

*Wessex Archaeology*

# Broadwater Road, Thamesmead London Borough of Greenwich

Archaeological Desk-based Assessment

Ref: 55000.031

*April 2004*

**BROADWATER ROAD  
THAMESMEAD  
London Borough of Greenwich  
Archaeological Desk-Based Assessment**

Prepared on behalf of  
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**Figure 4 Merebrook Projects Ltd. ‘Site Investigation Locations’ plan (July 2003)**

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**Archaeological Desk-Based Assessment**

**Summary**

David Wilson Homes commissioned Wessex Archaeology to undertake an archaeological desk-based assessment of land covering some 3.8 hectares at Broadwater Road/Tom Cribb Road in the London Borough of Greenwich, centred on Ordnance Survey NGR 544475 179250 (hereafter the Site). This report aims to make an assessment of the potential archaeological resource on the Site, in order to assist the statutory authorities, the local planning authority, and the developer in formulating an effective strategy for the recording, preservation or management of that resource. This process follows advice set out in the Department of the Environment's Planning Policy Guidance Note 16 (PPG16). The Site has planning permission for residential redevelopment with an archaeological condition attached.

A Study Area (a square of side 2000m, centred on the Site) was defined to direct a search of all publicly available sources to assess the date and character of any potential archaeological deposits and features that might exist on the Site. There is only limited evidence for human activity in the Study Area from the Prehistoric to the early historic period and no indication of a specific focus on the Site itself. In the Post-Medieval period, major developments occurred to the west of the Site, with the construction of the Royal Dockyards and Ordnance Storehouses at Woolwich from 1518, and particularly the sequence of ordnance factories beginning with the Royal Laboratory in 1696, later known as the Royal Arsenal/Royal Ordnance Factory. Until the early 19<sup>th</sup> century the Site appears to have been undeveloped marshland.

The Site was first developed as part of an extension of the Royal Arsenal in 1812–14. This development consisted of land reclamation, and the construction of a canal system and adjoining ammunition production and storage facilities. Cartographic sources pertaining to the Site's development and operation by the Ordnance Board during the 19<sup>th</sup> century were examined at the National Archives (Public Records Office).

The Ordnance Factory declined after the First World War, finally closing in 1994. The canal was filled in and the Site cleared of buildings from the 1920s onwards. During the 1980s retained areas of hard standing were removed as part of a large-scale reclamation scheme to remove or seal contaminated ground. Documentation held by the London Development Agency was consulted for information on the Site's contamination and the extent of the modern remediation works. The possibility of contamination relating to past land-uses remains a significant concern on this Site.

Despite the substantial impacts of past development and remediation measures, some potential remains for the survival *in situ* of peat and alluvial sequences of Prehistoric and later date, as well as pre and Post-Medieval land surfaces, particularly relating to the use of the ordnance factory and its canal system in the 19<sup>th</sup> and early 20<sup>th</sup> century.

### **Acknowledgements**

David Wilson Homes commissioned this report. Wessex Archaeology would like to thank Eric Duff of the London Development Agency and the staff at the National Archives (Public Records Office) for their assistance.

Lawrence Pontin managed this project for Wessex Archaeology. The report was researched and written by Hilary Valler and edited by Bruno Barber. Mark Roughley produced the illustrations.

**BROADWATER ROAD  
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**Archaeological Desk-Based Assessment**

**1 INTRODUCTION**

**1.1 Project background**

1.1.1 David Wilson Homes commissioned Wessex Archaeology to undertake an archaeological desk-based assessment of land at Broadwater Road (the Site) in the London Borough of Greenwich. The Site covers an area of c.3.8 hectares, centred on Ordnance Survey National Grid Reference (NGR) 544475 179250 (**Figure 1**).

1.1.2 This study aims to collate the known archaeological and historical information about the Site and surrounding area, and to examine this in the light of impacts of known past development of the Site, in order to assess the potential for archaeological remains to survive within the Site boundary. The study also aimed to assess potential impacts on any archaeological resource likely to be caused by the development of the Site and to suggest appropriate strategies to mitigate those impacts.

1.1.3 The proposed scheme is at an early stage of design, but is understood to involve a housing development across the entire Site (see Section **5.3**).

1.1.4 The desk-based assessment (*Archaeological Assessment*) has been carried out in accordance with the standards originally specified by the Institute of Field Archaeologists (IFA 1999).

**1.2 Site description, topography and geology**

1.2.1 The Site is broadly rectangular in plan, bounded by Tom Cribb Road to the south, Broadwater Road to the east, and by Marshgate Path to the west. To the north, the Site is bounded by residential buildings, which front onto Carronade Place and Temple Close.

1.2.2 The Site presently is presently open ground, with a small number of trees along the south-east boundary and across the northern and central portions. Areas of raised ground exist on the eastern border with Broadwater Road, and along the western boundary.

1.2.3 Various phases of work have taken place on the Site with the intention of removing or sealing contaminated ground and preparing the Site for redevelopment. In the early 1980s foundations on the Site were removed and the excavations led to large earth movements and mixing of soils. Following geotechnical investigations in 1985 the Site was capped with a sand layer (Carpenter and Lowe Ltd 2001).

- 1.2.4 Previous ground investigations have shown the made ground beneath the Site to consist of two distinct layers. A sand capping of orange-brown, silty, slightly clayey-sand was recorded in varying thickness from 0.1m to 0.8m. Below this lies the 'old' made ground, this is typically of soft to firm dark grey to black sandy clay with brick and concrete rubble, loose gravel and clinker, recorded to a depth of up to 5m below ground level (Carpenter and Lowe Ltd 2001).
- 1.2.5 Beneath the made ground lie superficial drift deposits of alluvium. The alluvium comprises horizontal bands of stiff green clay, sand and gravels up to 6.9m thick with bands of fibrous peat. The underlying solid geology comprises Thanet Sand overlying Cretaceous Upper Chalk.



## **2 PLANNING AND LEGISLATIVE BACKGROUND**

### **2.1 National planning guidance**

#### *Scheduled Ancient Monuments*

- 2.1.1 The initial legislation concerning protection for archaeological and historical sites recognised as being of national importance is provided by the *Ancient Monuments and Archaeological Areas Act 1979* (as amended). Any developments that might impact Scheduled Monuments or their settings would normally be subject to the granting of Scheduled Monument Consent by the Department of Culture, Media and Sport.

#### *Listed buildings*

- 2.1.2 Protection for historically important buildings is principally based upon the *Planning (Listed Buildings and Conservation Areas) Act 1990*. Recent guidance on the approach of the planning authorities to development and historic buildings is provided by *Planning Policy Guidance Note 15: Planning and the Historic Environment* (PPG15), issued by the Department of the Environment in September 1994.

