

REPOSITORY WOODS,
WOOLWICH, GREATER LONDON
AN ARCHAEOLOGICAL SURVEY OF THE ROYAL
MILITARY REPOSITORY TRAINING GROUNDS
SURVEY REPORT

Sarah Newsome, Jonathan Millward and Wayne Cocroft



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Training Grounds**

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SUMMARY

Between January and April 2008 English Heritage's Archaeological Survey and Investigation team undertook a detailed archaeological survey of Repository Woods and the practice fortification that forms its eastern boundary, both of which were formerly part of the Royal Military Repository, Woolwich. The work was undertaken as part of the research for the Survey of London's forthcoming volume on Woolwich parish and complements detailed architectural and historical research undertaken by English Heritage on the Woolwich Rotunda, which was moved from Carlton House to its present location, close to the eastern boundary of the Repository, in 1818.

The research has revealed the unique role that the Royal Military Repository played in training soldiers in the mounting and movement of heavy artillery at the start of the 19th century and has shown that the surviving landscape of tracks and ponds, later to provide a picturesque setting for the Rotunda, was a military creation with both practical and recreational uses. Concurrent with the re-erection of the Rotunda, a linear practice fortification was constructed along the eastern boundary of the site which, though it clearly had a primary practical function, served to enhance the setting of the building. The survey recorded the earthwork remains of training batteries and fortifications dating from the start of the 19th century onwards as well as slit trenches and evidence of other activities from the 20th century, highlighting the area's continued use as a training facility. Repository Woods and the Napier Line compound are the property of the Ministry of Defence and there is no public access.

CONTRIBUTORS

Sarah Newsome (English Heritage Archaeological Survey and Investigation – Cambridge), Jonathan Millward (EPPIC student) and Wayne Cocroft (English Heritage Archaeological Survey and Investigation - Cambridge) undertook the fieldwork. Sarah Newsome wrote the report. Derek Kendall took photographs and Deborah Cunliffe completed the survey drawing.

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ARCHIVE LOCATION

The project archive is located at the National Monuments Record, Swindon

DATE OF SURVEY

The survey was undertaken between January and April 2008.

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INTRODUCTION

Background to project

In January to April 2008 English Heritage's Archaeological Survey and Investigation team undertook a detailed archaeological survey of an early 19th-century training fortification and the nearby training grounds, known as Repository Woods, which were both originally part of the Royal Military Repository, Woolwich. This was undertaken as part of a wider study of the open spaces of Woolwich which will be incorporated into the Survey of London's forthcoming volume on the parish. The work also complements extensive architectural and historical research undertaken by English Heritage (Cole *et al* 2009) into the Woolwich Rotunda, which was moved from Carlton House to its site at the eastern side of Repository Woods in 1818. The departure in 2007 of the Royal Artillery from Woolwich after nearly 300 years also provided a suitable opportunity to undertake the survey before the new occupiers arrived and any potential changes of use occurred.

Woolwich is located 10km south-east of central London, to the south of the River Thames. Repository Woods and the training fortification earthwork are situated on the western side of Woolwich parish on its boundary with Charlton, to the west of Woolwich Barracks and at the north-west corner of Woolwich Common (Figure 1). Repository Woods is an area of deciduous woodland. Its eastern boundary is defined by the earthwork remains of the training fortification. To the south is the Napier Line compound, now occupied by units of the household division, but formerly the site of the Royal Military Repository buildings. The northern side of the woodland is bounded by Hillreach road which becomes Little Heath as it heads west. The western boundary is marked by housing and to the south by Charlton Cemetery. The boundary between Woolwich and Charlton parishes runs down the western side of the woodland.

The aim of the project was to provide an accurate plan of the archaeological features within Repository Woods, and of the training fortification to the east, in order to assess the survival of features related to the 19th and 20th century training activities in the area (Figure 35). As well as contributing to the Survey of London's research, this information will allow better understanding and future management of the Repository Grounds and of the landscape context of the grade II* listed Rotunda building. The survey involved undertaking a detailed measured survey of all the earthworks and structures within Repository Woods, as well as of the training fortification earthwork, at 1:1000 scale using electronic techniques (see Methodology). The Rotunda compound was not surveyed. The site is currently occupied by the Ministry of Defence and there is no public access to Repository Woods, though the training fortification is visible from the public highway to the east.

The training fortification has sometimes been known as the 'Napier Line' but the authors have not found any historical evidence for the term.

