

SO: 5LO 694418
80896
EV: ELO 10269
MO: MLO 99021

THE JUNCTION OF LIVERPOOL STREET AND BLOMFIELD STREET

London EC3

City of London

Watching biref

February 2009

PLN
19 FEB 2009



**THE JUNCTION OF LIVERPOOL STREET
AND BLOMFIELD STREET**

London EC3

City of London

Watching biref

National Grid Reference: 533029 181618

Project Manager	Rosalind Aitken
Authors	David Soraupre Natasha Powers Anne Davis
Graphics	Carlos Lemos

**Museum of London Archaeology
© Museum of London 2009**

Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
tel 020 7410 2200 fax 020 7410 2201
molas@museumoflondon.org.uk
www.museumoflondonarchaeology.org.uk

[LVB06] *Watching brief report* © MOL ARCHÆOLOGY

**Drainage pipe replacement at the Junction of
Liverpool Street and Blomfield Street
London EC3**

A report on the watching brief

Site code: LVB06

Author David Sorapure

Natasha Powers

Anne Davis

Summary (non-technical)

This report has been commissioned by The Corporation of London Environmental Department (Street Scene), in order to set out the results of excavations carried out at the junction of Liverpool Street and Blomfield Street EC3.

The work was monitored in the week of 24th of August (Phase 1), and again between the 20th and 29th of November 2006 (phase 2), following the discovery of human bone by contractors.

During phase 1 contractors had excavated a series of shallow pipe trenches beneath the roadway of Liverpool Street (NGR: 533031 181619). A deeper trench was required at one end and here the contractors had disturbed a human skull. The excavated section was a maximum of 1.3m deep and approximately 0.5m wide. No additional trenches were dug. The deposit containing human remains was recorded in section. Natural ground was not observed, and the highest survival of archaeological deposits occurred at 1.28m below the street level. Five contexts of skeletal material ([9], [11]-[14]) were recovered, this included material recovered from the contractors spoil heap.

Phase 2 monitored the deep excavation of a drop shaft approximately 1.40m by 1.80m, to allow for the unblocking and reuse of an existing pipe (NGR: 533023 181622). The work reached a depth of 5.10m below the present street level. Archaeological deposits and human remains were recorded and removed in section and plan where possible within the shaft. Natural ground was not reached within the depth needed to carry out the proposed drainage work and the highest survival of human remains occurred at 1.65m below present street level. Nine contexts of skeletal material ([101]-[111]) were excavated from the shaft under difficult conditions. The nature of the excavation and intensive use of the cemetery contributed to problems of recovering mixed individuals.

The shaft dug during phase 2 exposed black, silt/clay river deposits with dumps of animal bone, oyster shell, leather and plant material, below the human remains. These river deposits are typical of most found in the City, formed to a greater or lesser extent, by the interaction of geological processes with human activity. The alluvium of the site consists of peats, clays and waterlain sand and gravels which contain dateable artefacts from the Roman period through to the medieval period.

The human bone excavated in both phase 1 and 2 almost certainly derive from the 'New Cemetery', or Bethlem Church Ground which was in use between 1569 and 1720. Some of the bone showed signs of pathology such as deficiency disease, dental caries, and infectious disease such as venereal syphilis.

Table of Contents

1	Introduction	1
1.1	Site background	1
1.2	The planning and legislative framework	1
1.3	Origin and scope of the report	1
1.4	Aims and objectives	2
2	Topographical and historical background	3
2.1	Topography	3
2.2	Prehistoric	3
2.3	Roman	3
2.4	Saxon	3
2.5	Medieval	3
2.6	Post-medieval	3
3	The watching brief	4
3.1	Methodology	4
3.2	Results of the watching brief	4
4	Assessment of Human Remains	7
4.1	The Human Bone Archive	7
4.2	The Human Bone	7
4.2.1	<i>Intoduction</i>	7
4.2.2	<i>Methods</i>	7
4.3	Results	8
4.3.1	<i>Phase 1:</i>	8
4.3.2	<i>Phase 2: Articulated remains</i>	8
4.3.3	<i>Phase 2: Disarticulated remains</i>	9
4.4	Tables	10
5	Potential of archaeology	17
5.1	Significance of the data	17
5.2	General discussion of archaeological potential of the human remains	17
5.3	Original research aims	17
5.4	Significance of the data	18
6	Publication and archiving	19
7	Appendix: Plant Remains	20
7.1	Site archive: finds and environmental, quantification and description	20

7.1.1	<i>Introduction/methodology</i>	20
7.1.2	<i>Charred remains</i>	20
7.1.3	<i>Mineralised remains</i>	20
7.1.4	<i>Waterlogged remains</i>	20
7.1.5	<i>Faunal remains</i>	20
7.1.6	<i>Artefactual remains</i>	21
7.2	Analysis of potential	21
7.3	Significance of data	21
8	Bibliography	23
9	NMR OASIS archaeological report form	25
9.1	OASIS ID: molas1-20169	25

List Of Illustrations

Front cover: Detail of Ogilby's map of 1672 showing Bethlehem Church Yard

Fig 1	Site location plan	28
Fig 2	Trench locations	29
Fig 3	Sections	30
Fig 4	Plans of phase 2 shaft	31

1 Introduction

1.1 Site background

On the morning of the 18th August, the Museum of London Archaeology Service received a call from the Wood Street control room stating that contractors had disturbed human remains whilst digging service trenches in Liverpool Street, an area of known Roman and post-medieval burials. A Museum of London osteologist attended the site on the 18th of August to determine the nature and, date of the remains and to establish that the material was of a non-suspicious nature.

Phase 1 of the watching brief began on the 24th of August at the junction of Liverpool Street and Blomfield Street, hereafter called 'the site' (NGR: 533031 181619). The site is located on the pavement, bounded by Blomfield Street to the west (Fig 1)

The centre of the site is at OS National Grid Reference (NGR): 533030 181645. Modern ground level immediately adjacent to the site is 12.80m Ordnance datum (OD).

Phase 2 of the watching brief began on the 21st of November, in response to the contractors need to dig a deep drop shaft to expose and unblock an existing drainage pipe (NGR: 533023 181622). This shaft was only a few meters to the west of the pipe trench dug in phase 1 (Fig 1) but the depth of the proposed works in phase 2 allowed for not only the recovery of human remains but also the investigation of any surviving earlier features as well as the recovery of soil samples and artefacts.

A *method statement* was previously prepared by MoLAS, which covers the whole area of the site (MoLAS, 06). This document should be referred to for information on the natural geology, archaeological and historical background of the site, and the initial assessment of its archaeological potential.

1.2 The planning and legislative framework

The legislative and planning framework in which the archaeological exercise took place was summarised in the *Method Statement* which formed the project design for the watching brief (see Section 1.2, MoLAS, 06).

1.3 Origin and scope of the report

This report was commissioned by The City of London and produced by Museum of London Archaeology (MOL Archaeology). The report has been prepared within the terms of the relevant Standard specified by the Institute for Archaeologists (IFA, 2001).

The purpose of the watching brief was to determine whether archaeological remains or features were present on the site and, if so, to record the nature and extent of such remains. A number of more site-specific research aims and objectives were established in the preceding *Method Statement*, and are outlined in the following section.

The purpose of the present report is to analyse the results of the excavation against the original research aims, and to suggest what further work, including analysis or publication (if any), should now take place.

1.4 Aims and objectives

The following research aims and objectives were established in the *Method Statement* for the watching brief (Section 2.2):

- Is there any prehistoric activity or residual finds on the site?
- Is there any evidence for Roman gravel roads, buildings or burials on the site?
- Is there any evidence for later roman activity on the site?
- Are there any Saxo-Norman remains on the site?
- Is there any information about St Mary Bethlem, such as the boundaries to the priory that may be revealed by the site? Are there any medieval features such as cellar walls, pits and wells?
- What is the ultimate depth of the post-medieval burials from the 1569-1720 cemetery?
- What is the nature and character of modern disturbance and truncation?

