are present in all six contexts, ranging from later 16th- to 19th-century in date. Coarse redwares from London area are the most common category, with 33 sherds (29 ENV), mainly cauldrons and pipkins, bowls and dishes, but including a few jugs and jars; of note are two large sherds from a large lid and part of the base of a bunghole jar (both [925]). Tin-glazed wares are the second most common category, with 19 sherds (14 ENV), of which nine sherds have a plain white glaze; these include the spout from a wet drug jar ([925]) and a burnt bowl rim ([945]). Context [925] includes part of a dish decorated in blue and yellow showing part of the upper body of a royal figure holding a ?sceptre, apparently female; if so this is likely to be Queen Anne (c 1705). Also present are three sherds with polychrome decoration which date contexts [919] and [925] to after 1701, and possibly before 1711; five sherds could be of mid 18th-century date. In third place are Surrey-Hampshire border wares, the whiteware and redware variants together totalling 11 sherds; of interest is a sherd that could be from a *Schweinetopf*, a form of portable casserole on legs that was invented in Germany in the early 16th century (Ruempol and van Dongen 1991, 121) and later made in England by German potters (Pearce 2007, 194–99, figs 111–2). The form is very uncommon, either in London or anywhere else, but there is a complete example in the Museum of London collections (MoL acc no 69.12/1; ibid, fig 112, no 709; fig 117), and fragments are known from Southwark (Knight 2002, 18, fig 25) and Leonard Street (Blackmore 2012), amongst other sites.

Imports amount to nine sherds, with a mix of German stonewares from Raeren, Frechen and Westerwald, tin-gazed wares from the Netherlands, Italy and Spain. The former include part of a small Bartmann jug with early style face mask and decorated band around the girth ([949]). The tin-glazed wares comprise sherds from two south Netherlands maiolica vases ([919], [925]), a sherd from an Italian jug ([947]) and another from a dish in Isabela polychrome ware.

Minor fabric types include post-medieval fine redware from Essex (two sherds),

Midlands purple ware butterpot (one sherd), Staffordshire-type combed slipware, including two sherds from a posset pots) and two sherds of possible Brill ware: a porringer handle and the ladle handle from a pipkin (both [925]). Of interest is part of the base of a possible industrial vessel with an applied thumbed strip around the cut-out opening, which is made in Peninsula House ware ([945]). There are no industrial finewares in this group.

Discussion

The medieval pottery could be derived from a number of sources in the area, or simply rubbish brought out of the city. The same applies to the post-medieval pottery, although there does appear to be a chronological progression from the earliest finds in [974] (dating 1480 to 1600) to the latest in [919] (dating 1701 to 1711). Industrial ceramics occur sporadically across the Broadgate area, but the find from [945] is unusual and possibly unique in London.

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19.3.3 Pile Line GENERAL WATCHING BRIEF

Introduction

The post-Roman pottery assemblage from this watching brief amounts to 30 sherds (27 ENV, 1.167kg) from contexts [888], [890] and [899]. The sherds were examined macroscopically and using a binocular microscope (x 20), and recorded on paper and computer using standard Museum of London codes for fabrics, forms and decoration. The numerical data comprises sherd count, estimated number of vessels and weight. No finds merit illustration. The data can be accessed on the Oracle database and also in an excel spreadsheet.

The medieval wares

Three sherds (238g) of coarse Surrey-Hampshire border ware were found in [888]. One is from a jug with chips of fired clay under a green glaze on the underside, showing that it was stood on an area of waste clay while still wet and then fired upside down. Another is from the rim of a probable frying pan with sooting on the underside of the socketed handle. The third is from the rim of a jar.

The post-medieval wares

Post-medieval wares (929g) are present in all three contexts, ranging in date from later 16th- to 19th-century in date. Coarse redwares from London area, tin-glazed wares and industrial finewares are more or less equally represented, with seven, six and six sherds respectively. The redwares ([888], [899]) include two sherds from a rounded bowl with at least one horizontal handle. These cannot be closely dated, but the tin-glazed wares include both 17th- and 18th-century forms and decoration, mixed together in [888], [899]. The other pre-industrial wares comprise Surrey-Hampshire border ware (2 sherds, [888], 899]), one of post-medieval fine redware from Essex ([888]) and base sherds from two English stoneware tankards ([890]) and [899]). The latest finds comprise transfer-printed wares and part of an English porcelain cup, found with two burnt sherds of Sunderland ware in [890].

Also present is part of a large thick-walled crucible, found in [899] (<289>); this was clearly used for metal-working as there are copper alloy deposits on the inner surface, while the outer wall is covered with a thick bubbly 'glaze'.

Discussion

The medieval pottery may be derived from activity within the nearby precinct of the Austin Friars. The post-medieval wares could be from a number of sources, but they appear to follow a chronological progression, with those from [888] dating from 1650 to 1680, while those from [899] date from 1700 to 1750 (although mainly earlier). The latest finds are from [890], the pottery from which dates to *c* 1807 to 1840. Industrial ceramics occur sporadically across the Broadgate area, but although four other crucibles have been found during different phases of excavation the number is insufficient evidence for metal-working as such on the site.

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19.4 Clay tobacco pipes

Jacqui Pearce and Nigel Jeffries

Introduction

The clay tobacco pipes from XSM10 were recorded in accordance with current MOL Archaeology practice and entered onto the Oracle database. The pipe bowls have been classified and dated according to the Chronology of London Bowl Types

(Atkinson and Oswald 1969), using the prefix AO, with the dating of 18th-century pipes refined by reference to Oswald's Simplified General Typology, distinguished by the prefix OS (Oswald 1975). Quantification and recording follow guidelines set out by Higgins and Davey (1994; Davey 1997).

The clay pipes

A total of ten clay pipe bowls and two stem fragments were recovered from contexts [732], [733] and [888]. All identifiable pipe bowls are typical of London manufacture and all show signs of having been smoked.

From [732] and [733], the pipe bowls range in date from *c* 1660 to 1680 for the earliest examples, to *c* 1730 to 1780 for the latest. The only types recorded within the earlier range are AO15 and AO18, which are the most common types found in London during this period. Context [733] yielded one example of each and no later pipes, so has been dated to *c* 1660 to 1680. One type AO15 and two type AO18 pipe bowls were found in context [732], together with one bowl of type OS11 and one of type OS12, which give this context its later date. In the absence of makers' marks there is no possibility of refining the clay pipe chronology further.

The clay tobacco pipe <308> retrieved in [888] and is a bowl type used from 1700 to 1770 (AO25). Five makers operating 1716 to 1741 with the IA initials may be responsible for making this pipe with the left side heel also bearing a shield symbol located above the first name initial.

A small group of pipes were recovered from context [925], which yielded 6 pipe bowls all dated 1680 to 1710 and includes three marked pipes <309> <310> <311>. Five of the six bowls are AO21 types, including all the three marked pipes with the crown symbol relief moulded on each side of the heel.

Bibliography

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19.5 Glass

Lyn Blackmore

Introduction

The finds have been recorded in accordance with current MOLA practice and entered onto the Oracle database.

19.5.1 Pit 4

Bulk glass

Three pieces of glass (145g) were recovered from context [732]. The earliest is the complete rim and neck of an onion bottle, which has a broad flat string set just below the flat-topped mouth. Two bases are from phials, one wide and in natural green glass (Diam at base 40mm, body *c* 50mm), the other narrow and in a darker glass (Diam at base *c* 23mm, body *c* 30mm); both have pontil scars.

Discussion

Onion bottles went out of use *c* 1730, although from the string form the present example should be earlier than this. Taking the forms together, the bottle would appear to be slightly older than the phials, which would normally date to after *c* 1760 (Noël Hume, 1970, fig 17, nos 11 to 13). Whether the fact that the narrow one is made of dark green glass can argue for an earlier date is debateable, but the over dating fits will with that of the pottery and clay pipes.

Bibliography

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19.5.2 Trench 14

Description

Three small pieces of glass cullet (69g) and a piece of glass slag (109g) were found in [925], which also contained part of a glassworking crucible (40g) with a dark grey body and greenish glassy surfaces both internally and externally (wall thickness *c* 23–5mm).

Discussion

It is possible that these finds are derived from the glasshouse in Broad Street recorded by Pepys in 1660; whether this was operated by Mansell, however is unclear, as the latter factory could have been in Broad Street, Ratcliffe, not the City (Watts 2009, 27, 64, note 4).

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19.6 Leather

Beth Richardson

There are two substantially complete leather shoes from context [914] (Pit 10). One is a child's shoe with an insole and tread-sole, a vamp and one piece quarters and the other an adult-sized shoe (insole and vamp only).They are both mid to late 16th-century 'slip-on' shoes, broader but similar in style to modern espadrilles with rounded toes, high straight-throated vamps and one-piece quarters (backs) with straight top edges. They are both undecorated. The child's shoe has diagonal cut marks on the tread sole (cf Bowsher and Miller 2009, 199, <S34>).

Slip-on shoes were the most common style of shoe found on the Tudor warship the *Mary Rose,* which sank in 1545 (Mould in Gardiner 2005, 79-80, Type 2), and in the well-preserved late 16th-century deposits at London's Rose Playhouse (Bowsher and Miller 2009, 192-9). The shoes from the Crossrail Broadgate Ticket Hall site are also well-preserved good examples of this type. They should be more closely dated following integration with the stratigraphy and analysed with the rest of the 16th-century leather from the Crossrail sites.

19.7 Accessioned finds

Michael Marshall

19.7.1 Pit 4

The accessioned small finds from Pit 4 are summarised below (see Table 7). A total of 53 accessioned finds of post-medieval date were recovered from two contexts [732] and [733] of which 44 are 'small finds'. The accessioned post-Roman glass vessels, clay tobacco pipes and building material are reported on separately (see 19.5, 19.4 and 19.1).

Material	Post Medieval
Ceramic	2
Iron	1
Copper-alloy	2
Bone and ivory	39
Period total	44

Table 7: Summary of small finds from Pit 4 by material and date

Summary

39 bone and ivory accessions make up the largest group within the Pit 4 assemblage. Of these 23 are of bone waste and *c* 12 are of ivory waste. The bone waste comprises mostly offcuts and blanks, most of which can be divided into three main groups as has been done for the earlier work on the site. All have been recorded and added to the continuing total of comparable material from the site at large.

Eight fragments are 'ring offcuts', transverse sections of cattle metacarpal produced

during lathe working, and showing signs of at least two earlier stage of processing in the form of file and ?draw knife tool marks on their outer surfaces. These are present in both contexts. It seems likely that at least some of these are trimmings from the production of cylindrical objects such as handles and needle cases. However, two finds, <264> and<271> both from [733], are part-finished D sectioned rings or groups of rings abandoned after mistakes during lathe finishing. This alters our understanding of this type of offcuts, suggesting that they may in fact be part finished blanks for curtain rings, knapkin rings or bone collar/ferrules.

Ten finds are blocks or rough outs of cattle metacarpal or long bone wall. These too come from both contexts. These are only partially shaped so their final intended form cannot be assessed. By analogy with the finds from Trenches 1 and 2 (Crossrail 2011d, section 18.6), it is probable that some were intended for further subdivision and further working to produce peg like blanks.

Only one of these peg shaped blanks <260>, [732] was found in the current batch of finds. This is in contrast to the other phases of work, especially Trenches 1 and 2, where they made up a significant proportion of the assemblage; *c* 60% of the total from Trenches 1, 2, 5, 6, 7, 9 and 13 (Crossrail 2011d, section 18.6). This example adds little to the discussion of their intended function. Tuning pegs or dowels remain the most likely end products.

More singular pieces of bone working waste are <253>, [732] a length of cattle metacarpal with a knife worked exterior surface, which may be a blank for a bone handle and <261>, [732] a small broken cylindrical object, possibly damaged during manufacture, made out of sheep/goat metacarpal. Judging by form and material choice it is likely that this is part of a needle case of the type described in the earlier report on batch 1.

The elephant ivory waste falls into two major groups. The first comprises fragments of tusk wall which retain their outer surface. These probably mostly come from the head end of the tusk where the ivory is very thin and reflect trimmings. A few fragments, especially <246>, <247> and <248>, could be blanks or blocks intended for further working, but the slender triangular sections of these pieces again suggests that they were cut from the hollow head end of the tusk and are thus less useful material. Both types of waste were found in both contexts. Ivory makes up a larger proportion of the waste material in Pit 4 than in the earlier groups of waste.

The bone and ivory objects are fairly unremarkable. There are two handles. <249>, [733] is a bone handle plate from a scale tanged implement; presumably a knife. <238>, [733] is a circular sectioned ivory handle which tapers in width towards the blade and is also probably from a knife. Both are classic post-medieval forms appropriate for the 18th-century date suggested by the pottery and pipe dates from the contexts. A one piece double sided comb <237>, [733] is of a basic form known from the early medieval period onwards, but which is well represented in late medieval and post-medieval London. It may be of ivory rather than bone, which was increasingly the case from the 17th century onward. <236>, [733] is an ivory ring fitting of unknown function.

Two copper-alloy objects comprise <272>, [733]: a heraldic six petalled seeded and barbed rose mount of 17th/18th-century date, and part of a probable buckle pin <273>, [733] of uncertain date.

Two fragments of large ceramic crucibles, <280> and <281>, both came from [733]. Both are of large post-medieval forms and have heavy vitrification demonstrating use for a high temperature industrial process. Green corrosion products on the interior

surfaces of both vessels suggest that this was copper-alloy casting.

The only non-vessel glass find is a probable spectacle lens <278>, [733]. It has convex faces and has been ?deliberately grozed/chipped. It is not closely datable, but spectacles were not invented until the 13th century, and the earliest archaeologically attested examples from London are of the mid 15th century. Given the quality of the glass a post-medieval date seems likely, and there is no reason to doubt a context date in the 18th century.

The only object directly related to the burial evidence is an iron coffin handle/grip <285>, [745]. It is rather plain with a squared grip and a simple expansion half way along the plate. The form is not directly paralleled amongst the major assemblages of coffin fittings from Christchurch, Spitalfields or the Quaker cemetery at Kingston upon Thames, but the general style is appropriate for a 17th to 18th-century date. Further comparisons with other post-medieval London cemetery sites at the next stage of work may find closer parallels and a tighter date.

Discussion

Overall the assemblage is of some interest and further expands our understanding of the site. All of the objects could date to the 18th century although some could have earlier or later currencies. The single coffin fitting <285>, [745] is the only find directly related to the cemetery and may be of some importance to its dating. A small number of domestic debris such as cutlery and fittings may waste dumped in the cemetery or relate to subsequent activity. This should become clearer at analysis. They are of limited value in and of themselves, although the spectacle lens is rather unusual, but together with the finds from the earlier work on the site will help to characterise domestic life in the area.

Overwhelmingly the assemblage is industrial in character and reflects bone, glass and metal working. Together with the material from the earlier batches the bone working waste is fast becoming a key assemblage both for post-medieval London and nationally.

It is notable that the bone waste in the two contexts [732] and [733] is similar in character. Given the slightly different emphasis on dates between the early and later 18th centuries for these two contexts from the pot data, this is of some interest. Given the homogeneity of the material between the two, it is unlikely that there are multiple distinct episodes of bone working on the site. Instead we must either be looking at disturbed residual material in the later contexts, a long lived industry with limited evidence of change, or possibly a single episode of dumping around the middle of the 18th century at the interface between the two periods. Closer consideration of the stratigraphic evidence and evidence for residuality in the pot data may help clarify this.

The other key point which should be emphasised at this point is the variability in the composition of the bone working waste from across the site. Detailed analysis is pointless until the sequence is formalised at post-excavation analysis, but it is notable that this assemblage from Pit 4 contains some material (ivory waste) not well represented elsewhere, and lacks material (bone pegs) which is the major constituent of the other assemblages. Although these types are not mutually exclusive, this may reflect some meaningful spatial patterning and reflect the waste from different workshops or processes being concentrated in certain parts of the site.

19.7.2 Trench 14

Summary

This note addresses the accessioned finds from Trench 14. The material has been processed and recorded in accordance with standard MOLA practice and is summarised below (Table 8).

Material	Accessions	Fragments
Bone	5	5
Ivory	5	6
Total	10	11

Table 8: Summary of post-medieval material from Trench 14

Discussion

The assemblage of finds from Trench 14 consists exclusively of bone and ivory working waste, all of which was recovered from two contexts [919] and [925]. There are no significant differences in the material between the two contexts and so they are considered together below.

There are five fragments of bone waste. <317>, [919] is a short length of cattle metatarsal sawn at either end and reduced to give it a facetted roughly circular section using a draw knife or similar. This may have been a preliminary worked blank intended for lathe working. <319>, [919] is a transverse section of a cattle metapodial shaft, sawn on one end and lathe cut on the other with file marks on the edges. Fragments similar to these two pieces of varying lengths have been found in all the phases of work on the site (type 2 waste.) These appear to represent trimming or abandoned pieces from lathe working. These pieces are undiagnostic but identified lathe turned products from the site include needle cases and larger cylindrical cases/boxes as well as ring/ferrules.