#### *Planning Policy Guidance Note 16*

- 2.1.3 Guidance on the importance, management and safeguarding of the archaeological resource within the planning process is provided by *Planning Policy Guidance Note 16: Archaeology and Planning* (PPG 16) issued by the Department of the Environment in November 1990. This set out the Secretary of State's policy on archaeological remains on land, and provided recommendations many of which have been integrated into local development plans. The underlying principle of this guidance is that archaeological resources are non-renewable, stating that:

*'where nationally important archaeological remains, whether scheduled or not, are affected by proposed development there should be a presumption in favour of their physical preservation [Para. 8]'*.

- 2.1.4 Appropriate management is therefore essential to ensure that they survive in good condition. In particular, care must be taken to ensure that archaeological remains are not needlessly or thoughtlessly destroyed. They can contain irreplaceable information about our past and the potential for an increase in future knowledge. They are part of our sense of national identity and are valuable both for their own sake and for their role in education, leisure and tourism.
- 2.1.5 The key to informed and reasonable planning decisions is for consideration to be given early, before formal planning applications are made, to the question of whether archaeological remains are known to exist on a site where development is planned and the implications for the development proposal. Paragraph 19 of PPG16 states:

*‘In their own interests...prospective developers should in all cases include as part of the research into the development of a site...an initial assessment of whether the site is known or likely to contain archaeological remains’.*

Paragraph 22 adds:

*‘Local Planning Authorities can expect developers to provided the results of such assessments...as part of their application for sites where there is good reason to believe there are remains of archaeological importance’.*

- 2.1.6 Development plans should reconcile the need for development with the interests of conservation — including archaeology. Detailed development plans should include policies for the protection, enhancement and preservation of sites of archaeological interest, and their settings.
- 2.1.7 Decisions by planning authorities on whether to preserve archaeological remains *in situ*, in the face of proposed development, have to be taken on merit, taking account of development plan policies and all other material considerations — including the importance of the remains — and weighing these against the need for development.

## **2.2 Local planning guidance**

- 2.2.1 The London Borough of Greenwich receives advice on archaeological issues in relation to planning matters from the Greater London Archaeology Advisory Service of English Heritage. The London Borough of Greenwich’s *Unitary Development Plan* (UDP) was adopted in November 1994. The policies set out in this document determine the position of archaeology as a material consideration in the planning process and incorporate recommendations from the Department of the Environment’s *Planning Policy Guidance Note 16* (PPG 16). The most important of the Borough’s policies and statements regarding archaeology are as follows:

**POLICY D27A:** At identified sites of known archaeological remains of national importance, including scheduled monuments, there will be a presumption in favour of the physical preservation of the remains *in situ* and to allow for public access and display. For sites of lesser importance the Council will seek to preserve the remains *in situ*, but where this is not feasible the remains should be either excavated and removed from the site, or excavated and recorded before destruction. Appropriate conditions/legal agreements may be used to ensure this is satisfied.

**POLICY D27B:** The Council will expect the applicants to properly assess and plan for the impact of proposed development on archaeological remains where they fall within ‘Areas of Archaeological Potential’. In certain instances preliminary archaeological site investigations may be required before proposals are considered. The Council will seek to secure the co-operation of developers in the excavation, recording and publication of archaeological finds before development takes place by use of planning conditions/legal agreements as appropriate.

*Reason:* The Borough's archaeological heritage represents a local community asset which is desirable to preserve and utilise both as an educational and recreational resource. The objectives of new development can often conflict with the need to preserve, or to remove and record such remains. Potential developers should be alerted early on in the planning process of likely remains so as to secure their preservation. The support of local archaeological groups is essential to this process. The potential for the discovery of significant remains in large areas of the Borough is high, whilst the opportunity to preserve such finite resources is usually restricted to one occasion.

**Para 6.64** The Council will also:

- (a) pursue land use policies which are sensitive to the potential threat development can pose to archaeological remains and adopt a flexible approach to the design of new development in areas where the preservation of archaeological remains is paramount;
- (b) Encourage co-operation amongst landowners, developers and archaeological groups by promoting the principles laid down in the British Archaeologists and Developers Liaison Group Code of Practice;
- (c) encourage developers to allow an appropriate level of archaeological investigation where significant remains are unexpectedly discovered during construction, and if applicable make provision for the provision or recording of such finds by a recognised archaeological organisation.

- 2.2.2 The Council has designated a number of Areas of Archaeological Potential in the borough. The present Site lies within one of these Areas, as defined on Map 10 of the Greenwich UDP.

### **2.3 Statutory constraints**

- 2.3.1 The Site does not contain any Scheduled Ancient Monuments or Listed Buildings. Certain chance archaeological finds might potentially be subject to compulsory reporting in compliance with the Treasure Act 1996 or the Burial Act 1857.
- 2.3.2 The Site falls within an Area of Archaeological Potential (as defined on Map 10 of the Greenwich UDP), where UDP Policy D27B (above) applies.

### 3 METHODOLOGY

- 3.1.1 For the purpose of this report, a Study Area was established as a square of side 2000m, centred on Ordnance Survey NGR 544475 179250 (the Site centre) (**Figure 1**). The Study Area allows an assessment of the archaeological potential of the Site to be made through consideration of its wider context, for example known archaeological sites and findspots as listed in the Greater London Sites and Monuments Record and available cartographic sources.
- 3.1.2 Research for this report was undertaken between 17<sup>th</sup> December 2003 and 19th March 2004. The following sources of information were consulted:
- Greater London Sites and Monuments Record (GLSMR) and Historic Buildings Record, maintained by English Heritage's Greater London Archaeological Advisory Service (GLAAS). The GLSMR comprises a record of all known archaeological sites and findspots. For the purpose of this report, the data has been synthesised and assigned a Wessex Archaeology (WA) number. These are listed in **Appendix 1** and located on **Figure 1**.
  - London Development Agency for relevant reports.
  - National Archives (Public Records Office) for cartographic sources. All maps consulted are listed in **Appendix 2** and those that show relevant information are presented in **Figure 2** and **Figure 3**.
  - Other geotechnical reports provided by the client, listed in the bibliography (Section 7), and referred to in the text as appropriate.

## 4 RESULTS

### 4.1 Explanation of numbering

- 4.1.1 There are no known archaeological sites and findspots from within the boundaries of the Site itself. The archaeological and historical background of the Study Area is described by chronological period in the following sections. Relevant sites and findspots referred to in the text, including the GLSMR entries, have been re-ordered and re-numbered with a site-specific Wessex Archaeology (WA) numeration. These are shown in **Figure 1** and listed in **Appendix 1**.

### 4.2 Prehistoric (c.500,000 BC – 43AD)

#### *Palaeolithic (c.500,000 – 10,000 BC)*

- 4.2.1 Although there are important finds of Palaeolithic date from the north bank of the River Thames and the Lea Valley, there are none from the Study Area.