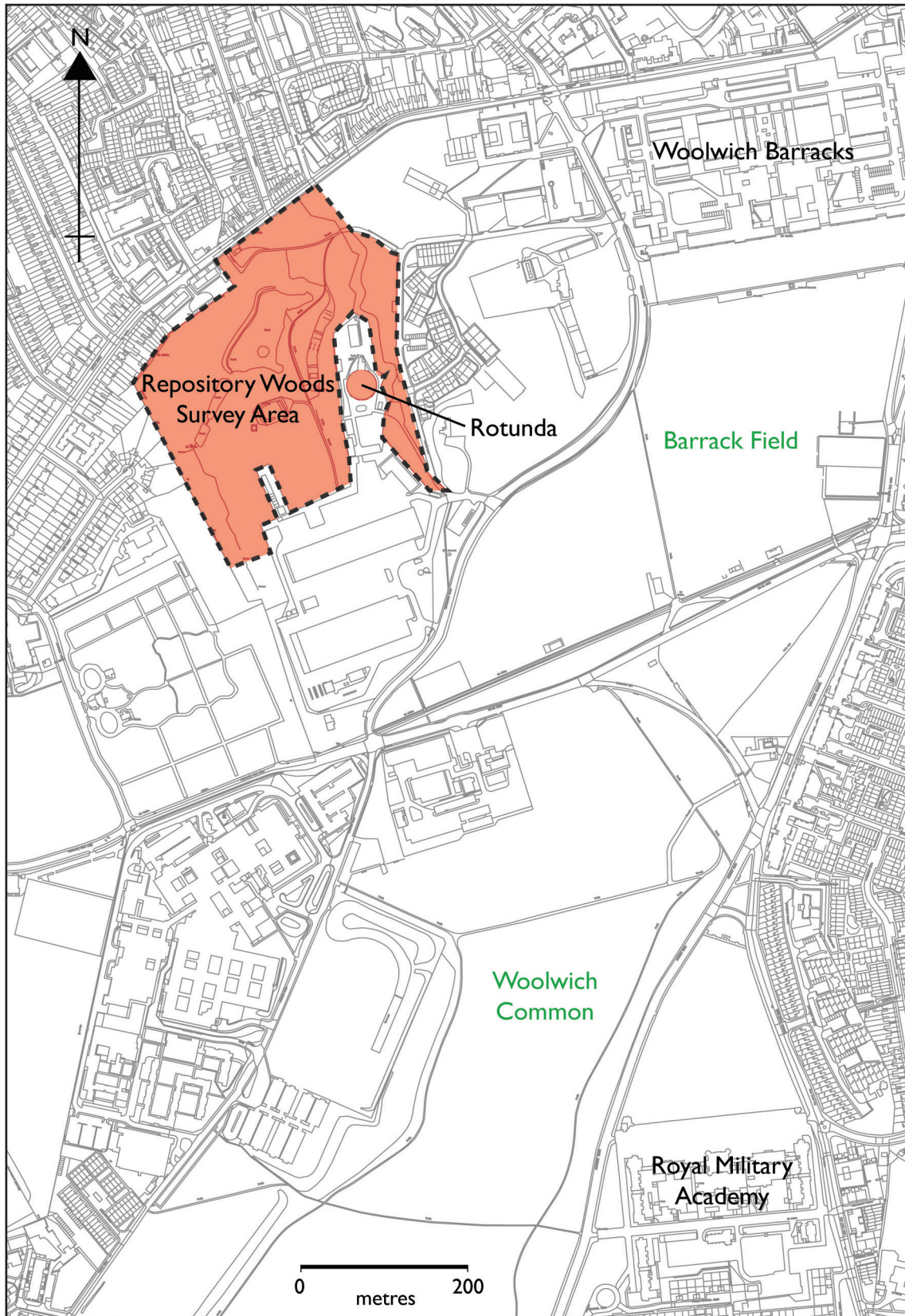


Figure 1: The location of the survey area. © Crown Copyright. All rights reserved. English Heritage 100019088.2009

TOPOGRAPHY AND GEOLOGY

The survey area consists of undulating terrain which drops from a height of 45m AOD to 25m AOD from south to north, reflecting an underlying change from the Blackheath Pebble Beds to the Woolwich Beds across the site (British Geological Survey 1998). The area is characterised by a series of long narrow valleys. A now-culverted stream runs into the southern end of the site and feeds the series of man-made ponds.

