



# Crossrail Act 2008

Crossrail Ltd

## Woolwich Station

### Detailed Desk-Based Assessment

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## 1 Executive Summary

This DDBA is an update to and expansion of an earlier Specialist Technical Report (STR), which supported the published ES (Crossrail 2005), and the subsequent update of the baseline (MoLAS 2008). The Woolwich Station site was assessed in the main Environmental Statement as amended by Amendment of Provisions (AP) Environmental Statement in May 2007. The AP assessment for the station stated that the baseline resources were the same as those described in the main ES for the adjacent Arsenal Way Shaft site (subsequently removed from the scheme), in particular buildings from the Royal Arsenal. The baseline has been updated as part of this DDBA and the new data have been compared with the original ES baseline. For this more detailed assessment, additional documentary and cartographic sources were examined for a study area around the site, including any archaeological investigations carried out subsequent to the Crossrail ES (or the results of which have since become available).

The site is located in an Area of Archaeological Potential and in a Conservation Area designated by the local authority. This assessment has refined the archaeological potential for the site outlined in the ES. The ES identified a Low potential for *in-situ* Palaeolithic remains (High importance). While these are occasionally found sealed beneath or within the Head deposits (shown by the British Geological Survey in this area), site-specific boreholes revealed no Head deposits, so this potential has been reduced to Very Low/Negligible. Recent work by Oxford Archaeology at the Teardrop site, west of the site, suggests that the station site has a Moderate potential for Late Iron Age evidence (High importance) linked to a nearby *oppidum* (hill fort). The site also has a High potential for Roman burials (High importance), as the Roman cemetery excavated by Oxford Archaeology at the Dial Arch (1999–2001) is likely to extend into the site. The site has a Low potential for Anglo-Saxon remains (when it lay east of the known settlement, in marshy land), and a High potential for later medieval remains (Moderate importance). The site lay immediately south-east of the manor house, and straddled a stream, along the course of which were tenements, cottages and mill houses. Two 'London-ware' kilns are located in the study area and similar finds could be encountered within the site. The site has a Low potential for post-medieval burials (High importance). Convicts were buried in large numbers in informal burial grounds at Arsenal from c 1776 to 1856. The site also has a known High potential to contain the footings of buildings from the Arsenal (Low to Moderate importance).

The non-listed built heritage on the site consists of part of the buildings of Gunnery Terrace, built in the mid-19th century as an iron foundry. The assessment has found that the listing status of these buildings is appropriate. The Gunnery Terrace buildings on the site (Units 12 and 14–16) are to be demolished. The assessment has determined that these buildings are of sufficient architectural and historic interest to be archaeologically surveyed, before and possibly during demolition, to Level 2 in the applicable English Heritage specifications. Attention should be paid to the successive changes made to the buildings, evidence for which was visible inside and out.

The ground reduction for the station box would remove any archaeological remains present from its footprint. In light of the archaeological potential of the site and its location in an Area of Archaeological Potential, further site investigation works (comprising boreholes, inspection and investigation pits or trenches) of the underlying deposits and the foundations of surrounding buildings are recommended prior to the commencement of the enabling works in quarter two of 2010. The results would allow further archaeological assessment of the nature, presence and depth of any archaeological remains and enable the formulation of an appropriate mitigation strategy, for preservation by record or no further work. Any works which would have an impact on archaeological remains would potentially also impact on buried human remains; therefore, a Burial Licence is likely to be required. It would be advisable to apply to the Ministry of Justice in good time to clarify the status of the site and obtain the necessary licence and permissions.

## 2 Introduction

This detailed desk-based assessment (DDBA) relates to the construction of Woolwich Crossrail Station (National Grid Reference 544110 178940: Fig 1). The proposals comprise a station box (18m deep x 22m wide and 256m long) with shafts at both ends to ground level. The station box will be constructed using diaphragm walls and piling. Significant ground reduction adjacent to the box and dewatering of the site will be required in order to enable the construction works to proceed. Gunnery Terrace is to be demolished as part of the development.

The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum requirements (EMR) for Crossrail (available at <http://www.crossrail.co.uk/the-railway/getting-approval/parliamentary-bill/environmental-minimum-requirements-including-crossrail-construction-code>). These follow the principles of Planning Policy Guidance Note 16 on archaeology and planning (1990). Accordingly the nominated undertaker or any contractors will be required to implement certain control measures in relation to archaeology before construction works begin.

The Woolwich Station site was assessed in the main ES as amended by the AP ES in May 2007. The AP assessment for the station stated that the baseline resources were the same as those described in the main ES for the adjacent Arsenal Way Shaft site (subsequently removed from the scheme), in particular buildings from the Royal Arsenal. The baseline has been updated as part of this DDBA and the new data have been compared with the original ES baseline. Therefore, the archaeological background to the site is covered in the Crossrail 'Environmental Statement Specialist Technical Report (STR): Crossrail, Assessment of archaeology impacts. Technical Report. Part 4 of 6, South-East route section, 1E0318-E2E00-00001' (February 2005) (Crossrail 2005, see Appendix 6.7). This DDBA is an update to and expansion of the STR, which supported the published ES, and the subsequent update of the baseline (MoLAS 2008, Appendix 6.6). The Crossrail ES and supporting STRs also define the baseline built heritage resources (both statutorily protected and non-listed) across the route, the potential significant impacts, mitigation and any residual impacts after that mitigation is employed (Crossrail 2005).

This DDBA has been carried out in accordance with the standards specified by the Institute for Archaeologists (IfA 2001), English Heritage (EH 1998, 1999), and the Association of Local Government Archaeological Officers. This assessment is based on the Scheme Design available at the time of writing. Within the limitations imposed by dealing with historical material and maps, the information in this document is, to the best knowledge of the authors and MOLA, correct at the time of writing. Further archaeological investigation, more information about the nature of the present buildings, and/or more detailed proposals for redevelopment may require changes to all or parts of the document.

### 2.1 Aims and Objectives of the Assessment

The DDBA is a programme of targeted, site-specific research. The aim of the assessment is to:

- Describe the survival and extent of known or potential archaeological features that may be affected by the proposals;
- Assess the likely impacts arising from the proposals, taking into account detailed engineering plans;
- Provide recommendations to further quantify the nature of the archaeological resources;



- Inform the site-specific Written Scheme of Investigation (WSI) in respect of any required mitigation aimed at reducing or removing completely any adverse impacts.

### 3 Methodology and Sources

This DDBA draws on the following Crossrail Studies:

- Crossrail 2005 Environmental Statement Specialist Technical Report (STR): Crossrail, Assessment of archaeology impacts. Technical Report. Part 4 of 6, South-East route section, 1E0318-E2E00-00001, February 2005; and
- MoLAS 2008 Crossrail MDC4 Archaeology, Updated Baseline Assessment, January 2008.

The 2008 baseline has been updated as part of this DDBA and the new data have been compared with that baseline. Although Woolwich Station was outside the MDC4 scope the Arsenal Way shaft was included and includes information relevant to this study. Additional documentary and cartographic sources, including the results of any archaeological investigations subsequent to these earlier reports, were examined for the purposes of this DDBA, in order to determine the likely nature, extent, preservation and significance of any archaeological remains within the site. Fig 2 shows the site in relation to known archaeological and historical features within a 300m-radius study area.

The following sources were consulted:

- MOLA – published historic maps and archaeological publications;
- National Monuments Record (NMR) – information on statutory designations including Scheduled Monuments and Listed Buildings;
- The Greenwich Heritage Centre – published histories and historic maps; and reports on the Royal Arsenal: Mills Whipp Partnership 1995 ‘The Royal Arsenal Woolwich, An Archaeological Study’; RCHME 1994 ‘Historic buildings report – The Royal Arsenal at Woolwich’ Vols I and II;
- Oxford Archaeology (OA, previously Oxford Archaeology Unit, OAU) – ‘The Royal Arsenal, Woolwich. Phase 1: Infrastructure Works Post-Excavation Assessment and Research Design’ (OAU 2002); ‘Proposed development at The Royal Arsenal and Teardrop Site, Woolwich’. Archaeological desk-based Assessment and Historical Buildings Assessment (OA 2004); ‘The Royal Arsenal, Woolwich, Phase 1 The Warren, Archaeological Evaluation Report’ (OA 2005); and ‘Assessment of Units 12, 15 and 16, Gunnery Terrace (OA 2009);
- British Geological Survey (BGS) – geology map 271;
- Berkeley Homes – Geotechnical data (Soil Mechanics 2009 Ground Investigation between Woolwich Station and Plumstead Portal Crossrail Line 1 - Package 20 - Report No D7901); and Proposed works (Waterman Proj. no. C11331, No. 0003, Rev A02, 11/12/09), see Appendix 6.1;
- MoLAS, 2006 Crossrail Archaeological Monitoring of ground investigations. Borehole package 10 Plumstead. Unpub. report (author: Spurr G), see Appendix 6.1 for further detail and
- Internet – web-published material including Local Plan.

Mark Stevenson and Rob Whytehead of English Heritage were consulted as part of this DDBA and their help in clarifying different aspects of the site, especially areas of archaeological potential and the results of previous investigation for which reports are not available (see Section 4.2), is duly acknowledged.

The DDBA included a review of historic maps held by Greenwich Heritage Centre, in order to identify phases of building construction on the site (Fig 16–Fig 18). The historic maps were scanned and located spatially in relation to the site using ArcGIS 9.9, i.e. the maps were 'georeferenced' by overlaying them to identifiable features (e.g. buildings or boundaries that still exist). As a result of the distortion that frequently occurs in early maps and of subsequent distortions resulting from the copying process (either photocopying or photography), georeferencing of historic maps is subject to a varying degree of error. Where possible, the outlines of historic buildings have been located more precisely, so that the digitised plans provide the 'best fit' possible given the limitations of early maps. Note that north is approximate on early maps. This DDBA also entailed a review of geotechnical borehole data in site and adjacent areas (Appendix 6.1). This review provides an indication of the underlying topography and geology, and areas of truncation and archaeological survival potential. The results are illustrated in Fig 25, which shows areas of archaeological potential within the site.

A site visit and built heritage appraisal were carried out on the 23rd of October 2009, in order to determine the topography of the site and the nature of the existing buildings on the site, and to provide further information on areas of possible past ground disturbance and general archaeological potential. Observations made on the site visit have been incorporated into this report.

Section 6 of this report contains supporting appendices, borehole data, a glossary of technical terms, and a full bibliography.

## 4 Results

### 4.1 Site location, topography and geology

The site lies immediately north of Plumstead Road and extends in an east–west direction across Arsenal Way (National Grid Reference 544110 178940: Fig 1). It is bounded by No 1 Street to the west, the Royal Carriage Factory to the north, and Cornwallis Road to the east. The site slopes very gently down from 108.8m Above Tunnel Datum (ATD) in the west to 107.5m ATD in the east. (Note that in line with Crossrail conventions, heights provided in metres ATD have 100m added to Ordnance Datum [OD] heights.)

The site falls within the historic parish of Woolwich, and lay within the County of Kent prior to being absorbed into the administration of the Greater London Borough of Greenwich.

The site is located c 400m south of the River Thames. Woolwich lies on a promontory of bedrock (Thanet Beds) protruding into the floodplain (alluvium). This higher and dryer ground would have made the area attractive for settlement throughout prehistoric and historic times.

The British Geological Survey (BGS map 271, not reproduced) shows the site on Head deposits above Tertiary Thanet Beds (sands and gravels). Head deposits are formed in periglacial conditions (not buried by flowing ice but subject to severe freezing), when surface thawing causes mass movement down-slope over a still frozen substrate, generally accumulating at breaks in the slope (a deposition process known as 'solifluction'). Head deposits are characteristic of the climatic fluctuations that took place during the Pleistocene so that Palaeolithic flint tools are occasionally found within or beneath Head deposits at the base of the slope (MoLAS 2005, 7).

Geotechnical boreholes monitored in 2006 by MoLAS (now MOLA), tabulated in Appendix 6.1 (Table 6) and located on Fig 3, did not reveal Head deposits within the site, but showed Lambeth Group gravels and Thanet Beds at variable depths, in one location (WP7R) very close to the ground surface, but generally at a depth of c 1.5–2m below ground level (bgl). Following this, further geotechnical investigations were carried out by Soil Mechanics (2007–9) (Table 7) and Waterman created a geological ground model across the site (Fig 4). This second phase of geotechnical investigation did not show any evidence of the Head deposits either, but confirmed the results of the earlier phase. Of particular interest, is the presence of alluvium in two boreholes (marked in yellow on Fig 4), which may indicate a buried stream or a dip in the natural topography.

The deposits recorded comprised:

- Made ground: generally thicker than recorded in the first phase of boreholes, being up to 3.60m thick (WS48) along the northern edge of the site, adjacent to the Royal Carriage Factory, but only 0.40m thick in the south-central part of the site (BS46). It is mostly of modern origin (concrete inclusions), but potentially contains late 19th–early-20th century material (possibly earlier) in some locations;
- Alluvium: observed in two locations between c 106m and 99m ATD (WP87B, WP87C, B587, in the western part of the site, and WP97R in the eastern part of the site), as shown in Fig 4. Boreholes WP87B, WP87C, B587 are located in the same area as a stream shown on historic maps (see below) so may indeed be the buried channel;
- Natural River Terrace Gravels: occurring at 0.40m bgl in the south-central part of the site (BS46) and extending to depths of 5m in the central area of the site (WS48). The gravel may represent a component of the Lambeth group;
- Lambeth Group: occurring between c 1.20 and 5.20m bgl. The Lambeth group comprises gravels (the 'Woolwich and Reading beds') deposited above the Thanet Beds

during the Tertiary period. They therefore are of no archaeological interest, pre-dating human occupation, but are the base upon which the Holocene and later archaeological deposits developed. The Upnor formation, referred to in the table above, is part of the Lambeth group; and

- Thanet Beds: occurring at depths of c 2m bgl to 16–17m bgl. The Thanet Beds are approximately 60 million years of age and therefore are of no archaeological interest other than forming a promontory on which Woolwich developed.

## 4.2 Overview of past investigations

There have been ten archaeological investigations of note in the study area, including one within the site (Fig 5). The westernmost part of the site (corresponding to Zones 4 and 5 of OA's investigations) has been remediated, i.e. the soil was excavated to a depth of 1.5m, the soil cleaned and reinstated. Trial pits and trenches were excavated in Zones 4 and 5 of the site. These revealed widely differing heights in the gravels and sand, resulting from three centuries of development at the site (OA 2005). PCA monitored the insertion of shallow service runs within parts of the site; however, this report was not available at the time of writing (Mark Stevenson, pers. comm. 09-11-09). The excavations at the Dial Arch (1999–2001) (corresponding to OA's Zone 2), immediately to the north-west of the site, revealed some 158 inhumations (oriented north–south) and nine cremations. Together with outlying cremations in the study area (shown on Fig 5), they indicate the presence of a large cemetery, which is likely to extend within the site. Part of the cemetery along the western edge of the site has been cleared by OA, but areas of the site have never been investigated (see 4.4, below).

In 2007, OA carried out an archaeological investigation along Warren Lane at the Teardrop Site (site code TDP07), c 200m west of the site. There was found a major Late Iron Age ditch (c 20m-wide and 6m-deep) thought to enclose an *oppidum* (a hillfort or a proto-town, one of only two known examples in the London area) located on high ground. Unpublished excavations in the 1980s by Woolwich District Archaeological Society (WDAS) had also revealed a substantial ditch, considered to belong to the *oppidum*. A 14th-century London Ware kiln was also excavated.

The historical background to the Arsenal has been the subject of extensive research (e.g. Hogg 1963, Burford and Watson 1997) and only a brief summary is presented in the next section to provide the necessary background for understanding the site.

## 4.3 Chronological summary

**Table 1: Time Periods**

<b>Prehistoric</b>	
Palaeolithic	700,000-10,000 BC
Mesolithic	10,000–4,000 BC
Neolithic	4000–2000 BC
Bronze Age	2,000–600 BC
Iron Age	600 BC–AD 43
<b>Historic</b>	
Roman	AD 43–410
Anglo-Saxon – medieval	AD 410–1485
Post-medieval	AD 1485–present

### *Prehistoric period (c 700,000 BC–AD 43)*

With its location on a promontory, rising high above the river, and the marshes on either side, Woolwich offered a wide diversity of habitats and food resources to prehistoric people. This setting would have been suitable for occupation by a sparse, nomadic population. In this area, the Crossrail route follows the base of this higher ground, where Head deposits, which occasionally contain Palaeolithic flint tools (Crossrail 2005, 7), tend to accumulate. No Head deposits were recorded by the geotechnical investigations carried out at the site (see above). There are no known Palaeolithic remains within the site and study area.

The Mesolithic hunter-gather communities of the postglacial period (c 10,000–4,000 BC) relied on the resources of the floodplain. The floodplain, which formed from c 11,000 BC, as the last glaciation came to an end, consists of alluvial silts and peats, representing a wider river bordered by marshes, channels and creeks, prior to reclamation and embanking in the later prehistoric period (Crossrail 2005, 7). Hunting, fowling, fishing and plant resources would have attracted nomadic Mesolithic groups. Mesolithic remains are generally sealed and preserved by deeper deposits of alluvium, deposited during transgression phases (sea level rise) in the Thames estuary (Crossrail 2005, 8). There are no known Mesolithic finds within the site and study area.

Extensive marshes formed along the Thames valley during the Neolithic (c 4000–2000 BC). Permanent settlements would have focused on the higher ground further south or on islands within the marsh. Sea levels rose again in the Bronze Age (c 2,000–600 BC), submerging areas of lower ground along the foreshore, so that creeks and fleets would have criss-crossed the area of the site. Antiquarian finds of this period include weapons and preserved wood (possibly forming a trackway), of vague provenance in the area of the Warren (later the Arsenal). The discovery of metal artefacts associated with a former wetland has been linked to votive or ritual activities. Prehistoric pottery sherds of unspecified date are also reported by the SMR from within the site (SMR 13213). These finds indicate exploitation of the marshes for its resources (eg grazing, fishing, fowling, salt making, craft materials, and pottery manufacture) (Rippon 2000, 1).