#### *Mesolithic (c.8,500 – 4,000 BC)*

- 4.2.2 A water channel (**WA 1**) dating from the Late Mesolithic to the Early Neolithic period was found during borehole investigations in Battery Road approximately 675m to the north east of the Site. Work was conducted by Geoarchaeological Service Facility (GSF) in 1994 (Site Code GSF 94/03). Localised deposits found in the sequence, included peats which formed during a period of falling sea levels known as the ‘Tilbury II regression’. These deposits were interpreted as buried land surfaces marginal to a major channel, dissected by tributaries and subject to flooding, erosion and re-working. Some 150m north-west of this find, an evaluation undertaken by Museum of London Archaeological Services (MoLAS) in 1997 (Site Code GAC97), found struck flint, fire-cracked flint, animal bone and charcoal (**WA 2**). These date to the same period and were thought to represent localised human activity, possibly associated with the watercourse.

#### *Neolithic (c.4,000 – 2,400 BC)*

- 4.2.3 The borehole investigation, as shown above (above **4.2.2**) shows that the sequence of peat and alluvium continued to form through the Neolithic period (**WA 3**). One peat layer was identified as belonging to the Tilbury III regression phase (late Neolithic to early Bronze Age).

#### *Bronze Age (c.2,400 – 700 BC)*

- 4.2.4 In November 1996 MoLAS undertook a series of archaeological boreholes at Gallions Reach Urban Village (Site Code GR96), some 600m north-east of the Site. The recorded sequence of deposits (**WA 4**) was of gravel sealed by sand and clays, in turn overlain by peats dated to the Bronze Age. Further to the north-east, another evaluation (GAC97) also recorded peat deposits identified as related to the Tilbury IV regression phase, dated to the Bronze Age (**WA 5**). The same evaluation also revealed a stream channel (**WA 9**) filled with silt and peat layers representing seasonal flooding which are dated to the Bronze/Iron Age.

- 4.2.5 Preserved wood and a Bronze Age sword were found 475m west of the Site during the digging of ditch in 1777 or 8 (**WA 6 & WA 7**). A further bronze weapon (**WA 8**) was found some 200m north of the Site.

*Iron Age (c. 700 BC – AD 43)*

- 4.2.6 On Battery Road (675m north-east of the Site), the upper levels of the sequence of deposits recorded in borehole investigations (GSF94/03) were interpreted as estuarine alluvium which had formed close to the edge of the channel (**WA 9**). The same investigation recorded other deposits interpreted as probable river-edge archaeological contexts (ground surfaces) of Iron Age and Roman date (**WA 10**). These later deposits lay within three meters of the present ground surface.
- 4.2.7 An Iron Age hillfort or oppidum (**WA 11**) is presumed have lain approximately 750m west of the Site, at Woolwich Powerstation. The settlement would have been situated on the Thames riverside, but little evidence has been found to confirm its presence. An excavation undertaken by South East London Archaeological Unit (SELAU) in 1986 revealed a large ditch running north to south, produced late Roman material. No report giving the detailed results of this excavation has been found, and there are no other finds of Iron Age date recorded in the vicinity of the Site.

*Undated Prehistoric*

- 4.2.8 One findspot of pottery sherds (**WA 12**) is listed in the GLSMR as Prehistoric, with no specific date associated with it. It lies 475m to the south-west of the Site centre.

**4.3 Romano-British (AD 43 – 410)**

- 4.3.1 A pot containing eight coins of Trajan (AD 98–117) was found near to Sandbach Place (**WA 13**), c.500m to the south of the Site. A coin of Antonius Pius (AD 138–161) (**WA 14**) and part of a Roman slide key (**WA 15**) were found in Plumstead 950m to the south-east. An evaluation in Milk Street, 800m to the west of the Site, by Newham Museum (Site Code HE-MS96), recorded late 2<sup>nd</sup> to late 3<sup>rd</sup> century pottery and other domestic refuse in a dump layer (**WA 16**). Three postholes were recorded cutting through this layer (**WA 17**), possibly indicating the site of a settlement. Some 1km south-east of the Site, a coin of Constantine I (AD 308–357) (**WA 18**) and one of Constantius II (AD 337–361) (**WA 19**) were found, providing more evidence of Roman settlement in the vicinity of Plumstead.
- 4.3.2 There is a known cemetery c.600m to the west of the Site, at the Royal Arsenal Carriage Depot. Bones and ashes in a large urn with two small accompanying vessels are recorded (**WA 20**), while another cremation burial was found in Dial Square (**WA 21**) 50m further to the south west, with votive pottery (**WA 22**) found on the Plumstead Road. A burial with 3<sup>rd</sup> to 4<sup>th</sup> century coins was recorded approximately 450m south-west of the Site, in Burrage Road (**WA 23**).

#### **4.4 Saxon and Medieval (AD 410 – 1499)**

- 4.4.1 An early Anglo-Saxon coin was recovered from the site of Woolwich Powerstation (**WA 24**) approximately 750m to the north-west of the Site. A similar distance south-west of the Site, an evaluation by MoLAS at 8 Wilmount Street (Site Code WN96) recovered residual abraded pottery dating to the 10<sup>th</sup> – 11<sup>th</sup> centuries (**WA 25**). The evaluation also revealed a small pit or possible posthole (**WA 26**) which contained abraded century pottery of 13<sup>th</sup> century date (**WA 27**).
- 4.4.2 A possible pair of Medieval rowel spurs (**WA 28**) with a dagger (**WA 29**) were recovered from Plumstead approximately 950m south-west of the Site.

#### **4.5 Post-Medieval and Modern (AD 1500 – present)**

##### *The Arsenal*

- 4.5.1 From 1518 Woolwich was the site of the Royal Dockyards and ordnance storehouses. Development closer to the present Site only began in 1671, with the purchase by the Crown of Woolwich Warren, later known as Royal Arsenal West (**WA 30**).
- 4.5.2 The origins of the property, on which the Royal Arsenal came to be built, can be traced to the purchase of a mansion by Sir Martin Bowes in 1538. The mansion (**WA 31**) lay between Gunwharf and The Warren. It was reconstructed in about 1545. Bowes enclosed part of the garden and owned mills and a mill pond to the east. After Bowes' death (1566), the estate was sold to John Peers, who passed it to brothers George and John Barne. The land passed through various hands before being sold to the Crown in 1671 to be used as an ordnance store. The mansion was adapted for the use of Ordnance officers in 1682–3 and later divided into apartments for the storekeeper, the Master Gunner of England and the Lieutenant of the Ordnance. The Arsenal began as a storage depot: the change of role to that of munitions factory only began in 1696 with the construction of the Royal Laboratory (**WA 32**) for the purpose of manufacturing ammunition. In 1715–17 the Royal Brass Foundry was established (Royal Artillery Museum 2003). The Royal Ordnance Factory (**WA 33**) (as it was later called) remained in operation until its final closure in 1967.
- 4.5.3 A storehouse for fireworks (**WA 34**) was built at the Warren in 1672–3. It collapsed after 1713 and was rebuilt in 1717. The building was converted to an infirmary in 1741. Foundations found during construction in 1888 may have been part of the Firework Barn. A workshop (**WA 35**) was built on the Royal Arsenal to the west of the Site. At Prince Ruperts Walk, some 425m north-west of the Site, a carriage yard was constructed in 1705 and a Thames-side wharf in 1712 (**WA 36**).
- 4.5.4 A major courtyard complex (**WA 37**) was built some 450m west of the Site in 1717–20, possibly designed by Nicholas Hawksmoor. The building, once called Great Pile, is now called Dial Square. It originally comprised single storey buildings surrounding two courtyards. Artificers' Court to the south,

contained the smithy, carpenters shop and the turning, washing and engraving houses for gun-making. Basin or Fountain Court to the north contained the armourers' shops and the Master Founders house.