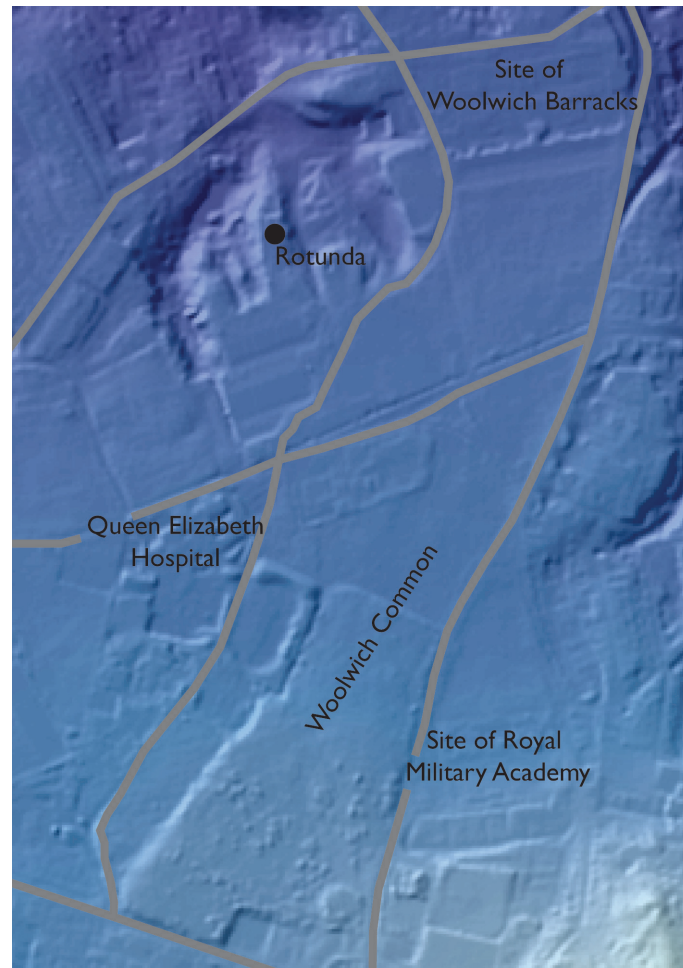


Figure 2: The incised topography of the Repository Grounds in relation to the location of the Rotunda to the east (derived from 5m digital terrain data - areas of lower elevation are shown in darker blues) Height data licensed to English Heritage for PGA, through Next Perspectives™.

PREVIOUS RESEARCH

The area has been under military control since the Royal Military Repository took possession of the land sometime in the late 1700s, though it was accessible to the public until the early 20th century. Subsequent restrictions in access mean that no previous archaeological research has taken place within the survey area and no archaeological remains or finds are recorded on the National Monuments Record or the Greater London Sites and Monuments Record. The Woolwich Rotunda is a Grade II* Listed Building (200360) and the Royal Artillery Institute Observatory (200361), Repository gatehouse (200508) and northern boundary wall (200407) are all Grade II Listed Buildings.

Research into the Rotunda over a number of years by English Heritage staff (Jon Clarke, Emily Cole, Susan Skedd) has highlighted a great deal of documentary material relating to the Royal Military Repository and its grounds and a report drawing together this work is forthcoming (Cole *et al* 2009).

DOCUMENTARY EVIDENCE FOR THE HISTORY OF THE SITE

The broader military presence in Woolwich has a long and established history of which only a brief resume will be provided in this report.

This section draws on extensive background research undertaken by Susan Skedd and Emily Cole (2008) into the Rotunda's history at Woolwich.

The Royal Artillery in Woolwich

The establishment of the Royal Artillery in Woolwich was preceded by the Royal Dockyard, established in 1512 (Skedd 2008, 3), and the transfer to Woolwich of firework and munitions activities in the mid 17th century. During Henry VIII's reign the ordnance and artillery activities which were to later become the Royal Arsenal were established on a site known as the Warren (Skedd 2008, 3) close to the river. The Royal Artillery was created by Royal Warrant in 1716 in order to provide to two companies of professional artillerymen and thereby alleviating the problems and expenses of having to recruit and train gunners as and when conflict arose (Timbers 2008, 22). The training and education of these soldiers then became an issue and in 1741 the Board of Ordnance formed a military academy in Woolwich (Timbers 2008, 25) based at the Warren. However towards the end of the 18th century, the expansion of the Board's manufacturing activities was putting pressure on space at the Warren and plans were made to move the cadets south to the edge of the Common. This move instigated the construction of an array of new buildings, including the New Barracks, completed 1777, and the Royal Military Academy, built 1806 (Timbers 2008, 62).

History of the Repository Grounds

Before the Royal Military Repository

Small-scale maps from the mid-18th century show that the area of the future Repository Grounds was on the eastern edge of a large woodland called Hanging Wood which encompassed parts of Woolwich and Charlton parishes (e.g. Andrews, Drury and Herbert 1769). Immediately to the east of Hanging Wood were a cluster of buildings, identified on later maps (e.g. TNA:PRO MPH 1/571) as Bowater's Farm, located at the cross roads where Artillery Place and Repository Road now meet (Figure 3).

The Board of Ordnance began to lease land from the Bowaters in or around 1773 but a map which may have been produced to accompany these transactions (TNA:PRO MPH 1/562) shows the land where the barracks were later built, rather than the future Repository Grounds to the east. Interestingly this map also shows Mulgrave Pond, with the land between it and Mr Bowater's Farm to the west being labelled 'Part of the Park'. It seems more likely that one of two maps of the future Repository Grounds apparently dating to or after 1788, one surveyed by Lt Peter Couture RE (Figure 3) and one by 'gentlemen cadets' (TNA:PRO MPH 1/571; TNA:PRO MPH 1/235), relate to the area's acquisition by the Board of Ordnance particularly as the survey was undertaken by a Royal Engineer, though the title 'An Accurate Survey of the Ground adjoining to the

Barrack Field at Woolwich, on which the Royal Artillery was reviewed the 9th July 1788' leaves a question mark over the exact date of the survey.