Unpublished excavations run by South-East London Archaeological Unit (SELAU) in 1986 at the former Woolwich Power Station, c 350m north-west of the site, recorded a massive 25ft-wide (c 7.6m) ditch running south-north towards the river. The ditch, which was flanked on the east side by a smaller ditch, was traced for a length of 30m. The excavation also revealed evidence of Iron Age (c 600 BC–AD 43) occupation in the form of 'a few pits and postholes' to the west of the ditch (WDAS 1988, 15) (the SMR mentions that round houses were found - SMR 070992).

Recent excavations by OA at the 'Teardrop' site (site code TDP07), c 200m west of the site (Fig 2), revealed a similar ditch that ran east-west. Roman material was collected from the upper fills but optically stimulated luminescence (OSL) samples dated the main fill of the ditch to the Late Iron Age. Sealing the ditch fills were medieval and post medieval layers, including structures. This ditch has been interpreted as the southern limit of an Iron Age *oppidum* (a hillfort, or a fortified early town), bounded to the east by the ditch described above. The *oppidum* was sited to take advantage of the spur of ground overlooking the river, which probably formed the northern boundary. The location of structural remains to the west of the ditch (see above) suggests that occupation extended beyond the fortified settlement.

Although London was described as an *oppidum* by Roman writers, no evidence for a pre-Roman settlement has been found near the City, and such sites are rare in Greater London. The discoveries at Woolwich are therefore of great significance for the understanding of these types of settlements and the later Iron Age period.

### *Roman period (AD 43–410)*

It is thought that a Roman road may have followed the course of Plumstead Road, possibly to the south or across the site, following the higher ground on the edge of the river terrace. The road has not been observed archaeologically and, given the uncertainty over its location, it is not shown on Fig 2. A main Roman road, known as Watling Street, ran across Shooters Hill, c 2.5 km to the south of the site, and connected Roman settlements at Deptford, Greenwich, Charlton, Woolwich, Plumstead and Erith (Brown 2002, 294–295). Watling Street linked Londinium (the Roman provincial capital) to Duroverum (Canterbury) and the Continent (Margary 1955, 45).

Roman cemeteries are usually located outside towns and along main roads, as Roman law forbade the burial of human remains inside towns. Evidence suggests that there was Roman occupation of the *oppidum*, explaining the presence of Roman burials in the westernmost part of the site (Fig 2). A large urn with bones and several vessels containing ashes were unearthed in the area of the Dial Arch (at the Royal Arsenal Carriage Department), during the digging of drains in the 19th century (SMR 11336).

Investigations by OA at the Dial Arch in 1999–2001 revealed a Roman cemetery containing 158 inhumations orientated north–south, and potentially a total of nine cremations (OAU 1999). The preservation of human bone was very poor and fragments of teeth and cranium were retrieved (OAU 2002, 26). For the most part the burials were identified through body stains in the sand and gravel and by grave cuts. Coffin nails and occasional corroded coffin furniture were recovered. Some 25% of the burials had grave goods, which included whole pottery vessels, clusters of hobnails, coloured glass beads, shale buttons and gaming counters, shale and copper alloy bracelets, and coins (OAU 2002, 26). A small number of outlying graves were also found, several orientated E-W, indicating Christian burials. Roman cremation burials were also reported to have been found in Zone 4, within the site (Fig 5). South of the cemetery area, excavations revealed 17 post-holes and 12 pits (OAU 2002, 26) interpreted as part of a settlement, whose focus is likely to have been on the same site as the *oppidum* (see above). There is evidence of Roman activity on the opposite side of the River, possibly suggesting a Roman ferry crossing existed in the Woolwich area.

### *Anglo-Saxon and medieval period (AD 410–1485)*

The site lies in the historic parish of Woolwich, which was probably split in the 9th century from Lewisham, an early medieval manor (or estate) (Hasted 1797–1801, 441; VCH Essex vi, 8; Watson 1987). Although there is some evidence for Late Roman activity associated with the *oppidum*, there is currently no evidence for occupation continuing into the Saxon period. The church of St Lawrence (which no longer exists but was originally located c 300m west of the site) is mentioned in 11th-century sources (Watson 1986, 7), and would have formed the nucleus of the settlement, possibly to the east of the church but also extending north of High Street along lanes stretching down to the River (OA 2004, 14). It is likely that during this period the site lay in marshy land on the edge of the settlement.

The centre of the later medieval town of Woolwich was located along the present High Street. The earliest available maps, such as Rocque's map of 1746 (Fig 8), show the settlement running up both sides of the High Street, c 350m west of the site. There are records of the purchase in 1442 by the Priory of St Mary Overy in Southwark of two messuages (houses and outbuildings), a garden, a croft with a curtilage and a wharf named as Hayeshawe in Woolwich town (OA 2004, 14).

Evidence for medieval activity (flood defences) was also found during an evaluation (2004/05) at the Royal Arsenal (site code RYA99), c 130m north of the site. A series of small scale, successive timber stake and wattle structures on an east-west alignment, were radiocarbon-dated to the medieval period, the earliest structure ranging AD 1020–1280. They have been

interpreted as former fence lines, possibly fish traps, and the foundations to an earthen river wall, which was observed to overlie these structures. Two ditches were considered contemporary elements of the network of drainage ditches which enabled the reclamation of this area of the Plumstead Marshes behind the river wall to provide agricultural land. This system is apparent on historic maps from 1670 to 1749 and historically may have its origins from the 'inning' (reclamation) of the marshes in the medieval period (source SMR).

Excavations in 1999–2001 at the Arsenal (site code RYA99), c 140m north of the site, identified a well-preserved 'London-ware' pottery kiln and a significant volume of medieval kiln waste. An associated pit probably for the storage of clay was located c 5m north of the kiln (OAU 2002, 35–6). Similar kilns and London Ware wasters have since been found on the Teardrop site, c 200m east of the site, during excavations in 2007–8 (site code TDP07). The kiln products seem to indicate a date of c 1300–1350. These remains represent the only known production sites for this ware in London (see Fig 2 for their location), and are therefore of great significance (OA 2004, 15).

#### *Post-medieval period (AD 1485–present)*

Early 18th-century maps refer to this area of Woolwich as the "Warren". The area, a well-stocked rabbit warren immediately east of the manor house, was established in the 16th century by Martin Bowes, who also constructed ponds and moats, mill houses and a mill pond, probably along a stream or channel (shown on later maps across the site, see below). By 1566, there were orchards and fifteen cottages or tenements within the estate (Burford and Watson eds 1997, 19). The SMR reports that the later medieval manor house, renamed Tower Place, was located immediately north-west of the site, on the site of the former Military Academy (Fig 2).

By the end of the 16th century, ordnance was being stored at the Woolwich gun wharf for military purposes, and as early as 1651, proof butts were placed in the Warren for trialling guns. In 1667, by order of Charles II, Prince Rupert had a battery constructed to protect Woolwich dockyard from Dutch raids (Burford and Watson eds 1997). The estate and manor house had by then been acquired by Sir William Pritchard, an Eltham businessman and government contractor. Pritchard swapped part of his land with the Crown, so that the exercising of guns continued by the gun wharf next to the Dockyard, at safe distance from his house. The Crown acquired the land in 1671 (ibid.). The mansion house was later acquired and adapted for use as Officers' accommodation in 1682–3 (ibid.).

The construction of the Royal Arsenal and Dockyard was the biggest development in Woolwich. The site lies along the southern edge of the Royal Arsenal, falling partially within the Carriage Department and the Officers' Residences Department. Historic maps dated from the 18th century onwards show the development of the site within the context of the Royal Arsenal. On modern Ordnance Survey maps, the Arsenal is blanked out for reasons of military secrecy, but a map from the 1930s (marked 'secret' but since declassified) shows the Arsenal and the site in great detail (discussed below).

#### *The Arsenal layout*

Borgard's 1701 plan of the Warren (Fig 6) shows a rectilinear building, named 'Mr Pritton's House' (marked O on the plan); also within the site is a feature marked R, listed as 'mortar for experiment'. The northern edge of the site partially overlaps a complex of buildings marked S, and listed as 'Packmans house'. Packman House is thought to date to at least 1660 and was demolished in 1740 (OAU 2002, 97). The plan shows the early development of the Royal Arsenal, including the triangular shaped 'New Carriage Yard' (Prince Rupert's Fort) to the north of the site, alignments of cannons (1-47), and the Royal Laboratory ('A') (beyond the site boundary).

A map of the Warren dated 1717 (Fig 7) shows 'Mr Pritton's House' in a different location (marked O on this plan). There are no buildings shown within the site, but a large pit is shown in the south-west corner of the site. The map also shows a stream crossing the western edge of the site in a north-south direction and a millpond to the north, beyond the site. The stream formed the boundary between the Woolwich and Plumstead parishes, crossing Plumstead Road a little to the east of Beresford Square (Burford and Watson eds 1997, 19). Boreholes in this location revealed alluvium between c 106m ATD to 99m ATD (Fig 4), which could indicate the presence of the buried stream. Excavations in this area by OA noted that the Thanet sands dropped from 107.16m ATD to 105.40m ATD in this area, which could indicate the presence of the stream or channel (OA 2005, 32).

Rocque's map of 1746 (Fig 8) shows the site within 'The Warren', but none of the earlier buildings. The easternmost part of the plan falls beyond the limits of the area surveyed by Rocque. John Baker's plan of 1749 (Fig 9) shows a complex of buildings in the north-west of the site, which is otherwise shown as open ground. The stream still appears to cross the site. A later plan from 1777 (Fig 10) shows these two buildings as 'Old Barracks' and 'New Barracks'. This map also shows a linear building and small gardens in the far south-western corner of the site and an L-shaped building in the western part of the site.

To the west of the site stands the Verbruggen House ('Building 13' in MOD plans and OA reports), originally built as a house for Jan and Pieter Verbruggen, appointed master founders from 1770. The building was later used by the Ordnance Board, which was generally responsible for providing weapons and military equipment, and thus was responsible for the arsenal. The Verbruggen House is a red brick building on two storeys with a basement and habitable roof space, under a slated mansard roof, documented as constructed in 1772-3. This building should appear in a plan of 1777 but the building likeliest to be this one is shown slightly out of position. The house appears more clearly in plans of 1810 and 1845. (Later additions have been removed and the building, now refurbished, has been statutorily listed grade II since 1973.)

Three old wooden ships, known as 'Hulks', were moored at the Royal Arsenal and used as prisons. A map of 1800 (not reproduced, mentioned in Burford and Watson eds 1997, 50) shows convicts' sheds, beer house and garden, but not their burial ground. The marsh land where they were buried was gradually built over as the Royal Arsenal spread eastwards, when bodies were occasionally reburied in small hillocks or mounds (*ibid.*). Large numbers of convicts were interred in informal burial grounds at the Woolwich Warren from c 1776 to 1856, as shown by the quantities of human bone found in the area during the construction of the Royal Gun Factories in 1859 and at the Butts in 1912. None of these burial grounds are shown on historical maps and it is possible that these burials extended into the site.

The first buildings at the present Gunnery Terrace in the north-east of the site ('Building 7' in MoD plans and OA reports) were part of the carriage works, where gun carriages were made and cannon fitted on them. Most of the buildings of the carriage works ('Building 10') are situated immediately to the north of the site. These buildings were initially constructed in 1802-3 and have been much modified subsequently (and have been statutorily listed grade II since 1973). The buildings at Gunnery Terrace are now separated from the main carriage works by Arsenal Way (formerly known by various successive names), which marks the eastern boundary of the original Warren. A small building first appears just to the east of this boundary on a map of 1777 (Fig 10 and Fig 18), but the first extensive buildings forming part of the carriage works appear on a map of 1810, labelled 'waggon sheds' (OA 2004, fig 7h). These sheds are shown running parallel to each other from north to south, on the same alignment as the present buildings of Gunnery Terrace, but with some possible exceptions the first buildings seem not to have survived subsequent rebuilding and enlargement. The exceptions are relatively narrow ranges of buildings with clerestory roofs running from north to south along the west edge (Unit 11) and on the north-east of the group of buildings (Units 1 and 2), which may possibly date

from 1802–03 or be early rebuildings on the same lines as the original structures. The other buildings in this group have a fairly complicated building history, and at present form a series of single-storey rectangular spaces, with brick walls, large windows, and slated pitched roofs ranged for the most part from west to east (Units 9, 10, 12 and 14–16). They are labelled ‘C21’ to ‘C27’ on a plan of 1946 (OA 2004, fig 7t) and simply ‘Building 7’ on a plan of 1952. (None of the buildings in this group is statutorily listed but all of them, like other buildings nearby, are in Royal Arsenal Woolwich Conservation Area.)

The plan dated 1845 (Fig 11) shows that the stream crossing the west of the site in the 18th century had been filled in. The map shows the wagon sheds (six north–south linear structures) in the eastern part of the site. Three further buildings, probably also barracks, and a smaller building of unknown function are shown in the eastern part of the site.

The map of the Royal Arsenal from 1867 (Fig 12) shows considerable development and infilling of the site, with the ‘Works Department Offices’ and Police Head Quarters located in the south-west of the site, a Wood Store and large Timber shed in the east, and the Officers’ Quarters in the west of the site. The large Carriage Departments are shown along the northern boundary of the site.

The Officers’ Quarters were excavated by OA in 1999–2001 (site code RYA99). Zone 4 (within the site) (see Fig 5) revealed ‘excellent structural plan of the foundations and cellar walls to former standing structures from this area including possible WW2 bunker (not on historic maps), Cadet Quarters (Old and New Barracks), extensions and drainage for Verbruggen’s House’ (OAU 2002, 59). No remains pre-dating the Warren or the Arsenal were found.

The Ordnance Survey 1932 map (Fig 13), marked ‘secret’, is the only OS map to show the site and the Royal Arsenal (the area was blanked out for security reasons, and does not appear on Goad maps either). A medical store and surgery are shown in the south-west of the site. The Officers’ Quarters are still shown in the western part of the site. Small buildings shaded in grey (part of the Engineering Department according to the map legend) occupy the central area of the site, and a coal depot is in the eastern end of the site. The 1952 MOD plan of the Arsenal (Fig 14) shows the addition of a few small buildings, possibly sheds, in the central area of the site. The 1:2500 OS map of 1980 only shows the southern edge of the site, which appears to be mostly vacant. The modern course of Plumstead Road has since been diverted, effectively separating the Main Gate from the rest of the Arsenal

Table 2 below lists the buildings that could be securely identified within the site. Given the limitations inherent in the georeferencing of historic maps, buildings located along the site boundary have also been included. The table should be read in conjunction with Fig 16–25, which show the location of the buildings. Most of the 19th-century buildings can be considered to be of local significance. Earlier buildings linked to the early development of the Arsenal would be of regional significance.

**Table 2: Buildings within the site or along site edges identified from historic maps**

No.	Description	Map	Fig
1	Mr Pritton’s House. Elongated building with gabled roof.	1701	16
2	Irregular feature marked ‘mortar for experiment’	1701	16
3	‘Packmans house’ (c 1660–1740) (just beyond north-western site boundary)	1701 1717	16, 17
4	“New Barracks and “Old Barracks” shown in the western side of the site.	1749 1777 1845	18, 19, 20
5	Linear building and small garden plots (immediately west of site, probably outside site boundary)	1749 1777	19, 20

6	L-shaped building of unknown function	1777 1845?	19, 20?
7	Cadet barracks (south of site, possibly outside)	1777 1845?	19, 20?
8	Verbruggen's House (built 1772–3). Grade II listed. Buildings 13 in MoD plans and OA reports. This building is extant and is located outside the western boundary of the site.	1777 to 1980	19, ?20, 21, 22, 23, 24
9	Wagon sheds	1777 1845	19, 20
10	Carriage works. 'Waggon' sheds, etc. 'Gunnery Terrace'. Not listed. Building 7 in MoD plans and OA reports.	1810 1845 1867 1930s 1952	20, 21, 22, 23
11	Three elongated buildings, probably sheds and/or barracks, and a smaller building of unknown function, probably related to the adjacent barracks, in the eastern part of the site. (Some of these are possibly the same as or a development of No. 6.)	1845 1867 1930s	20, 21, 22
12	Group of small buildings labelled 'Works Department Offices' at the west end of the Police Quarters (No. 13)	1867 1930s 1952	21, 22, 23
13	Police Quarters	1867 1930s 1952	21, 22, 23
14	Large Timber shed (development of No. 9?)	1867 1930s	21, 22
15	Pattern Room and Stores	1867 1930s 1952	21, 22, 23
16	Officers' Quarters (development of No. 4?)	1845 1867 1930s	21, 22, 23
17	Row of small buildings along Plumstead Road, along southern boundary of the site (development of No. 7?)	1930s 1952 1980	22, 23, 24
18	Small buildings (part of the Engineering Department) in the central area of the site.	1952	23

#### 4.4 Factors affecting archaeological survival

Successive phases of construction within the site will have truncated any archaeological remains present from previous buildings (built up areas are shown as having Moderate potential in Fig 25). From an archaeological perspective, although they represent an impact on earlier remains, they are interesting in their own right (see section 5.1 below).

A scheme of remediation and the installation of new infrastructure were carried out during 1999 and 2000. These works were monitored by OA (including watching brief, evaluation, strip and record, and area excavation) (OA 2004, 9). These areas are shown as having Low to Moderate archaeological survival potential in Fig 25. The site covers Zones 4 and 5 of OA's report: Zone 4 was remediated to 1.5m bgl (with all archaeological remains removed to this depth), while Zone 5 was not remediated (it therefore still has Moderate to High potential for archaeological remains). Verbruggen's House within Zone 4 was not affected by the works. Road 9, which bisects the site in a north–south direction, was remediated to 0.75m bgl, so that archaeological remains may survive below this level of truncation.