- 4.5.5 The Regiment of Artillery was formed at the Arsenal in 1716, and in 1741 the Royal Military Academy was established (Clarke 2003). The Academy Room (**WA 38**) originally had a gallery around all four sides.
- 4.5.6 A barracks for gentlemen cadets (**WA 39**) was built on Plumstead Road in 1751. It was demolished in 1988. The gun foundry on Plumstead Road (**WA 40**), designed by the Board of Ordnance, was built on the demolished Greenwich Barn, with houses and an orchard to its east. The building was designed to provide a complete artillery service for the army and navy. It was built of wood, framed in a brick shell, with one large and one small furnace. The building was rebuilt in 1771–4 with the timber frame being replaced by brick after being burnt down by one of the furnaces. The Gateway (**WA 41**) of the foundry still survives, with a recently restored pair of cast iron gates. An Officers Mess (**WA 42**) lies to the west of the Site.
- 4.5.7 To the north of the Site, a military ferry (**WA 43**) across the Thames was established in 1803, as a result of the increased workload caused by the Napoleonic Wars. It ran from a boathouse at the east end of the Arsenal site to the Essex shore. A ferry service during the First World War followed a similar route.
- 4.5.8 Some 300m west of the Site lay a storehouse (**WA 44**) built for the Arsenal between 1805 and 1814. It was a grand building with three ranges. In 1831 some walls were rebuilt due to cracking caused by poor foundations. Middle Gate House (**WA 45**), some 100, south-west of the Site was built for the storekeeper of the Royal Arsenal where Wither's Farm had previously stood, it was converted to offices in 1920.
- 4.5.9 In 1805 King George III visited The Warren and gave it the title of the Royal Arsenal, marking its prime significance in ordnance manufacturing (Royal Artillery Museum 2003). In the early part of the 19<sup>th</sup> century, possibly between 1806 and 1810, a Martello Tower (**WA 46**) was built to protect the southern part of the Arsenal. It disappeared before 1813 with the construction of a sawmill in the area.
- 4.5.10 All of the above Post-medieval entries relate to the development of the Arsenal well to the west of the Site itself. The earliest known major development on the Site itself is marked by the construction of a canal system from 1812 onwards (**WA 47**). The first canal, built between 1812 and 1814, was dug along the eastern side of the Arsenal and marked an eastward expansion of the Arsenal, including the area of the Site within its boundaries for the first time (**Figure 2**). Land reclamation works would have taken place as part of the development. The canal acted as both the eastern boundary, and as part of the eastern defences of the Arsenal, but its main purpose was to provide easy transport of materials between the river and the Arsenal. At the mouth of the canal, the Thames river-wall was rebuilt, and the canal was lined with embankments. An entrance lock (**WA 48**) from the Thames to the



canal was built to bring supplies (especially timber) into the Arsenal. A western branch of the canal, adjacent to the sawmill, was added in 1814–16 for the unloading of timbers from barges. It is this branch of the canal that traverses the present Site (**Figure 2**).

- 4.5.11 In 1814–16 two brick-built, octagonal guardhouses (**WA 49**) were built on either side of a causeway to protect the Thames frontage of the Arsenal. The western building was for the use of officers and to the east for the men of the guard. Steps which lead down to the river were removed in 1931. One of the entrances from the Plumstead Road was called the Middle Gate (**WA 50**); it was formerly known as Plumstead Gate. Further to the west another gateway (**WA 51**) was built due to improvements to the Royal Arsenal when the entrance was moved from Warren Lane. It originally consisted of two gate piers of Neoclassical design with flanking gate houses of one storey plus attic. It has been heavily altered with two floors added to the west side, including a bell tower in 1859. In 1986 the gateway was partially demolished and isolated from the rest of the Arsenal with the building of a new road.
- 4.5.12 A small presbytery (**WA 52**) on Woolwich New Road was built in 1843. Designed by AWN Pugin, it had a large extension added in 1870 by his son, EW Pugin.
- 4.5.13 The first section of the Royal Arsenal Railways (**WA 53**) opened on the 10<sup>th</sup> January 1873. It was later extended to connect and feed all the departments of the Site. Trains ran to a timetable and included passenger trains between the main gates and the eastern end of the Site. In 1907 the rail system comprised 47 miles of track, with ten stations along the length of the Arsenal. By 1918 this had grown to 120 miles of track. Surviving remnants include a single narrow gauge line behind the Dial Arch Block and tracks which entered an 1887 carriage inspection shed. Tracks and crossings exist on other parts of the Arsenal and it is likely that many more are covered by modern surfaces. An iron swing bridge (**WA 54**) to the south east corner of the canal's river lock was built c.1876 to serve a standard gauge line to connect with the London Chatham Dover Railway (LCDR) at Plumstead.
- 4.5.14 The development of the railway, yards and ordnance factory buildings on either side of the canal is illustrated in a plan of 1866 (**Figure 3**). After the First World War, the ordnance factory was in decline, as the armed forces concentrated production and storage of ordnance in more remote areas. The entire length of the canal, from the swing bridge at the Thames lock was filled in between 1926 and 1936.

*Other*

- 4.5.15 To the south of Plumstead Road, some 650m south west of the Site, two houses (**WA 55** and **WA 56**) have listed building status.
- 4.5.16 At Woolwich Power Station, 750m west of the Site, part of a Post-Medieval settlement (**WA 57**) was excavated, with evidence of structures, pits, tanks, and pottery. An excavation by South East London Archaeological Unit in 1986 revealed some evidence for pottery and claypipe manufacture (**WA 58**).