Three other fragments are type 3 waste, blocks produced by sawing cattle long bones into sections then splitting them longitudinally into smaller sections of wall which could then act as blanks for further working. <323>, [925] is from the distal end of a femur while <320>, [919] and <318>, [919] are from metatarsals.

There are five fragments of ivory waste. One is certainly a sawn offcut <314>, [925] and represents part of the curved outer surface of the tusk removed while creating a squared off block. It is from the solid section of the tusk and large enough that it could have been further worked to make smaller objects if that had been desired. This is an ivory waste morphology which has not previously been recorded. Two <316>, {919] and <322>, [925] are sub rectangular offcuts or blanks. <327>, [919] is a finer strip. All three could have been intended to produce the kind of well finished rectangular ivory strips/blocks found in an earlier phase of work on the site which may have been intended for use as inlay.

<315>, [919] is a very different object a sub circular sectioned peg. Bone or ivory waste of this sort (type 1) has been found in most phases of work on the site. These appear to represent part finished objects. The intended products are uncertain but tuning pegs and dowels are amongst the most likely.

Catalogue

Bone waste (possible type 2 blank)

<317>, [919]

Complete; L 24mm, Diam 25. Length of cow metatarsal sawn at both ends with ?draw knife marks on surface which have made it roughly cylindrical but have not erased the natural groove.

Bone waste (type 2)

<319>, [919]

Incomplete; L 3mm, diam 26. Fragment of a thin slice of cow metatarsal, sawn on one end lathe cut on the other with rasp/file marks on edge

Bone Waste

Bone waste (type 3)

<318>, [919]

Complete; L 28mm. Section of cow metatarsal wall, sawn top and bottom and split longitudinally.

Bone waste (type 3)

<320>, [919]

Complete but broken; L 34mm. Quarter to third of a section of cow metatarsal wall. Sawn top and bottom and split longitudinally

Bone waste (type 3)

<323>, [925]

Complete; L 36mm. Half section of cow femur wall from near the distal end. Sawn at top and bottom then split longitudinally

Ivory

Ivory waste

<314>, [925]

Complete; L 46mm. Fragment of ivory waste. Retains curved outer face but split top and bottom and across interior to give a plano-convex section.

Ivory waste (as bone type 1)

<315>, [919]

Complete; L 70mm. max diam 12mm. Peg waste, in danger of splitting. Tapering

section. Knife facet surface, sawn at either end

Ivory waste

<316>, [919]

Complete; L 60mm. Ivory ?offcut, sub rectangular.

Ivory waste

<321>, [919]

Incomplete; L 57mm, W 12mm. Ivory strip, possible inlay blank

Ivory waste

<322>, [925]

Complete but broken; L 60mm, W 12mm. Split sub rectangular block, probable shaving off an elephant tusk tapers to one end perhaps from near the base. Possible inlay blank.

19.7.3 Pit 11

Introduction and summary of previous work

The material has been processed and recorded in accordance with standard MOLA practice and is summarised below (Table 8). The finds from the earlier phases of work on the site have been reported on separately.

Material	Roman Accessions
Copper	1
Iron	1
Lead	1
Total	3

Table 9 Summary of Roman accessioned material from Pit 11

Discussion

All of the datable finds from the present assemblage are Roman, and all come from context [979]. <326> is an example of an iron slide lock key. It is unusually well made for an iron example. The distinct pattern on its bit would have correlated with voids in a bolt inside the lock mechanism, and by inserting the key the user pushed out the tumblers, after which it would be possible to slide the bolt (see Manning 1985, 92 for a full functional discussion).

The other finds are less diagnostic. The first is a copper-alloy stud <327> with a boss in the centre of its circular head. The form is relatively common in the Roman period

(eg Crummy 1983, rig 120, 3215 for similar) and is a type found both with a short rivet shaft for use on leather objects and with a stud/nail shank. Unfortunately this example is too damaged to determine its function. <325>, [979] is too irregular to be anything but a lead patch. It has been cast into a square sectioned hole, probably in a ceramic vessel or tile to seal it up

This context also produced 9 bulk iron nail fragments, representing at least 8 nails. (see Table 10). The assemblage is too small for detailed analysis, but several of the complete examples had certainly been used and seem to represent at least two taphonomic pathways.

The complete nails can be divided into three size ranges all of which have simple flat heads with centrally square sectioned shanks. The first is a single short tack 22.5mm in length. The other is a group of 5 ranging from 57mm to 75mm in length. The two slightly longer examples have bent over tips, suggesting they were hammered right through a timber of *c* 55mm in width. These first two groups show no sign of having been extracted. A third group comprises a single nail 85mm long when bent. This nail and a loose tip fragment which could have come from a similar nail have probable 'extraction curves' created during removal with a claw.

Context	[979]
Head	1
Shaft	
Tip	1
Complete	7
Total fragments from context	9
MNN from context	8

Table 10 Summary of Roman bulk nails from Pit 11. MNN is minimum number of nails based on count of most common recurring element.

Summary and potential

This very small mixed assemblage requires no further work at present, but should form part of any larger publication project. While it is not particularly diagnostic as to the character of the Roman occupation, it does include a number of objects broadly datable to this period which will help define the site chronology, and the condition of the nails should make a modest contribution to discussion of changing land use and taphonomy. Both the finds and nails are very well preserved, suggesting that future work on Roman sites in this area will yield positive results for metal small finds.

Catalogue of accessioned finds

Iron key

<326>, [979]

Complete; L 52mm. Slide lock key. Rectangular sectioned handle with integral suspension loop at the rounded butt. Narrowed square sectioned neck. Bit has five components comprising four right angled triangles arranged in two sets of

rectangular pairs divided by a simple narrow rectangle. Manning type 2 (1985, 93). Roman.

Copper-alloy stud

<327>, [979]

Incomplete; Diam 15.5mm. Head of circular stud with domed boss centre and distinct flange. Roman.

Lead vessel patch

<325>, [979]

Complete; L 17mm, internal L 11.5mm, shaft W 14mm, shaft Th 12mm, Max W 45mm. Lad vessel patch, rectangular shaft with broad flat irregular head, now deformed, and slightly expanded sub circular foot.

Bibliography

Crummy, N 1983 *The Roman small finds from Excavations in Colchester 1971-9* CAR Report 2

Manning, W.H 1985 *Catalogue of the Romano-British iron tools, fittings and weapons in the British Museum* British Museum Press

19.7.4 Pile Line general watching brief

Introduction

Registered finds from the pile line general watching brief encompass <289 to 307> and are summarised below (Table 11). Finds have been catalogued and recorded in line with standard MOLA procedures. The post-medieval bone-working waste is tabulated and summarised below and has been recorded in detail elsewhere as part of the ongoing recording of this important assemblage.

Material	Post Medieval Accessions	Fragment count
Ceramic	1	1
Bone	13	38
Ivory	5	5
Total	19	45

Table 11: Summary of material from Pile Line GENERAL WATCHING BRIEF pits

Discussion

The material from the pipe line watching brief represents bone and ivory working and copper-alloy casting. The quantity of bone working waste continues to be remarkable, and while the general range of material is similar to the earlier groups, there are important differences in both the composition of the group and the exact craft practices represented. To summarise there are three main types of waste. ‘Ring

offcuts' are essentially transverse sections of lathe turned long bones, mostly cattle metapodials, Pegs are semi cylindrical whittled rods. Blocks are reduced fragments of long bone wall, often sub rectangular and probably represent an early stage in reduction of the raw material. Final assessment of the group as a whole should take place once excavation is complete, but finds from the other sites suggests a broad range of material was being produced, with certain or probable products including needle cases, curtain rings/collars and knife handles.

One object could be finished <297>, [899] a thin rectangular polished block, possibly ivory, which might be a piece of inlay. However it could be part of a more complicated unfinished object.

	Rings	Pegs	Blocks + Initial Reduction
Batch 1 and 2 (Evaluation Trenches)	100	36	23
Batch 3 (Pit 4)	8	1	10
Batch 4 (Pile Line GENERAL WATCHING BRIEF)	9	1	28
Total	117	38	61

Table 12: Three main categories of bone waste by excavation batch

At present amongst the definite waste bone predominates with 38 fragments over a mere four fragments of ivory. The predominance of bone blocks by fragment is distinctive, as is the presence of larger piece of bone and bone epiphyses. This differs from previous evaluations Trenches 1, 2, 5, 6, 7, 9 and 13 (Crossrail 2011d, section 18.6), and suggests that this area of investigation has a higher proportion of waste from the initial stages of the bone processing sequence (Table 12). However, as this is from a watching brief rather than excavation, it may not be strictly comparable with the earlier material.

Individual pieces of interest include a probable bone handle blank broken during diameter reduction <294>, [900]; a bone ring off cut which appears to be having slices cut off <298>, [912] and a circular ivory disc <292>, [899] perhaps part worked into a counter or similar.

The copper-alloy casting evidence is slight but unequivocal; a fragment of used crucible with adhering copper-alloy prills <289>, [899]. This is of identical fabric and similar condition to earlier examples from the site.

Catalogue

Ceramic

Ceramic crucible

<289>, [899]

Incomplete; Fragment from the ?base of a post medieval crucible. Vitrified surfaces with copper-alloy prills and adhering slag. Grey purple fabric with quartz and occasional rock inclusions.

Bone and ivory

Ivory ?inlay

<297>, [899]

Complete; L 54mm, W 11.5mm, Th 2.5mm. Ivory object .Rectangular well finished. Probably an inlay

Bone and ivory blanks

Bone waste (blank)

<294>, [900]

L 86mm, max Diam 25.5. Bone cylindrical lathe turned blank. One end sawn the other broken accidentally during working. Handle or cylindrical box. Successive stages of working. Survival of file marks at sawn end, then draw knife all over surface, broken during lathe reduction.

Ivory waste (blank/roughout)

<292>, [899]

Complete; diam 44.25m; Th 9mm. Circular roughout of ivory, some of outer casing intact.

Triangular sectioned ivory waste

Ivory waste

<290>, [899]

Complete; L 54mm, max Th 12.5mm

Ivory waste

<295>, [900]

Incomplete; L 92mm, Th 16mm. Offcut from ?roughing out, triangular section, sawn at both ends. One smooth exterior face survives

Ivory waste

<303>, [912]

Incomplete; L 51, max Th 11mm. Probable offcut from roughing out, triangular section, sawn and one end snapped at other. Knife cutting marks.

Pegs

Bone peg

<291>, [899]

L 50.5mm, max Diam 7mm. Straight, sub circular section.

Ring off cuts and others Lathe turned

There are a total of 9 ring off cuts. They have been added to the tables for the site as a whole. Two fragments representative of the interesting features from the 4th batch are catalogued here

Bone waste (part cut blank?)

<298>, [912]

L 20, max Diam 25mm.

Standard ring off cut but seemingly in process of having a fine slice removed

Bone waste

<296>, [900]

L 14mm, max Diam 30mm.

Ring off cut with halfway internal and external turning.

Blocks and part reduced cattle bones

Bone waste

<302>, [912]

Four sections through cattle metapodials sawn at either end measuring 23.5, 26.5, 30.5, and 32.5mm. Three have been split in half longitudinally but not further divided.

Bone waste

<307>, [888]

Four pieces of part reduced cattle long bone waste (probably all metapodials.) Two sawn off epiphyses 56.5 and 40mm long and two sections from near epiphyses showing taper of the shaft 83mm and 66mm long.

Bone waste

<307>, [888]

20 fragments of bone block waste, cattle long bones sawn into sections then split longitudinally ready for further working.

Length	Max Width	Comment
30	25.5	
30	20.5	
31.5	18.5	
31	13	
33.5	14	
32	18	
36	24	
35	23	
31.5	19.5	
35	36.5	
37	34.5	
34	40.5	
35	38	
33	36.5	
35.5	37.5	
37	36	
38	27	
35	23.5	
37	26	Mid shaft
42	27	Mid shaft

Table 13: Dimensions of blocks from <307>, [888]

Ivory waste

<303>, [912]

Incomplete; L 51, max Th 11mm. Probable offcut from roughing out, triangular section, sawn and one end snapped at other. Knife cutting marks.

Ivory waste

<295>, [900]

Incomplete; L 92mm, Th 16mm. Offcut from ?roughing out, triangular section, sawn at both ends. One smooth exterior face survives

Potential and significance

The present assemblages further expands our understanding of the bone and ivory working industry at the Broadgate site. The significance of this material is best seen within the context of the total assemblage, which is by far the largest recorded on the Museum of London Archaeology or Museum of London databases, and by fragment count larger than all other post-medieval assemblages from London put together. It seems likely that this represents one of the largest and most important collections of bone and ivory working waste from Britain, although further comparative research must await analysis.

19.8 Human Bone

Michael Henderson and Don Walker

Introduction

An osteological evaluation was conducted on the human skeletal remains recovered from two evaluation trenches and one watching brief, carried out by the Museum of London Archaeology (MOLA) on the site of the future Crossrail Broadgate Ticket Hall, Liverpool Street, London EC2M, within the City of London.

Surviving *in situ* articulated human remains were excavated in Pit 4, located along the utilities corridor northern pile line to the south side of Liverpool Street, and Trench 14, located in the north pavement of Liverpool Street. This report also contains an osteological evaluation of one disarticulated human bone found in Pit 11, located along the utilities corridor northern pile line to the south side of Liverpool Street.

Methods

All articulated remains were examined following Museum of London Archaeology standards (Powers unpublished). The results were entered directly into an Excel spreadsheet with each context scanned to collate data for completeness and preservation. A summary catalogue recorded each body area present. Overall completeness was then estimated in 5% increments from 5-95% based upon the proportions of bone present (skull 20%, legs and feet 20%, arms and hands 20%, torso and pelvis 40%). Bone preservation was coded on a three point scale from good to poor (1-3) following Connell and Rauxloh (2003). Age and sex estimates were carried out when appropriate elements were present. Where appropriate skeletal elements survived, age and sex was estimated. Each individual was also assigned an age-at-death code, based on the eruption of the permanent teeth, (Gustafson and Kock 1974) and epiphyseal fusion (Scheuer and Black 2000) with those individuals displaying erupted third molars and/or with appropriate fusion of epiphyses recorded as adults. No further division of adults into age categories was attempted at this stage (Table 14). Biological sex of adults was estimated through observations of cranial and pelvic morphology following (Buikstra and Ubelaker 1994), and recorded on a five point scale (Table 14).

Age code	0	Neonate/foetus
	1	1 month to 6 years (to M1 erupted)
	2	7-12 years (M2 unerupted)
	3	13-16 years (M3 unerupted)
	7	Adult
	12	Sub-adult (age unknown)
Sex code	1	Male
	2	? Male
	3	Intermediate
	4	? Female
	5	Female
	9	Undetermined
	0	Sub-adult

Table 14: Evaluation codes

Gross pathological changes and dental pathology were recorded by disease category following Connell and Rauxloh (2003). This was supplemented by brief descriptions of location and type where appropriate. Details of pathological lesions were described in brief and classed by category of disease and if possible specific disease type, according to Powers (2008).

A note was made of bone condition and any staining present. Intrusive animal bone was separated from the human bone, when identified, and its presence recorded. Intrusive elements were noted and the minimum number of individuals (MNI) for each context estimated based on the presence of repeated elements, age, morphology and preservation.

Results

19.8.1 Pit 4

Pit	No. contexts	No. boxes (Skeleton)
4	62	32

Table 15: Pit 4 - Human Bone General Summary

Archaeological excavation recovered 62 contexts of *in situ* articulated burials from Pit 4. Intrusive elements were recorded in 60.7% contexts (37/61). Contexts [743] and [744] comprised the heavily mixed remains of two subadult individuals of similar age and element size and will require further separation at analysis. A total of 61 contexts were therefore used in the following statistical analysis.

Approximately half of the assemblage displayed a high level of bone preservation (31/61: 50.8%), the surfaces in good condition with no erosion and fine details clearly visible. Moderate preservation levels were recorded in 47.5% (29/61) of contexts and only one burial was poorly preserved (1/61: 1.6%).

Green staining resulting from contact with copper objects was observed in 15 contexts (15/61: 24.6%) and iron fragment inclusions, most likely the remnants of coffin fittings were found with one skeleton (1/61:1.6%). A fragment of intrusive animal bone was found in one context (1/61: 1.6%).

Overall skeletal completeness ranged from 15–95% with 65.6% of burials showing ≥50% of skeletal elements present (40/61), 42.6% (26/61) ≥75% complete and 23.0% (14/61) with ≤25 of bones present.