## 5 Discussion

### 5.1 Archaeological and built heritage potential

The significance of archaeological remains is outlined in the Crossrail ES (Volume 5) & Specialist Technical Report. As part of this DDBA, different phases of buildings have been identified within the site. These phases are shown in Fig 16–25.

Fig 25 shows areas of archaeological survival potential, by combining the information from previous investigations and the extent of historic and modern building. The significance of the structures from these phases has been further considered to depict areas of potential.

This DDBA confirms the potential previously established for the site in the Crossrail ES (see Appendix 6.7), and identifies further potential for Iron Age and Roman remains, in light of recent archaeological investigations in the study area and site.

The site has Very Low/Negligible potential for *in-situ* Palaeolithic remains (High importance). Occasionally, these are found sealed beneath or within the Head deposits, shown on the BGS map of the area, but Head deposits were not recorded by two subsequent phases of geotechnical investigations at the site.

The site has Moderate potential for later prehistoric remains. Recent work by OA at the Teardrop site, west of the site, carried out since the Crossrail ES, suggests that the site has a Moderate potential for Late Iron Age evidence (High importance) linked to a nearby *oppidum* (hill fort). Although it is very unlikely that the *oppidum* extends as far east as the site, evidence for Iron Age occupation (such as post-holes, pits, and possibly round houses) was found beyond the limits of the *oppidum*, so that similar remains might be found within the site.

The site has a High potential for Roman remains, comprising settlement evidence and burials. Burials would be of High importance (depending on their degree of preservation), while settlement evidence may be of Moderate to High Importance (depending on extent and preservation). A Roman cemetery, excavated by OA in 1999–2001, falls partially within the site. Although the western edge of the site (corresponding to Zone 4) was excavated by OA and all archaeological remains were cleared to a depth of 1.5m bgl, there is still potential for burials and other remains, both below that depth and elsewhere within the site. The potential within the previously remediated area may be considered Low to Moderate.

The site has a Low potential for Anglo-Saxon remains, when it lay east of the known settlement, in marshy land. The importance of any remains would depend on their nature and degree of preservation.

The site has a High potential for later medieval remains (Moderate importance), as it lay immediately south-east of the medieval manor house, and straddled a stream or channel, along the course of which were tenements, cottages and mill houses. The production of 14th-century 'London-ware' is attested in the vicinity of the site and, while the kilns were found closer to the River, it is possible that similar finds could be encountered within the site.

The site has a Low potential for post-medieval burials (High importance). The bodies of convicts were interred in large numbers in informal burial grounds of unknown extent at the Woolwich Warren from c 1776 to 1856.

The site also has a demonstrated potential to contain the footings of buildings from the Arsenal (Low to Moderate importance), as shown in Fig 16–25 and listed in Table 3. Although none of these buildings is considered as being of High importance (eg major military or historic building within the Arsenal), collectively they potentially provide useful information on the development of the Arsenal.

The existing buildings of Gunnery Terrace within the site form the southernmost buildings of the group at present known as Gunnery Terrace, which are not listed. These particular buildings are at present identified as Units 12 and 14–16, corresponding to those identified in a plan of 1946 as in Table 3.

**Table 3: Identity in 1946 of buildings at 12–16 Gunnery Terrace**

Present number	1946 number
12	Did not exist, but C26 occupied south-east corner of the area of No 12
14	Western portion of C24
15	Eastern portion of C24
<b>16</b>	C23, including additional building to south-west with canted corners

These buildings at Gunnery Terrace were constructed, on the basis of plan evidence, form, and building materials and techniques, for the most part probably at some time in the third quarter of the 19th century. Unit 16 comprises two ranges side-by-side, each with a pitched roof running from west to east. The ranges are open to each other, the valley between the roofs being supported by a wrought-iron composite riveted lattice girder carried on four cast-iron columns. The roof frame is intact but the covering has been recently replaced (Fig 27). The original wagon sheds of 1802–3, which are first shown on a plan of 1810, appear little changed on a plan of 1858 (OA 2004, fig 7m). The next later reliable plan, of 1878, shows the structure of Unit 16 in roughly its present form. The external walls and the roof structure of Unit 16 would therefore have been constructed between 1858 and 1878. The buildings are labelled as a ‘forger’s shop’.

To the south of the two ranges of Unit 16, a smaller building was added, characterised by canted corners in plan and a pitched roof with a clerestory and skylights along its ridge, running from west to east (Fig 28). The roof frame and covering remain intact. A map of 1895 shows this addition.

A third range runs from west to east immediately north of and next to Unit 16, but not communicating with it, and this range contains Units 12, 14 and 15. The north wall of this range was actually constructed as the south wall of other buildings further to the north, which have since been demolished. The present Units 12, 14 and 15 were constructed as infill between this northern building and Unit 16 to the south at some time, according to map evidence, between 1895 and 1920. The steel-framed roof visible in Units 14 and 15 is of a 20th-century type, and has either been reinforced or partially rebuilt. The structure at the extreme west end of this northern range is further infill, housing Unit 12, dates from after 1946 when the area appears as a small open space on a plan, and in form and size was modelled so as to fit with the existing units (Fig 26).

The significance of the buildings on this site, especially those that are proposed to be demolished, namely 12 and 13–16 Gunnery Terrace, may be considered in terms of the applicability of the published criteria for statutory listing of buildings (DoE 1994, 26–7, paragraph 6.10), English Heritage guidance on the statutory listing of heritage assets (2007), English Heritage guidance on appraising and managing conservation areas (2005) and English Heritage’s conservation principles (2008), which identify four main values by which the significance of a building may be assessed. These values are as follows:

- evidential value: the potential of the physical fabric of a building or structure to yield evidence of past human activity;

- aesthetic value: this derives from the ways in which people draw sensory and intellectual stimulation from a building or structure; in this assessment attention is paid to what other people have said or written, rather than the assessor's own subjective reactions;
- historical value: the ways in which past people, events and aspects of life can be connected through a building or structure to the present, such a connection often being illustrative or associative; and
- communal value: this derives from the meanings of a building or structure for the people who know about it, or for whom it figures in their collective experience or memory; communal values are closely bound up with historical, particularly associative, and aesthetic values.

Evidential and aesthetic values correspond most closely to architectural interest, in the terms of the published criteria for statutory listing, while historical and communal values correspond to historic interest. These different approaches to assessing the built heritage, which are partly the result of streamlining the planning system and its policies with respect to archaeology and the built heritage, should be compatible with each other.

The heritage significance of the buildings and structures in each built heritage has been rated very broadly by reference to the values set out in the English Heritage conservation principles. The ratings are seven in number and very simple, ranging from 'very low' through 'medium' to 'very high'. These ratings are given below, together with a comment on possible measures of mitigation in case of proposed demolition or substantial alteration (Table 4). It should be understood that these ratings give an initial indication of how the local planning authority and English Heritage may regard the built heritage on this site, and the mitigation measures they may require if demolition or substantial alteration is proposed. The present assessment is therefore not definitive.

**Table 4: Assessment of significance of buildings**

Building	Evidential value	Aesthetic value	Historical value	Communal value	Comment
Units 12, 14–16 Gunnery Terrace	Medium-High	Low	Medium	Low	Not listed. By implication, considered for statutory listing and rejected.

## 5.2 Impact assessment

The proposals comprise the construction of a station box (18m deep x 22m wide x 256m in length) extending from the east of Verbruggen's House towards Cornwallis Road (Fig 29). Ground level will be reduced to c 105.00m ATD, removing the made ground from the footprint of the batter and cutting into the underlying River Terrace Deposits/Thanet Sand. Piling and diaphragm walls will be progressed from this reduced level. Two shafts at both ends of the box will connect the station to ground level.

The Gunnery Terrace buildings which are not listed but are of local interest will be demolished. In addition an existing modern marketing suite will be removed at the start of the project.

During the demolition phase a number of utilities will be diverted involving some localised excavation.

The overall impact will be the removal of any surviving archaeological deposits between Verbruggen's House and Cornwallis Road with some localised impacts elsewhere within the site boundary from service diversion works.

### 5.3 Recommendations

This DDBA is to inform a site-specific WSI, setting out mitigation measures appropriate to the preservation by record of the heritage assets present at the site. In light of the archaeological potential of the site and its location in an Area of Archaeological Potential, it is recommended that further investigation be carried out in order to determine the presence, nature, date and extent of any archaeological remains that might be present. Further site investigation works of the underlying deposits and the foundations of surrounding buildings are proposed prior to the commencement of the enabling works which begin in quarter two of 2010. These investigations include up to 12 boreholes with associated inspection pits of varying depths; and investigation pits or trenches into the foundations of buildings at the site. These investigations would enable the formulation of an appropriate mitigation strategy, for preservation by record (targeted archaeological excavation and recording, and/or an archaeological watching brief for remains of lesser significance), or no further work.

Non-listed built heritage assessment and recording forms part of the archaeological mitigation strategy for Crossrail. The definition of non-listed built heritage adopted follows 'Information Paper D22 Archaeology' and encompasses above ground historic features and structural elements of historical interest.

Two main groups are:

- Non-listed buildings proposed for demolition in conservation areas; and
- Historic street furniture and materials falling within a worksite and being temporarily or permanently impacted upon by the works.

The detailed scope for this element of works includes:

- Important non-listed buildings of historic interest proposed for demolition in conservation areas (as set out in 'Information Paper D18, Listed Buildings and Conservation Areas');

The Crossrail Environmental Statement and supporting Specialist Technical Reports define the baseline built heritage resources (both statutorily protected and non-listed) across the route, the potential significant impacts, mitigation and any residual impacts after that mitigation is employed (Crossrail 2005).

An assessment of the site has been undertaken by MOLA in order to identify any non-listed built heritage which will be demolished as part of the proposals. The survey has identified the level of mitigation works in advance of demolition. The results of the survey are outlined in Table 5 below. There were no other non-listed features, such as street furniture, of note. However, movable objects such as cannons should be removed to safe storage.

The different degrees of intensity and levels of detail possible in archaeological building survey and recording are explained in *Understanding historic buildings: a guide to good recording practice* (English Heritage 2006).

**Table 5: Built Heritage Assets**

Name	Image	Description	Significance	Impact	Mitigation/Further Investigation
<p>Building 7, Units 12 and 14–16, Gunnery Terrace</p>		<p>Late 19th-century and 20th-century industrial structures, with brick walls and wrought-iron and steel roof frames and columns.</p>	<p>Documented as built from the third quarter of the 19th century onwards. Considerably modified in the course of use for iron founding and fitting guns to gun carriages.</p>	<p>To be demolished</p>	<p>Appropriate mitigation by means of archaeological and historical survey, before and if necessary during demolition, to Level 2 in English Heritage specifications (2006). Attention should be paid to the successive changes made to the buildings, evidence for which was visible inside and out.</p>

## 6 Appendices

### 6.1 Borehole data

**Table 6: Summary of geotechnical investigations (2006) (in m ATD) (see Fig 3 for location)**

BH Ref	Ground level	Alluvium	Natural Gravel	Lambeth Group	Thanet Beds	Notes
WP5R	108.48				105.48	
WP6R	108.16			106.46	105.66	
WP7R	106.66			106.21	105.16	
WP8R	107.35			105.35		
WP18P	106.80			104.40		

**Table 7: Summary of geotechnical investigations (2007–9) (in m bgl - below ground level) (see Fig 4 for location)**

BH Ref	Made Ground	Alluvium	River Gravel	Terrace	Lambeth Group	Thanet Beds
WP38R	0–2.20 m bgl (undated)					2.20–16.40m m bgl
WP39R	0–0.70m bgl (modern) 0.70–1.20m bgl (undated)				1.20–3.20m bgl (Upnor Formation)	3.20–17.04m bgl
WP40R	0–2.50m bgl (modern)				2.50–3.25m bgl (Upnor Formation)	3.25–17.93m bgl (weathered Thanet sand)
WP37P	0–2.70m bgl (modern)					2.70–17.00m bgl
WP86PB	0–2.70m bgl (modern)					2.70–16.02m bgl
WP87	0–3.30m bgl (modern)					3.30–9.20m bgl
WP88R	0–1.20m bgl (modern)		1.20–4.10 (river terrace deposits)		4.10–5.25m bgl (Upnor Formation?)	5.25–17.00m bgl
WS46	0–0.40m bgl (modern)		0.40–2.60m (river terrace deposits)			2.60–4.20m bgl (test pit ended)
WS47	0–0.60m bgl (modern)		0.60–2.30m bgl			2.30–4.20m bgl (test pit ended)
WS48	0–3.60m bgl (modern)		3.60–5.20m bgl (test pit ended)			
WS49	0–2.75m bgl		2.75–4.00m bgl (river terrace)			4–5.20m bgl (test

	(modern)		deposits)		pit ended)
WP89R	0–1.60m bgl (modern)			1.60–2.00m bgl (Upnor formation?)	2.00–16.03m bgl
WP97R	0–1.20m bgl (modern)	1.20– 4.70m bgl			>4.70m bgl
WP96	0–2m bgl (modern)		2.00–5.10m bgl (river terrace deposits)	5.10–6.70m bgl	6.70–17.80m bgl
WP87C	0–0.30 bgl (borehole terminated)				
WP87B	0–0.30 bgl (borehole terminated)				

Note: Boreholes prefixed “B” (from B584 to B590) predate the factual reports from Crossrail Pack 10 and Pack 20, so that copies of the formal logs were not available at the time of writing.

## 6.2 Glossary

<i>Alluvium</i>	Sediment laid down by a river. Can range from sands and gravels deposited by fast flowing water and clays that settle out of suspension during overbank flooding. Other deposits found on a valley floor are usually included in the term alluvium (eg peat).
<i>Archaeological Priority Area / Archaeological Priority Zone</i>	Areas of archaeological priority, significance, potential or other title, often designated by the local authority.
<i>Brickearth</i>	A fine-grained silt believed to have accumulated by a mixture of processes (eg wind, slope and freeze-thaw) mostly since the Last Glacial Maximum around 17,000BP.
<i>BP</i>	Before Present, conventionally taken to be 1950
<i>Bronze Age</i>	2,000–600 BC
<i>Building recording</i>	Recording of historic buildings (by a competent archaeological organisation) is undertaken <i>'to document buildings, or parts of buildings, which may be lost as a result of demolition, alteration or neglect'</i> , amongst other reasons. Levels of recording are defined by Royal Commission on the Historical Monuments of England (RCHME) and English Heritage.
<i>Built heritage</i>	Upstanding structure of historic interest.
<i>Colluvium</i>	A natural deposit accumulated through the action of rainwash or gravity at the base of a slope.
<i>Conservation Area</i>	An area of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance. Designation by the local authority often includes controls over the demolition of buildings; strengthened controls over minor development; and special provision for the protection of trees.
<i>Cropmarks</i>	Marks visible from the air in growing crops, caused by moisture variation due to subsurface features of possible archaeological origin (i.e. ditches or buried walls).
<i>Cut-and-cover [trench]</i>	Method of construction in which a trench is excavated down from existing ground level and which is subsequently covered over and/or backfilled. Typically used for laying services.
<i>Cut feature</i>	Archaeological feature such as a pit, ditch or well, which has been cut into the then-existing ground surface.
<i>Detailed Desk-based assessment (archaeological) (DDBA)</i>	A programme of targeted, site-specific research resulting in a written document whose purpose is to determine, as far as is reasonably possible from existing records, the nature of the archaeological resource within a specified area.
<i>Devensian</i>	The most recent cold stage (glacial) of the Pleistocene. Spanning the period from c 70,000 years ago until the start of the Holocene (10,000 years ago). Climate fluctuated within the Devensian, as it did in other glacials and interglacials. It is associated with the demise of the Neanderthals and the expansion of modern humans.
<i>Early medieval</i>	AD 410–1066. Also referred to as the Saxon period.
<i>Environmental Impact Assessment (EIA)</i>	The process whereby information about the environmental impacts of a development or scheme is collected, assessed and taken into account in reaching a decision on whether it should go ahead or not.
<i>Environmental Statement (ES)</i>	The ES is the document, which sets out the likely environmental impacts of the scheme. The ES is the main output from the EIA process.
<i>Evaluation (archaeological)</i>	A field evaluation is <i>'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area'</i>
<i>Excavation (archaeological)</i>	An archaeological excavation is <i>'a programme of controlled, intrusive fieldwork with defined research objectives which examines, records and interprets archaeological deposits, features and structures and, as appropriate, retrieves artefacts, ecofacts and other remains within a specified area...The records made and objects gathered during fieldwork are studied and the results of that study published in detail appropriate to the project design'</i>
<i>Findspot</i>	Chance find/antiquarian discovery of artefact. The artefact has no known context, is either residual or indicates an area of archaeological activity.
<i>Geotechnical</i>	Ground investigation, typically in the form of boreholes and/or trial/test pits, carried out for engineering purposes to determine the nature of the subsurface deposits.
<i>Head Deposits</i>	Weathered/soliflucted periglacial deposit (ie moved downslope through natural processes).
<i>Historic Environment Record (HER)</i>	Archaeological and built heritage database held and maintained by the County authority. In some counties this is named the SMR (see below).