All research is undertaken within the priorities established in the Museum of London's *A research framework for London Archaeology, 2002*

2 Topographical and historical background

2.1 Topography

A stream bed of one of the upper channels of the Walbrook, made up of sands, silts and gravels occupying a shallow broad channel running east to west make up the earliest deposits in the area.

2.2 Prehistoric

A series of excavations in 1985 over a wide area adjacent to the site revealed no prehistoric activity.

2.3 Roman

The excavations in 1985 revealed brickearth and clay dumping and wooden revetments along the Walbrook River during the Roman period. From the late Roman period peat deposits indicate a large marsh which accumulated in the area.

2.4 Saxon

There is no evidence of Saxon activity found in the vicinity of the site.

2.5 Medieval

The 1985 excavations revealed a 13th–14th-century north-south ditch which corresponds to one previously recorded near the City wall to the south. Wooden revetments indicating the precinct of St Mary Bethlehem Hospital were also found.

2.6 Post-medieval

In the 1985 excavations some 400 post-medieval burials were excavated from an area within the boundaries of a churchyard, founded in 1569 by the City to relieve the congestion occurring in parish burial grounds. The cemetery was used up until 1720 and the burials were found in high density, some 8 per cubic m. The earlier burials were mostly un-coffined but a large proportion of the later inhumations were coffin burials.

3 The watching brief

3.1 Methodology

All archaeological excavation and recording during the watching brief was done in accordance with the *Method Statement* (MoLAS, 2006) and the MoLAS Archaeological Site Manual (MoLAS, 1994).

The slab/ground was broken out and cleared by contractors under MoLAS supervision. Trenches were excavated by hand by the contractors, and monitored by a member of staff from MoLAS. Once human remains were noted work was halted until a member of staff from MoLAS had recorded and removed the remains.

The heights of observations and/or archaeological remains were recorded relative to pavement level. Where relevant, sections were drawn at a scale of 1:10 or 1:20; numbered contexts were allocated where appropriate.

The site has produced: one trench location plan; 21 context records; 11 1:20 plan and section drawings; 5 photographs. The human bone removed from the site was returned to Mortimer Wheeler House for temporary storage whilst arrangements for reburial could be made.

The analysis phase of post-excavation was based around the creation of a phased matrix of the 6 contexts for phase 1 and 15 contexts for phase 2.

The site finds and records can be found under the site code LVB06 in the MoL archive.

3.2 Results of the watching brief

In total, two separate interventions (trenches) were made, named phase 1 and phase 2. There follows a brief description of the archaeological deposits as recorded.

For all trench locations see Fig 2.

<i>Watching Brief Phase 1</i>	
Location	Liverpool St/ Blomfield St
Dimensions	1.2m by 0.6m
Modern ground level/top of slab	12.8m OD
Base of modern fill/slab	11.5m OD
Depth of archaeological deposits seen	1.5m below pavement level
Level of base of deposits observed	11.24m OD
Natural observed	N/A

The phase 1 trench (See Fig 3) measured 1.20m north-south by 0.60m west-east, to a depth of 1.56m. At a depth of 1.23m lay a loose dark brown, sandy silt [1], 0.33m thick, containing occasional charcoal flecks, oyster shell, animal bone and a single fragment of pottery of a fabric dated to between the mid sixteenth and eighteenth centuries. This layer also contained all the human bone from phase 1 and represents the cemetery deposit. The deposit was only excavated to a depth of 1.56m in order to facilitate the drainage works, and all the human remains were removed to this depth.

Sealing this context was a 0.2m thick limestone slab which was overlain by a deposit of modern concrete, tarmac, sand and rubble 1m thick, topped by the modern road surface.

<i>Watching Brief Phase 2</i>	
Location	Liverpool St/Blomfield St
Dimensions	1.4m by 1.8m
Modern ground level/top of slab	12.8m OD
Base of modern fill/slab	11.3m OD
Depth of archaeological deposits seen	1.7m
Level of base of deposits observed	7.7m OD
Natural observed	N/A

The phase 2 trench measured 1.40m north-south by 1.80m west-east and was excavated to a depth of 5.10m (Fig 4). The narrowness and depth of this shaft required wooden shoring to be added at various stages of the excavation. At the base of the shaft the earliest deposit seen was a compact, organically rich, black silty-clay [109], with occasional patches of dark brown deposits. This contained frequent animal bone and oyster shell; occasional plant material (straw), pottery, snail shells and leather fragments, with the deeper areas of the deposit producing less inclusions (see appendix for assessment of plant remains). This layer represents river and marsh deposits along with frequent dumping of rubbish which may date from the Post-medieval period.

In the north-west corner at the base of the shaft the black silty-clay deposit [109] was truncated by modern sandy gravel ballast [114] which surrounded the pipe being removed (Fig 5). This ballast began within the upper, modern levels of the shaft and continued below the limit of excavation and to the south in an area tunnelled through into [109].

On the eastern side of the shaft, the black silty-clay [109], was cut by a possible channel pit [112] to a depth of 9.60m OD (Fig 4). This cut was filled by fairly loose, dark brownish-grey silt [110] with occasional rounded pebbles and frequent disarticulated human bone [111]. The human bone [111] was the remains of multiple individuals, heavily mixed together. Cut [112], fill [110] and [111] continued beyond the limit of excavation to the east and south and were partially truncated by the modern pipe ballast [114] to the west (Fig 4).

On the north side of the shaft above [109] lay a fairly loose, dark grey silt deposit [100] (Fig 4). This deposit contained seven contexts of articulated human bone, [101], [102], [103], [104], [105], [106] and [107]. There were fragments of wood with these skeletons and despite their intermingling it is likely that these seven contexts represent *in situ* burials. The burial deposit [100] was truncated to the south-west by the pipe and ballast of [114] and to the south east by Victorian brick sewer gullies [108] at 10.96m OD (Fig 4). Deposit [100] was overlain by modern service pipes at a depth of 11.30m OD.

The Victorian brick sewers [108] were running east to west within the trench and overlay skeletons [111], truncating fill [110] and cut [112] (Fig 4). The gravel base of the Victorian drain [108] reached a level of 10.15m OD. [108] consisted of two "U" shaped brick sewer gullies, both lined with hard smooth concrete, probably both originally flowing into the main sewer. Brickwork in the south-west corner of the shaft is also part of this drainage system (Fig 4).

The southernmost drainage gully was 0.26m lower than the northern adjacent gully and contained a loose, dark brownish-grey clayey-silt [113], which was not fully excavated (Fig 4). However a number of disarticulated human bones were visible protruding from [113] and were removed.

The burials within the shaft of phase 2 and the trench of phase 1 are both clearly associated with the 'New Cemetery' (1569-1720), originally called St Mary Bethlehem, which ran west to east along the north side of Liverpool Street.

No grave cuts were discernable for any of the burials which is typical of City churchyards. Due to their small size and crowded nature the practice of re-excavating and disturbing burials as new graves were dug, constantly turns over the ground. It is possible therefore that cut [112] containing the disarticulated human remains of [111] was a charnel pit dug to make new space within the Church Yard (Fig 4).

4 Assessment of Human Remains

Natasha Powers

4.1 The Human Bone Archive

Phase	Number of contexts	Number of boxes
1	5	1 skeleton
2	9	11 skeletons

Table 1 General Summary

4.2 The Human Bone

4.2.1 Introduction

On the 18th August, the Museum of London Archaeology Service received a call from the Wood Street Police control room stating that contractors had disturbed human remains whilst digging service trenches in Liverpool Street, at the junction with Blomfield Street. From 1569 to 1720s this area was used as an 'overflow' burial ground for the City, known as the New Churchyard. Archaeological work in the area during the 1980s demonstrated that the burial ground was very intensively used with an estimated eight burials per cubic metre; twice that normally anticipated in a post-medieval burial ground.