The demographic analysis of the skeletal assemblage from Pit 4 indicated that the majority of remains comprised adult individuals (51/61: 83.6%) with ten subadults (16.4%). The pooled adult demographic data demonstrated an almost equal distribution of males (20/51: 39.2%) and females (18/51: 35.3%). It was not possible to estimate the biological sex of 13 adults (13/51: 25.5%). Observation of dental eruption stages suggested that half of the identified subadults (5/10: 50.0%) were aged between one month and six years at death (Table 16).

	n	%
Neonatal/foetal	0	-
1 month to 6 years	5	8.2
7–12 years	0	-
13–17 years	0	-
Subadult	5	8.2
Adult	51	83.6
Total	61	100

Table 16: Age distribution of articulated burials from Pit 4

The most commonly recorded pathological bone conditions were seen in the teeth. Dental disease affected 30 individuals (30/61: 49.2%), 28 adults (45.9%) and two subadults (2/61: 3.3%). Deposits of calculus adhered to the tooth surfaces (calcified plaque) was the most commonly observed condition, this was present in 41.0% of individuals. Carious lesions (cavities) were present in 34.4% of skeletons (21/61%), periodontal disease (gum disease) affected 6.6% (4/61%) and two adults displayed periapical lesions (dental abscess) at tooth socket locations. Enamel hypoplasia (developmental crown defects) affected 6.6% of individuals (4/61). Sixteen individuals had suffered ante-mortem tooth loss (16/61: 26.2%) including female [815] who had an edentulous mandible, having lost all the teeth of the lower jaw

during life.

Degenerative joint disease was recorded in just under half of adults (25/51: 49.0%). This mainly affected the joints of the spinal column (22/51: 43.1%) including Schmorl's nodes (herniations), osteoarthritis, osteophytes (new bone formation), inter-vertebral disc disease (pitting) and bony fusion of vertebral elements. Six adults presented osteoarthritis at extra-spinal locations (6/51: 11.8%) and male [750] had bone changes to the head of the left great toe possibly resulting from gout.

Infectious bone changes were recorded in 21.6% of adults (11/51). This mainly comprised evidence of non-specific infection where it was not possible identify a specific causative disease. This comprised plaques of new bone formation to the outer cortical bone surfaces (periosteal lesions) and inflammation of bone cortex (osteitis). Three adults displayed lesions to the visceral (inside) surfaces of the ribs including male [805] with severe thickening of the rib shafts suggesting chronic lung infection. Female [807] had new bone growth to the maxillary sinus indicating sinusitis.

Female [737] displayed extensive plaques of active and healed bone formation to the femoral and tibial shafts (legs) and mandible possibly resulting from venereal syphilis.

Seven adults had suffered traumatic injury (7/51: 13.7%). Adult [752] had a healed fracture of the left tibia resulting in fusion with the fibula and male [805] had a fractured right calcaneum (foot bone). A healed fracture to the left distal humerus of male [750] may have resulted in partial dislocation and restricted movement of the lower arm. Adult [731] had a compression fracture of the left knee and male [741] had fractures to two metatarsals (toes) of the right foot, both resulting in secondary joint disease.

Two adults displayed evidence of circulatory disease (2/51: 3.9%). Male [726] had erosive lesions to several vertebrae possibly representing Scheuermann's disease and male [819] had a healed lesion to the right patella (knee) joint surface (osteochondritis dissicans).

Evidence of congenital bone changes were present in 7.8% of adults (4/51). Female [813] had two abnormally formed thoracic vertebrae resulting in a severe scoliosis (curvature) of the mid-lower spine. There was also evidence of a malformation to the parietal bone of the right skull.

Two subadults (2/10: 20%) had bone changes evident of a metabolic condition. Subadult [777] had extensive thickening of the long bone shafts with thinning to the metaphyseal ends, enlarged cranial bones with regions of pitting and flaring of the sternal rib ends suggesting rickets and / or scurvy.

Four individuals (4/61: 6.6%) had lesions to the roofs of the orbits indicating cribra orbitalia and female [787] displayed pitted lesions to the endocranial (inner) surface of the occipital bone.

Conclusion

A minimum number of **62** *in situ* articulated burials were identified during archaeological excavation of Pit 4.

The information gathered from these burials can be combined to the dataset for the 215 in situ articulated burials previously recovered during archaeological evaluations

at the Broadgate Ticket Hall, Liverpool Street works.

The investigation and osteological analysis of this buried population under modern archaeological conditions will provide an extensive, robust and statistically significant dataset. This will enable wide ranging and meaningful research regarding demographic structure, metric and pathological information of a population who lived during a period of great change and development. The expanding capital with and associated spiralling population would have resulted in increased pressures on resources leading to overcrowding, poor sanitation and increased pollution that would have impacted upon the lives and health of the inhabitants.

The analysis of possible burials of 16th to 18th-century date and association with the Hospital of St Mary Bethlehem (Bedlam) will help to further our knowledge and understanding of a hitherto archaeologically underrepresented time period (Museum of London 2002, 72) and allow for comparisons to be drawn with contemporary assemblages both within and outside of London and also from different time periods.

19.8.2 Trench 14

Trench	No. contexts	No. boxes (Skeleton)
14	24	7

Table 17: Trench 14 - Human Bone General Summary

Twenty-four contexts of articulated human bone were excavated in Trench 14. The majority of these were single individuals, but three contained intrusive elements from other burials. A full summary of the articulated and disarticulated bone examined can be found in Table 19.

All the articulated contexts were either well (41.7%) or moderately well (58.3 %) preserved. No burials were poorly preserved. Context [931] had a small adhering fragment of corroded iron attached to the shaft of the left femur, probably from a loose piece of metal in the burial soil. The same may be true of green copper staining observable on bones within 5 burials (/24: 20.8%). However, burial [935], a probable female adult, had bilateral staining centred on the temporal bones of the skull. This has been observed in medieval cemeteries, such as St Clement, Clementhorpe, in York, Syon Abbey in Middlesex and Holywell Priory in London, and may have been caused by metal fixing pins for a headdress (Gilchrist and Sloane 2005, 81; Bull et al 2011, 121, 130).

The range of skeletal completeness varied from a low of 10% to a high of 70%. Only the lower limbs were recovered from a large proportion of burials. This was the chief reason for the high number of individuals which were less than 25% complete (13/24: 54.2%). Only one third of the skeletons were over 50% complete (8/24: 33.3%).

The generally good preservation within the sample enhanced the analysis of its demography (Table 18). Fifteen adults and nine subadults were identified, a ratio of 1.7:1. Of the adults, there were two males and five females (1:2.5), and one was classed as intermediate. However, the low rates of skeletal completeness meant that sex could not be determined in seven adults. Six of the nine subadults (66.7%) were aged 13–17 years of age at death. Although adults were not apportioned age ranges, five were young enough to be aged by the state of epiphyseal fusion to between 18 to 25 years of age. Therefore, 11 individuals were aged between 13 to 25 years at death (/24: 45.8%), a very high proportion of adolescents/young adults.

Total	**n**	**%**
Neonatal/feotal	0	0.0
1 month to 6 years	2	8.3
7-12 years	1	4.2
13-17 years	6	25.0
Adult	15	62.5
Total	**24**	**100.0**

Table 18 Age distribution of articulated individuals in Trench 14

A relatively wide range of pathological lesions were observed within the sample. Due to the preponderance of lower limb bones, only six partial dentitions were present. Of these, five were affected by dental disease, a crude prevalence of 20.8% (5/24). Two individuals suffered from ante-mortem tooth loss (/24: 8.3%) and the same number from dental caries. Three had deposits of calcified plaque (calculus) on their teeth (/24: 12.5%). Only one individual was affected by enamel hypoplasia, periodontal disease and periapical abscess (4.2%).

Four individuals (/24: 16.7%), three adults and one subadult, had evidence of periosteal lesions. One had new bone growth on the internal walls of the maxilla, reflecting chronic maxillary sinusitis. The other three had non-specific periosteal lesions on the lower leg bones.

Two adult individuals were affected by injuries (/24: 8.3%). Adult female [933] had a thoracic vertebral endplate fracture reflecting compressive trauma to the back in adolescence. Adult [968] had a cortical bone growth on the left tibia. This might be the result of soft tissue trauma such as a ligament tear. Alternatively it may represent an osteochondroma, excessive neoplastic bone produced at the growth plate in childhood. Diagnosis in such cases relies on radiographic analysis.

Five individuals, all adult, suffered from joint disease (/24: 20.8%). In three cases this related to vertebral lesions, including osteophytes (bony bridging), Schmorl's nodes (disc displacement) and fusion. Two individuals had extra-spinal lesions: an adult male and an adult female, both with osteoarthritis of the right sternoclavicular joint.

Three adults and one subadult had evidence of metabolic disease (4/24: 16.7%). An adult probable female had slight cribra orbitalia in both orbits. One subadult (1 month to 6 years) was affected by rickets in the lower long bones. A further two adults (one male, one undetermined) had signs of resolved lesions, both in the legs.

Two adult individuals had circulatory disease (/24: 8.3%). One female had osteochondritis dissecans in the right ulna. A probable female had the same type of lesion in the acetabulum of the left os coxa.

One adult male (/24: 4.2%) had evidence of congenital disease in the form of unilateral spondylolysis in the fifth lumbar vertebra.

Context	Condition	% complete	Skull	Dentition	Torso	Pelvis	Legs	Feet	Arms	Hands	Age	Sex	Pathology comments
921	2	70	1	1	1	1	0	0	2	0	7	3	Vert. SN & fusion
928	2	70	0	1	1	1	2	2	2	2	7	1	R.stenoclavicular joint: OA. L.5: spondylolysis. Vert. OP & Sn
929	2	60	1	1	1	1	0	1	2	2	7	5	Vert. OP, AMTL
931	2	65	1	0	1	1	2	1	2	2	7	5	None
933	1	65	1	1	1	1	2	0	2	2	7	5	R.ulna: osteochondritis dissecans. Severe vertebral SN. Vertebral endplate fracture.
935	2	40	1	1	1	0	0	0	1	0	7	4	Maxillary sinusitis (bilateral). OA: R.clavicle (sternal end). 3 x fused thoracic vert.
937	2	10	0	0	0	0	1	0	0	1	3	0	None
939	1	65	1	1	1	1	1	0	2	2	3	0	Dental calculus
951	2	55	0	0	1	1	2	2	0	1	7	4	Tibiae: periostitis. L.acetabulum: osteochondritis dissecans
952	1	20	0	0	0	0	2	2	0	0	3	0	None
953	2	15	0	0	0	0	2	0	0	0	3	0	None
954	1	50	1	0	1	1	2	1	0	1	1	0	Lower long bones: rickets
955	1	20	0	0	0	0	2	2	0	0	3	0	None

Context	Condition	% complete	Skull	Dentition	Torso	Pelvis	Legs	Feet	Arms	Hands	Age	Sex	Pathology comments
956	2	20	0	0	0	0	2	2	0	0	7	9	None
959	1	10	0	0	0	0	1	0	0	0	3	0	None
960	2	20	0	0	0	0	2	2	0	0	7	9	None
962	2	30	0	0	0	1	2	2	1	0	7	1	Femora: resolved rickets
964	1	20	0	0	0	0	2	2	0	0	7	9	None
965	1	20	0	0	0	0	2	2	0	0	7	9	None
966	2	15	0	0	0	0	2	0	0	2	1	0	Tibiae: periostitis
968	2	20	0	0	0	0	2	2	0	0	7	9	Tibiae: resolved rickets. L.tibia: osteochondroma/soft tissue trauma
970	2	10	0	0	0	0	1	1	0	0	7	9	None
972	1	70	0	0	1	1	2	2	2	1	2	0	None
973	1	20	0	0	0	0	2	2	0	0	7	9	Tibiae & fibulae: periosteal lesions

Table 19 Summary of articulated bone in Trench 14

Conclusion

A minimum number of **24** articulated burials were recorded from Trench 14 at Broadgate Ticket Hall, Liverpool Street works, adding to our knowledge of burial practices in a hitherto underrepresented period (16th to 17th centuries) in London (Museum of London 2002, 72). The high proportion of adolescents and young adults within this sample, compared to assemblages from other areas of the burial ground associated with the Hospital of St Mary Bethlehem, may reflect variations in mortality over time, or age-related zoning.

19.8.3 Pit 11

One disarticulated human bone was found within context [979], the primary fill of Roman pit [980], with a MNI of 1.

Site code	Context	Body area	Elements present	Age	Sex	Pathology	MNI	Comments
XSM10	979	Lower limb	Fibula R	7	9	None	1	None
	Total MNI						**1**	

Table 20 Summary of disarticulated bone from Pit 11

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19.9 Zoology

Alan Pipe

19.9.1 Animal Bone from Pit 11 [978], [979] AND [979] {31}

Introduction and methodology

This report quantifies, identifies and interprets the animal bone recovered from hand-collected contexts [978] and [979]; and from wet-sieved sample [979] {31}. Species, body side and skeletal element were determined using the MOLA animal bone reference collection together with Schmid 1972. The complete assemblage was recorded onto the MOLA animal bone post-assessment database and is shown as an Excel table (Table 1), in terms of species, skeletal element, body side, age, fragment count and modification, for future reference and analysis with respect to available stratigraphic data. Fragments too severely fragmented for definite identification were assigned to the approximate categories 'unidentified bird', 'cattle-sized' or 'sheep-sized' as appropriate.

CONTEXT	SAMPLE	COMMON NAME	BONE	AGE	MODIFICATION	COMMENT	NOS.
978	0	horse	vertebra, atlas	adult			1
978	0	pig	tooth, mandibular	adult			1
979	0	cattle	femur	adult	chopped		1
979	0	cattle	premaxilla				1
979	0	cattle	radius	foetal/neonate			1
979	0	cattle	horn core	juvenile			1
979	0	cattle	scapula		chopped		1
979	0	cattle-sized	rib			fragments	3
979	0	chicken	femur	adult	chopped		1
979	0	deer, roe	radius	adult	chopped/knife-cut		1
979	0	pig	radius	juvenile			1
979	0	pig	skull			fragment	1
979	0	pig	innominate	adult	chopped		1
979	0	sheep	metatarsal	adult			1
979	0	sheep/goat	innominate	adult	chopped	male	1
979	31	bird, unidentified	vertebra	adult			1
979	31	cattle	innominate	adult	chopped	female	1
979	31	cattle-sized	rib			fragments	3
979	31	pig	tooth, mandibular				1
979	31	sheep-sized	long bone			fragments	6
979	31	sheep-sized	long bone		calcined	fragment	1
979	31	sheep-sized	vertebra				2
TOTAL							**32**

Table 21 Hand-collected and wet-sieved animal bone from Pit 11/catalogue

The bone assemblage (see Table 21)

A total of 32 fragments of well-preserved animal bone were recorded from hand-collected and wet-sieved contexts. Hand-collected contexts [978] and [979] produced 18 fragments; wet-sieved sample [979] {31} produced 15 fragments. Maximum fragment size generally exceeded 75 mm, with most bone in very good surface condition and all tool marks easily visible.

Context [978] produced only two bones; an atlas vertebra of adult horse *Equus caballus* and a worn mandibular (lower jaw) canine tooth of an adult female pig *Sus scrofa*. There was no evidence for modification.

Context [979] produced 15 fragments; derived mainly from cattle *Bos taurus* with fewer fragments of the other major domesticates; sheep/goat (including sheep *Ovis aries*) and pig *Sus scrofa*. Cattle produced rib fragments with single fragments of juvenile horn core, premaxilla (skull), scapula (shoulder blade) and foetal or neonate (newborn) calf radius (lower fore-leg). Sheep/goat produced a fragment of adult male innominate (pelvis) and an adult sheep *Ovis aries* metatarsal (hind-foot). Pig *Sus scrofa* produced single fragments of skull, juvenile radius (lower fore-leg) and chopped adult innominate (pelvis).

Poultry were represented only by a single complete, butchered femur (thigh bone) of adult chicken *Gallus gallus*. Game species were represented by a single complete, butchered, radius (lower fore-leg) of adult roe deer *Capreolus capreolus*.

Wet-sieved sample [979] {31} produced 15 fragments of animal bone derived almost entirely from the major domesticates; cattle, sheep/goat and pig. In addition to small numbers of ‘cattle-sized’ and ‘sheep-sized’ rib and long bone fragments, the sample included single examples of adult cattle innominate (pelvis), ‘sheep-sized’ vertebra and pig mandibular (lower jaw) tooth. A fragment of ‘sheep-sized’ long bone had been calcined white indicating a combustion temperature of at least degrees Celsius (Lyman 1994, 386).

Although clear evidence of butchery was noted on chicken, cattle, sheep/goat, pig and roe deer, there was no indication of working, pathological change or gnawing by canines or rodents.

Interpretation

This small but very well-preserved assemblage derives mainly from primary processing and post-consumption waste associated mainly with consumption of beef and, to a lesser extent, veal, mutton and pork, with some evidence for poultry (chicken) and game (roe deer). In addition, a single vertebra of adult horse suggests some disposal of non-consumed domesticates. Further analysis of the assemblage will allow very limited comment on local meat diet in terms of selection of species, carcase-part and age-group.