## 5 DISCUSSION

### 5.1 Summary of archaeological potential and significance

- 5.1.1 There are no Palaeolithic finds from the Study Area. There is a scatter of Mesolithic, Neolithic and Bronze Age sites and findspots across the Study Area, mostly consisting of sequences of peat and alluvium retrieved in borehole investigation. Potential Iron Age material was produced in a borehole investigation, while the postulated existence of an oppidum at Woolwich Power Station is noted, but remains unproven.
- 5.1.2 There is some evidence for Roman activity in the Study Area. In particular, a known cemetery lies to the west and south-west of the Site, presumably related to a nearby settlement. There is no evidence for occupational activity in the Anglo-Saxon period. Medieval occupation is present at two known sites, both well to the south-east and south-west of the Site.
- 5.1.3 Evidence for the Post-Medieval period is mainly related to the Royal Arsenal and its associated buildings, which lay to the west of the Site until the early 19<sup>th</sup> century. A settlement is recorded at Woolwich Powerstation.
- 5.1.4 The archaeological potential within the Site may be summarised as follows:
- There is a **Low** potential for Palaeolithic material given the paucity of finds in the area.
  - There is a **Low** to **Moderate** potential for Mesolithic, Neolithic and Bronze Age material, with the discovery to the north east of the Site of peat and alluvial deposits from these periods. Such sequences potentially extend between three to six metres beneath existing surface levels.
  - There is a **Low** potential for Iron Age material with all the finds being concentrated in one area.
  - There is a **Moderate** potential for Romano-British finds due to a number of findspots recovered from the Study Area.
  - There is a **Low** potential for Saxon and Medieval on the Site due to the finds being all contained within one area to the south of the Site in the Study Area.
  - There is **Moderate** to **High** potential for Post-medieval remains relating to the reclamation of the Site associated with its incorporation within the Royal Arsenal in the early 19<sup>th</sup> century, and for its subsequent development. In particular there is potential for remains of transportation facilities, the canal, and railways, as well as the foundations of buildings associated with the timber yards and ordnance factory, subject to the effects of demolition and modern reclamation and remediation work. There is some potential for remains pre-dating the incorporation of the

Site into the Royal Arsenal, although the area is likely to have been marginal marshy land prior to its development.

## **5.2 Impact of previous development**

- 5.2.1 Identified past developments will have had both negative and positive impacts on earlier archaeological deposits. The initial reclamation of the Site, thought to involve the deposition of large volumes of imported material to make up ground surfaces, should have sealed earlier ground surfaces and any archaeological evidence they contain. The construction of the early 19<sup>th</sup> century canal would have had a major destructive impact. It is likely that building footings, industrial features, ponds, services, and railway works would have resulted in localised but extensive intrusions into any earlier deposits.
- 5.2.2 However, remains of the 19<sup>th</sup> century Royal Arsenal should be seen as part of the archaeological record. The importance and vulnerability of Britain's 19<sup>th</sup> and even 20<sup>th</sup> defence heritage is increasingly recognised by academics, curators and government agencies.
- 5.2.3 Given the past use of the Site as an ordnance factory, possible soil contamination and unexploded ordnance are important concerns. Past land uses may have an indirect impact on underlying deposits, in terms of making it problematic to devise safe methods of archaeological investigation.

### *Present ground conditions*

- 5.2.4 Various phases of work are known to have taken place on the Site, to remove or seal contaminated ground and prepare the Site for redevelopment. In the early 1980s foundations on the Site were removed and the excavations are thought to have resulted in large earth movements and mixing of soils. No record of the extent of these excavations has been located, but it is clear that they may have had substantial impacts on 19<sup>th</sup> century and earlier remains on the Site. Following geotechnical investigations in 1985 the Site was capped with a sand layer (Carpenter and Lowe Ltd 2001), which has been shown to consist of orange-brown, silty, slightly clayey-sand in varying thickness from 0.1m to 0.8m.
- 5.2.5 Previous ground investigations have shown that the entire Site is underlain by variable made ground with thicknesses from 3.3m to over 6m. Much of this presumably relates to the 19<sup>th</sup> century reclamation of the land for the extension of the Royal Arsenal, and subsequent surfaces, buildings and use.
- 5.2.6 Beneath the made ground, the majority of the Site is underlain by variable thicknesses of soft alluvial clay and peat. At the extreme north and south ends of the Site, natural granular deposits are generally less deep, within 3 to 5m depth.

### **5.3 Impact of proposed development**

- 5.3.1 It is understood that the proposed scheme will consist of residential dwellings, with associated domestic gardens, open spaces, hardstanding and roads. The archaeological impact of the scheme is likely to depend on the extent of remediation measures (ground raising dumps, soil removal etc) already undertaken on the Site, the extent to which further such measures are required, and the type of foundation adopted (below **6.2**).
- 5.3.2 The development will be in keeping with the surrounding housing and comprise two, possibly three, storey housing with connecting roads and services.

## **6 CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Conclusions**

- 6.1.1 Although there is limited evidence for human activity in the general area from the Prehistoric period, the Site itself only seems to have been developed in the early 19<sup>th</sup> century. An extension of the ordnance factory known as the Royal Arsenal was created from marshland in the early 19<sup>th</sup> century, associated with a canal constructed in 1812–14, that acted as the eastern boundary and defence of the Arsenal and for transport between the depot and the Thames. On the site itself, a western branch of this canal was constructed in 1814–16 (see **Figure 2**). Buildings and yards of the ordnance factory and its timber yard subsequently covered much of the Site. The Royal Arsenal Railways were built in 1873 to connect all departments of the factory for the transportation of personnel. The canal, railway and all buildings have been infilled, removed or demolished in several poorly documented occasions over the course of the 20<sup>th</sup> century.
- 6.1.2 Any surviving remains relating to the 19<sup>th</sup>-century Royal Arsenal will be seen by military and industrial historians and archaeologists as being of considerable importance and worthy of record.
- 6.1.3 The impact of the Arsenal works and their removal will have had an adverse effect on any potential earlier archaeological deposits, which are mostly likely to consist of sequences of alluvium and peat, extending potentially from the Neolithic or Bronze Age to the early Post medieval period.

### **6.2 Recommendations**

- 6.2.1 Subject to a review of soil contamination reports, there appears to be scope for further geotechnical work to clarify ground conditions beneath the Site. Ideally this work would proceed in conjunction with archaeological monitoring (a ‘watching brief’). Such work would assist with creating a deposit model for the site, clarify the required foundation design, and contribute to an understanding of the evolution of the landscape of this part of the Thames estuary in the Prehistoric and later periods.
- 6.2.2 Given the uncertainty as to the actual nature and survival of the archaeological remains present beneath the Site, it is likely that the Planning Authority will require further clarification (perhaps an archaeological field evaluation (trial trenching) on the site) as part of the condition of the planning consent.
- 6.2.3 If a ‘field evaluation’ is considered, any trenches should be targeted on particular features of the Royal Arsenal (such as the canal or the ordnance factory buildings) recorded on existing plans, to confirm the precise correlation between the old plans and the Ordnance Survey National Grid.

- 6.2.4 Given the depth of made ground and alluvium overlying natural gravel it is likely that piled foundations will be required for all structures within the new development. All piles should be taken through the made ground and alluvial clay/peat/sand and upper gravel to be founded in the underlying sand gravel layer (Wilkinson Associates 2001). Due to potential soil contamination these piles may need to be sleeved

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## APPENDIX 1: Gazetteer of GLSMR entries referred to in the text

GLSMR entries have been assigned a Wessex Archaeology (WA) number. Their locations are mapped in Figure 1.