Following initial work to establish the material was of a non-suspicious nature (Powers 2006); archaeological investigation took place in two phases. Phase 1 (contexts [9]-[14]) consisted of a watching brief in the original drain run and the removal of any human remains within the area of the pipe trench to a depth of 1.50m. This included material recovered from the contractors spoil heap.

Following the completion of this work, the excavation of the area of a sewer shaft was undertaken (Phase 2). Archaeological deposits were removed to a depth of 5.10m and nine contexts of skeletal material ([101]-[111]) were excavated from the small trench under difficult conditions. The nature of the excavation and intensive use of the cemetery contributed to problems of recovering mixed individuals.

4.2.2 Methods

The remains were catalogued according to MoLAS standard procedures for disarticulated human remains (Powers *unpublished*). All disarticulated remains were catalogued in an excel worksheet with associated elements recorded within the same row. This summary catalogue enabled the estimation of the minimum number of individuals (MNI). During Phase 2, the excavator had noted six adult burials and one infant grave. On examination, all were found to contain parts of multiple individuals. Where a 'primary' individual could be identified this was recorded as a discreet inhumation. The association of elements within [102], [103], [104] and [105] was so poor that they were recorded as disarticulated bone, rather than as individuals.

Inhumations [101], [106] and [107] were recorded into a standard Excel spreadsheet for articulated burials. This included a summary catalogue by body area, preservation (from good (1) to poor (3)), broad age estimates and adult sex, together with gross pathological changes. Completeness was estimated to the nearest 5%, up to 95%.

For all remains, age and sex data was recorded using numerical codes (Table 2). Sub-adult age was based on the non-union of epiphyses (Scheuer and Black 2000). Adult sex estimation was based on the rapid visual assessment of general morphological characteristics of the cranium and pelvis (Buikstra and Ubelaker 1994). The minimum number of individuals (MNI) present within each context was estimated based on the presence of repeated elements or those where age, morphology or preservation indicated clearly that they were not from a single burial. Due to the large quantity of bone in context [111], the minimum number of individuals was estimated on the maximum number of repeated elements when age at death was accounted for, without any attempt at matching opposing elements. Summary observations were made on age and sex and gross pathological changes (Aufderheide and Rodríguez-Martín 1998).

4.3 Results

All remains recovered were in good or moderately good condition, though breakages were noted in many elements, including damage which had occurred in antiquity.

4.3.1 Phase 1:

The manner of the discovery of the material in Phase 1 resulted in poor archaeological integrity. Initial observations on site revealed two adult burials truncated at the neck or shoulder: crania with the cervical vertebrae, parts of the shoulder and upper arm lying in articulation. The remains appeared to be within a single grave, extended and supine. There was no evidence of coffins or coffin fittings. In total a minimum of seven adults and three subadults (including a neonate) were present.

The group included at least six males or probable males and one female, two older subadults and a neonate. The adults had suffered from extensive tooth loss during life. Dental calculus and heavy tooth wear, caries and dental abscesses were present. A well-healed fracture of a left clavicle was noted (Table 3).

4.3.2 Phase 2: Articulated remains

Context [101] contained the partial remains of three subadults. To enable further characterisation, measurements were taken of the diaphyses to provide age at death estimates based (Scheuer and Black 2000). This indicated that the remains of one pre-term foetus (presumably a stillbirth, though given the poor integrity possibly an intrauterine death), a full term perinate and a child of around 1 year of age were present (Table 4).

The older infant had active rachitic changes, the result of vitamin D deficiency, indicated by poorly mineralised and expanded humeral and ulna shafts, 'trumpeting' of the humerus and flaring of sternal rib ends. The cranial vault was porous.

Context [106] contained the partial remains of an adult female. A quantity of intrusive bone resulted in a minimum number of five individuals, including an adult male and an adolescent. Examination of the excavation plans suggested that the female ilium present was not associated with the long bones and it is possible that parts of six individuals were present. Context [106] appears almost certain to have been mixed with [104] above: a right femur from [104] was a possible pair with a left femur from [106].

Adult cranium [107] was the heavily truncated remains of a probable male. A thickened and disorganised appearance to the diploic space and pronounced

vascular impressions on the endocranial surface suggested that he had suffered from Paget's disease.

A summary of the inhumations can be found in Section 4.4.

4.3.3 Phase 2: Disarticulated remains

Context [102] contained parts of at least five adults and one subadult, [103] four adults and one subadult, [104] three adults and an adolescent, [105] two adults and one subadult and [108] at least five adults and one subadult.

From a count of the maximum number of repeated elements, the group as a whole contained parts of at least two subadults, an adolescent, a young adult, and 12 adults (the number of adult right tibiae present) including two males, two females and an adult with intermediate sexual characteristics.

A left ilium from [102] showed a shallow acetabulum with joint degeneration of the superior margin, possibly indicative of a congenital hip dysplasia.

Active infectious changes suggested that a right proximal femur, right radius and ulna from [105] and the right hand found in [104] were associated and the location of new bone formation strengthened a diagnosis of venereal syphilis. The large size and extreme robusticity of the elements suggested that they were probably male.

Context [108] was a deposit lying between two brick drain runs and was thought to have been re-deposited in the nineteenth century. The individuals present were predominantly represented by long bones, possibly reflecting collection bias on the part of the Victorian labourers (Table 5).

Context [111] consisted of a large quantity of mixed, disarticulated bone, disturbed by the construction of a brick gully. The excavator did not note any in-situ burials. Amongst the ribs were noted several groups of adjacent elements. Based on a simple long bone count there was a minimum number of 11 adults but when demographic data, specifically the sex of the crania was accounted for there were 11 males or probable males, four females, one adult of intermediate sex and one of unknown sex. This resulted in an overall MNI of 17 adults, four subadults and one neonate, a total MNI of 22 individuals.

Evidence of degenerative joint disease in the spine and dental disease was noted. Traumatic ankylosis of a fourth and fifth cervical vertebra had occurred, the result of gross osteophyte formation. A fragmentary subadult cranium showed bilateral cribra orbitalia, probably the result of iron deficiency anaemia. Deficiency disease was also evident in a subadult left tibia which exhibited extreme bowing resulting in a flattened 'boomerang' shape and indicating resolved rachitic changes.

An adult right fourth metatarsal showed evidence of an erosive arthropathy with destruction of the proximal joint surface. Non-specific infection had resulted in periostitis in an adult left tibia: striated new bone along the length of the shaft was active at the time of death.

Venereal syphilis was evident in an adult male cranium with well-healed stellate lesions and in a left tibia and right humerus with gummatous osteitis. In the limbs, bone formation was active at the time of death. Osteitis and periostitis in a left femur and right radius also had the appearance of syphilitic change (Table 6).

As a whole, the group displayed a variety of pathological conditions typically associated with post-medieval assemblages: deficiency disease, dental caries and infectious disease. There were at least two adults who had been suffering from venereal syphilis at the time of their deaths.