The complete absence of small wild vertebrates prevents any interpretation of local ecology or conditions.

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19.9.2 Invertebrate Fauna from Pit 11 [978] {30} AND [979] {31}

Introduction and methodology

Flotation of bulk samples [978] {30} and [979] {31} XSM10 yielded small numbers of mollusc shells; visual inspection using a binocular microscope indicated terrestrial and freshwater species. Preliminary identification following Macan 1977 indicated that post-assessment study has some potential for ecological interpretation of local habitats and conditions.

This short report summarises the molluscan fauna for these samples and considers their potential for further study.

The fauna

Sample [978] {30}

The mollusc group included only freshwater snails; margined ram's-horn *Planorbis planorbis*, great ram's-horn *Planorbarius corneus* and common bithynia *Bithynia tentaculata*. All three species are abundant in still and slow-flowing lowland, calcium-rich waters in S E England.

Sample [979] {31}

The mollusc group included at least two terrestrial species (unidentified snail species 1 and 2); an 'amphibious' wetland species (amber snail; family Succineidae); and two freshwater snail species; margined ram's-horn *Planorbis planorbis* and common bithynia *Bithynia tentaculata*.

In addition, this sample produced a fragment of cuttlefish internal shell (cuttle 'bone') probably present either as food waste or as a fragment of mould medium used in casting small metal objects.

CONTEXT	SAMPLE	MOLLUSCS (TERRESTRIAL)	MOLLUSCS (FRESHWATER)	MOLLUSCS (MARINE)	HABITAT
978	30		*Planorbis planorbis*		slow-still/well-vegetated
978	30		*Planorbarius corneus*		slow-still/possibly rotten vegetation
978	30		*Bithynia tentaculata*		slow-still/well-vegetated
979	31		*Bithynia tentaculata*		slow-still/well-vegetated
979	31		*Planorbis planorbis*		slow-still/well-vegetated
979	31	snail species 1			
979	31	snail species 2			
979	31	Succineidae			amphibious/wetland
979	31			cuttlefish 'bone'	

Table 22 Wet-sieved/floated invertebrates from Pit 11 [978] {30} and [979] {31]/preliminary identifications

Potential for further work

Identification of all mollusc species in both samples will allow interpretation of ecological conditions indicated by each sample, particularly in terms of vegetation, water flow, water quality and liability to seasonal desiccation, and will clearly highlight any ecological differences between the sample groups. Identification will follow Cameron & Redfern 1976; and Macan 1977. Ecological interpretation will follow Davies 2008; and Kerney 1990.

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19.10 Botany

Anne Davis

N.B. The information contained within this report is preliminary assessment data, and may be modified in the light of detailed analytical work. It should not be quoted without the permission of the author, or Head of Service.

Pit 11

Methodology

Two bulk samples were taken from primary fill [979]{31} and later fill [978]{30} of a Roman pit [980]. The samples were processed by flotation, and the wet flots evaluated to determine the presence and nature of any plant remains and other biological material present.

Results

Sample {31}, from the primary fill of pit [980], included large amounts of plant epidermis, from stems or roots, as well as a large assemblage of waterlogged seeds. The latter came mainly from aquatic or wetland plants such as celery-leaved crowfoot (*Ranunculus sceleratus*), fool's watercress (*Apium* cf. *nodiflorum*), sedges (*Carex* spp.) and gipsy-wort (*Lycopus europaeus*), suggesting that marshy habitats existed close by. Common plants of disturbed and waste ground, including burdock (*Arctium* sp.), hemlock (*Conium maculatum*), docks (*Rumex* spp.) and buttercups (*Ranunculus acris/bulbosus/repens*) were also well represented. Remains of food plants were rare and, apart from a number of elder (*Sambucus nigra*) and blackberry (*Rubus* cf. *fruticosus*) seeds which may have been part of the local flora, seemed to be limited to one or two seeds of coriander (*Coriandrum sativum*) and mulberry (*Morus nigra*), indicating that the feature does not seem to have been used as a cesspit. A number of mollusc shells were also found in this sample (see 19.9.2).

No plant remains survived in the second sample, {30}, which produced only a small number of mollusc shells.

The plant assemblage from fill [979] may be worthy of further analysis, and would provide information which could be used, in conjunction with that from the mollusc shells and from neighbouring Crossrail sites, to reconstruct the natural environment of the area.

19.11 Grave Marker

Adrian Miles

A single grave marker or gravestone, in two pieces, was recovered from Pit 7 (see 9.3.1 and Photo 13). It measured 0.40m by 0.53m wide (maximum dimensions) by up to 75mm thick. The edges are smoothed, while the rear is rough hewn, suggesting it was probably originally laid flat. Neither the original top or bottom of the stone survive.

Four lines of a partial inscription survived, all inscribed in capital letters (full capitals 37mm (1½ inches) high, small capitals 25mm (1 inch) high):

JOHN BA…

BAIL FA…AGED 25

WEEKS DYED Y^{E} 13^{D} OF

APRILL 1664

This is likely to be a family grave marker, as it is possible that more than one individual is mentioned and it would be unusual to have a grave marker for a 25 week old infant alone. However, the partial nature of the stone makes this difficult to be certain. The top surviving line mentions John Ba… which it is safe to assume is Bail (or Ball) as in the next line, where it appears to be a middle name, with Fa(c/o/g?)…being the surname.

19.12 Timber

Damian Goodburn

Timber [725], one large, boxed heart oak, earth–fast post base. The fragment was substantial and survived 370mm x 310mm x 300mm. The top end was rotted but an axe cut base and part of felling cut were preserved. Could be from one of several date brackets on technological grounds, including Roman, *c* 12th to 13th century, or possibly later post-medieval when some ancillary buildings were built with oak earth fast posts. Cleaned, recorded and sampled for possible tree-ring dating.

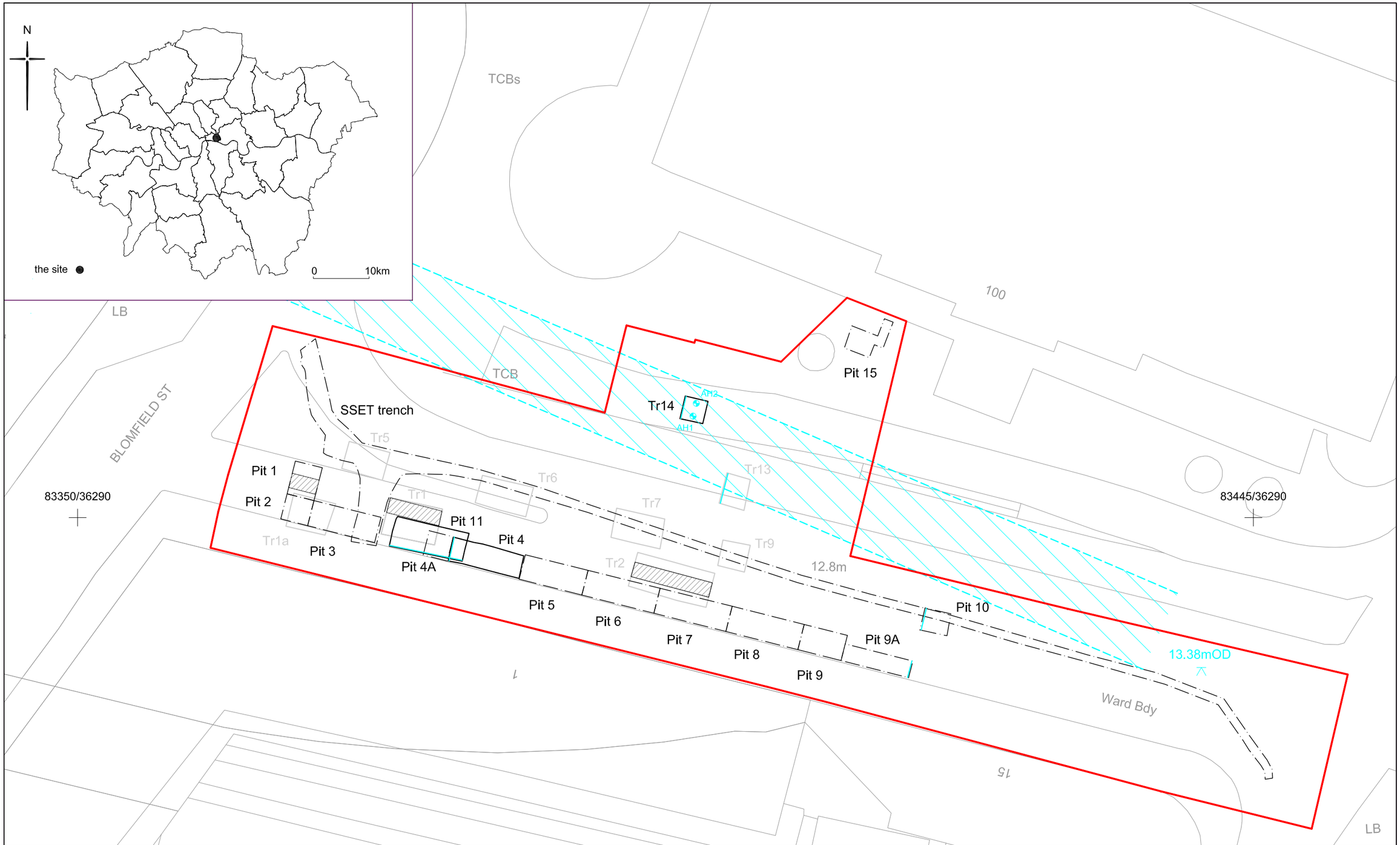

Fig 1 Location of archaeological investigations

- Site outline
- Evaluation and targeted watching brief areas
- General watching brief areas
- 2011 trench edges
- 110mATD TBM in mATD (for mOD, subtract 100m)
- Section line
- Auger holes
- Roman road conjecture
- Sewer [535]