Figure 3: Map from circa 1788 showing the area that was later to become the site of the Royal Military Repository. NB North is to the bottom of the image. The National Archives: Public Record Office MPH 1/571 (1)

Despite suggestions that the Repository Grounds were formerly part of Bowater Park (Anon. 1913, 64) the 1788 map shows hedged fields, some of which contain light tree cover (TNA:PRO MPH 1/571). This suggests a mixed landscape of arable cultivation and pasture. The land may have been attached to 'Mr Bowater's Farm', which as mentioned above, is marked on the same plan. It is worth noting that the ponds shown on this 1788 plan are not those which were constructed and survive in the Repository,

but historic Ordnance Survey maps (3rd edition 25 inch 1916) suggest that the largest, located immediately to the west of the gun park, survived into the 20th century. It had been infilled by 1946 when aerial photographs show it had been in use as allotment gardens for some time (RAF CPE/UKI803 5290 25-OCT-46).

The development of the Royal Military Repository

The Royal Military Repository at Woolwich was developed by William Congreve the elder (1743-1814) as a 'school of methods of mounting and dismounting ordnance' (Marsh 1986, 413). He had been heavily influenced by his experiences whilst a Captain in the Royal Artillery and by the difficulties in manoeuvring heavy ordnance that he had encountered in Canada during the Seven Years' War (1756-63) (Skedd 2008, 5). Consequently in 1774, Congreve devised an illustrated programme of exercises which involved manoeuvring:

Field Pieces over Ditches, Ravines, Inclosures or Lines ... To mount or dismount heavy Guns, when no Gyn is at hand; to get the Guns on Batteries with a far less number of Men than are usually employed in drawing them upon their platforms by bodily strength only. To raise any Carriages that may be overset on a march etc. (RAHT Collection RA/20) (Skedd 2008, 6),

and which became compulsory at the end of 1778 (Skedd 2008, 6).

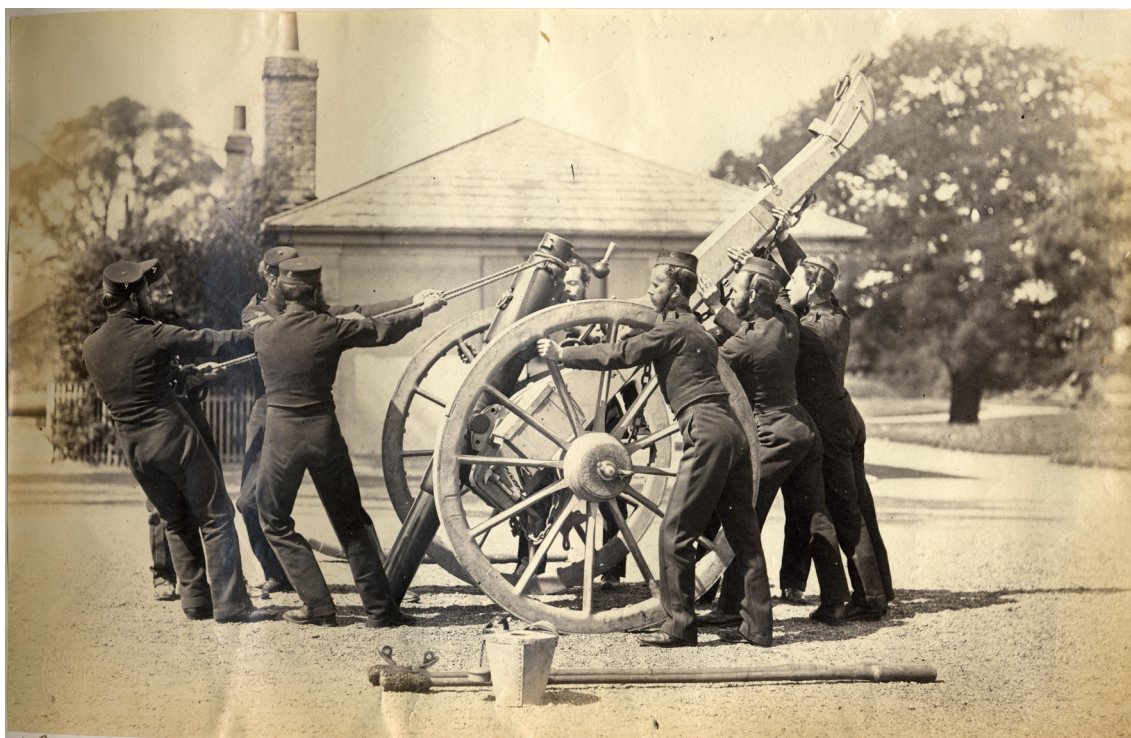


Figure 4: Cadets undertaking 'Field gun drill' for an 'Armstrong 12 pound breech loader' at the eastern end of the northern-most Repository shed. Though not signed the photograph is probably one of the series taken by John Spiller around 1858 to illustrate the Repository Exercises (see RAHT Collection AL 933). Courtesy of the Royal Artillery Historical Trust (RAHT Collection AL27/10)