4.4 Tables

Age Code	0	Neonate/foetus
	1	<7 years (M1 unerupted)
	2	7-12 years (M2 unerupted)
	3	13-16 years (M3 unerupted)
	7	Adult
	12	Sub-adult (age unknown)
Sex code	1	Male
	2	Possibly male
	3	Intermediate
	4	Possibly female
	5	Female
	9	Undetermined
	0	Sub-adult

Table 2: Assessment codes

Context	Elements present	Age	Sex	Pathology	MNI
9	Fragmentary cranium, C1-4, mandible	Adult	?M	Caries and am tooth loss	2 adults
	Left mid and sternal clavicle	Adult	-	-	
	Complete cranium, loose maxillary and mandibular teeth	Adult	M	Calculus, caries, abscess	
	Right proximal humerus	Adult	-	-	
	C1-4, C6-7, T1-2	Adult	-	-	
11	Left distal tibia	Adult	-	-	1 adult, 1 subadult
	Right scapula	Adult	-	-	
	Proximal hand phalanx	Adult	-	-	
	Right mandibular canine	Adult	-	-	
	R MT2	Adult	-	-	
	Right scapula	Sub-adult	-	-	
	Left ilium	Sub-adult	-	-	
Left basilar occipital	Sub-adult	-	-		
12	Left temporal	Adult	F	calculus, caries, am tooth loss	2 adults
	Right fibula	Adult	-	-	
	Fragmentary mandible and maxilla	Adult	M	-	
	C1-6	Adult	-	-	
13	Complete cranium and right mandible, C1-3	Adult	M	Severe am tooth loss	2 adults
	Frontal	Adult	?M	-	
	Fragmentary maxilla	Adult	-	Caries and am tooth loss	
	Rib	Adult	-	-	
	C1+2	Adult	-	-	
14	Multiple rib fragments	Adult	-	-	3 adults
	Cranial fragments	Adult	-	-	
	Proximal hand phalanx	Adult	-	-	
	Mandible	Adult	?Sex	AM tooth loss	
	Right humeral head	Adult	-	-	
	Right MC2	Adult	-	-	
	Left MC1	Adult	-	-	
	C7	Adult	-	-	
	Mid thoracic vertebra	Adult	-	-	
	Right tibia	Sub-adult	-	-	

Context	Elements present	Age	Sex	Pathology	MNI
	Left tibia	Neonate	-	-	
	Fragmentary cranium	Adult	M	-	
	Left temporal	Adult	?M	-	
	Right temporal	Adult	-	-	
	Right and left scapulae, upper ribs, right and left clavicles	Adult	-	Well-healed mid shaft fracture of left clavicle	
	C7	Adult	-	-	
	Mid thoracic vertebra	Adult	-	Schmorl's node	
	T12 x2	Adult	-	Schmorl's node	
	Left humeral head	Adult	-		
	Right radius	Adult	-		

Table 3: Summary of disarticulated bone, Phase 1

Element	Measurement (mm)	Age at death
Right femur	60.6	34 weeks
Right femur	76.5	39 weeks
Left humerus	94.2	1 year

Table 4: Subadult age at death estimates [101]

Context	Elements present	Age	Sex	Pathology	MNI	Comments
104	right humerus, right radius	Adult	9	none	4 (3 adults, 1 adolescent)	No pairs of ulnae
	right ulna	Adult	9	none		
	left ulna	Adult	9	none		
	left distal ulna	Adult	9	none		
	Right femur, right patella	Adult	9	none		
	Right MC1-5, prox 1st phalanx	Adult	9	Active periostitis on all elements. Syphilis (dactylitis)?		
	R MC1-3	Adult	9	none		
	4 proximal, 1 distal hand phalanx	Adult	9	none		
	12x R ribs	Adult	9	none		
	Sacrum	Adult	9	Sacralisation S1 (Fe nail adhering to S1)		
	R ilium, L ilium	Adult	2	none		
	R ischium R pubis, sacrum and L5, C1	Adolescent	2	complete Spina Bifida Occulta		
	R acromion	Adult	9	none		
R acromion	Adult	9	none			
108	3x R femora	Adult	9	none	6 (5 adults, 1 subadult)	No pairs of long bones
	2x L femora	Adult	9	none		
	R tibia	Adult	9	none		
	3x R tibiae	Adult	9	none		
	1x L tibiae	Adult	9	none		
	L mid and distal femur	Subadult	0	none		
	L radius	Adult	9	none		

Context	Elements present	Age	Sex	Pathology	MNI	Comments
	2x R humeri	Adult	9	none		
	R proximal humerus	Adult	9	none		
	L rib	Subadult	0	none		
105	R proximal femur, R radius, R ulna	Adult	9	Active periostitis on all elements. Syphilis?	3 (2 adults, 1 subadult)	
	R rib	Adult	9	none		
	R humerus	Adult	9	none		
	L radius	Adult	9	none		
	R proximal femur	Adult	9	none		
	R tibia	Adult	9	Healed (lamellar) periostitis		
	R distal femur	Subadult	0	none		
102	2x L femora	Adult	9	none	6 (5 adults, 1 subadult)	No paired long bones, no articulating vertebrae
	2x R tibiae	Adult	9	none		
	L tibia	Adult	9	none		
	2x R mid tibiae	Adult	9	none		
	Femoral mid shaft	Adult	9	none		
	L fibula	Adult	9	none		
	2x R humeri	Adult	9	none		
	L humerus	Adult	9	none		
	L radius and ulna	Adult	9	none		
	R proximal radius	Adult	9	none		
	L radius	Adult	9	none		
	R innominate	Young adult	2	none		
	L innominate	Adult	1	none		
	L ilium	Adult	9	Possible hip dysplasia		
	L ischium	Subadult	0	none		
	1 R 5x L ribs	Adult	9	none		
	L rib	Subadult	0	none		
	R glenoid and coracoid	Adult	9	none		
	L1	Adult	9	none		
	T12	Adult	9	none		
	Mid thoracic vertebra	Adult	9	none		
	C7	Adult	9	none		
	L5	Adult	9	none		
	L5	Subadult	0	none		
	Parietals (fragmentary)	Adult	9	none		
	Mandible	Adult	9	Ante-mortem tooth loss		
	L mandible	Adult	9	Ante-mortem tooth loss		
	R MT1	Adult	9	none		
	R MT4	Adult	9	none		

Context	Elements present	Age	Sex	Pathology	MNI	Comments
	R navicular	Adult	9	none		
	R MC3	Adult	9	none		
	R MC2	Subadult	0	none		
103	2x R femora	Adult	9	none	5 (4 adults, 1 subadult)	No paired bones
	2x L femur	Adult	9	none		
	2x R mid and distal femur	Adult	9	none		
	L mid and distal femur	Subadult	0	none		
	3x R tibiae	Adult	9	none		
	L tibia	Adult	9	none		
	L distal tibia	Adult	9	none		
	L fibula	Adult	9	none		
	R humerus	Adult	9	none		
	R mid and distal humerus	Adult	9	none		
	R mid and distal ulna	Adult	9	none		
	R ulna, R humeral head	Subadult	0	none		
	R innominate	Adult	4	none		
	R ilium	Subadult	0	none		
	L ilium	Adult	2	none		
	L ilium	Adult	3	none		
	L ilium	Adult	5	none		
	R clavicle	Adult	9	none		
	L clavicle	Adult	9	none		
	2x R glenoid & coracoid	Adult	9	none		
	R scapula	Adult	9	none		
	3 L ribs + fragments	Adult	9	none		
	L3	Adult	9	none		
	S1	Adult	9	none		
	4x proximal hand phalanges	Adult	9	none		
	L MC1	Subadult	0	none		
	R calcaneus	Adult	9	none		
	Proximal foot phalanx	Adult	9	none		
	Fragmentary cranium	Adult	1	none		
	Fragmentary cranium	Adult	1	none		
	3x mandibles	Adult	1	Ante-mortem tooth loss, caries		

Table 5: Summary of disarticulated bone, Phase 2

Body area	Elements	Age	Sex	Pathology	Comments
Axial	1 lumbar vertebra	Subadult	0	none	