1:300 @ A3

0 15m

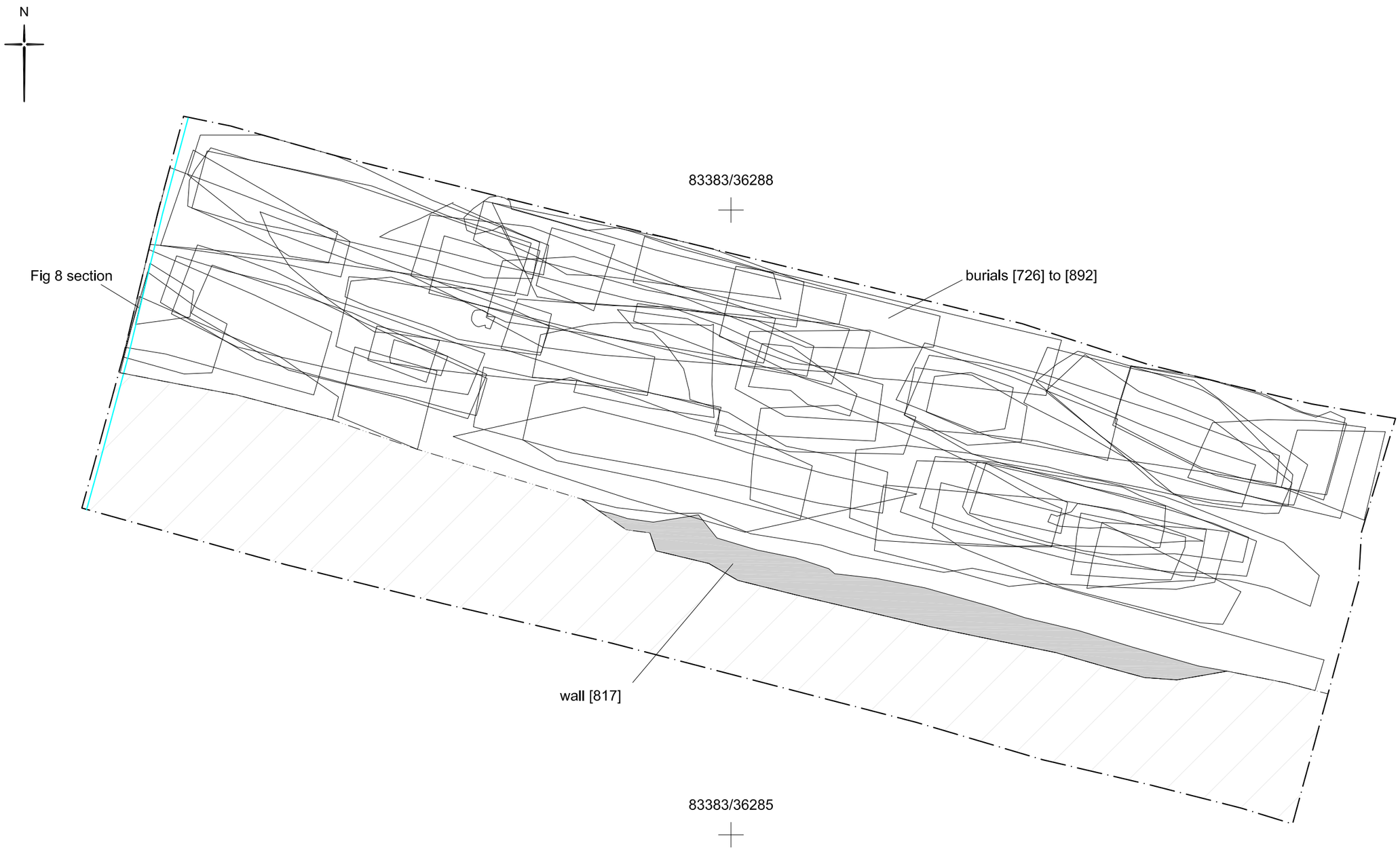

Fig 2 Pit 4 trench plan, showing cemetery horizon

Trench edge
Modern truncation
[11] Archaeological features
Section line

1:20 @ A3

0 1m

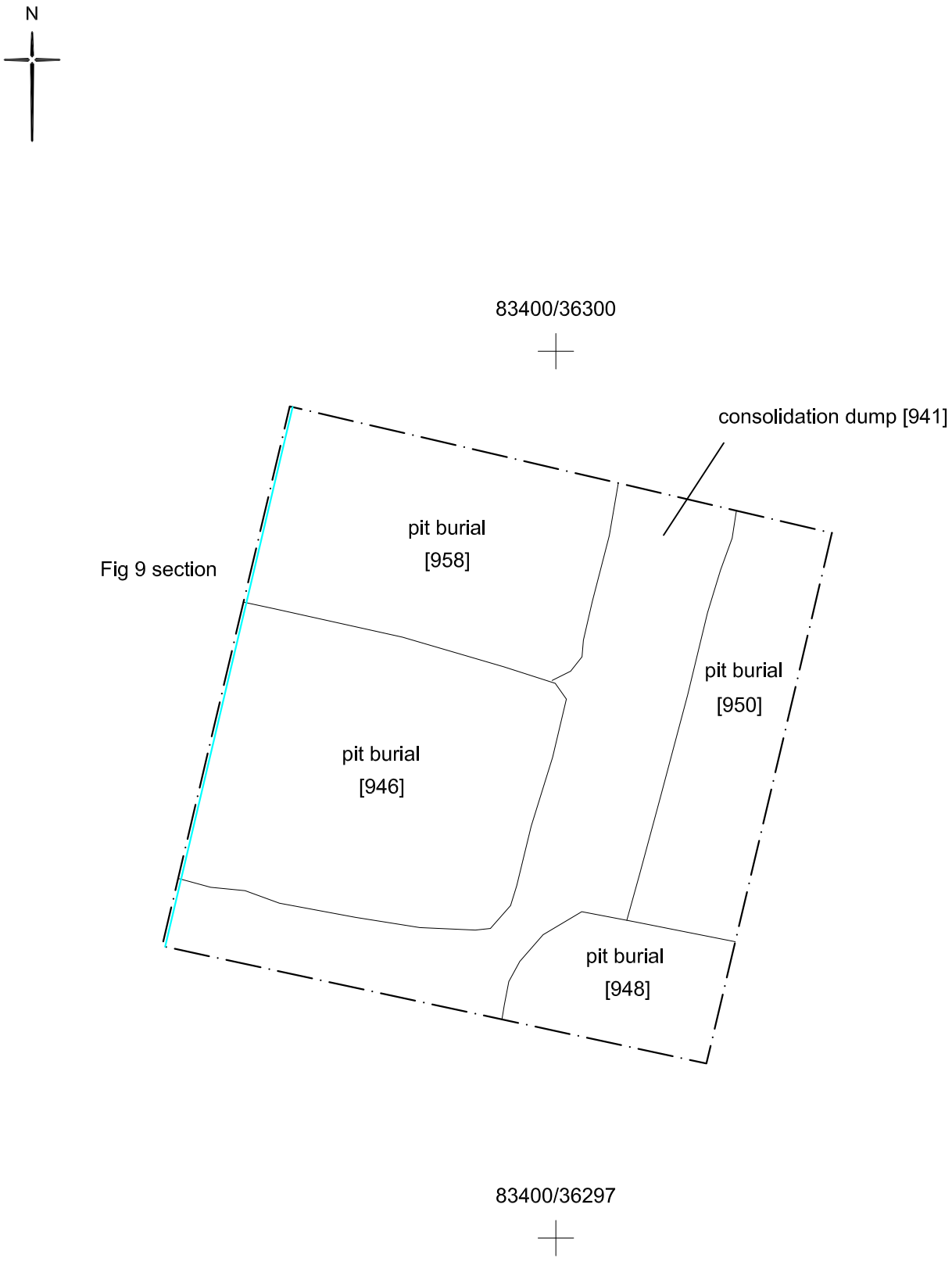

Fig 3 Trench 14 trench plan, showing pit burial horizon

Trench edge

[11] Archaeological features

Section line

1:20 @ A4

0 1m

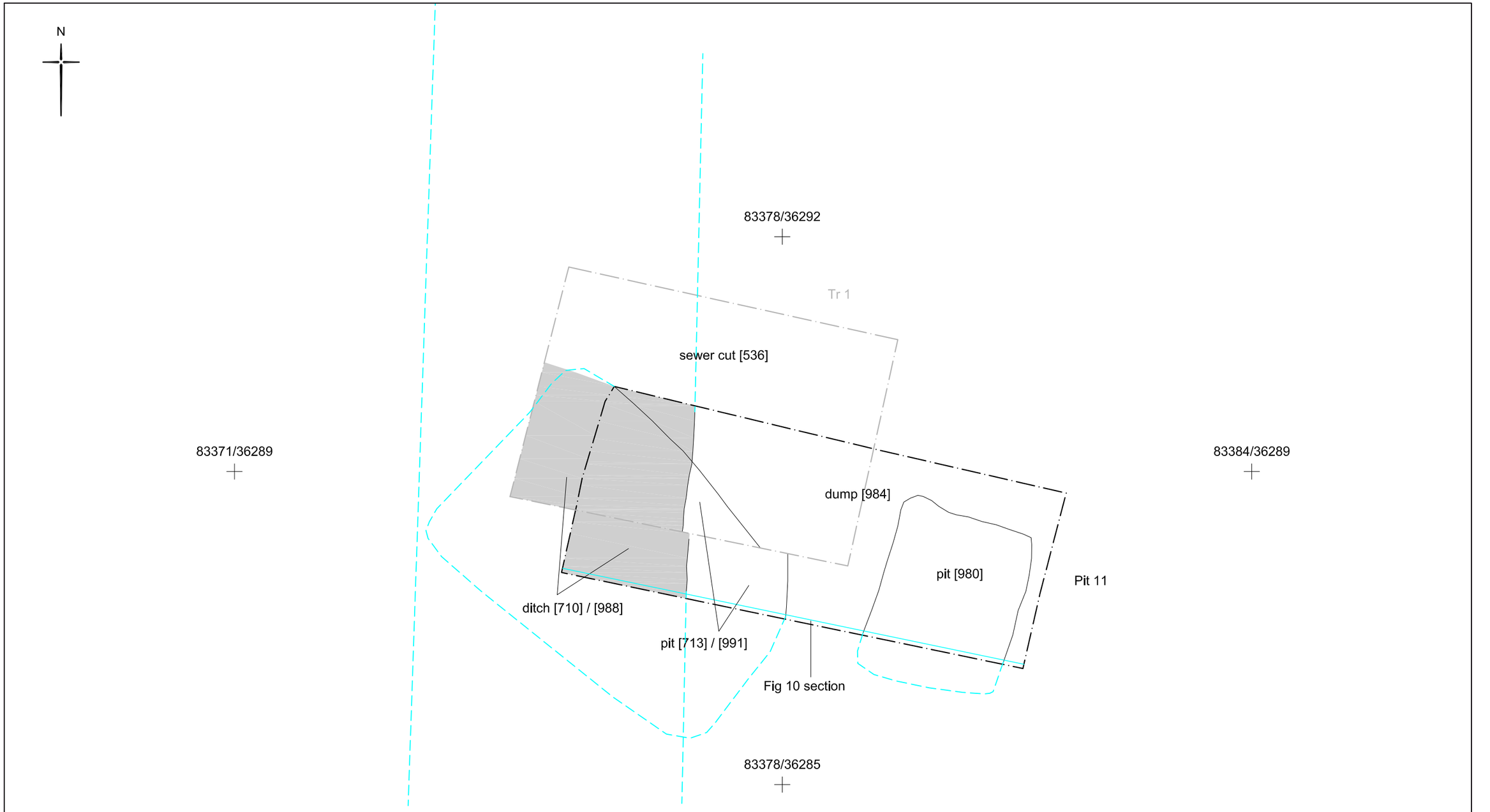

Fig 4 Pit 11/Trench 1 trench plan, showing Roman features

Trench edges
2011 trench edges
[11] Archaeological features
Conjecture
Section line

1:50 @ A3

0 2.5m

Fig 5 Pit 3 trench plan, showing post-medieval walls

Trench edge
2011 trench edges
[11] Archaeological features
Modern truncation

1:50 @ A3

0 2.5m

N

83392/36285

83405/36285

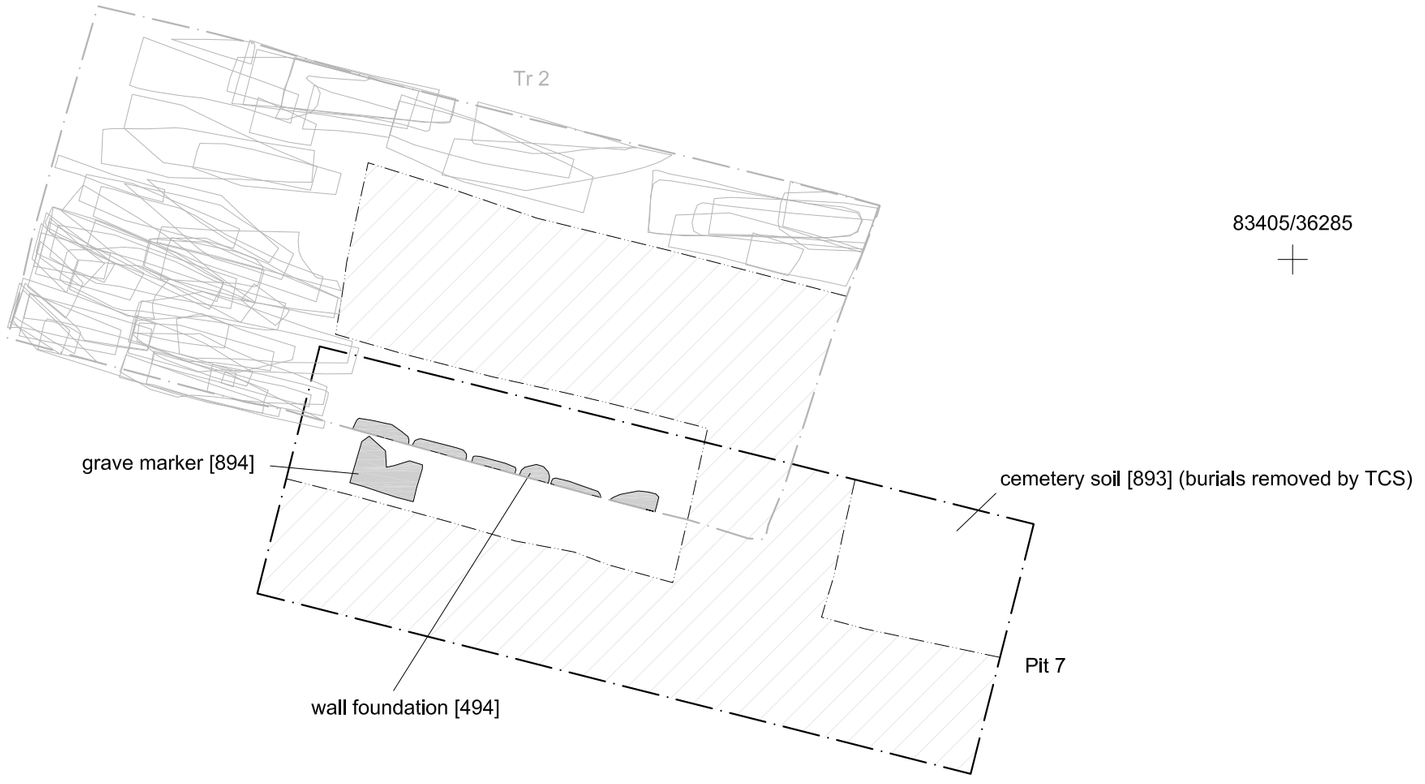

Fig 6 Pit 7 / Trench 2 trench plan, showing stone foundation, including re-used grave marker

Trench edge
2011 trench edges
[11] Archaeological features
19th to 20th-century truncations