The Repository exercises have been described as, 'a school of ingenuity in the application of mechanical principles' in the effective use of 'ropes, pulleys, levers and gravity' to manoeuvre heavy ordnance (Kaestlin, JP in Skedd 2008,6). This is an observation that was certainly backed up by General James Pattison in a letter dated 23 Jan 1775 where he says of Congreve's work 'he soon reduced the business to a much greater simplicity than we before had any idea of' (RAHT Collection MD939/16) and later illustrated by the series of photographs taken by John Spiller in and around 1858 which document the exercises (RAHT Collection Albums 933 and 27, e.g. Figure 4). Congreve's innovative training programme was highly successful and was not followed until 1812 by a similar programme for the Royal Engineers (Skedd 2008, 7).

Though the Royal Military Repository as an institution was created in 1778 (Duncan 1872, 307) (the same year that Congreve was made 'Superintendent of the Military Machines' (TNA:PRO WO 47/91)), it is not clear at exactly what date the Repository Grounds were acquired as the institution was initially established at the Warren. The land, which closely resembled the terrain that which Congreve had encountered in Canada (Skedd 2008, 5), may have first become available as part of the part of the Bowater Estate that was leased by the Board of Ordnance in 1773 (Timbers 2008, 30) but, as previously stated, the Repository Grounds are not included in what appears to be the associated survey (TNA:PRO MPH 1/562). Two years later, General Pattison offered some sand pits in Woolwich, owned by his brother, for the Repository exercises, stating that there was 'a great variety of unequal broken ground, furnishing many different inclined plans, even to perpendicular ones, or precipices, as also some suitable ravines, or hollow ways, where we might have an opportunity of trying many Experiments' (RAHT Collection RA/20). This might suggest that the area that later became known as the Repository Grounds was not available for these exercises until at least 1775. The sandpits were located to the east side of the barracks (P Guillery, pers comm) but it is not known whether Pattison attempted Congreve's exercises there. The land appears to have become the property of the Board of Ordnance between 1802 and 1804, transferred as part of a number of Acts of Parliament (Vincent 1888, 391-392) though, regardless of what exact date the grounds were first purchased or leased, it is clear that this was a phased process as correspondence in the Engineers' papers shows moves were being made to purchase pieces of land to 'complete' the Repository in 1809, some years after the first buildings were constructed (TNA:PRO WO 55/756).

In his 1872 *History of the Royal Regiment of Artillery*, Duncan notes that the Repository Grounds were later (though no date is specified) given over 'solely for instruction in the management of heavy ordnance but when it was first opened, the sharp turns and steep inclines of the Repository Grounds were made use of in training the drivers to turn and manage their horses' (Duncan 1872, 307). The 1788 maps do not show evidence of any immediate alterations to the landscape in these early days of the Royal Military Repository, though it is possible that they had little impact on the area as the main focus of activity seems to have remained at the Warren in this period.

Plans of new Repository buildings were given royal approval in May 1781 (TNA:PRO MPH 1/752) but Kaestlin (RAHT Collection MD939/16) implies these were at the Arsenal, where the Repository was originally established. This seems likely as buildings

shown on the Sandby view dating to the late 18th century (British Museum) are different to those shown on later photographs and described in later Ordnance Statements of Lands and Buildings (TNA:PRO WO55) on the later site of the Repository. Map evidence shows that the four Repository Sheds had been built by 1804 (TNA:PRO MPH 1/244/1/4). A 1799 map (British Library Online OSD 130/6) also shows the buildings but these may be later additions to the map base as the move to the site west of Barrack Field was probably prompted by the availability of £80,000 which had been provided to replace buildings lost in a fire at the Warren in 1802 (Skedd 2008, 14; TNA:PRO WO 47/2,573, p.1047; Kaestlin RAHT Collection MD939/16). Three of the buildings were used for 'travelling guns, carriages and stores' and the fourth was used as offices (TNA:PRO WO 55/2449). By 1804 the field boundaries had also been removed, presumably to facilitate the use of the area for the Repository exercises. The guard house to the far south close to the ha-ha at the original entrance to the Repository Grounds was built in 1806 (NMR WORK 43/747) by which date the eastern boundary and approach road had also been built (TNA:PRO WO 55/2355). It is worth noting that the rest of the boundary to the Repository was defined by 1811 (TNA:PRO MPH 1/32/1) and that the modern boundary to the site still largely follows this line. Whether the brick wall that survives on the northern and western sides of the grounds is as early as 1811 is difficult to ascertain from the map evidence but Board of Ordnance correspondence discussing the building of a wall at the northern boundary of the site in the period 1807-1809 seems to suggest that this is possible (TNA: PRO WO 55/756).