Body area	Elements	Age	Sex	Pathology	Comments
Axial	10 R clavicles	Adult	9	none	
Axial	10x Sacra	Adult	9	none	
Axial	11 L clavicles	Adult	9	none	
Axial	2 R ribs	Subadult	0	none	
Axial	25 lumbar vertebrae	Adult	9	Some Schmorl's nodes and IVD	
Axial	2x C1	Adult	9	none	
Axial	2x C1 & 2	Adult	9	none	
Axial	2x R and L innominate	Adult	1	none	
Axial	2x R innominates	Adult	5	none	
Axial	34 R ribs	Adult	9	none	
Axial	37x thoracic vertebrae	Adult	9	Some Schmorl's nodes and osteophytes	
Axial	48 L ribs	Adult	9	none	
Axial	4x L innominates	Adult	2	none	
Axial	4x R innominates	Subadult	0	none	
Axial	5x R scapulae	Adult	9	none	
Axial	6 x cervical vertebrae	Adult	9	none	
Axial	7x L scapulae	Adult	9	none	
Axial	C2	Adult	9	none	
Axial	C4 & 5	Adult	9	Traumatic ankylosis	
Axial	L clavicle	Subadult	0	none	
Axial	L scapula	Subadult	0	none	
Axial	R and L innominate	Adult	2	none	
Axial	R clavicle	Subadult	0	none	
Axial	R innominate	Adult	2	none	
L limb	10x L femur	Adult	9	none	
L limb	11x R femur	Adult	9	none	
L limb	14x unsided fibulae	Adult	9	none	
L limb	2x R femora	Subadult	0	none	
L limb	4x L tibia	Adult	9	none	
L limb	6x R tibia	Adult	9	One with active periostitis	
L limb	2x L femora	Subadult	0	none	
L limb	L femur	Adult	9	Osteitis/periostitis. Localised area - ulcer? Syphilis?	
L limb	L fibula	Adult	9	none	
L limb	L fibula	Adult	9	none	
L limb	L MT5	Adult	9	none	
L limb	L patella	Adult	9	none	
L limb	L tibia	Neonate	0	none	66.9mm
L limb	L tibia	Adult	9	Gummatous osteitis (active). Syphilis	
L limb	L tibia	Subadult	0	none	
L limb	L tibia	Subadult	0	Severe rachitic bowing ('boomerang'). Resolved.	
L limb	R calcaneus	Adult	9	none	
L limb	R MT1	Adult	9	none	
L limb	R MT4	Adult	9	Erosive	

Body area	Elements	Age	Sex	Pathology	Comments
				arthropathy	
L limb	R MT4	Adult	9	none	
L limb	R MT5	Adult	9	none	
L limb	R patella	Adult	9	none	
L limb	R talus	Adult	9	none	
L limb	R tibia	Subadult	0	none	
L limb	Unsided fibula	Subadult	0	none	
Skull	2x Fragmentary cranium	Adult	2	none	
Skull	3x Fragmentary cranium	Adult	5	none	
Skull	3x Occipital	Adult	2	none	
Skull	5x maxilla	Adult	9	Ante-mortem tooth loss, caries	
Skull	7x Fragmentary cranium	Adult	1	none	
Skull	8x mandibles	Adult	1	Ante-mortem tooth loss, caries	
Skull	Fragmentary cranium	Adult	1	Healed caries sicca. Syphilis	
Skull	Fragmentary cranium	Subadult	0	Cribr orbitalia	
Skull	Fragmentary cranium	Adult	3	none	
Skull	Fragmentary cranium & mandible	Adult	1	none	
Skull	Frontal	Adult	9	none	
Skull	Frontal	Adult	5	none	
Skull	L mandible	Adult	2	Caries	
Skull	Mandible	Subadult	0	none	
Skull	Mandible	Adult	5	Ante-mortem tooth loss	
Skull	Mandible	Adult	3	none	
Skull	Mandible and maxilla	Adult	2	Ante-mortem tooth loss	
Skull	Maxilla	Subadult	0	none	
Skull	Parietal	Subadult	0	none	
U limb	10x L humerus	Adult	9	none	
U limb	2x Proximal hand phalanx	Adult	9	none	
U limb	3x R MC2	Adult	9	none	
U limb	4x R radii	Adult	9	none	
U limb	6x L radii	Adult	9	none	
U limb	6x L ulnae	Adult	9	none	
U limb	9x R humeri	Adult	9	none	
U limb	9x R ulnae	Adult	9	none	
U limb	L capitate	Adult	9	none	
U limb	L humerus	Subadult	0	none	Older subadult
U limb	L MC1	Adult	9	none	
U limb	L MC2	Adult	9	none	
U limb	L MC2 & L MC3	Adult	9	none	
U limb	L MC3	Adult	9	none	
U limb	L radius	Subadult	0	none	
U limb	L radius	Subadult	0	none	Older subadult
U limb	L scaphoid	Adult	9	none	
U limb	R humerus	Adult	9	Gummatous osteitis (active). Syphilis	
U limb	R MC1	Adult	9	none	
U limb	R MC3	Adult	9	none	
U limb	R MC3	Adult	9	none	

Body area	Elements	Age	Sex	Pathology	Comments
U limb	R MC5	Adult	9	none	
U limb	R radius	Adult	9	Sclerosing osteitis. Syphilis?	

Table 6: Context [111]

Context	Condition	% complete	Skull	Dentition	Torso	Pelvis	Legs	Feet	Arms	Hands	Age	Sex	Pathology comments	MNI	General comments
101	2	55	1	1	1	0	0	0	1	1	1	0	Rickets (active)	3	Int. neonate lower torso and legs and foetal lower torso and legs - could all be aged
106	1	25	0	0	1	1	1	0	1	0	7	5	None	5	Int. male cranium, adult male R temporal and mandible adolescent L1, infant R ilium and S1, 2 adult L feet
107	2	20	1	0	0	0	0	0	0	0	7	2	Paget's disease	1	None

Table 7: Summary of inhumations, Phase 2

5 Potential of archaeology

5.1 Significance of the data

Whilst the archaeological remains are of local significance there is nothing to suggest that they are of regional or national importance Potential of archaeology Environmental Archive.

The human bone is of limited local significance as it extends the presumed boundary of the New Churchyard further to the south than previously believed. The site confirms the intensive use of this area for burials.

5.2 General discussion of archaeological potential of the human remains

During Phase 1, a single fragment of pottery vessel of a fabric dated to between the mid 16th and 18th centuries was found with the remains (N. Jeffries *pers comm.*). The closely packed nature of the burials, and loose soil surrounding, suggest that this area was originally part of a mass burial pit, as is consistent with the findings of previous archaeological investigations in the area.

The remains from Phase 2 were principally not found within their original burial context. It appears that those remains excavated as discreet individuals may also have been disturbed by Victorian drainage work.

Whilst it would be possible to calculate the true prevalence of disease (by element) within the group and re-association of remains could be attempted, the human remains are not from a secure context and represent a very small part of a large cemetery sample. Analysis would provide little additional information about the living population from which they originated. As such the assemblage does not justify additional expenditure. The human bone should be considered for reburial.

5.3 Original research aims

Is there any prehistoric activity or residual finds on the site?

There is no sign of prehistoric activity on the site.

Is there any evidence for Roman gravel roads, buildings or burials on the site?

There is no evidence for Roman gravel roads, buildings or burials on the site.

Is there any evidence for later roman activity on the site?

There is no evidence for later Roman activity on the site.

Are there any Saxo-Norman remains on the site?

There is no evidence of Saxo-Norman remains on the site.

Is there any information about St Mary Bethlehem, such as the boundaries to the priory that may be revealed by the site? Are there any medieval features such as cellar walls, pits and wells?

There is no sign of the boundary for St Mary Bethlehem Churchyard or Priory. There is no evidence of any medieval features such as cellar walls, pits and wells.

What is the ultimate depth of the post-medieval burials from the 1569-1720 cemetery?

The ultimate depth of the post-medieval burials in this particular spot (phase 2) from the 1569-1720 cemetery is 3.10m below street level or 9.70m OD.

What is the nature and character of modern disturbance and truncation?