1:50 @ A3

0 2.5m

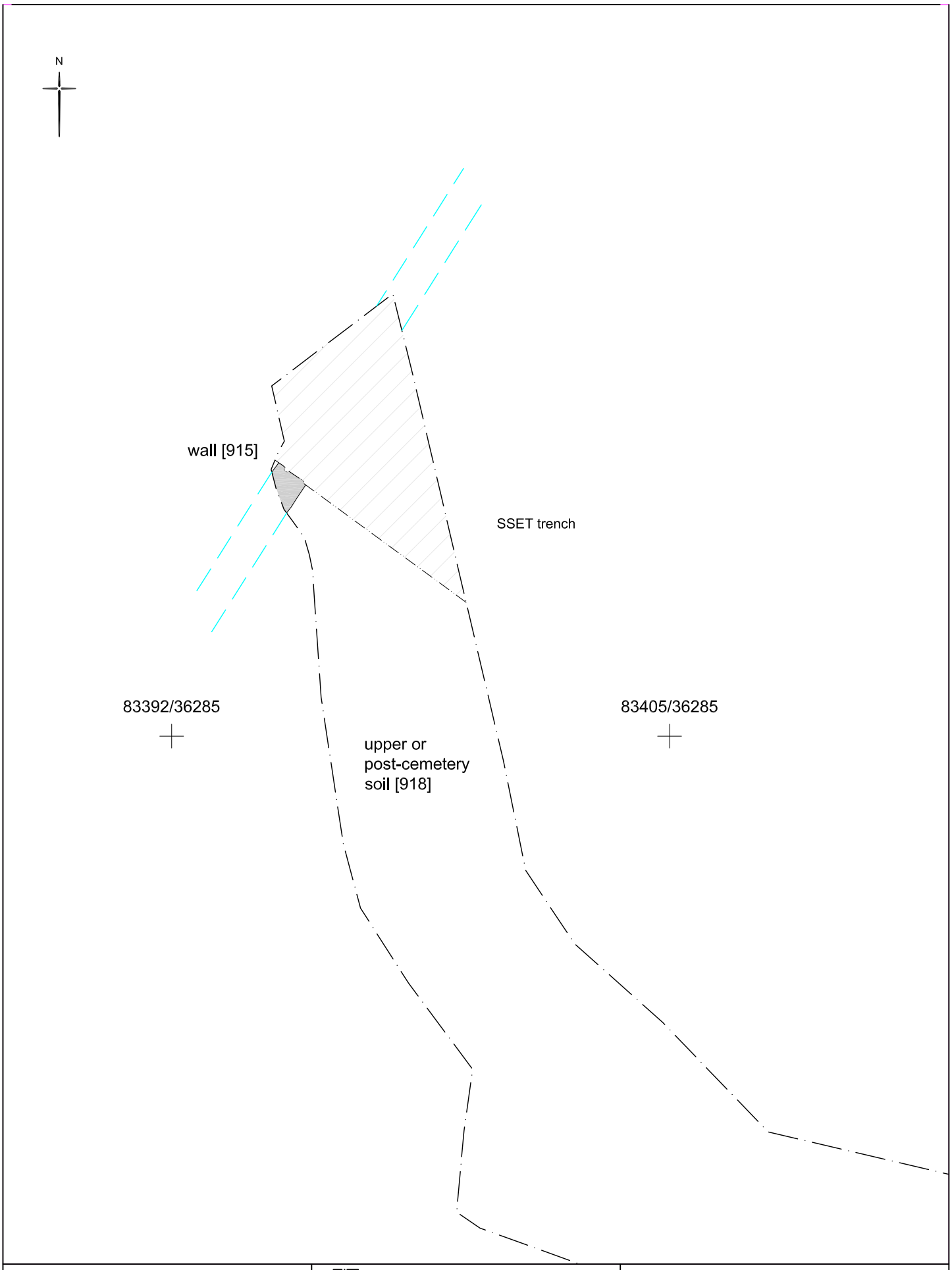

Fig 7 Western end of SSET trench, showing post-medieval wall

Trench edge
Modern truncation
[11] Archaeological features
Conjecture

1:50 @ A4
0 2.5m

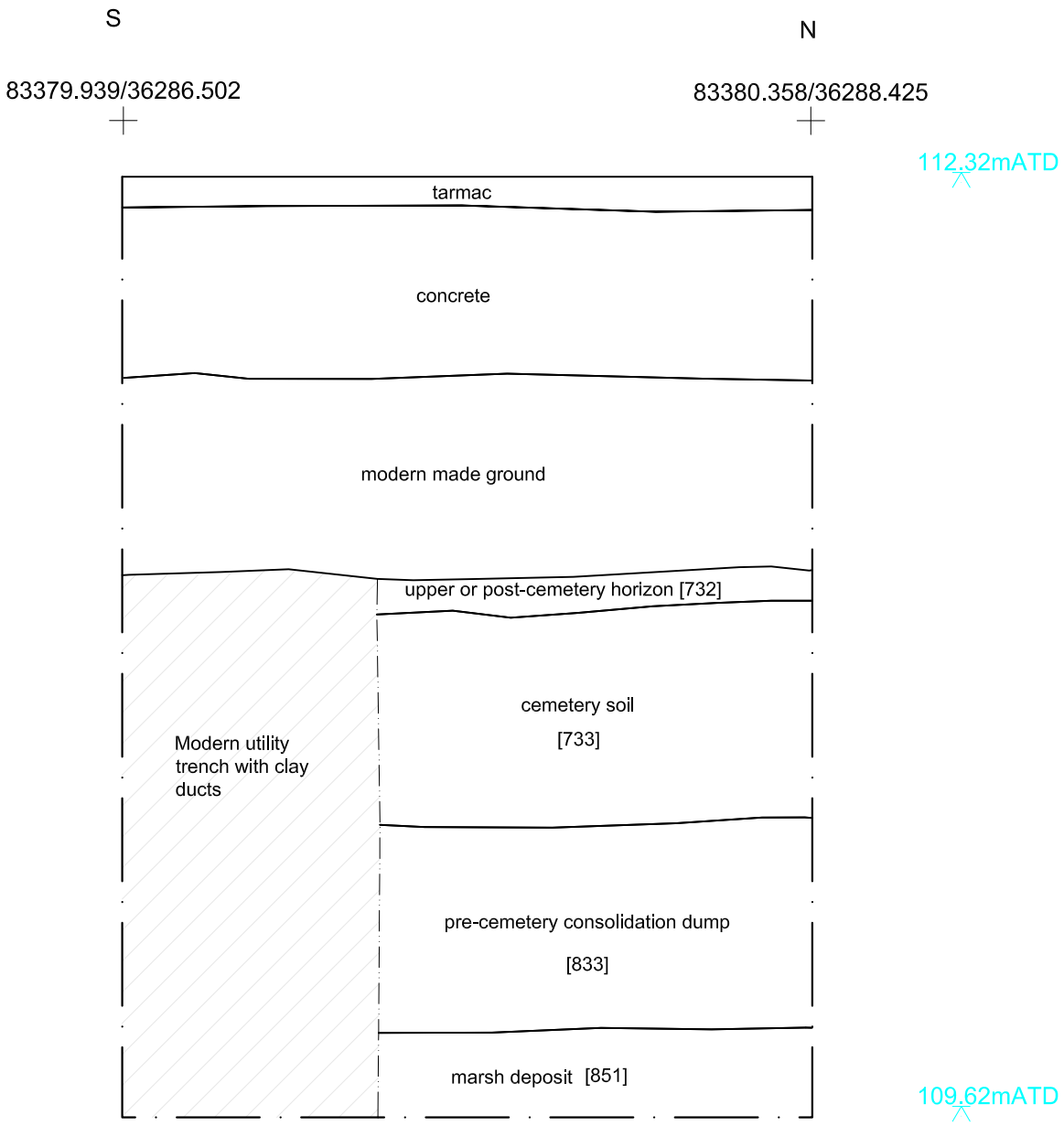

Fig 8 East-facing section of Pit 4

Limit of excavation

[11] Archaeological features

Modern truncation

110.24mATD Levels in mATD

1:20 @ A4

0 1m

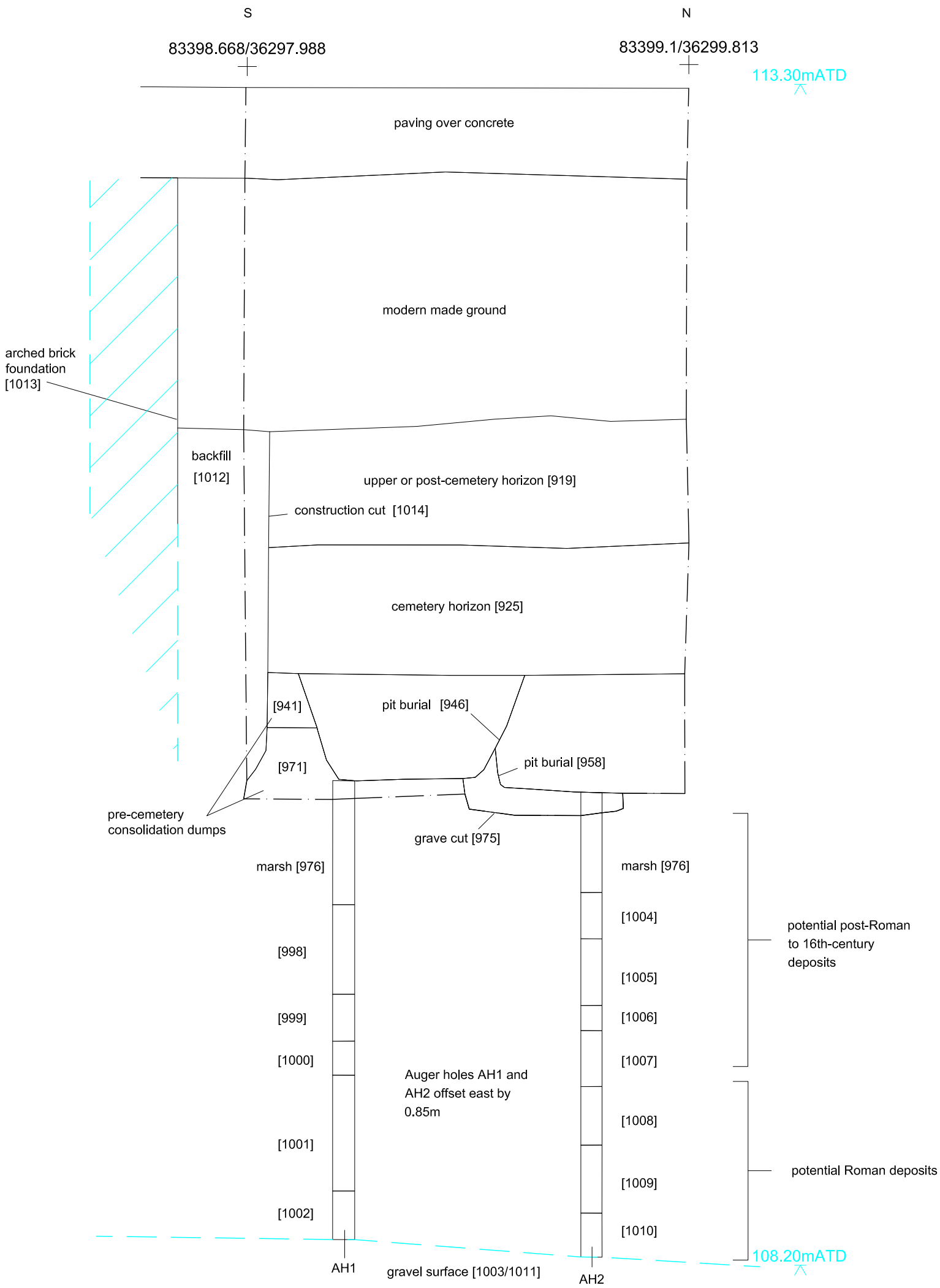

Fig 9 East-facing section of Trench 14

Limit of excavation

[11] Archaeological features

Conjecture

110.24mATD Levels in mATD

1:20 @ A3

0 1m

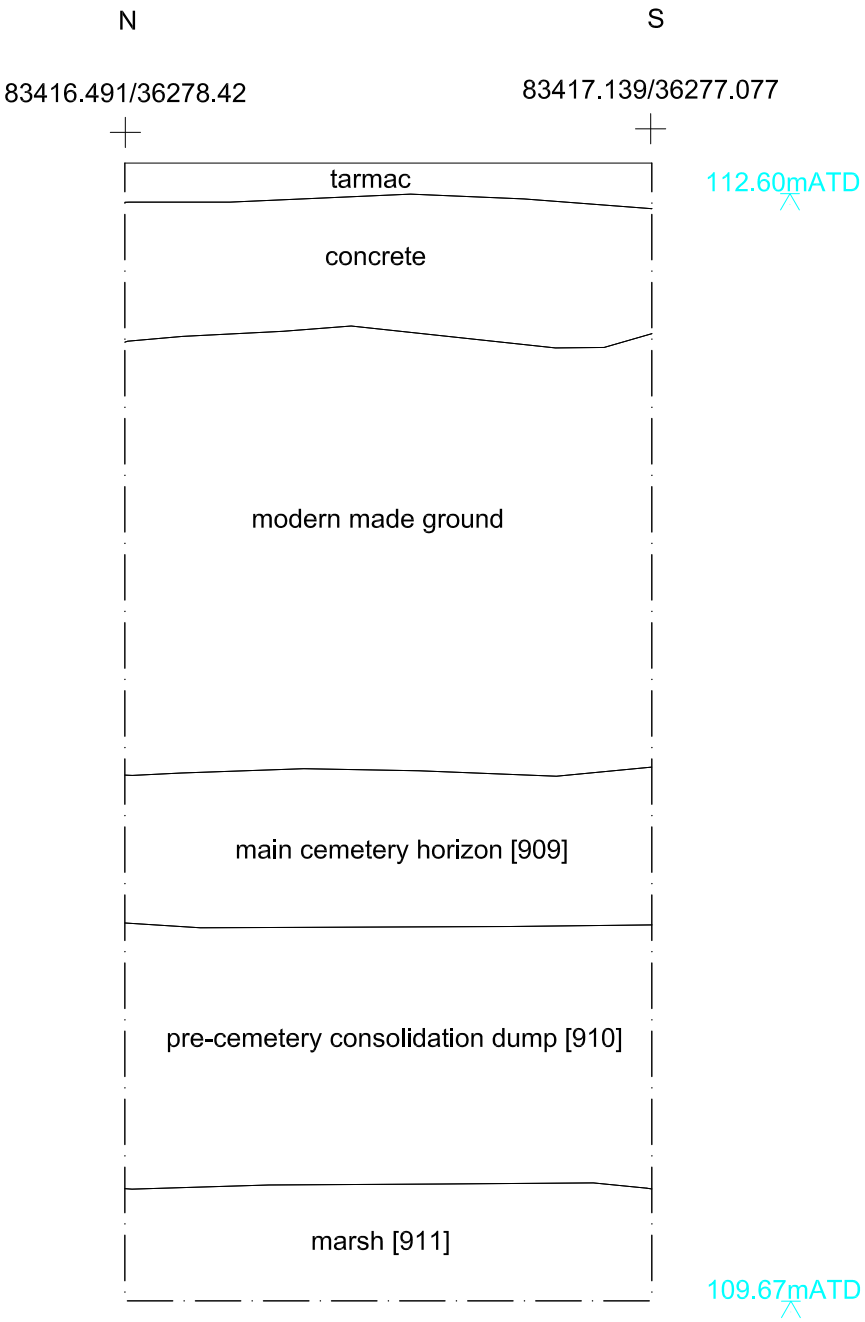

Fig 10 West-facing section of Pit 9A

Limit of excavation

[11] Archaeological features

110.24mATD Levels in mATD

1:20 @ A4

0 1m

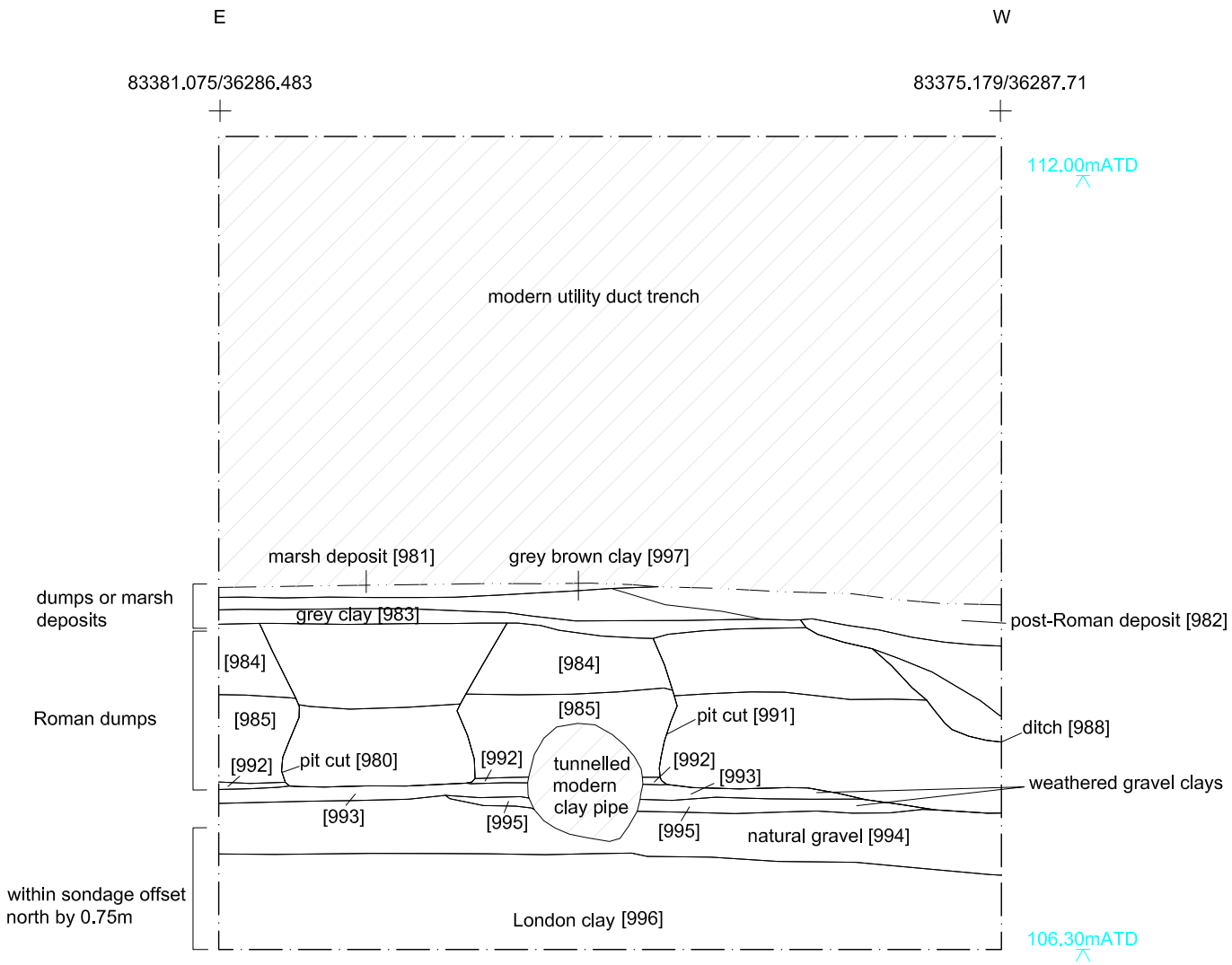

Fig 11 North-facing section of Pit 11

Limit of excavation

[11] Archaeological features

Modern truncation

110.24mATD Levels in mATD

1:50 @ A4

0 2.5m

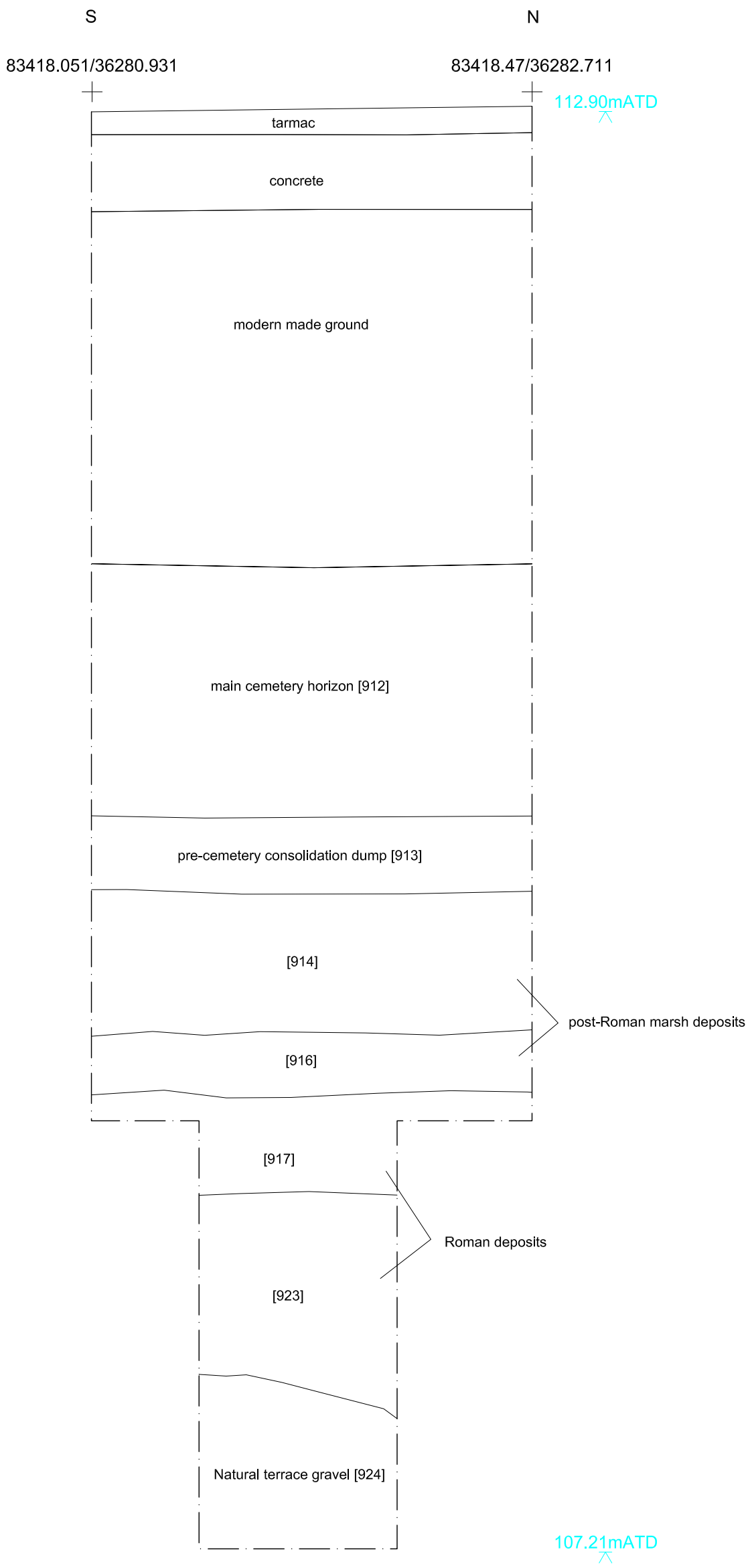

Fig 12 East-facing section of Pit 10

Limit of excavation

[11] Archaeological features

110.24mATD Levels in mATD

1:20 @ A3

0 1m

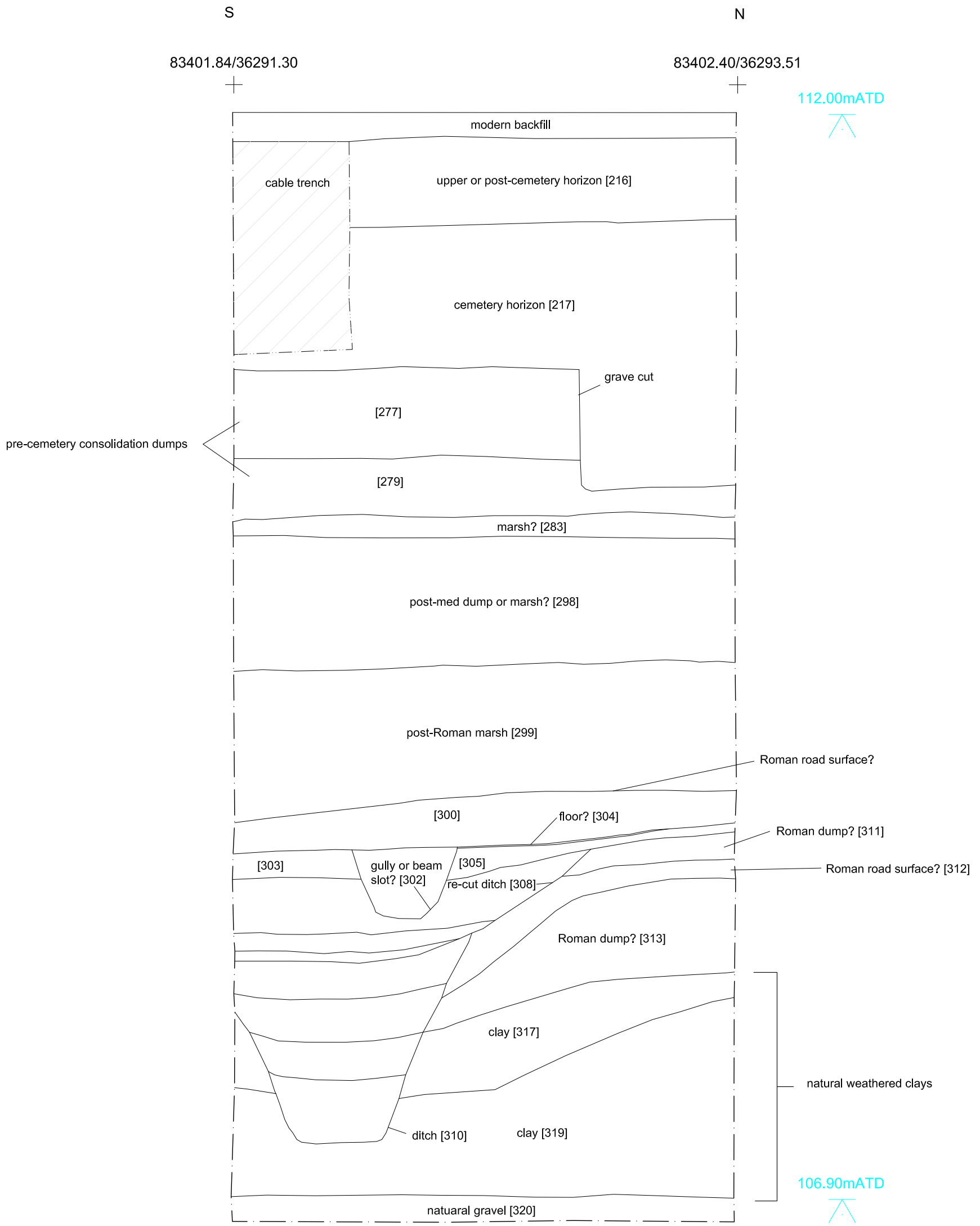

Fig 13 East-facing section of Trench 13, re-interpreted from Trench 14 results

Limit of excavation
[11] Archaeological features
Modern truncation
110.24mATD Levels in mATD