WA no.	NGR TQ		Description	Period	GLSMR no.
WA 1	4515	7970	Water channel	Late Mesolithic – Early Neolithic	071169
WA 2	4500	8000	Human activity	Late Mesolithic – Neolithic	071501
WA 3	4515	7970	Peat deposits	Neolithic – Bronze Age	071170
WA 4	4490	7980	Georch borehole	Neolithic – Bronze Age	071491
WA 5	4500	8000	Peat deposits	Bronze Age	071502
WA 6	4400	7920	Preserved wood	Bronze Age	071473
WA 7	4400	7920	Weapon	Bronze Age	071472
WA 8	4450	7950	Bronze weapon	Bronze Age	070216
WA 9	4500	8000	River channel	Late Bronze Age – Early Iron Age	071503
WA 10	4515	7970	Buried land surface	Iron Age – Romano-British	071171
WA 11	4360	7930	Hillfort	Late Iron Age – Romano-British	070992
WA 12	4400	7900	Pottery sherds	Prehistoric	070566
WA 13	4425	7858	Pot with 8 Trajan Coins	Romano-British	070224
WA 14	4530	7850	Antonius Pius Coin	Romano-British	070319
WA 15	4530	7850	Fragment of slide key	Romano-British	070322
WA 16	4370	8005	Dump layers	Romano-British	062640
WA 17	4370	8005	Three postholes	Romano-British	062641
WA 18	4535	7865	Constantius I coin	Romano-British	070387
WA 19	4539	7857	Constantius II coin	Romano-British	070314
WA 20	4385	7904	Urn & 2 small vessels with bone and ashes	Romano-British	070218
WA 21	4381	7900	Cremation burials	Romano-British	070228

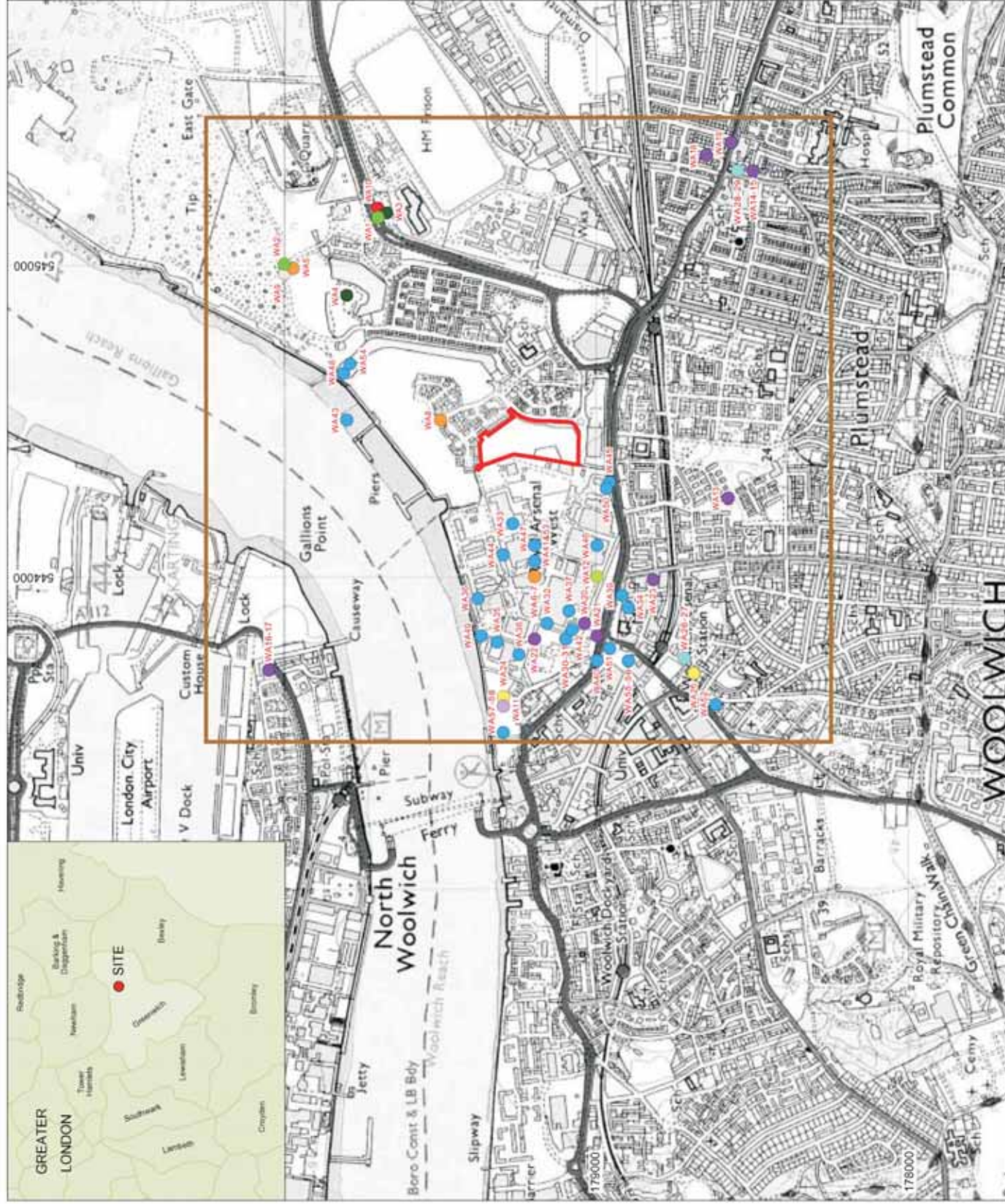
<b>WA 22</b>	4380	7920		Votive pottery	Romano-British	070260
<b>WA 23</b>	4399	7882		Burial with 3 <sup>rd</sup> /4 <sup>th</sup> C coins	Romano-British	070225
<b>WA 24</b>	4360	7930		Coin	Anglo-Saxon	071460
<b>WA 25</b>	4369	7869		Pottery	Anglo-Saxon	071392
<b>WA 26</b>	4369	7869		Pottery within pit	Medieval	071393
<b>WA 27</b>	4369	7869		Pit/posthole	Medieval	071394
<b>WA 28</b>	4530	7855		2 rowel spurs	Medieval	070363/4
<b>WA 29</b>	4530	7855		Rondel dagger	Medieval	070356
<b>WA 30</b>	4380	7910		Royal Arsenal	Post-Medieval	223243/00
<b>WA 31</b>	4380	7910		Manor house	Post-Medieval	070284
<b>WA 32</b>	4385	7916		Laboratory	Post-Medieval	223243/09
<b>WA 33</b>	4417	7927		Ordnance Factory	Post-Medieval	223243/19
<b>WA 34</b>	4390	7890		Fireworks storehouse	Post-Medieval	071477
<b>WA 35</b>	4379	7932		Workshop	Post-Medieval	223243/20
<b>WA 36</b>	4393	7938		Wharf	Post-Medieval	071476
<b>WA 37</b>	4389	7909		Courtyard complex	Post-Medieval	223243/04
<b>WA 38</b>	4375	7925		Academy building	Post-Medieval	075722
<b>WA 39</b>	4394	7892		Barracks	Post-Medieval	223243/14
<b>WA 40</b>	4373	7900		Foundry	Post-Medieval	223243/05
<b>WA 41</b>	4404	7920		Foundry Gates	Post-Medieval	223243/15
<b>WA 42</b>	4383	7908		Officers mess	Post-Medieval	223243/16
<b>WA 43</b>	4450	7980		Military ferry	Post-Medieval	071462
<b>WA 44</b>	4407	7930		Storehouse	Post-Medieval	223243/11
<b>WA 45</b>	4430	7896		House	Post-Medieval	223243/07
<b>WA 46</b>	4410	7900		Martello Tower	Post-Medieval	071480
<b>WA 47</b>	4410	7920		Canal	Post-Medieval	071478
<b>WA 48</b>	4465	7981		Canal lock	Post-Medieval	223243/17
<b>WA 49</b>	4381	7937		Guardhouse	Post-Medieval	223243/03