Map evidence appears to suggest that major landscaping in the Repository Grounds, such as the creation of ponds, took place at some time between 1806 and 1808, under the auspices of the Royal Military Repository, presumably for the specific purpose of recreating the type of terrain over which the heavy ordnance might need to be transported. By 1808 the largest pond had been created as well as two smaller ponds to the south (TNA:PRO MPH 1/189/4), though these are not the two smaller ponds that now exist on the site but were located further south in the south-western corner of the survey area (Figure 5). A bridge is apparent crossing the largest pond and the island is also visible. By 1815 a process of enlarging the main pond was in progress (TNA:PRO MPH 1/507/3-4) and between 1815 and 1827 (*ibid*; WO 55/2703) the two smaller ponds visible today were probably constructed. These are described as the 'Summerhouse Pond' and the 'Lower Pond' in later documents (RAHT Collection MD93). By 1932 it appears that the pond located at the northern end of the Repository, known as the 'Barrier Pond' (RAHT Collection MD93) was probably built but it was short-lived and had been infilled by the late 1860s. There is an early reference to the ponds being used for military exercises in E. W. Brayley's *The beauties of England and Wales* (1808), in which he states that 'on the west side of the Barracks is a piece of water where experiments with gunboats, &c., are occasionally made'. It seems unlikely that these would have occurred on the pond 'left in reserve for Mr Bowater' so it is likely that the piece of water referred to is the largest of the Repository Ground ponds (TNA:PRO MPH 1/180/2). The shed for the carriages of the Royal Horse Artillery had also been built by 1815 (TNA:PRO MPH 1/507/3-4).

The 1808 and 1815 maps (TNA:PRO MPH 1/189/4; MPH 1/507/3-4) show other significant developments such as the construction of a complex network of paths and

tracks around the grounds and features which may represent batteries or other artillery training structures (Figure 5), such as the earth and wood casemate construction shown on later photographs (RAHT Collection AL27/40-48; Figure 6) and the structures described as the 'West batteries' in later lists of the exercises (RAHT Collection MD 93).



Figure 5: Map of 1808 showing the Royal Military Repository with sheds, guardhouse, stepped boundary, ponds, paths and what appear to be training batteries. The National Archives: Public Record Office MPH 1/189/4.

Though the particular location is not specified, experiments with 'traversing platforms' seem to have been undertaken as early as May 1805 and by 1807 evidence exists of Congreve's wish to create purpose-built training structures in the Repository, such as a brick tower for teaching 'several modes of escalading works' (TNA WO 55/756). Plans of this tower survive (RAHT Collection MD213/13) though it is not clear if it was ever built. Of particular note from the map evidence (TNA:PRO MPH 1/189/4 – Figure 5; MPH 1/507/3-4) is the section of ditch and bank presumably constructed for the Repository exercises located immediately to the south-west of the largest pond, which survives today (below). Lists of the Repository exercises from the 1820s to 1840s detail that this earthwork (identified as the 'Fieldwork near Summerhouse Pond') was used for building bridges in order to assault it, to roll shells from the parapet and 'To throw hand grenades' (RAHT Collection MD93). Later maps depict various training earthworks in a very similar manner to the later training fortification and one of these may be the

experimental work with earthen 'piste' that Congreve the younger mentions (NMR MD 96/124; TNA:PRO WO 44/642).

Also noteworthy is the stepped boundary to the east of the Repository Grounds which is depicted differently to other boundaries on both the 1808 map (TNA:PRO MPH 1/189/4) and the map of 1810 (Greenwich History Centre). It is suggestive of an earlier fortified boundary pre-dating the later training fortification particularly as possible embrasures and artillery pieces are shown on certain faces in the same way as the earthworks created for the Repository exercises within the woodland are drawn. This is certainly a possibility as it seems that the idea of building practice fortifications has existed since the mid- 18th century (Anon. 1892, 3). However if this were the case there is no mention of a pre-existing structure in Congreve's letter asking for the practice fortification to be constructed (TNA:PRO WO 44/642) and it is likely to have been buried by later developments of the Rotunda compound. Unfortunately the boundary itself as it did not stretch as far as the less disturbed northern end of the later fortification.