<i>Holocene</i>	The most recent epoch (part) of the Quaternary, covering the past 10,000 years during which time a warm interglacial climate has existed. Also referred to as the 'Postglacial' and (in Britain) as the 'Flandrian'.
<i>Iron Age</i>	600 BC–AD 43
<i>Later medieval</i>	AD 1066–1500
<i>Last Glacial Maximum</i>	Characterised by the expansion of the last ice sheet to affect the British Isles (around 18,000 years ago), which at its maximum extent covered over two-thirds of the present land area of the country.
<i>Locally Listed Building</i>	A structure of local architectural and/or historical interest. These are structures that are not included in the Secretary of State's Listing but are considered by the local authority to have architectural and/or historical merit
<i>Listed Building</i>	A structure of architectural and/or historical interest. These are included on the Secretary of State's list, which affords statutory protection. These are subdivided into Grades I, II* and II (in descending importance).
<i>Made Ground</i>	Artificial deposit. An archaeologist would differentiate between modern made ground, containing identifiably modern inclusion such as concrete (but not brick or tile), and undated made ground, which may potentially contain deposits of archaeological interest.
<i>Mesolithic</i>	12,000–4,000 BC
<i>National Monuments Record (NMR)</i>	National database of archaeological sites, finds and events as maintained by English Heritage in Swindon. Generally not as comprehensive as the country SMR/HER.
<i>Neolithic</i>	4,000–2,000 BC
<i>Ordnance Datum (OD)</i>	A vertical datum used by Ordnance Survey as the basis for deriving altitudes on maps.
<i>Palaeo-environmental</i>	Related to past environments, i.e. during the prehistoric and later periods. Such remains can be of archaeological interest, and often consist of organic remains such as pollen and plant macro fossils which can be used to reconstruct the past environment.
<i>Palaeolithic</i>	700,000–12,000 BC
<i>Palaeochannel</i>	A former/ancient watercourse
<i>Peat</i>	A build up of organic material in waterlogged areas, producing marshes, fens, mires, blanket and raised bogs. Accumulation is due to inhibited decay in anaerobic conditions.
<i>Pleistocene</i>	Geological period pre-dating the Holocene.
<i>Post-medieval</i>	AD 1500–present
<i>Preservation by record</i>	Archaeological mitigation strategy where archaeological remains are fully excavated and recorded archaeologically and the results published. For remains of lesser significance, preservation by record might comprise an archaeological watching brief.
<i>Preservation in situ</i>	Archaeological mitigation strategy where nationally important (whether Scheduled or not) archaeological remains are preserved <i>in situ</i> for future generations, typically through modifications to design proposals to avoid damage or destruction of such remains.
<i>Registered Historic Parks and Gardens</i>	A site may lie within or contain a registered historic park or garden. The register of these in England is compiled and maintained by English Heritage.
<i>Residual</i>	When used to describe archaeological artefacts, this means not <i>in situ</i> , ie Found outside the context in which it was originally deposited.
<i>Roman</i>	AD 43–410
<i>Scheduled Monument</i>	An ancient monument or archaeological deposits designated by the Secretary of State as a 'Scheduled Ancient Monument' and protected under the Ancient Monuments Act.
<i>Site</i>	The area of proposed development
<i>Site codes</i>	Unique identifying codes allocated to archaeological fieldwork sites, eg evaluation, excavation, or watching brief sites.
<i>Sites and Monuments Record (SMR)</i>	Archaeological database held and maintained by the County authority. In some counties this is named the Historic Environment Record where the built heritage data has been incorporated.
<i>Study area</i>	Defined area surrounding the proposed development in which archaeological data is collected and analysed in order to set the site into its archaeological and historical context.
<i>Solifluction, Soliflucted</i>	Creeping of soil down a slope during periods of freeze and thaw in periglacial environments. Such material can seal and protect earlier landsurfaces and archaeological deposits which might otherwise not survive later erosion.
<i>Stratigraphy</i>	A term used to define a sequence of visually distinct horizontal layers (strata), one above another, which form the material remains of past cultures.

<i>Truncate</i>	Partially or wholly remove. In archaeological terms remains may have been truncated by previous construction activity.
<i>Watching brief (archaeological)</i>	An archaeological watching brief is ' <i>a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons.</i> '
Written Scheme of Investigation (WSI)	A written proposal for archaeological investigation of whatever form (evaluation, excavation, watching brief as above) which is submitted to the local planning authority as a statement of intent by an archaeological organisation employed by a developer. This should demonstrate that the organisation will carry out the required investigation to nationally accepted standards.

### 6.3 References

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#### **6.4 Other Sources**

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- Greenwich Heritage Centre
- Internet – web-published sources
- London Archaeological Archive and Resource Centre
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#### **6.5 Cartographic sources**

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Woolwich Warren in 1701

Woolwich Arsenal in 1717

'An exact survey of the Warren in Woolwich', 1749

'Plan of Woolwich Warren', 1777

Map of Woolwich District, 1845

The Royal Arsenal, 1867

Map of the Royal Arsenal (MOD 1952)

*Ordnance Survey maps*

Ordnance Survey 1st edition 25":mile map (1869).

Ordnance Survey 2nd edition 25":mile map (1897)

Ordnance Survey 3rd edition 25":mile map (1916)

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Ordnance Survey 1:2500 scale map. Sheets TQ4379 (1958)

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*Geology map*

British Geological Survey map sheet 271

*Engineering/Architects drawings*

Proposed works (Waterman Proj. no. C11331, No. 0003, Rev A02, 11/12/09)

## 6.6 Updated baseline/gazetteer (MoLAS 2008)

Site name	Woolwich Station					
<b>Obsolete EIA References</b>	<b>Site no.</b>	226	<b>Route Section</b>	South-East	<b>Window</b>	SE4
<b>Location</b>	South-East land of Royal Arsenal West, to the junction of Plumstead Road and Arsenal Way. Woolwich, LB of Greenwich					
<b>NGR</b>	543950 178970					
<b>Note</b>	This site was removed from the scheme during the EIA process in 2004, and re-introduced under Additional Provisions in 2006. The AP assessment for the station stated that the baseline resources were the same as those for the adjacent Arsenal Way Shaft site (now removed from the scheme), in particular buildings from the Royal Arsenal. The new data have been compared with that baseline.					
Changes in Designations						
<b>Designation</b>	<b>Change</b>					
<b>APZ</b>	Greenwich UDP adopted in 2006, expanded an Area of Archaeological Potential south to Beresford Road/Plumstead Road, covering the historic Royal Arsenal and the whole of proposed Woolwich Station site. The Woolwich Station site falls within the Woolwich Arsenal Conservation area.					
<b>SAM</b>	No change					
<b>SSSI, WHS, HP&amp;G</b>	No change					
New Baseline Data						
<b>Reference Site codes</b>	<b>Description</b>					
<b>GNI05</b>	Standing building recording. 19th-century buildings. <i>Outside</i> LLAU/LOD.					
<b>RYA99</b>	Evaluation (2004/05). The Royal Arsenal [The Warren], Woolwich: medieval flood defences and kilns with waste dumps, and clay storage pits; 18th-century structural and industrial remains, and 19th-century structures of the Royal Arsenal. <i>Outside</i> LLAU/LOD. (MLO77491, MLO97853, MLO98249, MLO98338, MLO98339)					
<b>RYG04</b>	Evaluation. Late 15th–early 17th-century pit and brick walls of the Cartridge Establishment. <i>Outside</i> LLAU/LOD.					
<b>RYR03</b>	Watching brief and excavation. Alluvial sand, peat and clay, also structural elements and industrial processes of the 18th and 19th-century Royal Arsenal. <i>Outside</i> LLAU/LOD.					
<b>RYW04</b>	Evaluation. Alluvial deposits overlaid by substantial deposits of post-medieval made-ground. <i>Outside</i> LLAU/LOD.					
<b>WAX06</b>	Watching brief. Negative evidence, modern truncation. <i>Outside</i> LLAU/LOD.					
<b>TDP07 (added since 2008)</b>	Teardrop Site, Warren Lane. Oxford Archaeology evaluation. A major Late Iron Age ditch (c 20m-wide and 6m-deep) enclosed an <i>oppidum</i> (or proto-town, the only known example in the London area) on a gravel promontory separating two areas of lower lying marsh. Later remains comprised: medieval layers, five post-medieval pottery kilns (two for the production of London Ware), industrial remains relating to the Royal Carriage Factory and gun carriages.					

SMR			
<p>A number of listed buildings (and one not listed) from the 18th–19th-century Royal Arsenal have been added to the SMR. Those in the search area are:</p> <p><b>Within the LLAU/LOD (but probably c 100m west of station box):</b></p> <ul style="list-style-type: none"> <li>• <b>200486</b> (MLO83124) Royal Arsenal Dial Square Entrance, built 1717/20. Listed Building Grade II.</li> <li>• <b>200487</b> (MLO82934) Royal Arsenal Brass Foundry, built 1716–1717. Listed Building Grade I.</li> </ul> <p><b>Immediately adjacent to LLAU/LOD (but probably c 100m west of station box):</b></p> <ul style="list-style-type: none"> <li>• <b>200484</b> (MLO83123) Royal Arsenal Main Guardroom, built 1788. Listed Building Grade II.</li> </ul> <p><b>Outside the LLAU/LOD:</b></p> <ul style="list-style-type: none"> <li>• <b>200206</b> (MLO83061) Main Entrance to Royal Arsenal, built 1829. Listed Building Grade II.</li> <li>• <b>200492</b> (MLO83424) Royal Arsenal Former new Carriage Store (Building 10), built 1802/05. Listed Building Grade II.</li> <li>• <b>200498</b> (MLO82905) Royal Arsenal Rifle Shell Factory Gateway, built 1856. Listed Building Grade II.</li> <li>• <b>398177</b> (MLO83285) The Officers' Block (Building 11), built 1717–1720. Listed Building Grade II.</li> <li>• <b>468763</b> (MLO83255) Royal Arsenal Former Paper Cartridge Factory (Building 17), built 1855–1856. Listed Building Grade II.</li> <li>• <b>468765</b> (MLO83257) Royal Arsenal (Building 19), built 1887. Listed Building Grade II.</li> <li>• <b>MLO77978</b> Royal Arsenal (Building 22), built 1903–1911. Not statutorily listed.</li> </ul>			
Assessment: changes to Baseline Resources			
Resources	Change	Reasons	Relevant Data
Medieval activity	Add low potential for medieval activity. Likely importance: low.	15th-century pits from evaluation in the Royal Arsenal	RYG04
Notes	Excavations and building records confirm the historical development of the Royal Arsenal, and potential for below-ground remains.		
Review			
Compiled by (MOLA)	<i>H. Dawson</i>		10/11/09
Edited by (MOLA)	<i>N. Elsdon, G. Malcolm</i>		
Approved by (MOLA)	<i>M. G. Dennis, G. Malcolm</i>		
Agreed by (MDC)			

## 6.7 Desk-based assessment- ES Specialist Technical Report (Crossrail 2005)

<b>Site name: Arsenal Way Shaft</b> [N.B. Woolwich Station was removed from the scheme during the EIA process in 2004, and re-introduced under Additional Provisions in 2006. The AP assessment for the station stated that the baseline resources were the same as those for the adjacent Arsenal Way Shaft site (now removed from the scheme). The baseline has been updated as part of this DDBA.]		<b>Site no. 411</b>	
<b>Route Section</b>	South-East	<b>Window</b>	SE5
<b>Location</b>	Beresford Street/Plumstead Road, Woolwich, LB of Greenwich		
<b>NGR</b>	544110 178940		
<b>Proposed Works</b>	Ventilation and emergency escape/access shaft and a construction compound ('worksite').		
<b>Geology and topography</b>	On Head deposits, c 100m south-west of the boundary with river alluvium. Ground level is c 8m OD. It is <i>possible</i> that alluvium may extend to the site, from interleaving of Head and Alluvial deposits at the boundary.		
<b>Baseline resources</b>	<ul style="list-style-type: none"> <li>No Scheduled Ancient Monuments within search area.</li> <li>The site is located in an <b>Area of Archaeological Potential</b>.</li> <li><b>Burial grounds:</b> from c 1776 to 1856, large numbers of convicts dying on the prison hulks moored on the river were buried within Woolwich Warren (cf Mayhew and Binny 1862). Although visible as rows of hillocks, the informal burial grounds were unmarked, with no defined boundaries. They are likely to have been on what was then undeveloped waste ground and marsh to the north-east of Wellington Avenue and the Crossrail site (see <i>Woolwich Arsenal</i> below). Great quantities of human bone were apparently found in this area during construction of the Royal Gun Factories in 1859, with further skeletons unearthed at the Butts in 1912. The ad hoc nature of the burial grounds gives a low potential for human remains within Woolwich Arsenal generally. There is also a potential for Roman burials (see <i>Roman cemetery</i> below).</li> </ul>		
	<ul style="list-style-type: none"> <li><b>High potential</b> for Woolwich Arsenal. Tower Place, a substantial Tudor mansion was fortified by Prince Rupert against the Dutch c 1667 and became an ordnance depot (the Royal Laboratory) c 1695. This area, the original nucleus of the Arsenal (known as Woolwich Warren) includes the Crossrail site and extended north approximately to Wellington Avenue. The discontinuity of layout beyond this point reflects later expansion onto land reclaimed from the Thames marshes. Although the Crossrail site is largely open ground, it was formerly occupied by a variety of buildings from the Arsenal. (Site codes RYA99 and WMS96 and GLSMR 071010, 223243, 071422, 071458, 071459, 070284, 071468, 071477, 071478, 071480, 071784).</li> </ul>		

	<ul style="list-style-type: none"> <li>• <b>Moderate potential</b> for a Roman cemetery found at the Arsenal in the 19th century and confirmed by later fieldwork (Site RYA99, GLSMR 070218, 070228, 070225, 071062). It has been suggested (Brown 2002, 294–5) that Plumstead Road, immediately to the south of the Crossrail site, follows the line of a subsidiary Roman road off Watling Street (A2). The road may have linked a number of Roman settlements along the south side of the River, including a possible ferry crossing at Erith and settlement at Plumstead (to the east), Woolwich itself, and at Charlton, Greenwich, and Deptford (to the west).</li> </ul>		
	<ul style="list-style-type: none"> <li>• <b>Low potential</b> for <i>in-situ</i> Palaeolithic remains sealed beneath or within Head deposits. Also in the study area, <i>but outside the Crossrail site</i>, for later prehistoric evidence on higher ground overlooking the floodplain, eg possible late Iron Age settlement (GLSMR 070992). Occasional fragments of pottery have been recovered from the vicinity (GLSMR 070566, 070260).</li> </ul>		
	<ul style="list-style-type: none"> <li>• <b>Low potential</b> for Roman and later occupation and land management, including possible flood defences (Site RYA99 and GLSMR 071392, 071393, 071394).</li> </ul>		
<b>Current status of land</b>	<p>The site is currently open, street-level hard-standing alongside Beresford Street with a warehouse (currently under conversion) occupying the north-eastern corner.</p> <table border="1" style="float: right;"> <tr> <td><b>Visited ?</b></td> </tr> <tr> <td>Yes</td> </tr> </table>	<b>Visited ?</b>	Yes
<b>Visited ?</b>			
Yes			
<b>Past impacts</b>	<p>Later industrial buildings from the Arsenal have probably truncated earlier remains above the Head deposits, but are themselves to be regarded as heritage resources.</p>		
<b>Importance of the baseline resources</b>	<ul style="list-style-type: none"> <li>• <b>High importance: low potential</b> for <i>in situ</i> Palaeolithic evidence <i>Reasons:</i> national and local <i>rarity</i>.</li> </ul>		
	<ul style="list-style-type: none"> <li>• <b>Moderate importance: high potential</b> for Woolwich Arsenal, including <b>low potential</b> for convict burials. <i>Reasons:</i> <i>statutory protection</i> for burials; <i>formal identification</i> within Area of Archaeological Potential; <i>supporting historical data and association</i>; <i>diversity and group value</i> of multi-phase resources; <i>potentially good survival quality</i> in an area that has not been recently redeveloped; contribution to <i>published priorities</i> (eg Museum of London 2002: 71, 74, 82, 83, 85).</li> </ul>		
	<ul style="list-style-type: none"> <li>• <b>Moderate importance: moderate potential</b> for Roman burials, and <b>low potential</b> for Roman and later occupation and land management. <i>Reasons:</i> <i>statutory protection</i> for human remains; <i>formal identification</i>; <i>local rarity</i> of other <i>in-situ</i> remains <i>archaeological supporting data</i> from previous burial finds; contribution to <i>published priorities</i> (eg Museum of London 2002, 85).</li> </ul>		
<b>Impact</b>	<p>Ventilation and emergency escape/access shaft, with associated construction compound (worksite). In detail the <b>impacts</b> are:</p>		
	<ul style="list-style-type: none"> <li>• A <b>basement box</b>, c 25m by 40m and c 6m deep, to house the shaft and associated plant, the perimeter retaining walls formed from secant piles. The <b>impact</b> would be to completely remove all surviving archaeological remains, with the possible exception of any Palaeolithic remains in the deeper Head deposits.</li> </ul>		

	<ul style="list-style-type: none"> <li>A <b>shaft</b> below the basement (to tunnel level): 16m in diameter and 34m deep. The additional <b>impact</b> of the shaft would be to remove any Palaeolithic remains within its footprint which had survived construction of the basement.</li> </ul>		
	<ul style="list-style-type: none"> <li>A <b>construction compound</b>, the Arsenal Way Worksite, would be established around the basement. There would be footings for temporary accommodation (0.4m to 0.8m deep); hard standing; temporary services (0.2m to 1.2m); grout plant (0.5m to 0.9m); hoarding posts (0.8m to 1.5m), dewatering systems (1.0m), and a temporary pedestrian overbridge (up to 1.0m). <b>Impact:</b> these works could partially remove any remains surviving close to the modern ground surface (eg from Woolwich Arsenal).</li> </ul>		
	<ul style="list-style-type: none"> <li>Details of <b>service diversions</b> are unlikely to be available within the timescale of the EIA, but they are likely to partially remove potential archaeological remains.</li> </ul>		
<b>Magnitude of impact before mitigation</b>	<b>Moderate</b> , with potential for a <b>Significant impact</b> .		
<b>Additional information required?</b>	Geotechnical/geoarchaeological and survey data, in particular levels of Head deposits, in order to refine the mitigation strategy. Documentary evidence regarding the 18th/19th-century buildings of the Arsenal.		
<b>Incorporated mitigation</b>	The generic data gathering and mitigation measures, as described in the incorporated mitigation, would be applied to this Crossrail site. Initially, DDBA and/or field evaluation would be required in order to refine the mitigation strategy. This may lead to archaeological excavation, constituting <i>preservation by record</i> .		
<b>Residual Impact after incorporated mitigation</b>	<b>None:</b> The incorporated mitigation measures would constitute <i>preservation by record</i> .		
<b>Site specific mitigation</b>	None required		
<b>Residual Impact after site specific mitigation</b>	<b>None</b>		
<b>Significance of Residual Impact</b>	<b>Non-significant</b>		
<b>Sources</b>	Engineering sources	Engineering Information provided by Crossrail ES Scheme Description	
	Historical / Archaeological sources	A 300m radius search of the GLSMR and LAARC. Greater London Industrial Archaeology Society (GLIAS) database v.2.65 Brown G, 2002 'Roman Greenwich' in <i>Archaeologia Cantiana</i> , CXXII 2002 Mayhew H and Binny J 1862, <i>The Criminal Prisons of London</i>	
<b>Researcher</b>	HK, PA, RF, PM, JC	<b>Date</b>	17/01/2005