1:20 @ A3
0 1m

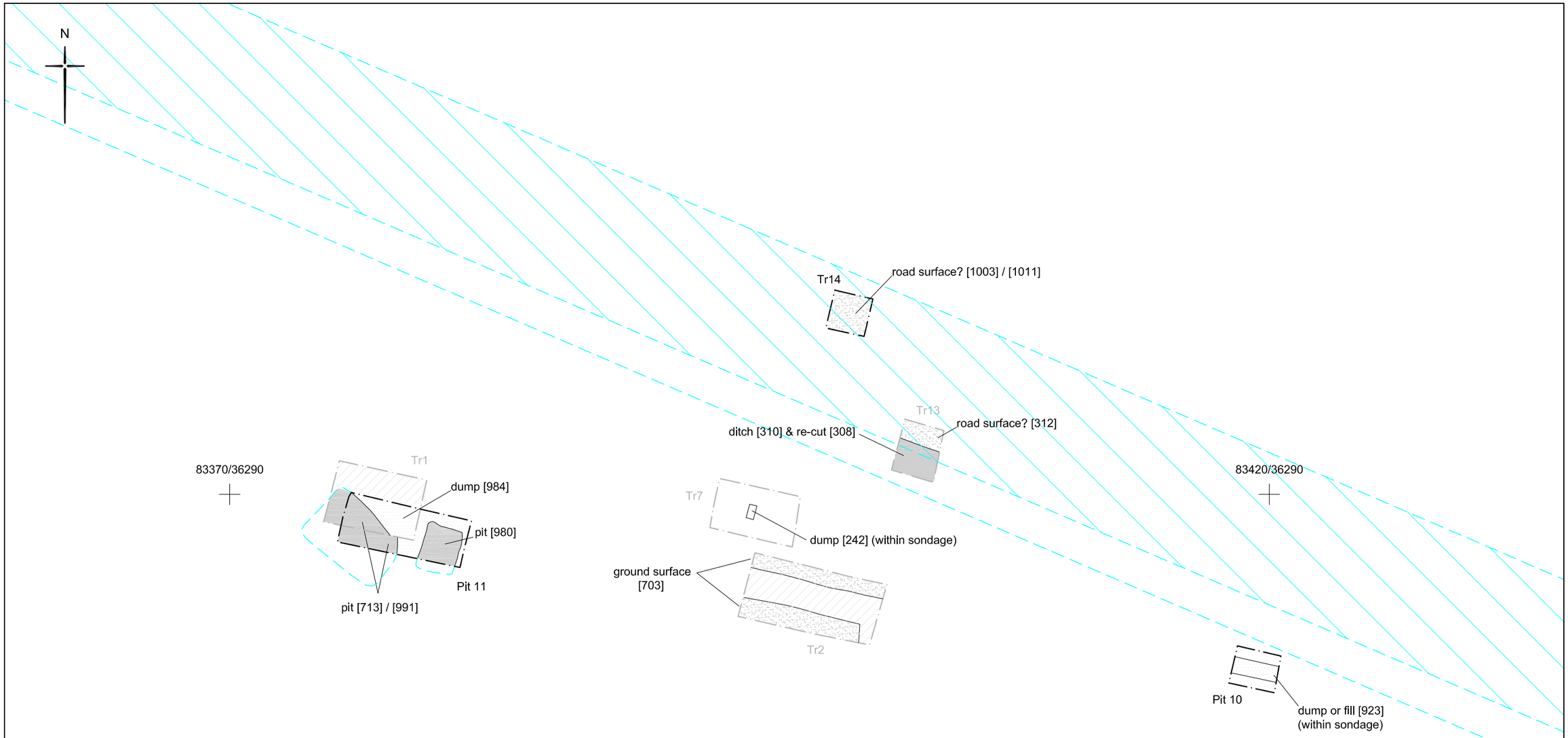

Fig 14 Provisional 1st to mid-2nd century Roman features

Trench edge
2011 trench edges
[11] Archaeological features
19th to 20th-century truncation
Conjectured Roman road
Conjecture

1:200 @ A3

0 10m

N

83385/36300

Tr1

ditch [710]

Pit11

clay dump? [983]

consolidation dumps [231] & [241]

Tr7

floor [304]

Tr13

dump [303]

beam slot? [306]

dumps [694] & [702]

Tr2

83385/36280

dump or fill [923]
(within sondage)

Pit 10

Fig 15 Provisional 2nd-century Roman features

Trench edge

2011 trench edges

[11] Archaeological features

19th to 20th-century truncation

Conjecture

1:200 @ A3

0 10m

Fig 16 Provisional 3rd-century Roman features

- Trench edge
- 2011 trench edges
- [11] Archaeological features
- 19th to 20th-century truncation
- Conjectured Roman road
- Conjecture

1:200 @ A3

0 10m

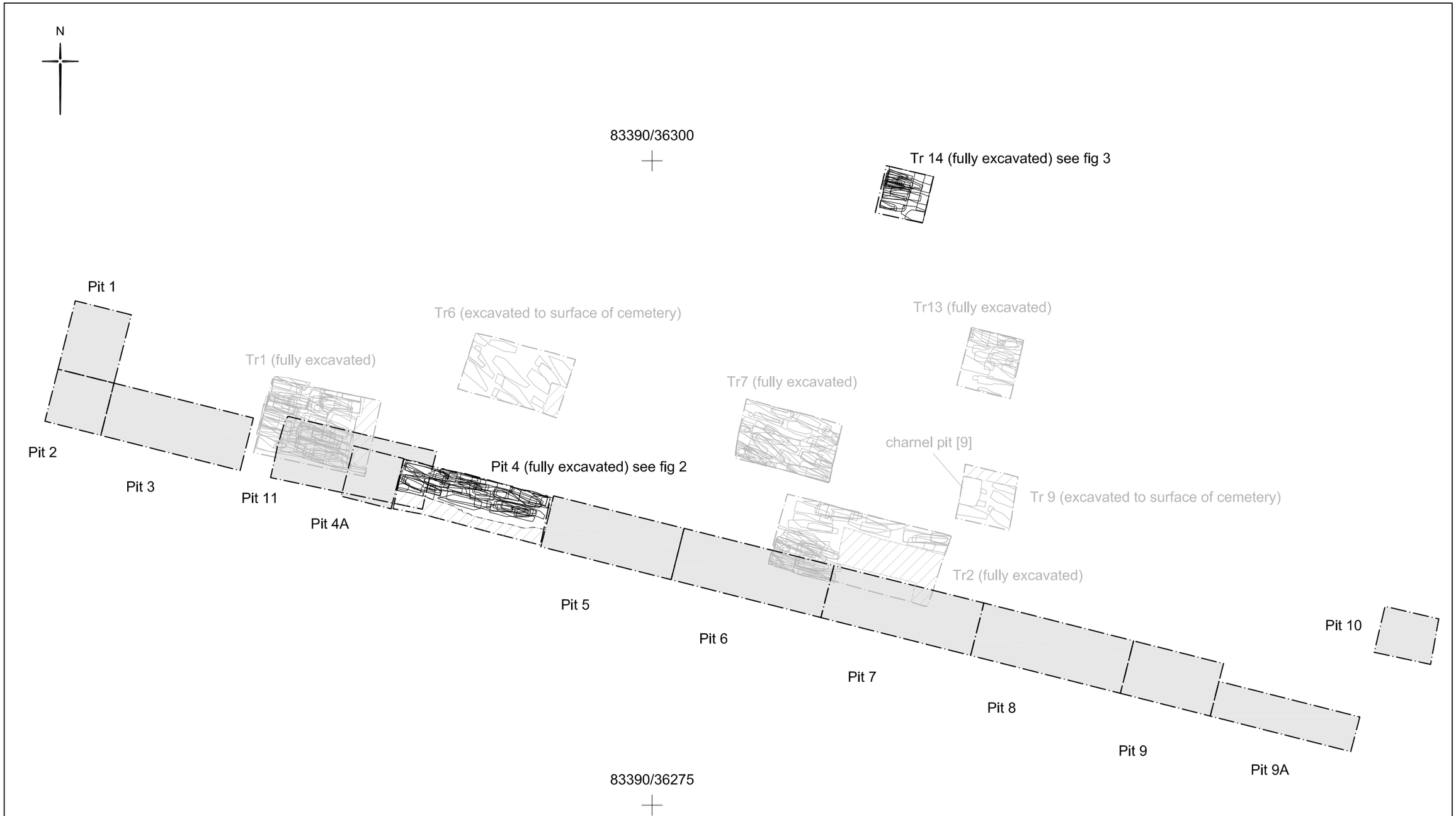

Fig 17 Burial overview

- Newly excavated trenches
- Previously excavated trenches
- Burials removed by exhumation contractor under MOLA GWB
- Archaeological features
- 19th to 20th-century truncation

1:150 @ A3

0 7.5m

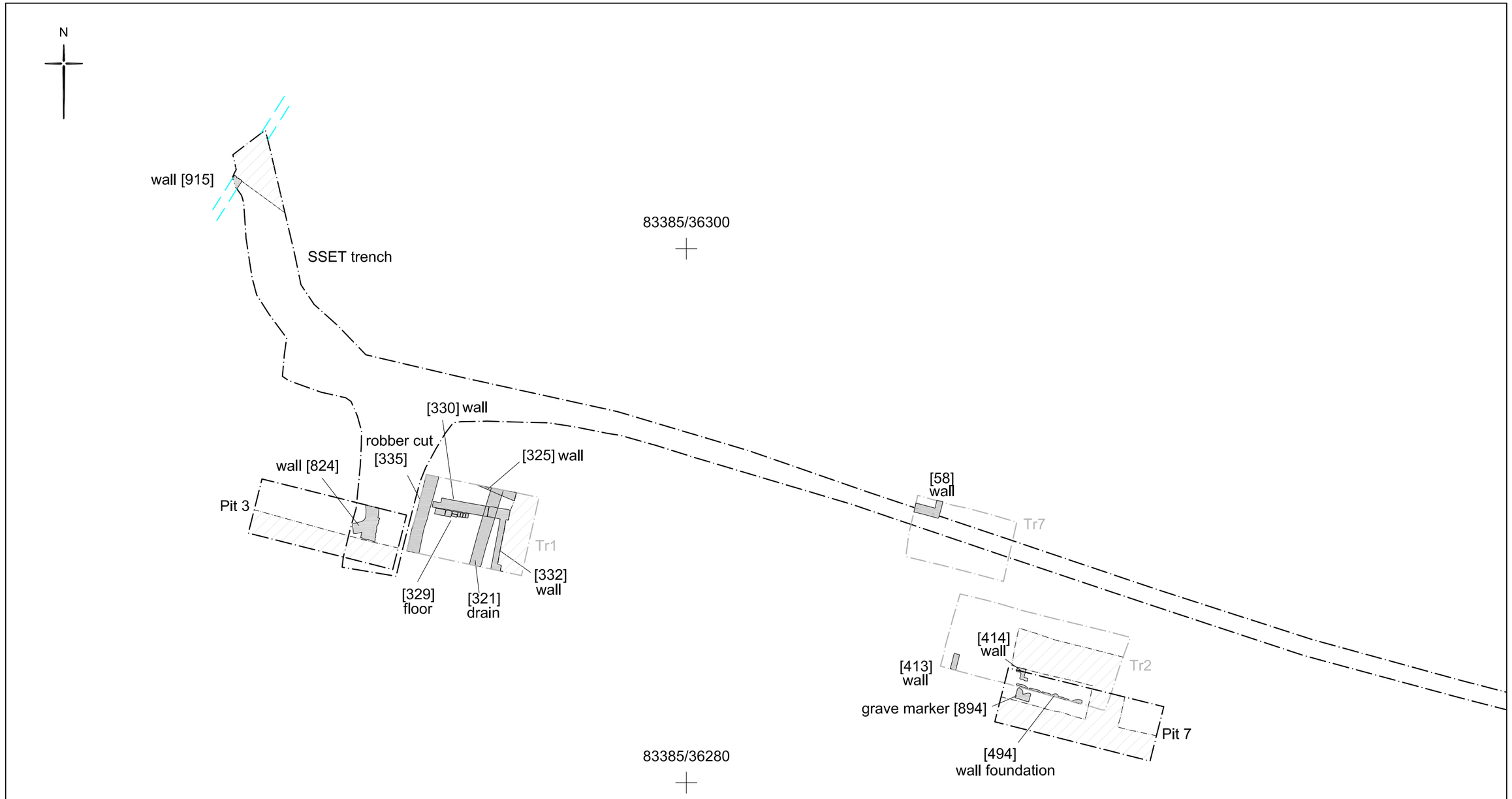

Fig 18 Post-medieval (16th to 18th-century) structural features

Trench edge
2011 trench edges
[11] Archaeological features
19th to 20th-century truncation
Conjecture