A Victorian brick sewer running west to east, itself truncated by modern sewage pipe. Also modern service pipes truncating the upper area of burials at 11.30m OD or 1.50m below the surface.

5.4 Significance of the data

Whilst the archaeological remains are undoubtedly of local significance there is nothing to suggest that they are of regional or national importance. Future research aims might include:

What is the depth of natural deposits?

What is the date of the black silty-clay marsh deposit [109]?

Are there any Roman surfaces or features pre-dating the black clay?

6 Publication and archiving

Information on the results of the excavation will be made publicly available by means of a database in digital form, to permit inclusion of the site data in any future academic researches into the development of London.

The site archive containing original records and finds will be stored in accordance with the terms of the *Method Statement* (MoLAS, 2006) with the Museum of London within 12 months of the end of the excavation.

7 Appendix: Plant Remains

ASSESSMENT OF THE PLANT REMAINS FROM LIVERPOOL STREET (LVB06)

Anne Davis

January 2007

Environmental Archaeology Section

Museum of London Specialist Services

7.1 Site archive: finds and environmental, quantification and description

Bulk soil samples	Flot, and flora from residue of 1 sample; 5 litres soil retained unprocessed
-------------------	--

Table 8: Finds and environmental archive general summary

7.1.1 Introduction/methodology

One five-litre sample was taken for environmental assessment. It was processed by flotation, using a Siraf flotation tank, with meshes of 0.25mm and 1.00mm to catch the flot and residue respectively. The residue was dried and sorted by eye for artefacts and environmental material. The flot was stored in industrial methylated spirits then scanned briefly, using a low-powered binocular microscope. The abundance, diversity and general nature of plant macrofossils and any faunal or artefactual remains were recorded on the MoLAS ORACLE database. Tables 9–11 show the sample details and contents of each sample.

7.1.2 Charred remains

None found.

7.1.3 Mineralised remains

None found.

7.1.4 Waterlogged remains

A large assemblage of waterlogged plant remains was present in the sample (see Tables 9 and 10). Wood fragments were abundant, and included two pieces of possibly worked roundwood. Many seed capsules of willow (*Salix* sp.) were present, as were seeds of aquatic and wetland plants such as pondweed (*Potamogeton* sp.), rigid hornwort (*Ceratophyllum demersum*), (*Ranunculus sceleratus*) and (*Alisma* sp.). These plants grow in or beside shallow, still or slow-moving water in ponds, ditches and slow rivers. Seeds of dry land plants including stinging nettle (*Urtica dioica*), (*Solanum nigrum*), hemlock (*Conium maculatum*) and hemp (*Cannabis sativa*) were also found suggesting that areas of dry land close to the site supported waste-ground vegetation.

7.1.5 Faunal remains

Waterflea eggs (Cladoceran ephippia) were common in the sample and fragments of beetle exoskeleton were also present. Two shells of freshwater(?) molluscs were noted.

7.1.6 Artefactual remains

Many small (<1mm) particles of silver-coloured slag were abundant in the sample, and occasional small pieces of clinker were also seen.

7.2 Analysis of potential

Analysis of the plant remains, and possibly the insects from the environmental sample has the potential to provide information on the nature of the aquatic and dry-ground environments in and around the excavated site. The slag particles may indicate industrial processes taking place in the area.

7.3 Significance of data

The significance of the botanical material lies in its interpretive value for this site and the surrounding area. It has no regional or national significance.

subgp	context	sample	BI	dating	proc vol(l)	flot vol(ml)	proc	wlg seed A D	wlg misc A D	wlg wood A D	comments
	109	1			5	120	F	3 3	3 3	3 1	IMS. WILLOW CAPSULES, WET & DIST GRND SEEDS
							W			1 1	

Table 9: Summary of botanical assessment data

A: abundance, D: diversity (1=occasional, 2=moderate, 3=abundance)

subgp	context	sample	BI	dating	proc	constituent	abundance	diversity	comment
	109	1			F	INV BEETLES	2	1	
		1			F	INV EPHIPPIA	3	1	
		1			F	WLG MISC	3	3	MUCH WOOD INC ROUND, WILLOW CAPS, LF, ROOT
		1			F	WLG SEEDS	3	3	CERDE, PTM, RANSC, API, URTD, SOL, CON, RUM, CANSA
		1			W	WLG WOOD	1	1	

Table 10: Details of botanical remains

subgp	context	sample	BI	dating	constituent	abundance
	109	1			CLINKER	M
		1			SLAG	M

Table 11: Details of artefactual remains

8 Bibliography

Aufderheide AC and Rodríguez-Martín C. 1998. *The Cambridge Encyclopaedia of Human Palaeopathology*. Cambridge University Press: Cambridge.

Buikstra JE and Ubelaker DH (eds.). 1994. *Standards for data collection from human skeletal remains: proceedings of a seminar at the field Museum of Natural History*. Arkansas Archaeological Survey research series No. 44, Fayetteville, Arkansas.

Corporation of London Department of Planning and Transportation, 2004 *Planning Advice Note 3: Archaeology in the City of London, Archaeology Guidance*, London

Department of the Environment, 1990 *Planning Policy Guidance: Archaeology and Planning* (PPG16)

English Heritage, 1991 *Exploring Our Past, Strategies for the Archaeology of England*

English Heritage, 1991 *Management of Archaeological Projects (MAP2)*

English Heritage, May 1998 *Capital Archaeology. Strategies for sustaining the historic legacy of a world city*

Institute of Field Archaeologists (IFA), 2001 *By-Laws, Standards and Policy Statements of the Institute of Field Archaeologists* (rev. 2001), *Standard and guidance: watching brief*

Institute of Field Archaeologists (IFA), supplement 2001, *By-Laws, Standards and Policy Statements of the Institute of Field Archaeologists: Standards and guidance – the collection, documentation conservation and research of archaeological materials*

Maresh, M. M. 1970. 'Measurements from roentgenograms'. In Mc Cammon, R. W. (ed.) *Human Growth and Development*. (Charles C Thomas: Springfield) p.157-200.

Museum of London, 1994 *Archaeological Site Manual 3rd edition*

Museum of London, 2002 *A research framework for London archaeology 2002*

Powers N. 2006. *Report on human remains discovered in Liverpool Street, EC1*. MoLAS Unpublished forensic report no. 1063

Powers N. in prep *Museum of London Archaeology Service guidelines for the assessment of inhumations and disarticulated bone*.

Scheuer, L., Black, S. 2000. *Developmental Juvenile Osteology*. (Academic Press, San Diego).

Schofield, J, with Maloney, C, (eds), 1998 *Archaeology in the City of London 1907-1991: a guide to records of excavations by the Museum of London and its predecessors*, Archaeol Gazetteer Ser Vol 1, London

Swift, D., Constantine, N., Nielsen, R., 2005. *Cable trench between Finsbury Market and Devonshire Square. An Archaeological Watching Brief Report* Museum of London Archaeology Service

Thompson, A, Westman A, and Dyson, T (eds), 1998 *Archaeology in Greater London 1965-90: a guide to records of excavations by the Museum of London*, Archaeol Gazetteer Ser Vol 2, London

9 NMR OASIS archaeological report form

9.1 OASIS ID: molas1-20169

Project details

Project name Drainage trenches at junction of Liverpool Street/Blomfield Street, London EC3

Short description of the project Contractors excavating shallow pipe trenches disturbed human remains associated with a known post-medieval burial ground. The remains were removed for analysis and will be reburied at a later date. Natural ground was not seen. Contractors digging a sewer drop shaft to a depth of 5.10m disturbed further human remains. The remains were recorded and removed. Natural ground was not seen.