Fig 1 Site location

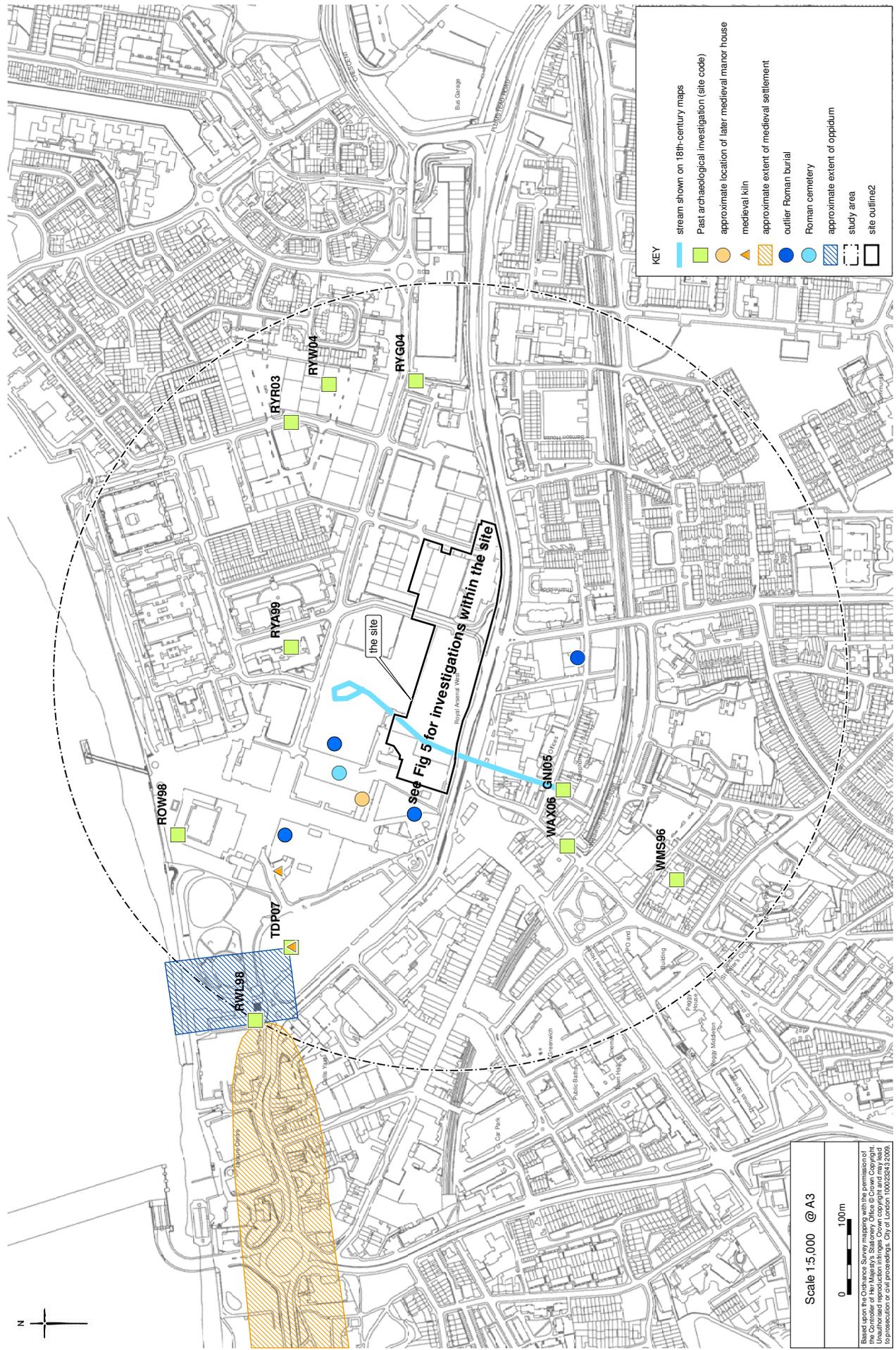


Fig 2 Principal archaeological and historical features

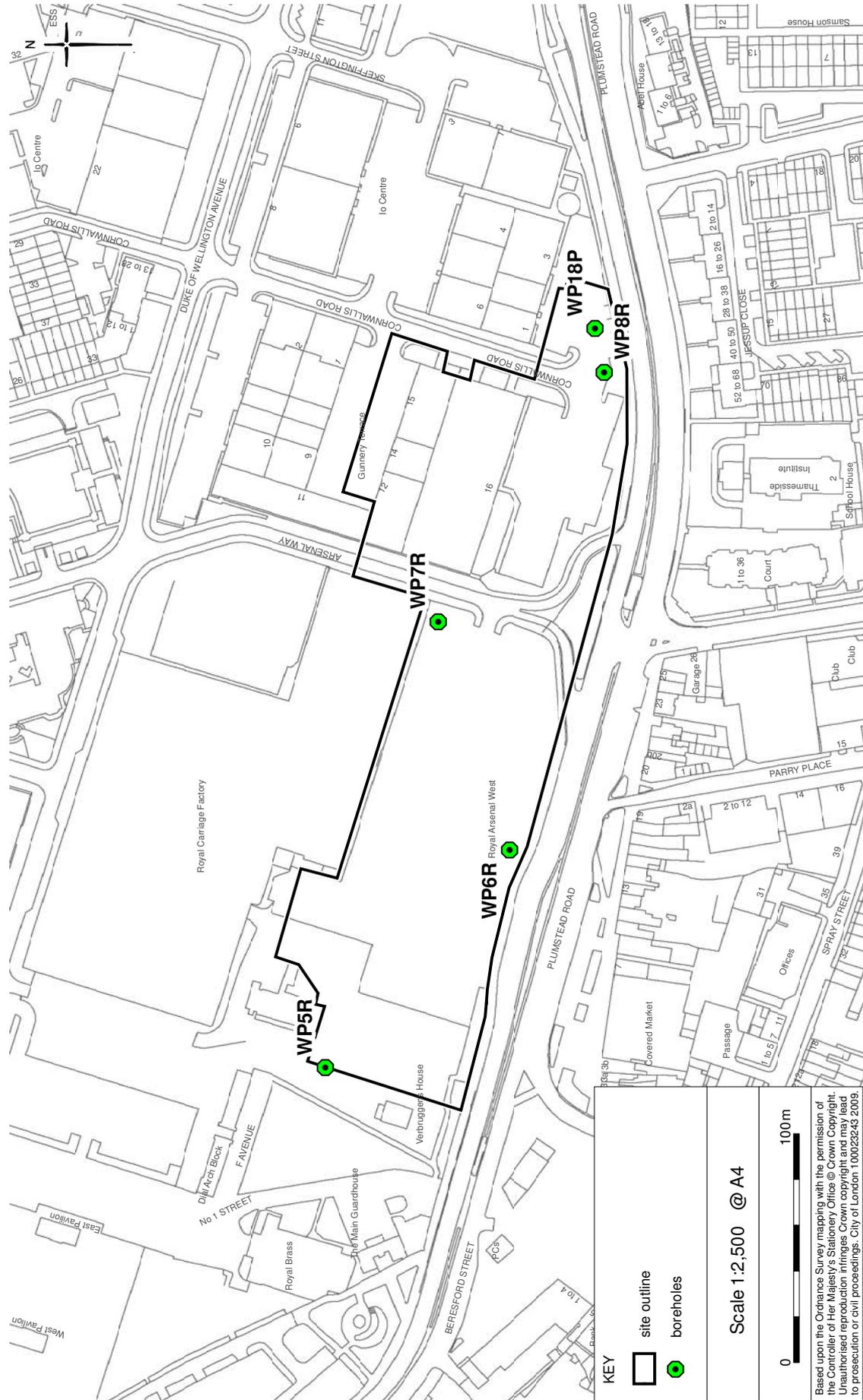


Fig 3 Location of boreholes monitored by MoLAS in 2006

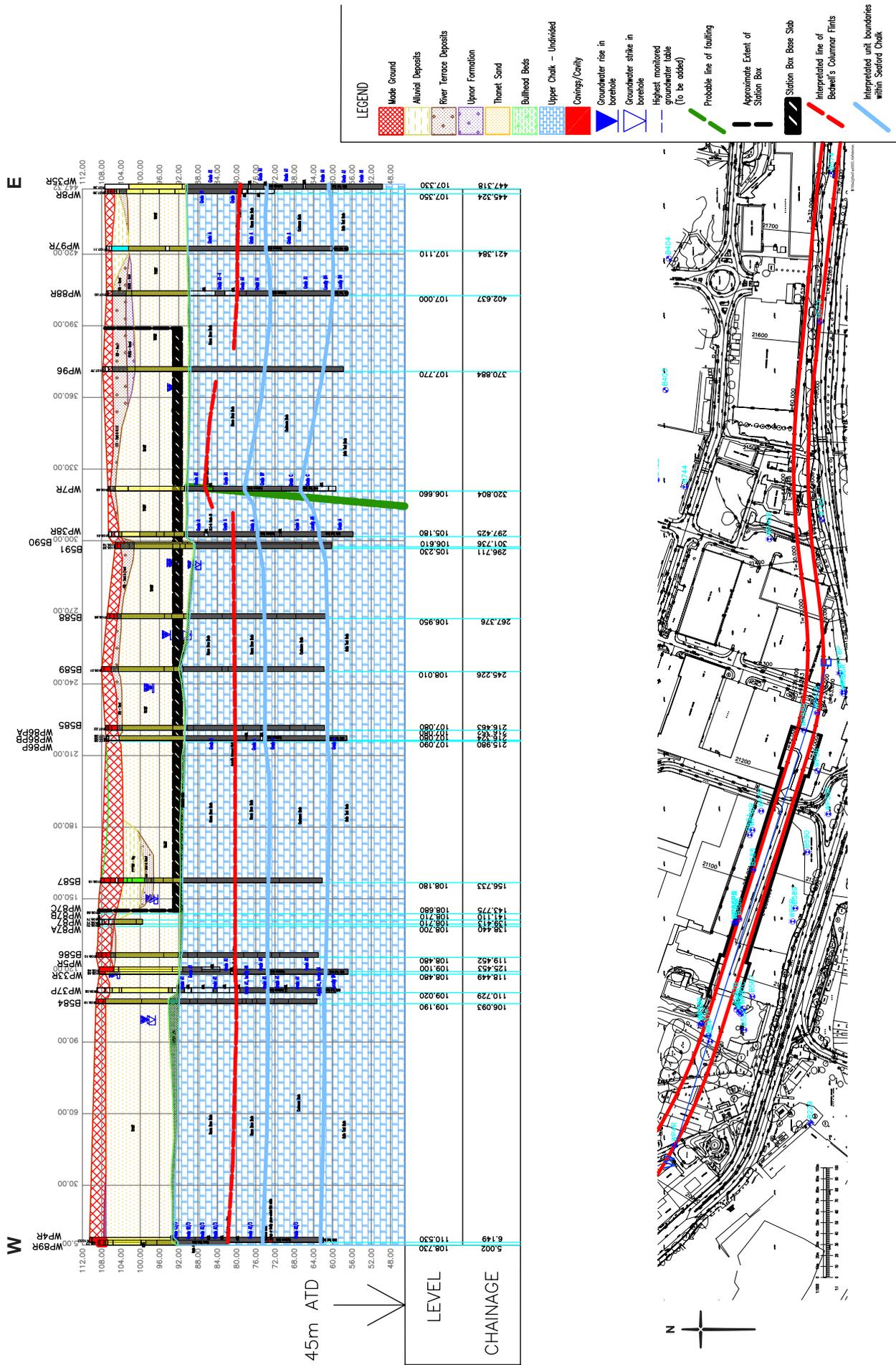


Fig 4 Geological Ground Model and Long Section through Station box (Waterman Proj. no. 11331, Number 003, Rv A04, 28/10/09)



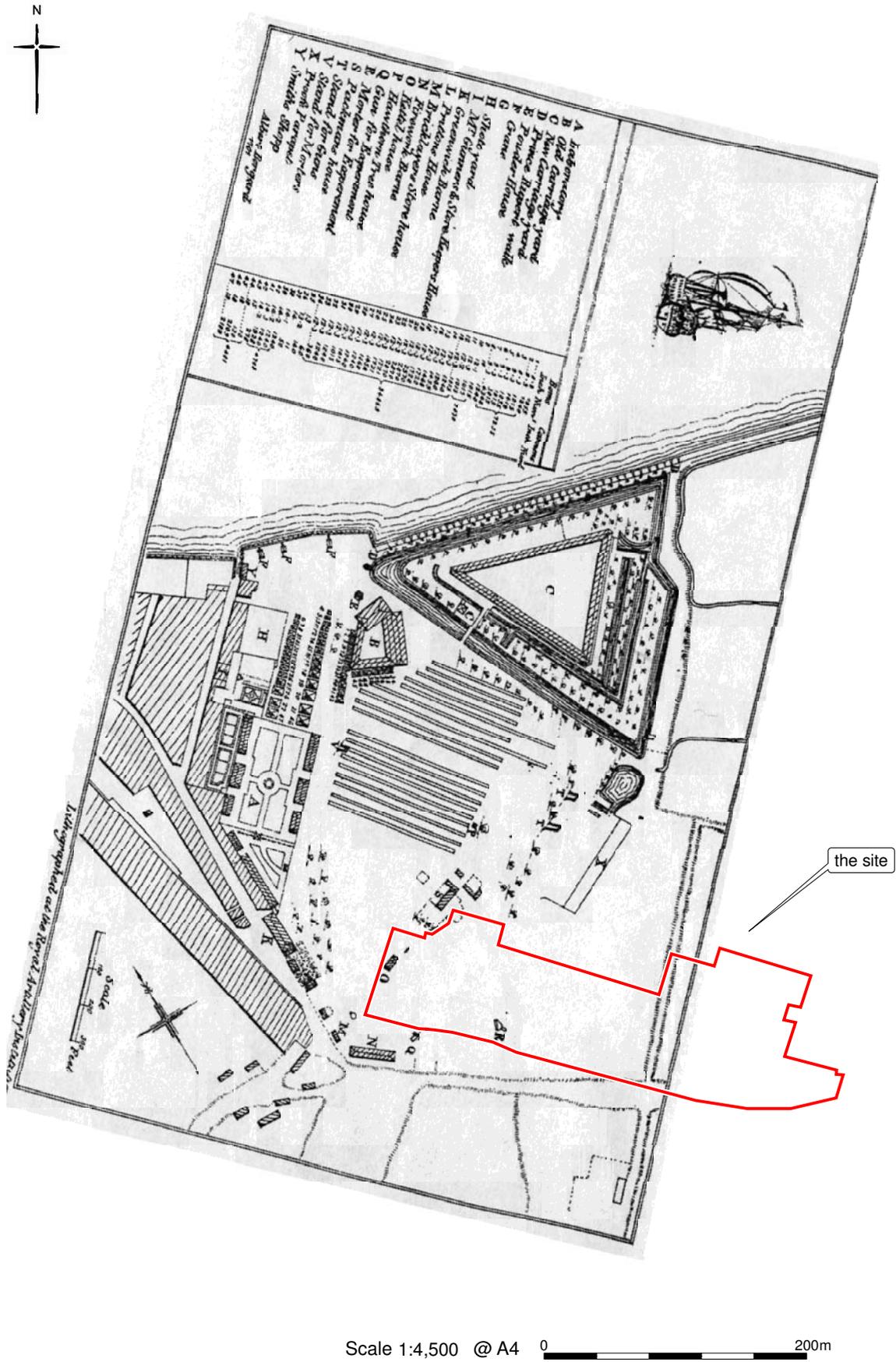
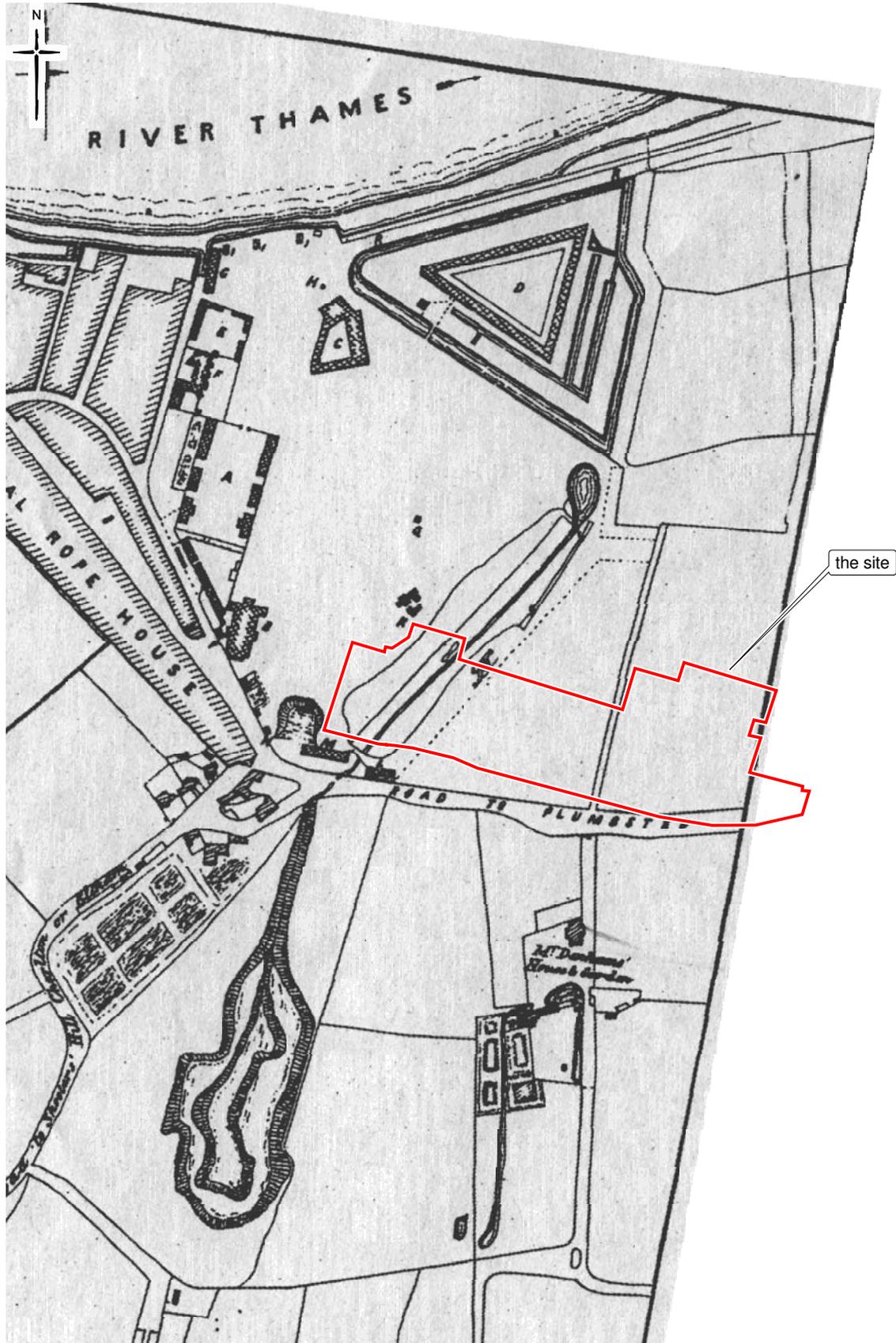