<b>WA 50</b>	4428	7897	Gate pier		Post-Medieval	223243/06
<b>WA 51</b>	4377	7896	Gate		Post-Medieval	223243/01
<b>WA 52</b>	4359	7862	Priests House		Post-Medieval	223626
<b>WA 53</b>	4405	7920	Railways		Post-Medieval	071459
<b>WA 54</b>	4468	7979	Iron swing bridge		Post-Medieval	223243/18
<b>WA 55</b>	4373	7890	House		Post-Medieval	223428/01
<b>WA 56</b>	4373	7890	House		Post-Medieval	223428/02
<b>WA 57</b>	4350	7930	Settlement		Post-Medieval	070994
<b>WA 58</b>	4350	7930	Pottery manufacture		Post-Medieval	070993

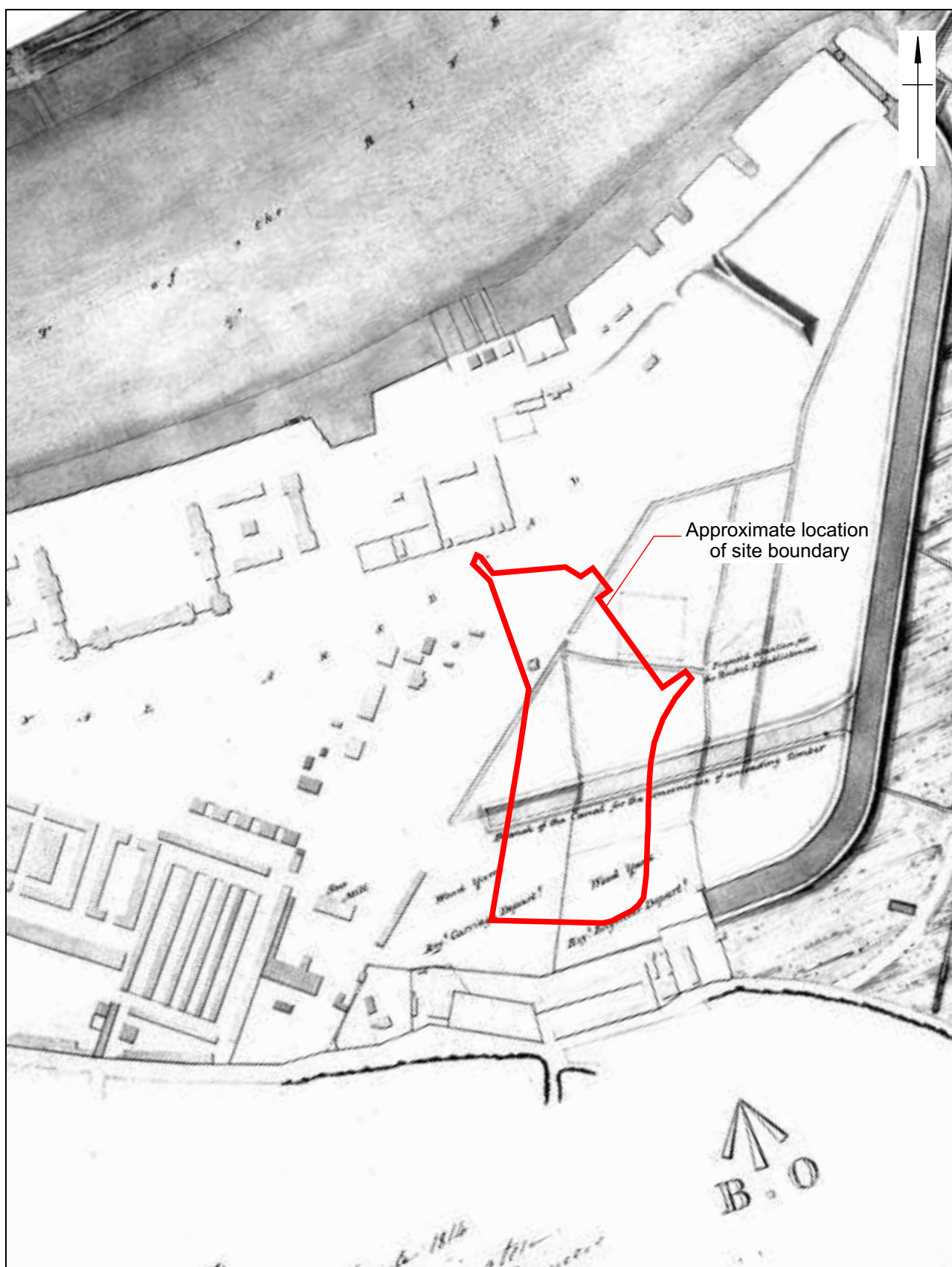
## APPENDIX 2: Cartographic sources


NB Historic Ordnance Survey mapping was consulted, but found to be of little use, as the Royal Arsenal was not shown on published maps for security reasons.

<b>Date</b>	<b>Title</b>	<b>Scale</b>	<b>Report figure</b>	<b>Source</b>
1814	Plan of the Royal Arsenal, Woolwich	1 inch:66 yards	<b>Figure 2</b>	PRO
1866	Survey plan of Royal Arsenal showing hundred & parish boundary		<b>Figure 3</b>	PRO