Project dates Start: 24-08-2006 End: 29-11-2006

Previous/future work No / No

Any associated project reference codes LVB06 - Sitecode

Type of project Recording project

Site status None

Current Land use Transport and Utilities 1 - Highways and road transport

Monument type HUMAN REMAINS Post Medieval

Significant Finds HUMAN REMAINS Post Medieval

Investigation type 'Watching Brief'

Prompt Instruction from the Corporation of London

Project location

Country England

Site location GREATER LONDON CITY OF LONDON CITY OF LONDON
Drainage trenches at junction of Liverpool Street/Blomfield Street,

London EC3
Postcode EC1
Study area 4.00 Square metres
Site coordinates TQ 33029 81618 51.5173006487 -0.08251573042440 51 31 02 N
000 04 57 W Point

Project creators

Name of MoLAS
Organisation

Project brief Corporation of London
originator

Project design MoLAS
originator

Project Sophie Jackson
director/manager

Project supervisor David Sorapure

Name of Corporation of London
sponsor/funding
body

Project archives

Physical Archive LAARC
recipient

Physical Archive ID LVB06

Digital Archive LAARC
recipient

Digital Archive ID LVB06

Paper Archive LAARC
recipient

Paper Archive ID LVB06

**Project
bibliography 1**

Publication type Grey literature (unpublished document/manuscript)

Title Drainage pipe replacement at junction of Liverpool
Street/Blomfield Street, London EC3: An archaeological watching
brief report

Author(s)/Editor(s) Sorapure, D.

Author(s)/Editor(s) Powers, N.

Author(s)/Editor(s) Davis, A.

Date 2007

Issuer or publisher MoLAS

Place of issue or London
publication

Description Unpublished MoLAS report

Entered by David Sorapure (dsorapure@molas.org.uk)

Entered on 13 April 2007

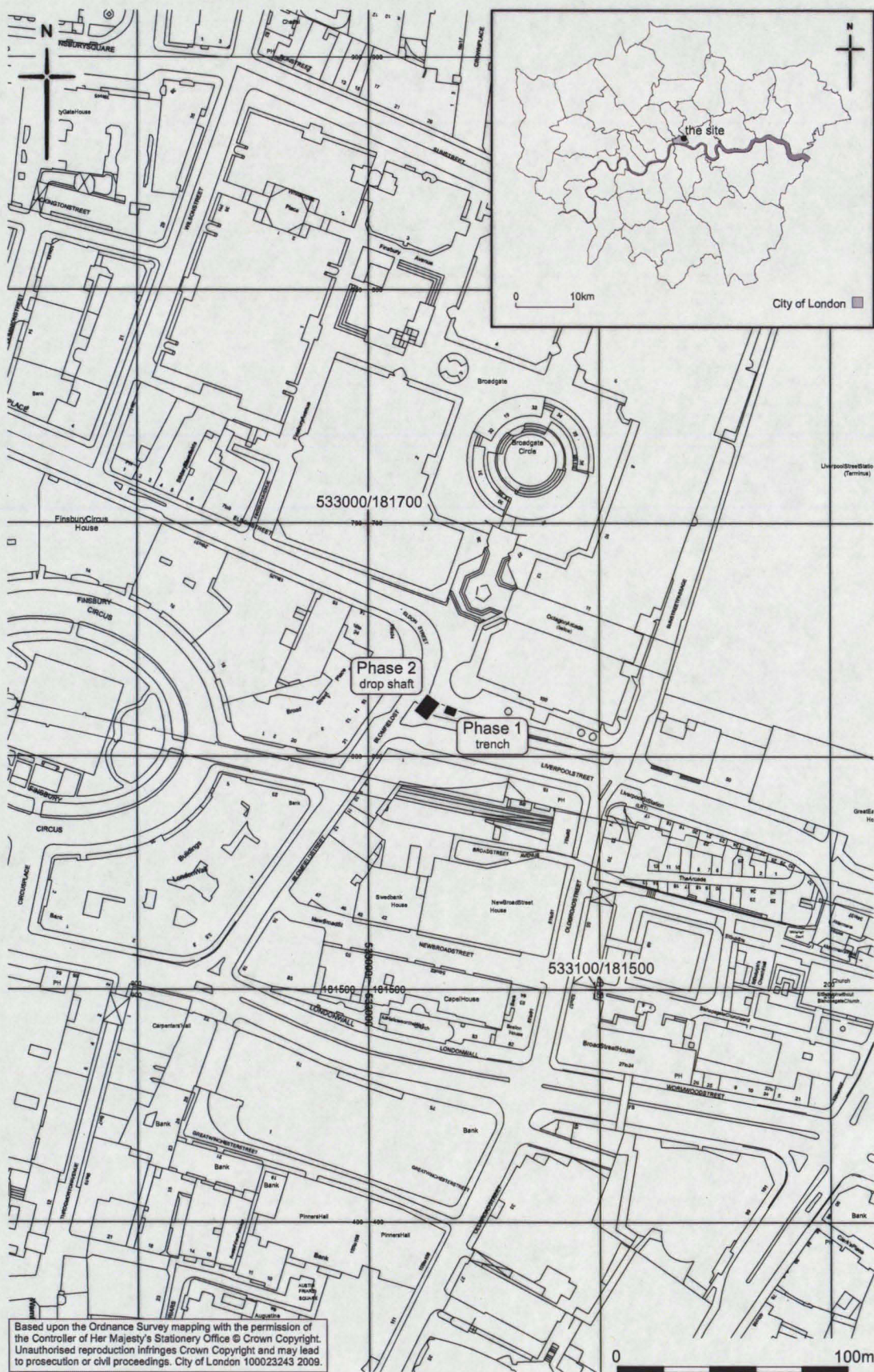
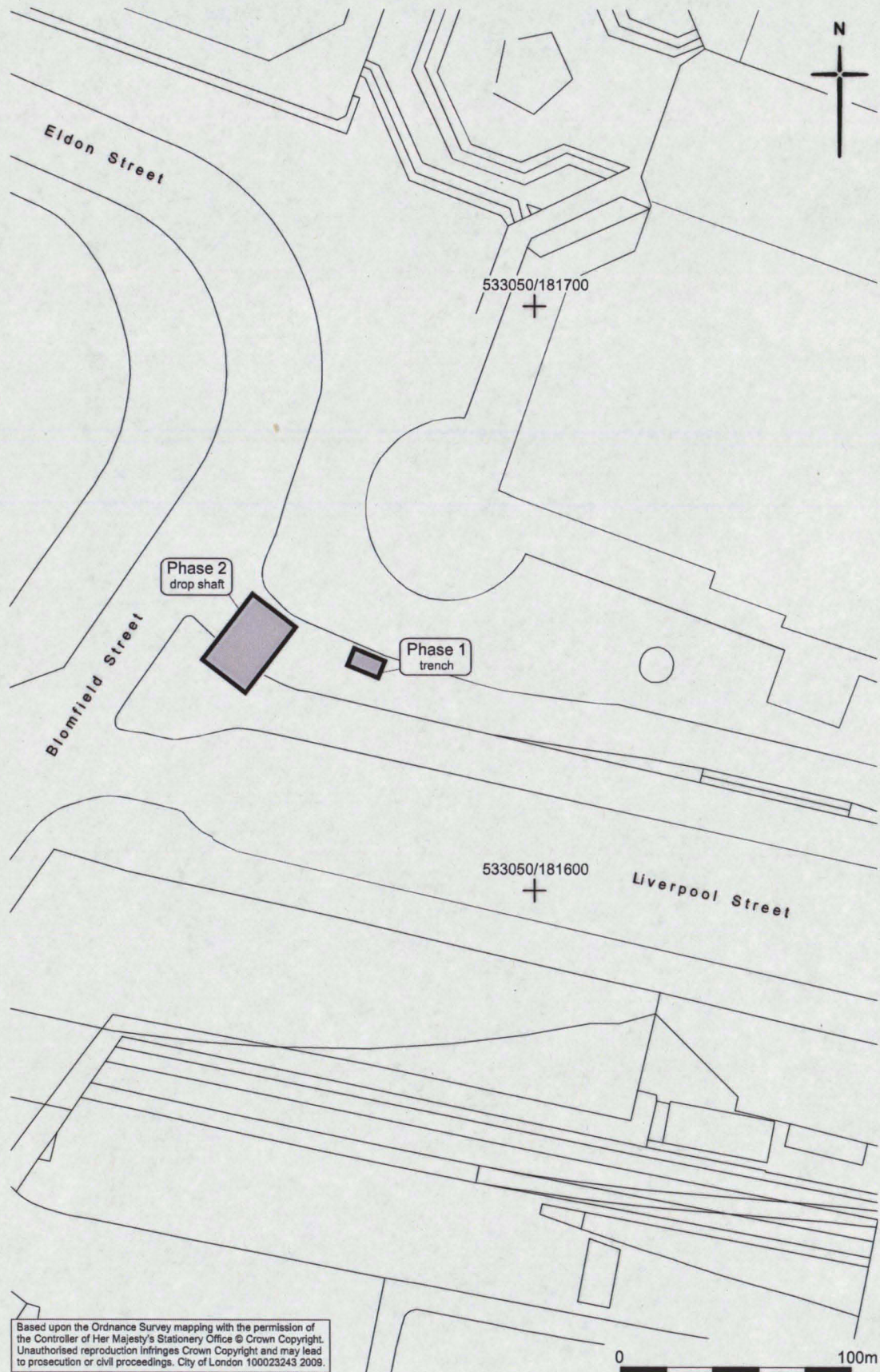