Fig 6 Woolwich Warren in 1701



Scale 1:4,500 @ A4 0 200m

Fig 7 Woolwich Arsenal in 1717



Scale 1:4,500 @ A4 0 150m

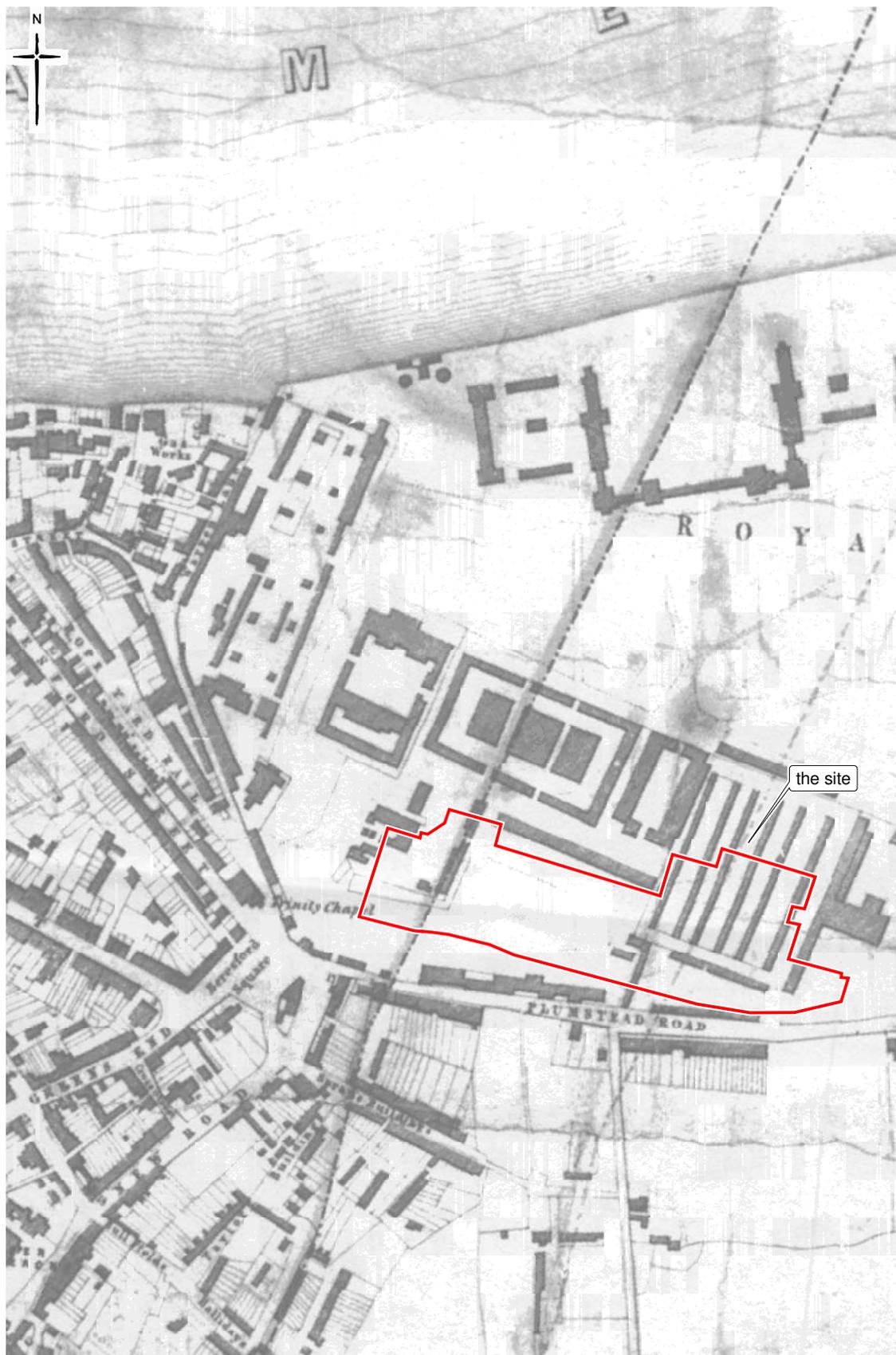
Fig 8 Rocque's map of 1746



Scale 1:4,500 @ A4 0 150m

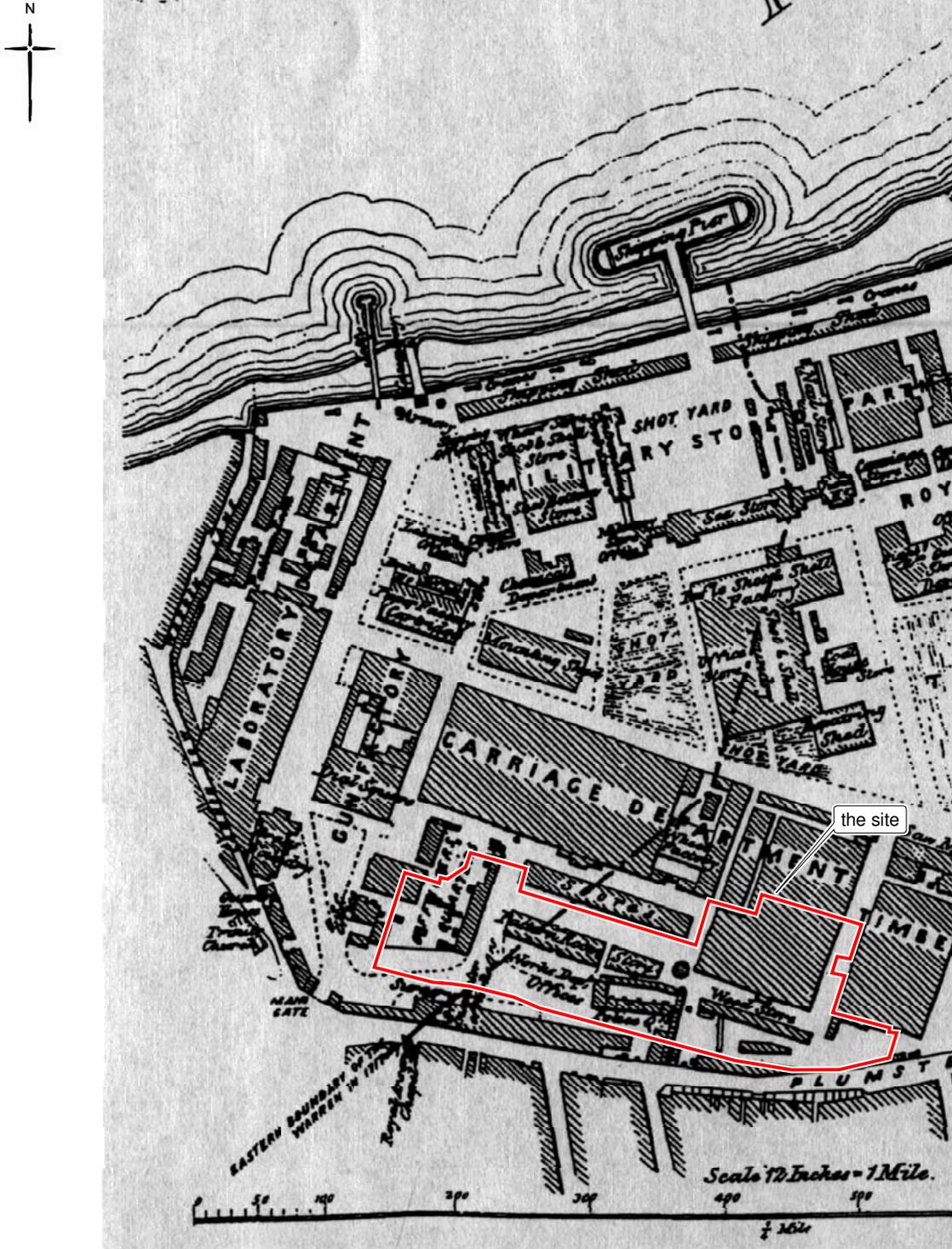
Fig 9 'An exact survey of the Warren in Woolwich', 1749





Scale 1:4,500 @ A4 0 150m

Fig 11 Map of Woolwich District, 1845



Scale 1:4,500 @ A4 0 150m

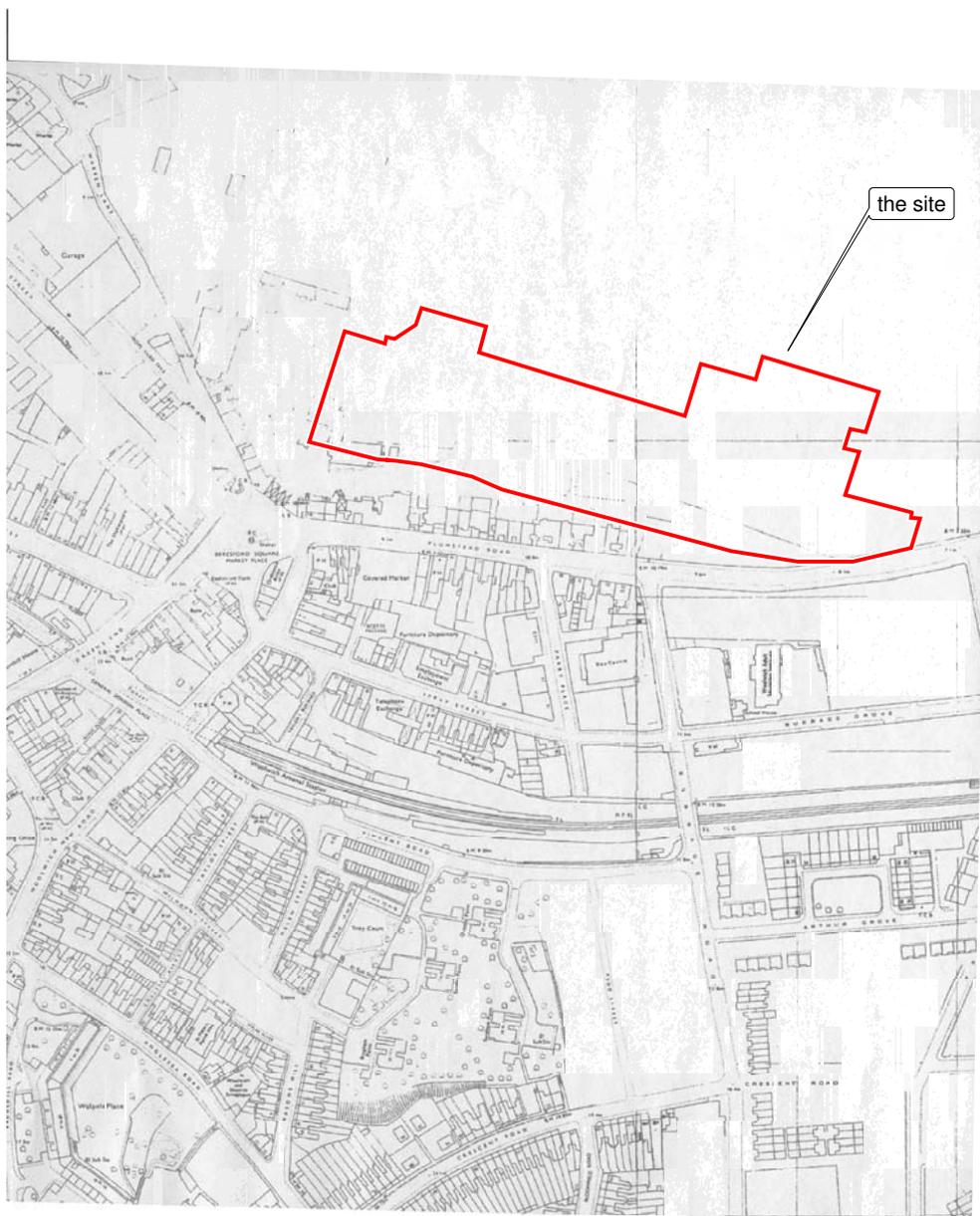
Fig 12 The Royal Arsenal, 1867





Scale 1:4,500 @ A4 0 150m

Fig 14 Map of the Royal Arsenal (MOD 1952)



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Scale 1:4,500 @ A4 0 150m

Fig 15 Ordnance Survey 1: 2500 scale map of 1980

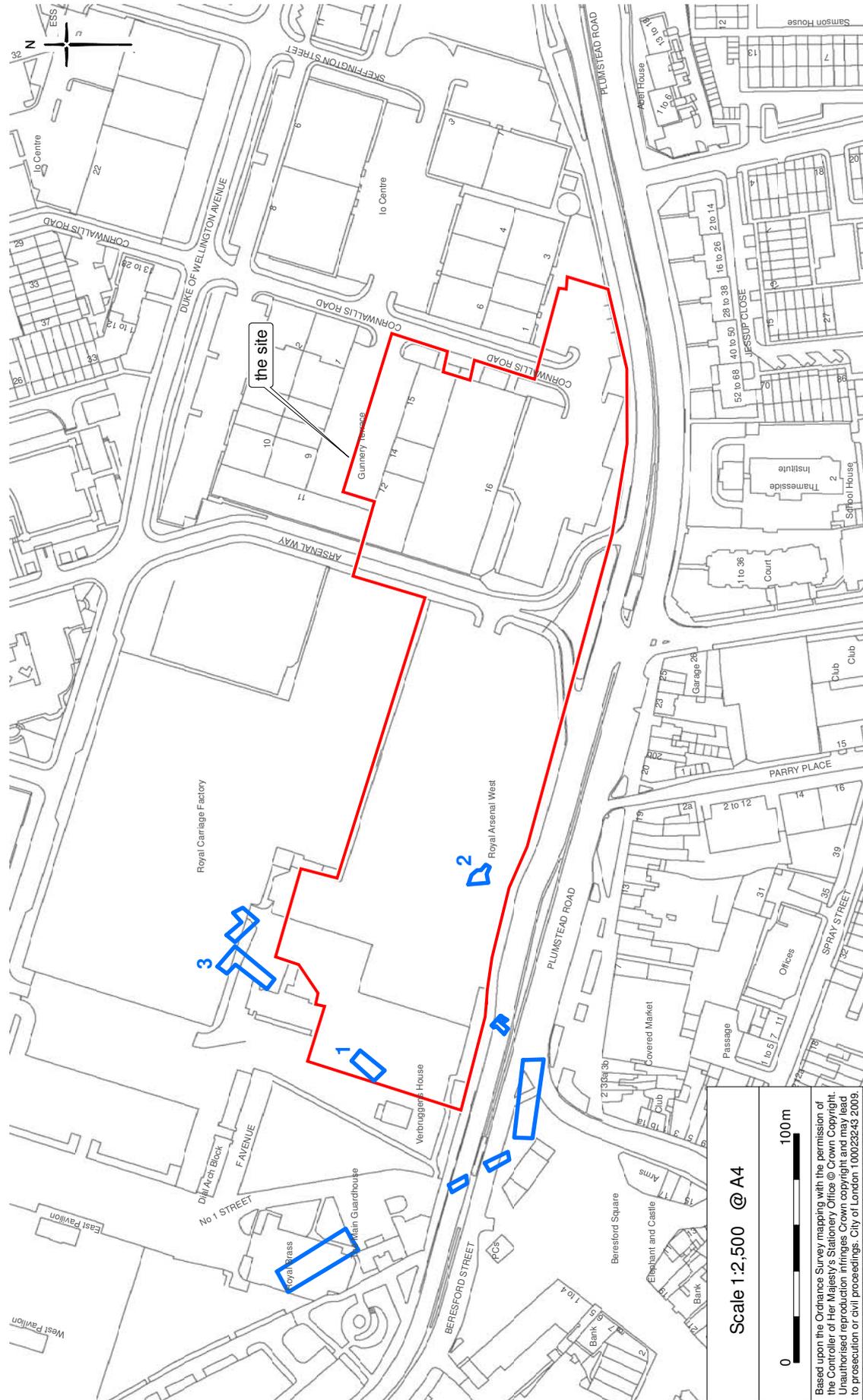


Fig 16 Schematic plan of the site with buildings shown on 1701 plan (see table 2)