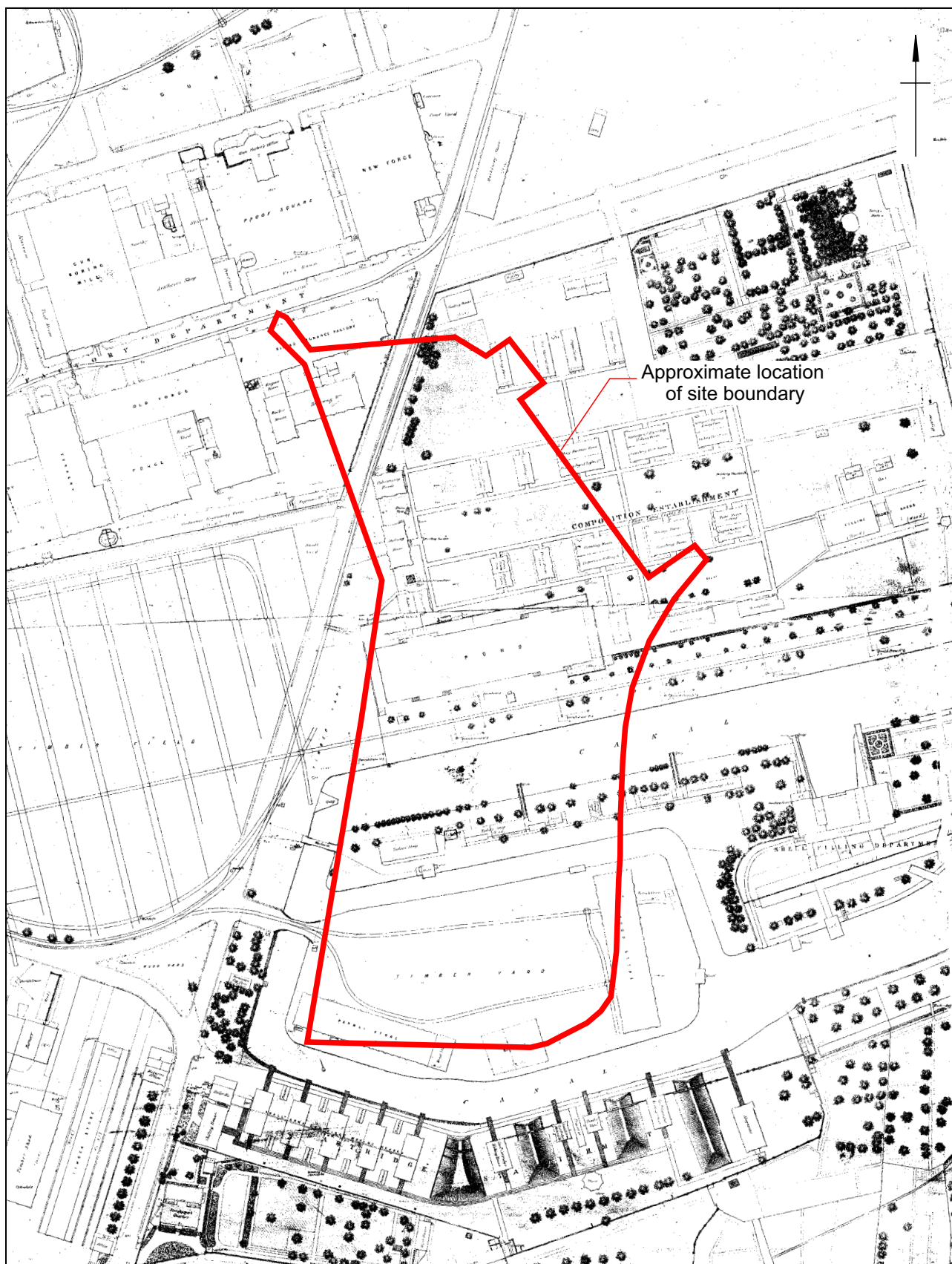






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Plan of the Royal Arsenal. Woolwich 1814, showing the proposed western extension of the canal (PRO) Figure 2



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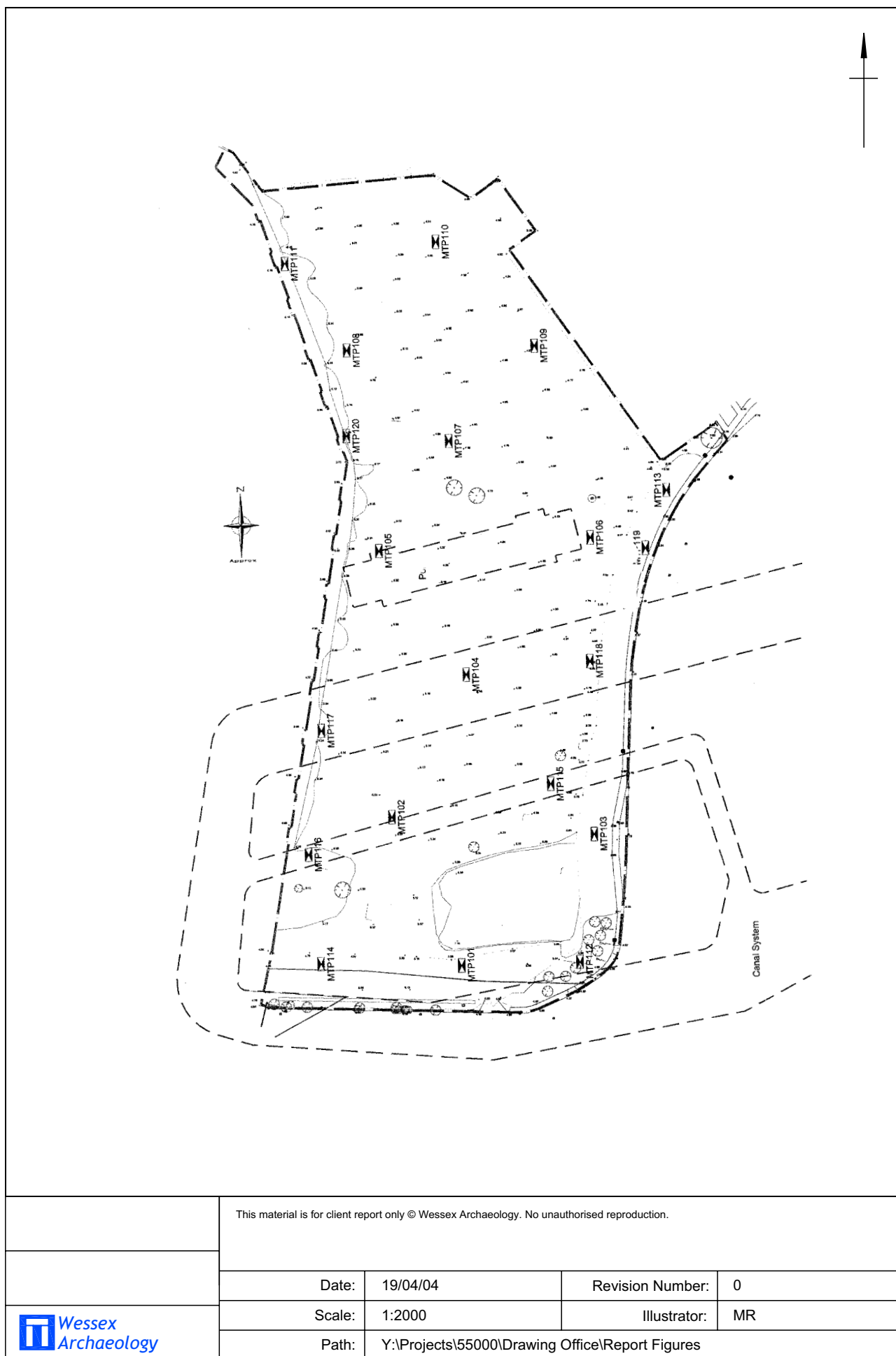
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Survey plan of Royal Arsenal showing the canal as built, 1866 (PRO)

Figure 3



Merebrook Projects Ltd. 'Site Investigation Locations' plan (July 2003)

Figure 4





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