Figure 6: Earth and wood casemate probably located on the site of the 'dog kennels' in the modern Napier Line compound. The photograph is probably one of a series taken by John Spiller in 1858 to illustrate the Repository exercises. The same structure may be shown in this location on maps as early as 1808 and is depicted in detail on the Bayly map of 1867. Courtesy of the Royal Artillery Historical Trust (RAHT Collection AL27/42)

The arrival of the Rotunda

By the end of 1818 when the dismantled building now known as the Rotunda arrived in Woolwich (Figure 7), a purpose-built military training landscape already existed to the west of the new barracks, where an agricultural landscape which had existed just 30 years previously. The Rotunda was originally constructed by the Prince Regent as a semi-permanent ballroom in the grounds of Carlton House in 1814 (Clarke 2007, 8) as part of the celebrations held there for the visit Allied Sovereigns after the defeat of Napoleon at the battle of Leipzig.

In 1818 the Prince Regent requested that the building be moved to Woolwich and Sir William Congreve the younger (who had succeeded to his father's positions after his death) was keen to make use of it in the Royal Military Repository, perhaps in part because the Rotunda's military and royal associations would reaffirm the connections that Woolwich already had with the Napoleonic victory. The acquisition by the Repository of many battle trophies from the conflict necessitated the provision of further accommodation for these items. The weapons became part of the historical teaching collection pioneered by the elder Congreve (Skedd 2008, 7-9) and which continued to grow under the younger Congreve and his successors (Skedd 2008, 18). Despite various discussions over costs and alterations, the Rotunda was re-erected during 1819 and was completed by May 1820 (Skedd 2008, 11-12).



Figure 7: The Woolwich Rotunda from the south. Photograph: Sarah Newsome (5 March 2008) © English Heritage

The Rotunda's location

The Rotunda's new location at Woolwich was not only chosen because of the practical use to which the building was to be put within the Royal Military Repository but also because, as Congreve the younger wrote in a letter of 7 December 1818, that spot was 'the most convenient as well as the most picturesque situation for it' (TNA:PRO WO 44/642, f.358). The prominent location provided views north to the Thames and of the barracks and the Royal Military Academy to the east and south respectively and allowed inter-visibility between these three high-status buildings (see Figures 1 and 2). Anyone looking towards the Rotunda would have seen the picturesque Repository Grounds as its backdrop. The later addition of the Royal Artillery Institution's domed observatory building to the east of the Rotunda during the late 1830s may have added to rather than detracted from the views to and from the Rotunda (see RAHT Collection AL933/2).

The development of the linear practice fortification

In late 1818 Sir William Congreve requested by letter both the construction of a training fortification and the re-assembly of the Rotunda building in the Repository (Skedd 2008, 14). In the letter to the Board of Ordnance (7 Dec 1818) he details how the fortification should be built with 'with Scarp and Counterscarp, Wet Ditch, Glacis and approaches in the Bottom of the Repository Ground, with such additions as may be found necessary to carry on a complete course of instructions in all that relates to the practice involved in the defence and attack of such a work, passing the Ditch, escalading etc.' (TNA: PRO WO 44/642 ff. 358-9). That Congreve considered the fortification a fundamental component of the Repository is in no doubt as he states that the fortification was 'the only thing wanting to make this Establishment the most complete school of practical military instruction, that does exist – or, I believe I may venture to say, that can possibly be devised'.

He continues to suggest that the fortification should not cost more than £500 (Skedd 2008, 16) and that it should be built out of 'Piste, or rammed earth, instead of Brick, agreeably to an experiment lately tried in the Repository', perhaps the origin of some of the Repository Ground earthworks described below. This construction method is visible on the Champion watercolour from circa 1850 (RAI A/C 8405/22), where earth sods are shown laid carefully like bricks, and on a later photograph apparently taken in 1858 (RAHT Collection AL933/6). All the images examined show the internal face of the earthwork and its embrasures revetted in brick although it is technically possible, albeit very unlikely, that the brick was not part of the original construction (RAHT Collection AL112/7).

The construction of the line was approved on 9 December 1818 (Skedd 2008, 16) but in a letter of 18 June 1819 Congreve states that 'the erection of the Rotunda at Woolwich be proceeded upon but that the section of fortifications be postponed until the next year' (TNA:PRO WO44/642) presumably due to mounting costs. By the time the Ordnance buildings at Woolwich were surveyed in 1821, the northern stretch of the pre-existing boundary has been removed to accommodate the Rotunda and though the stretch to the south may be part of a remaining pre-existing boundary as it appears in a different position to the later line (TNA:PRO MFQI/1274). The picture of the Rotunda

from 1820 by RW Lucas shows guns arranged along a wall immediately to the east of the Rotunda though this could be the pre-Rotunda boundary (Royal Collection: RCIN/PLS: 701653).