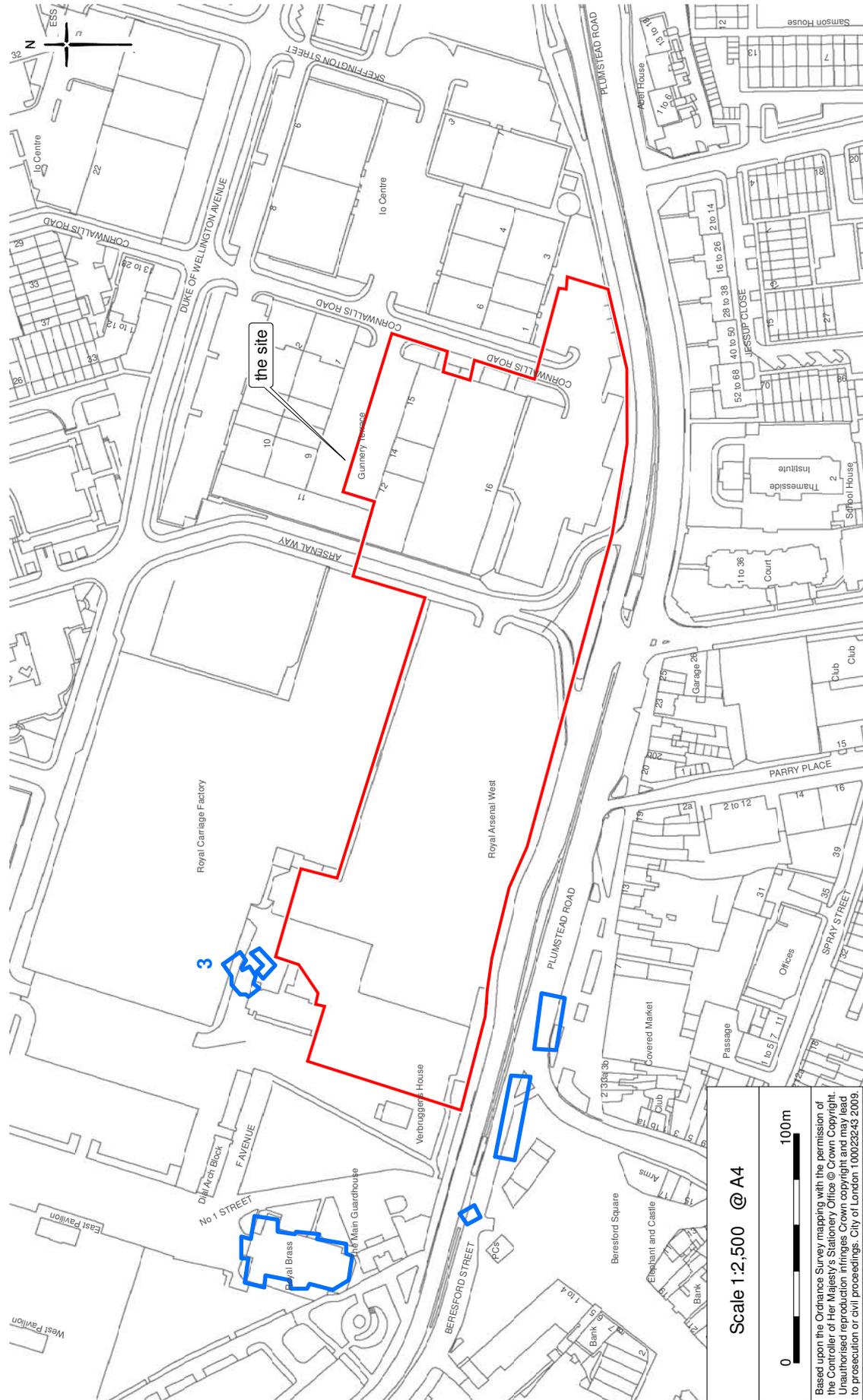


Fig 17 Schematic plan of the site with buildings shown on 1717 plan (see table 2)

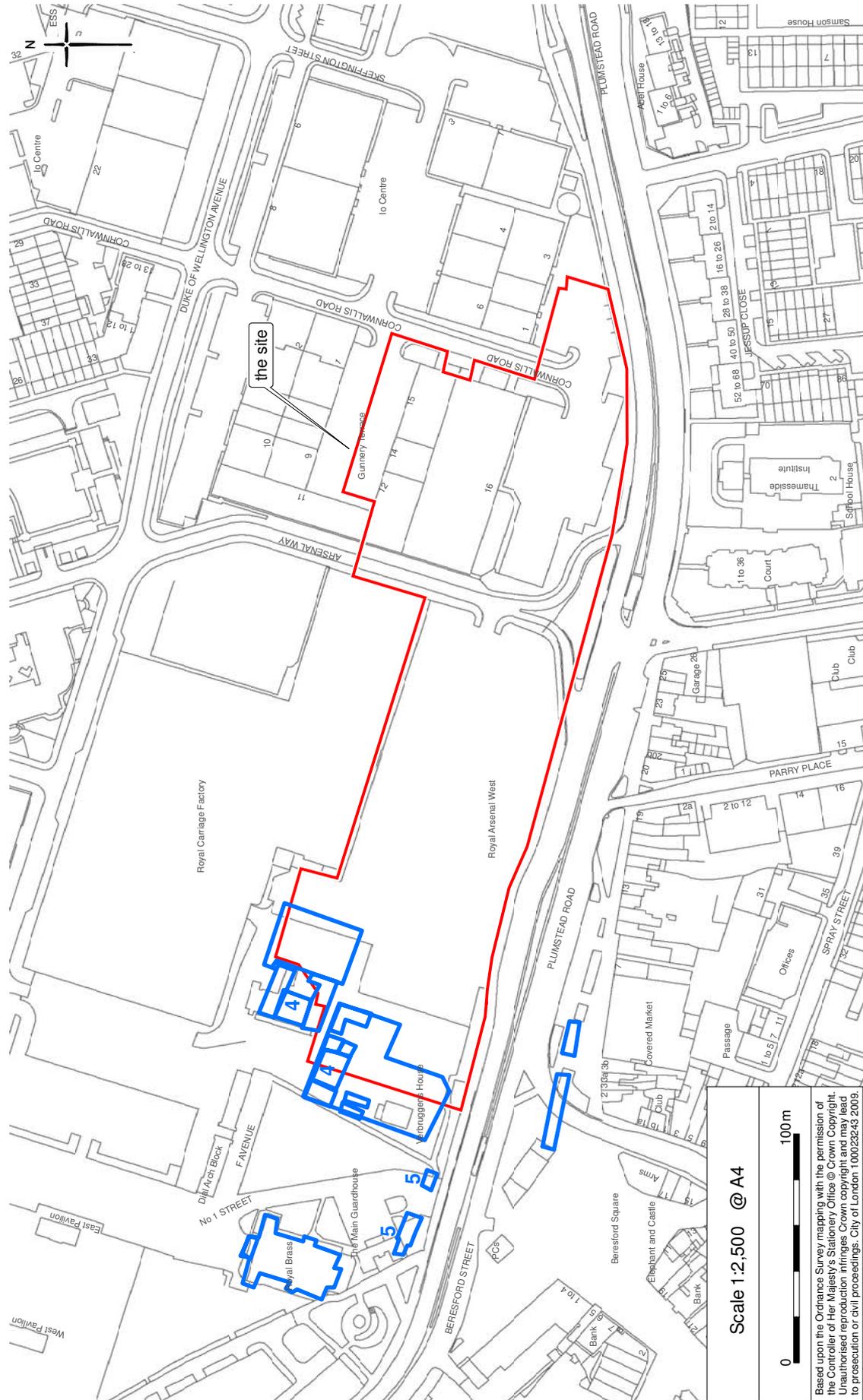


Fig 18 Schematic plan of the site with buildings shown on 1749 plan (see table 2)

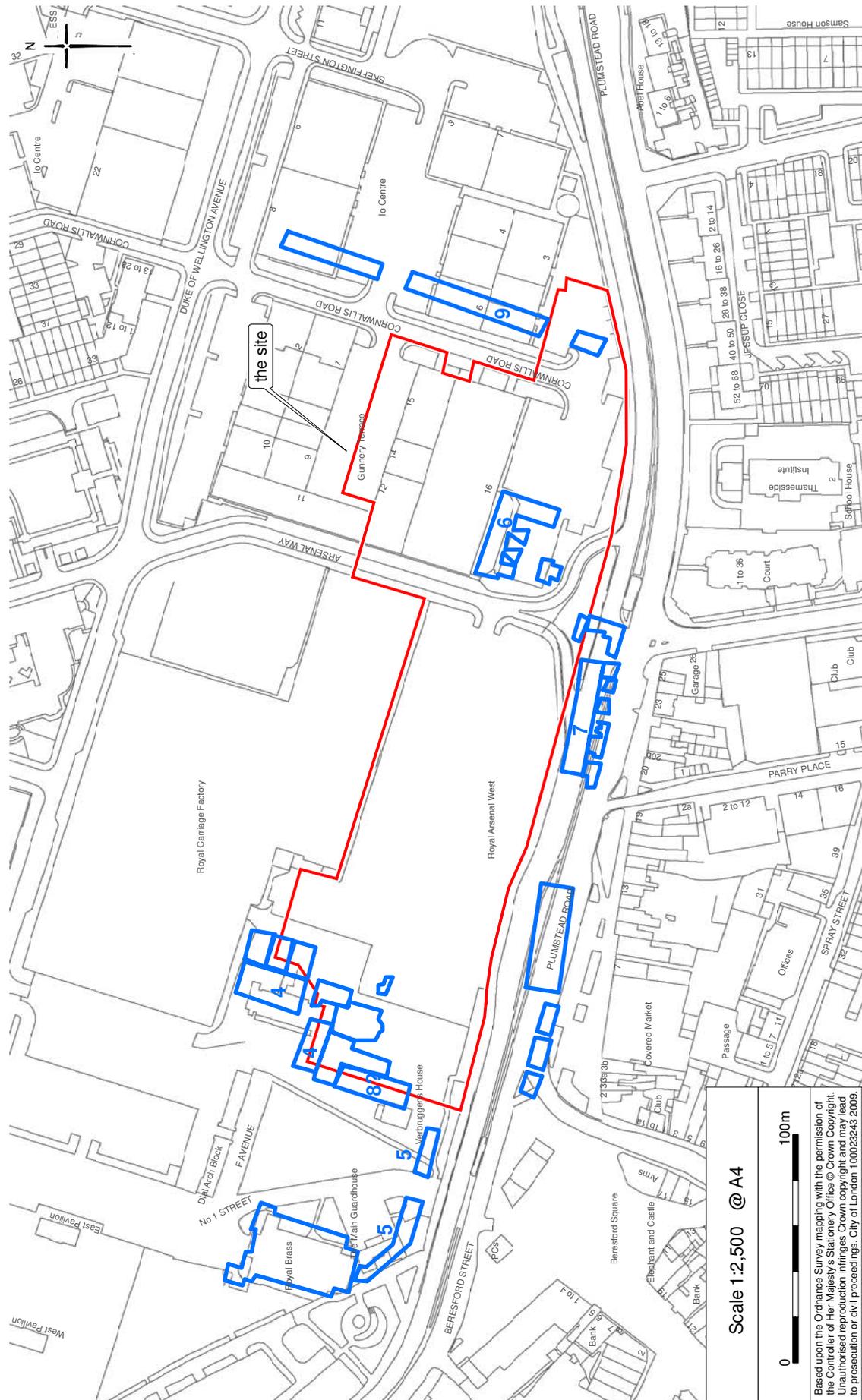


Fig 19 Schematic plan of the site with buildings shown on 1777 plan (see table 2)

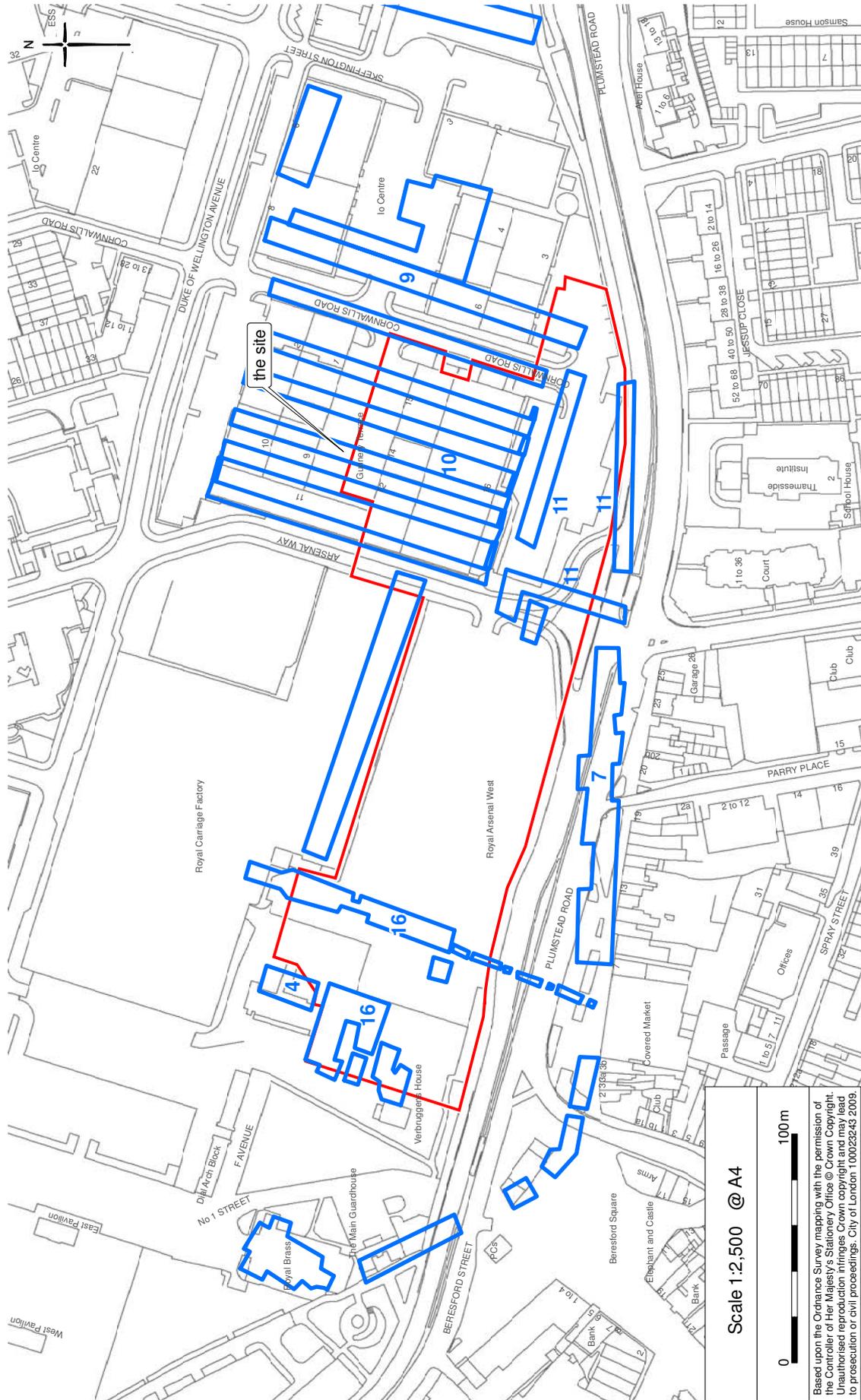


Fig 20 Schematic plan of the site with buildings shown on 1845 plan (see table 2)

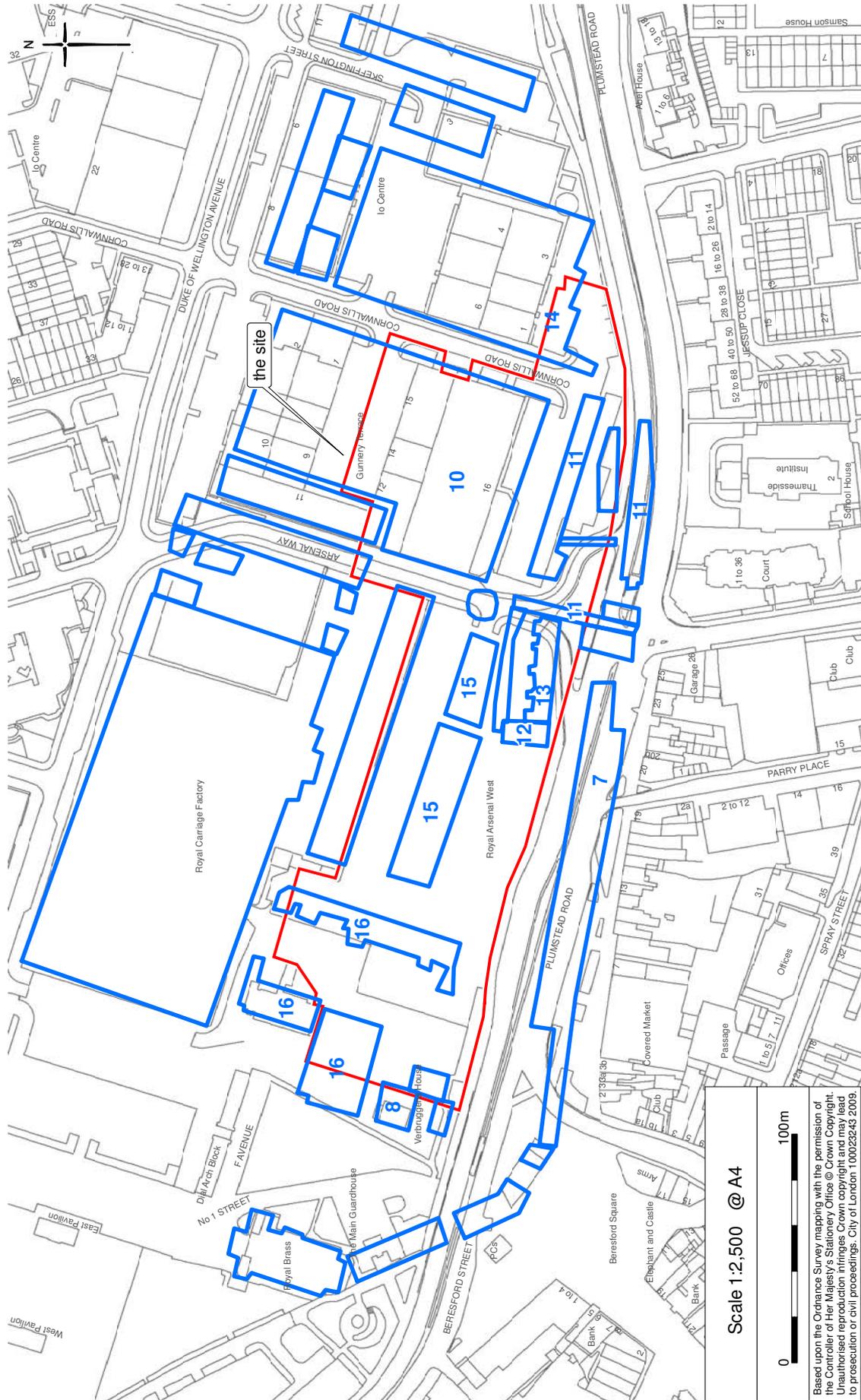


Fig 21 Schematic plan of the site with buildings shown on 1867 plan (see table 2)