1:150 @ A3

0 7.5m

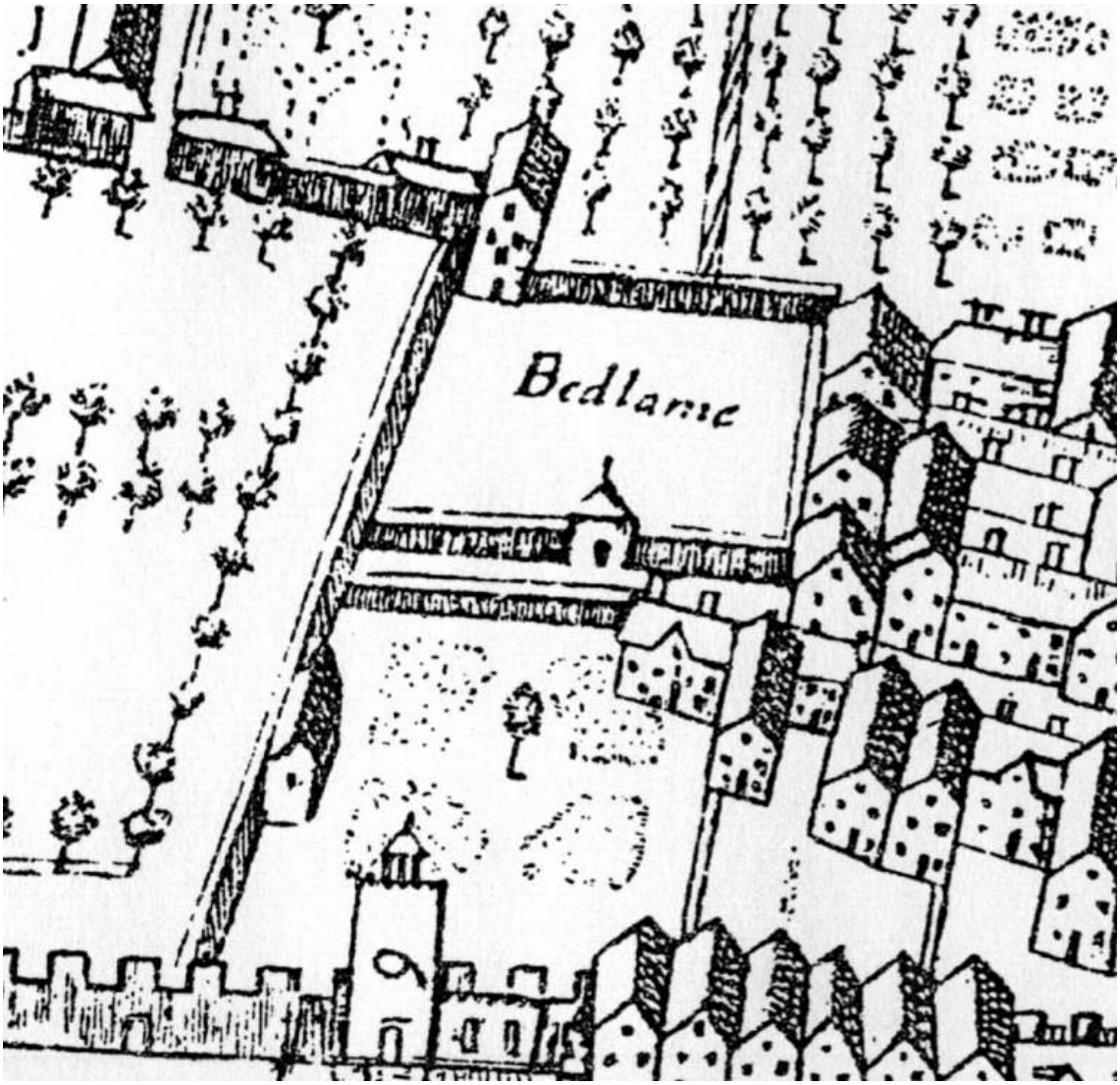

Figure 19 Faithorne and Newcourt's map of 1658

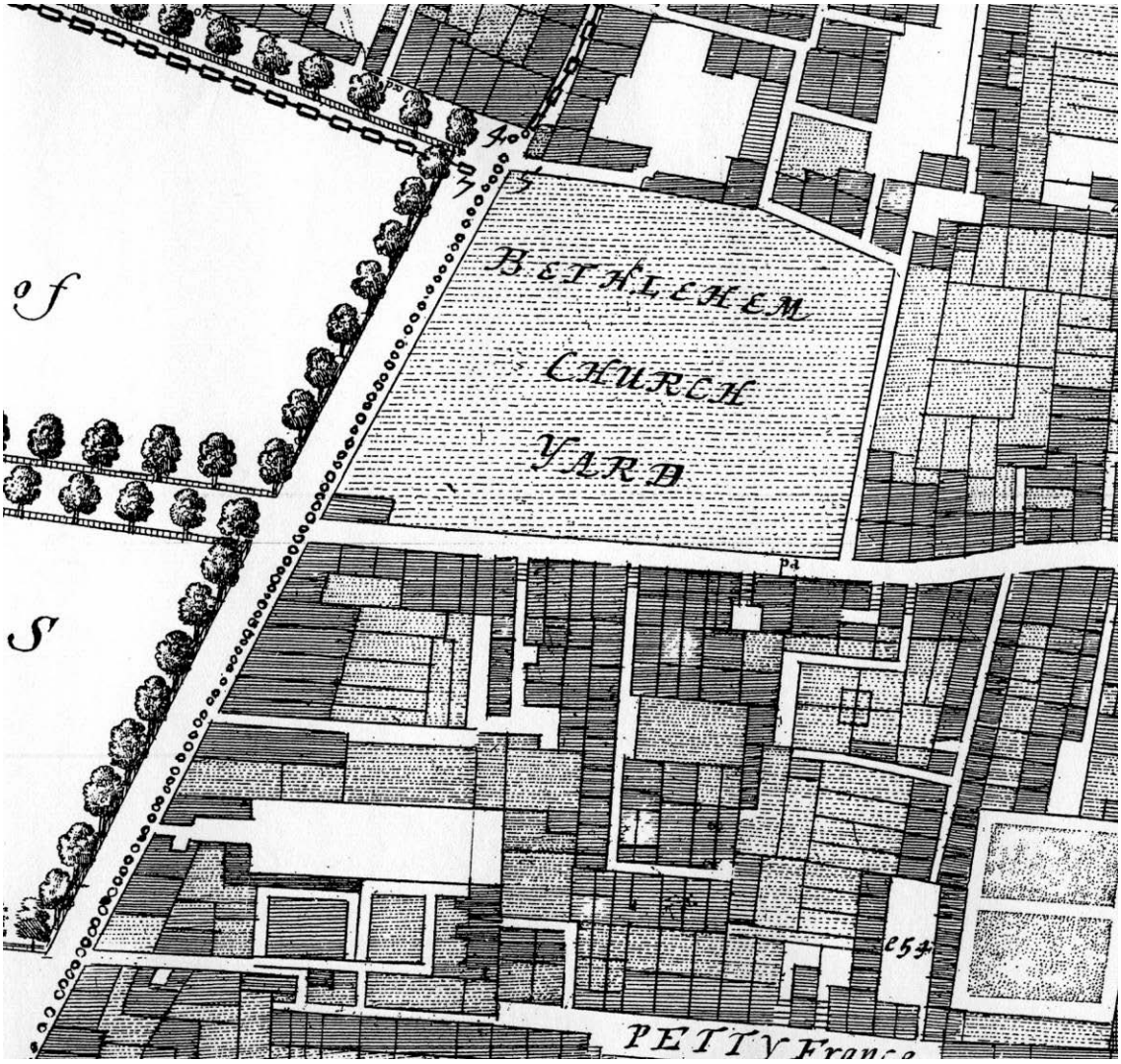

Figure 20 Ogilby and Morgan's map of 1676

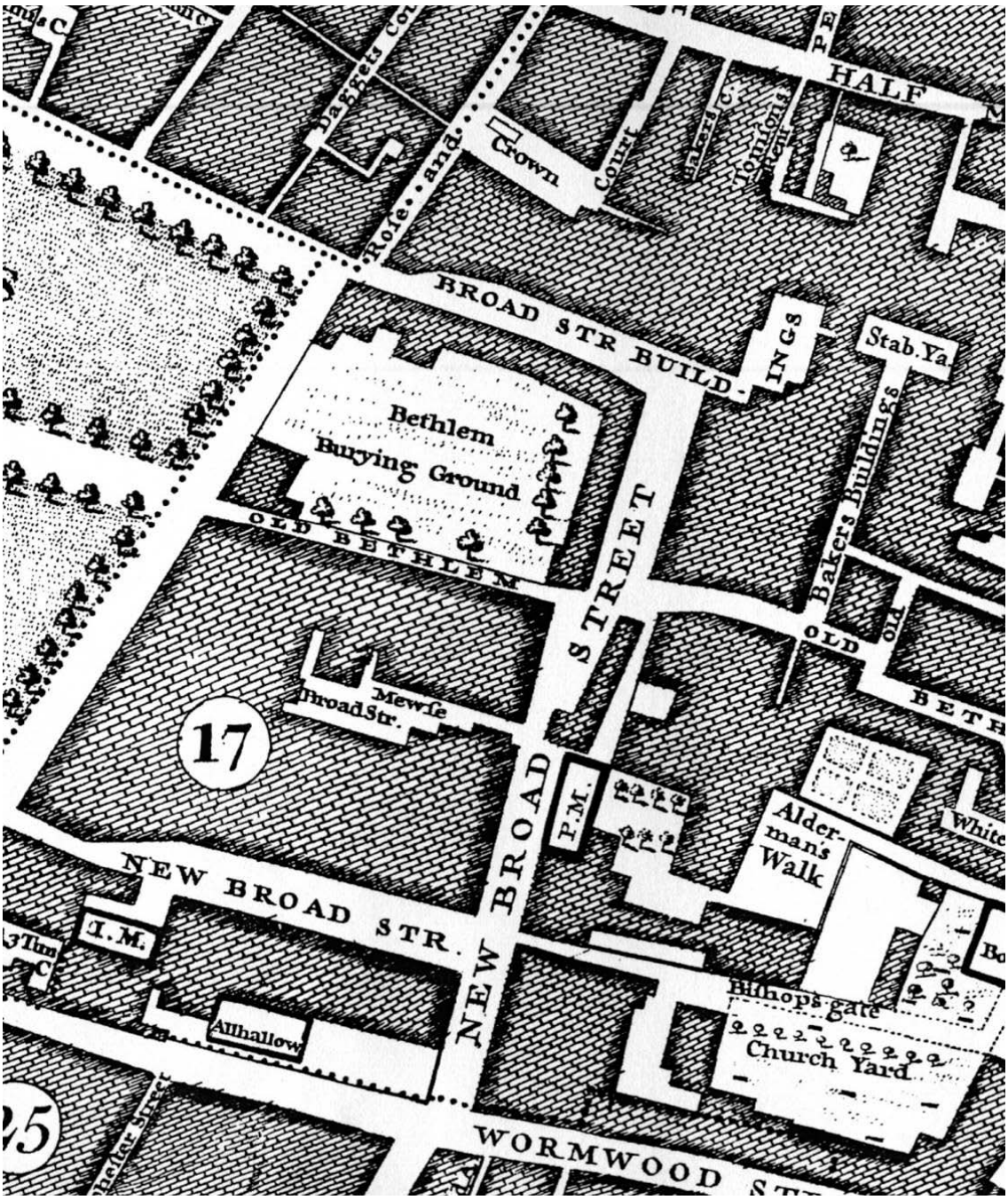

Figure 21 Rocque's map of 1746

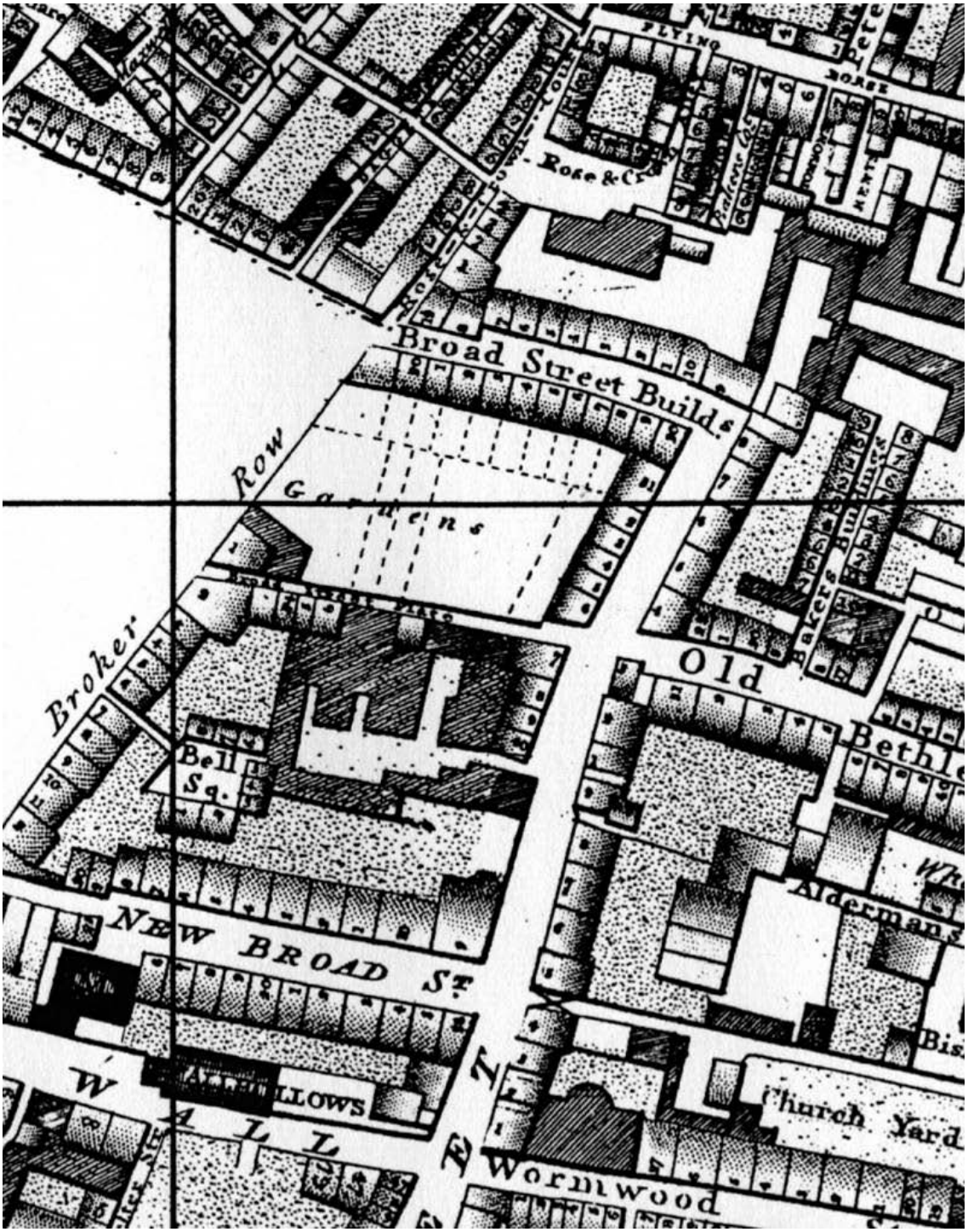

Figure 22 Horwood's map of 1799

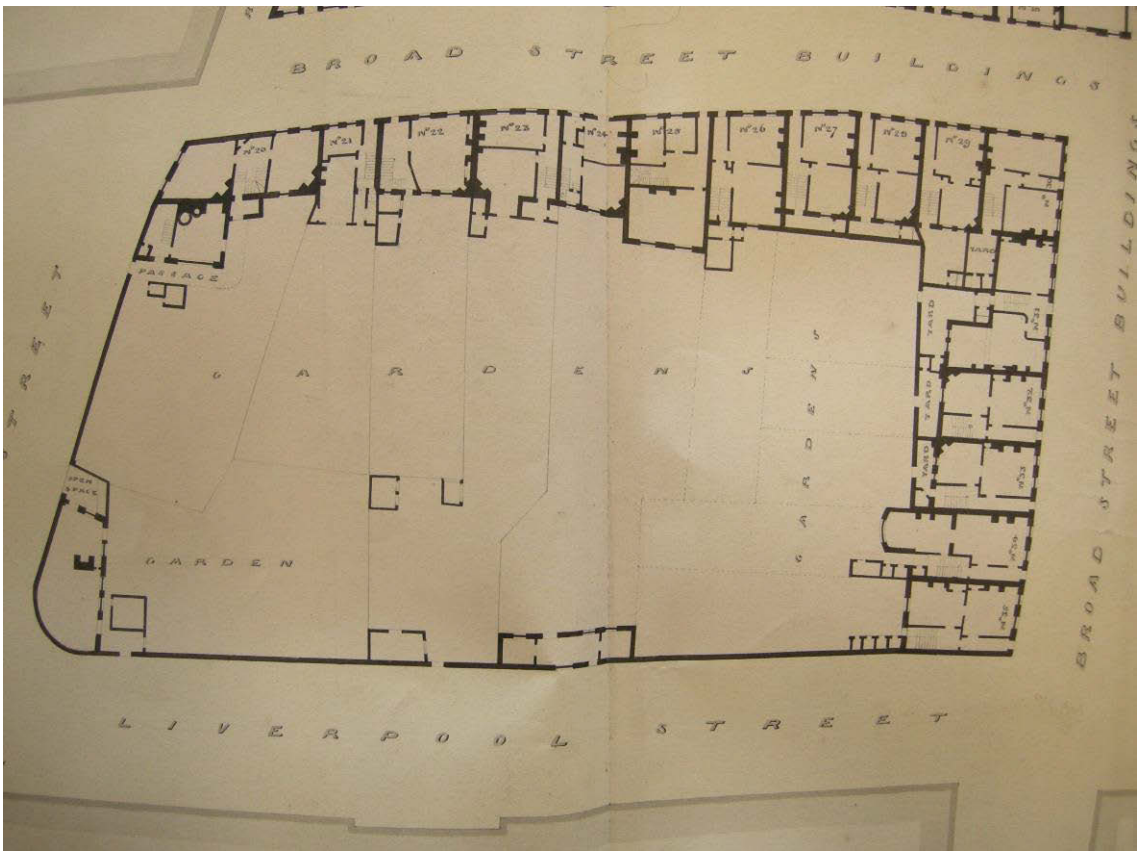

Figure 23 Corporation valuation plans of 1841 (London Metropolitan Archives)