Fig 1 Site location



Based upon the Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. City of London 100023243 2009.

Fig 2 Trench location

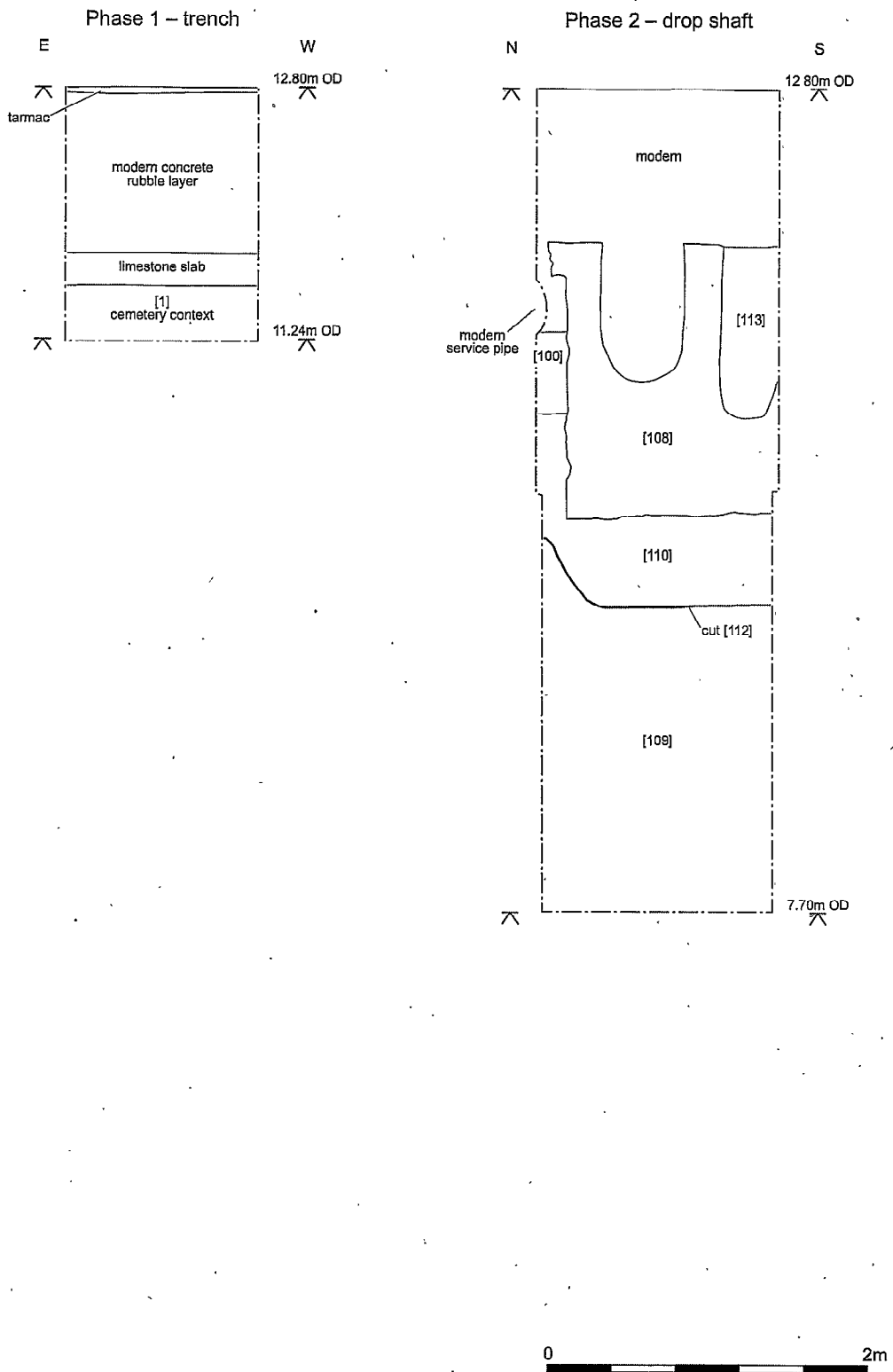
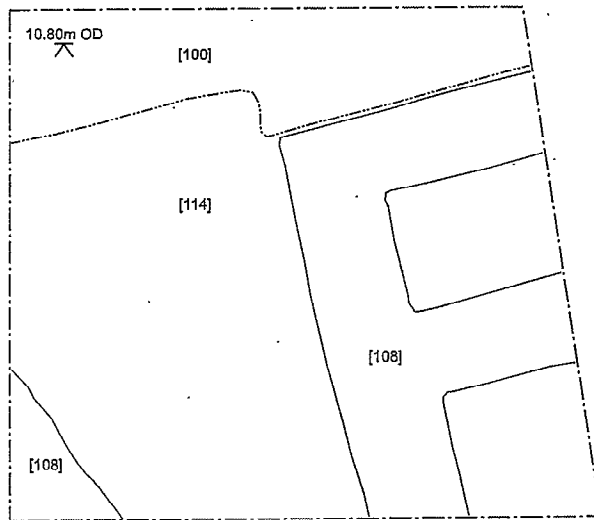


Fig 3 Sections



Plan A



Plan B

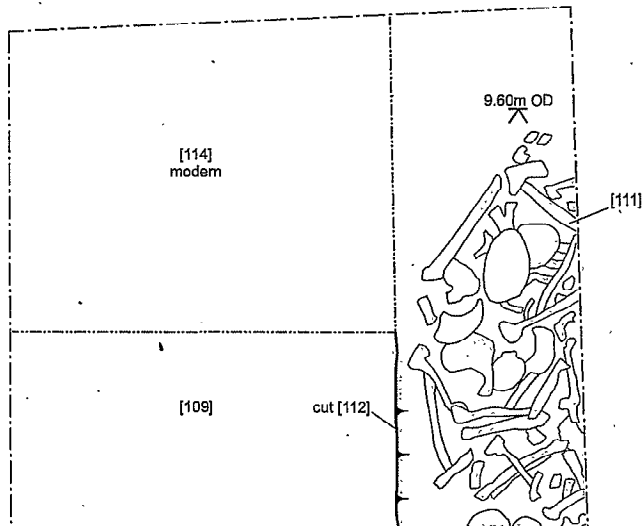


Fig 4 Plans of phase 2 shaft