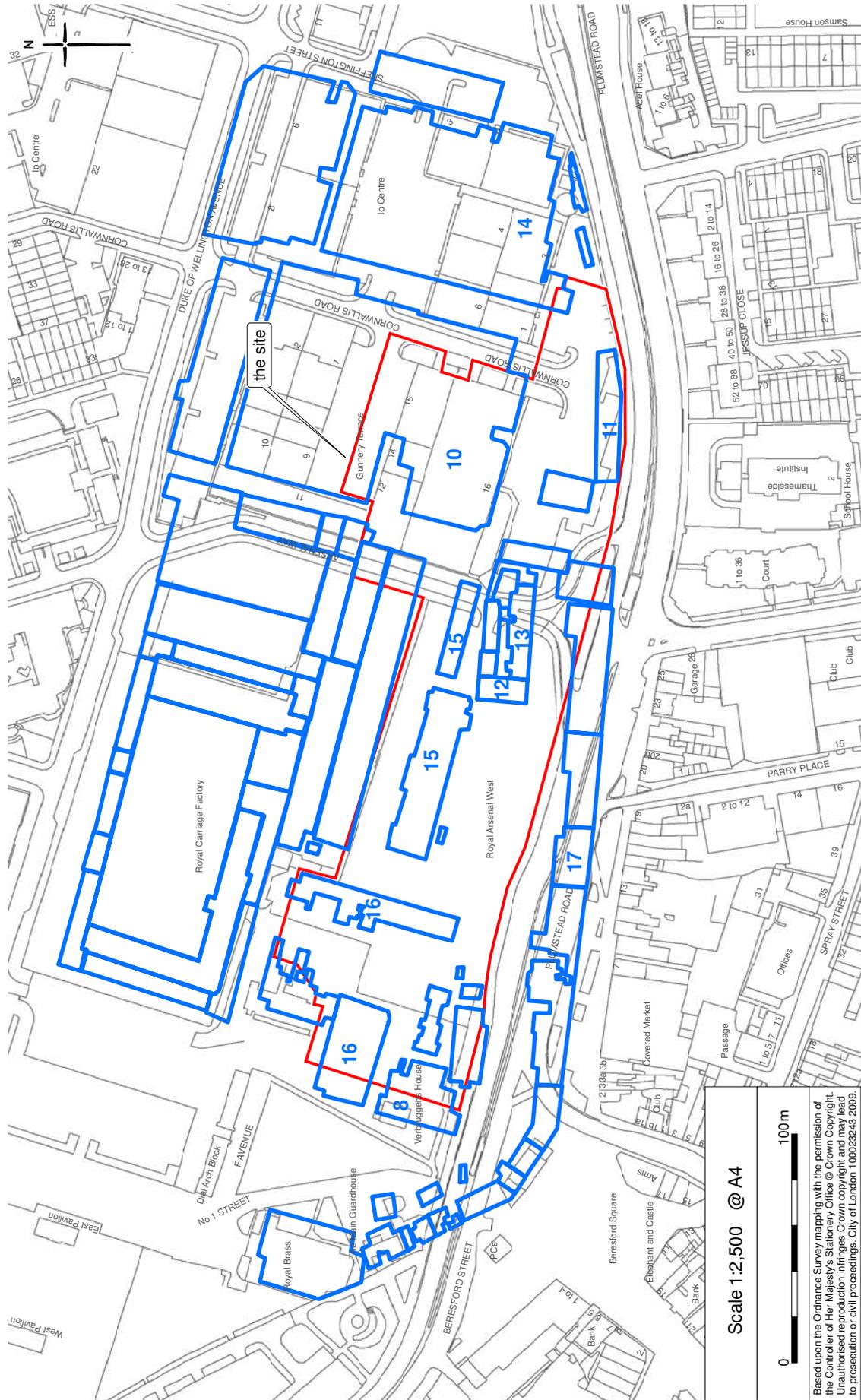


Fig 22 Schematic plan of the site with buildings shown on 1930s plan (see table 2)

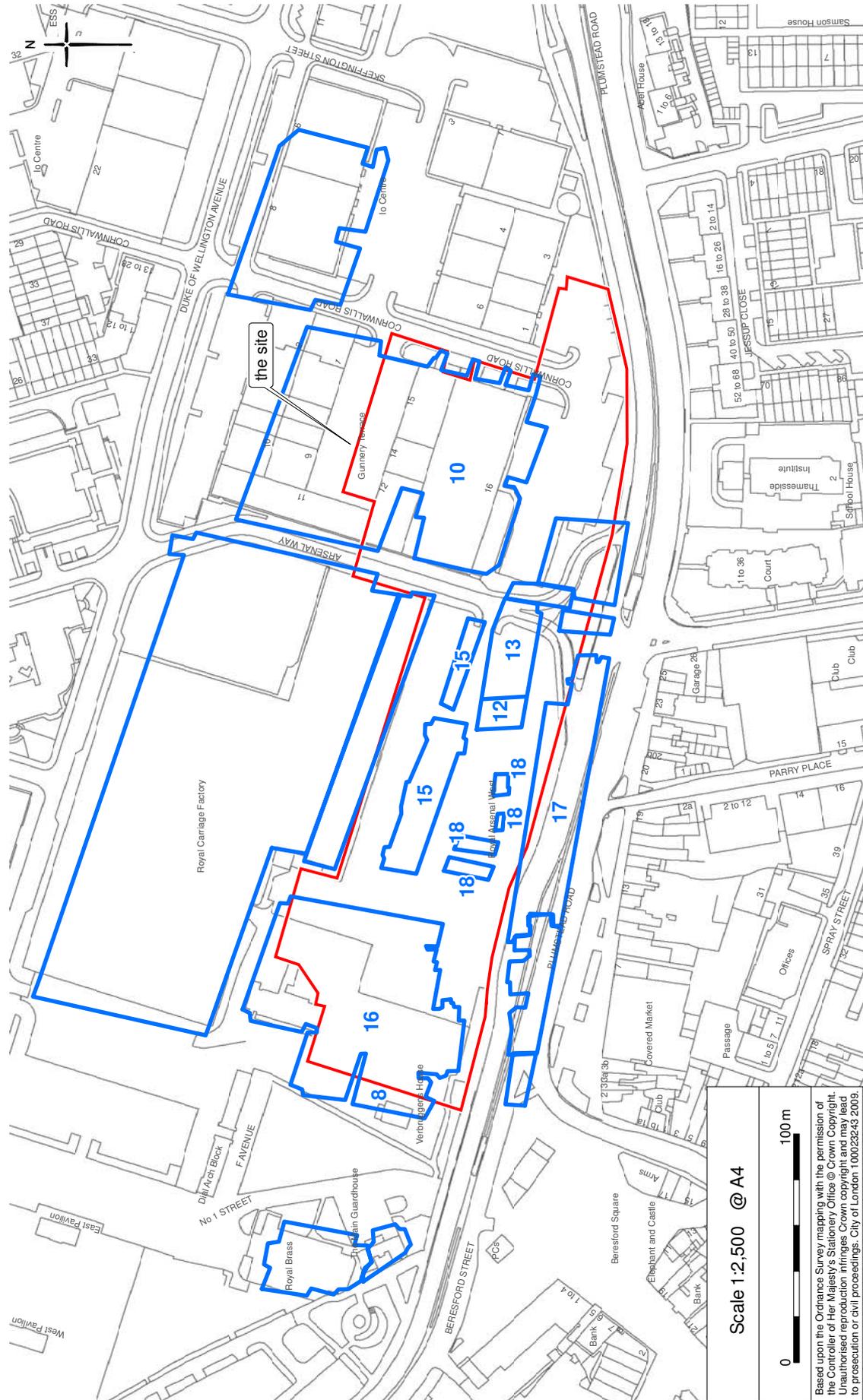


Fig 23 Schematic plan of the site with buildings shown on 1953 plan (see table 2)

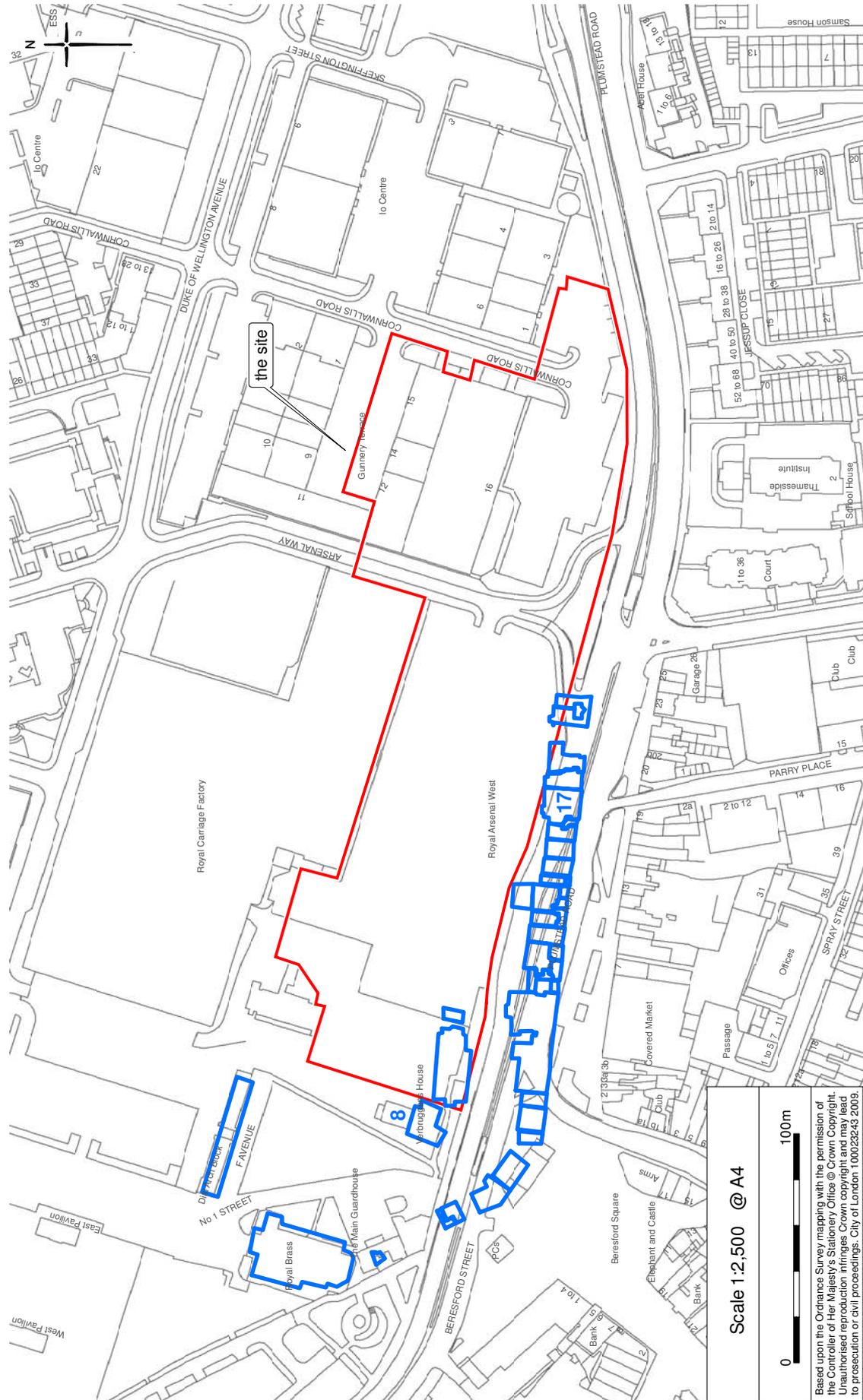


Fig 24 Schematic plan of the site with buildings shown on 1980 plan (see table 2)





Fig 26 The west elevation of Building 7, Units 12 and 16, Gunner Terrace, looking south-east (MOLA 20091023\_28.jpg)



Fig 27 The interior of the mid-late 19th-century part of Building 7, Unit 16, Gunner Terrace, looking west (MOLA 20091023\_13.jpg)



Fig 28 The interior of the late 19th-century addition on the south side of Building 7, Unit 16, Gunner Terrace, looking east (MOLA 20091023\_15.jpg)

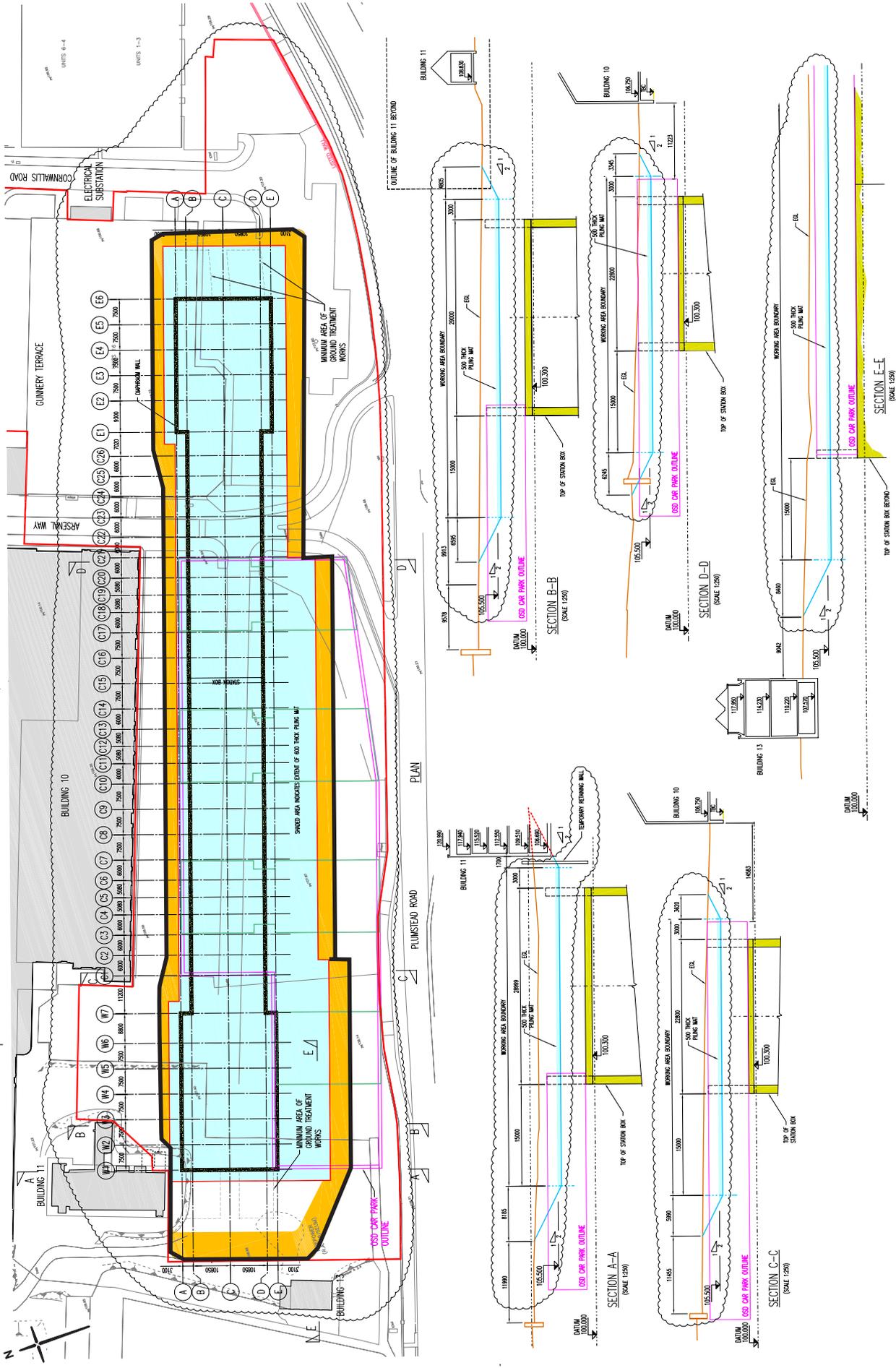


Fig 29 Proposed works (Waterman Proj. no. C11331, No. 0003, Rev A02, 11/12/09)