However Board of Ordnance correspondence suggests that the fortifications were under construction by 1824 (TNA:PRO WO 55/757) and the list of exercises detailed for 1830 (RAHT Collection MD93) mention the 'South Bastion', 'East Bastion' and 'Main Gate Curtain'. A map of the same date (TNA:PRO WO 55/2703) confirms (as far as the scale allows) that the line was complete and that it roughly followed the original boundary wall of the Repository Grounds to the east and the south. It also indicates the relative complexity of the southern section compared to the northern section, as do many later maps and contemporary photographs (Figures 8 and 9 and 36A and B). The fortifications may also have differed in scale between the two sections, as seen on an 1844 etching (GHC Vincent scrapbook i, 82) and the Rock and Co drawing from circa 1830 (Cole *et al*, nd), and later photographs show that, by 1858 at least, the parapet was lower in some places to accommodate certain types of ordnance (RAHT Collection AL933/15). Later photographs and maps show that the number of embrasures is the most notable difference between the two areas. This difference may reflect the primarily aesthetic role of the earthwork very close to the Rotunda or perhaps, more mundanely, the need to accommodate different types of ordnance.



Figure 8: Cadets practising drill with a 'Triangle Gyn' in the southern-most bastion of the practice fortification. The photograph is probably one of a series taken by John Spiller in 1858 to illustrate the Repository exercises. Guns are visible mounted on fixed and travelling carriages and the buildings originally used as the gatehouse and for the horse artillery are visible in the background. Courtesy of the Royal Artillery Historical Trust (RAHT Collection AL27/26)

The fortification differed from genuine defences as there were few divisions between the tightly-packed emplacements and no casemates, presumably to enable cadets to be instructed large groups, though practice casemates were constructed in the grounds to the west and later, in the 1850s, at the Royal Military Academy (A Williams, pers comm). The original entrance into the Repository, through the line, was to the south of the Rotunda, between the two elaborate but regular bastions. By the time that Campion painted his watercolour (RAI A/C 8405/22) of the Rotunda (circa 1850 according to the Rotunda Museum) there is what appears to be a wooden bridge across the ditch in the same position as the current entrance immediately to the south of the Rotunda.

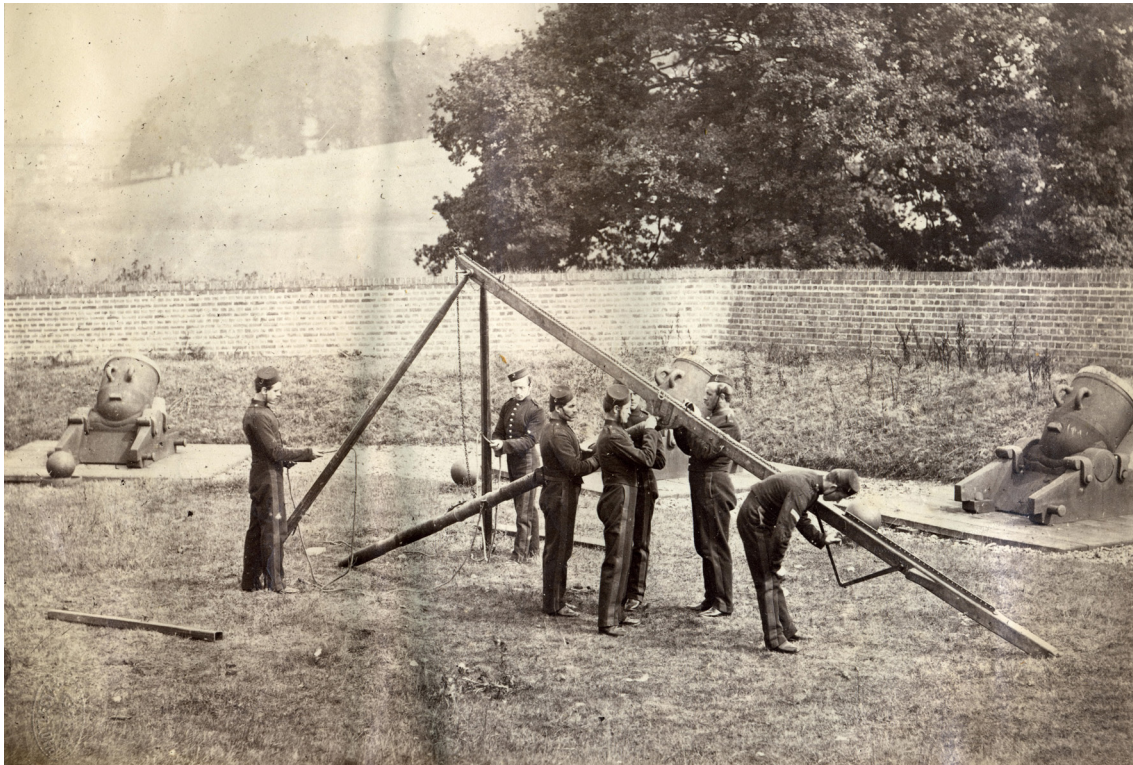
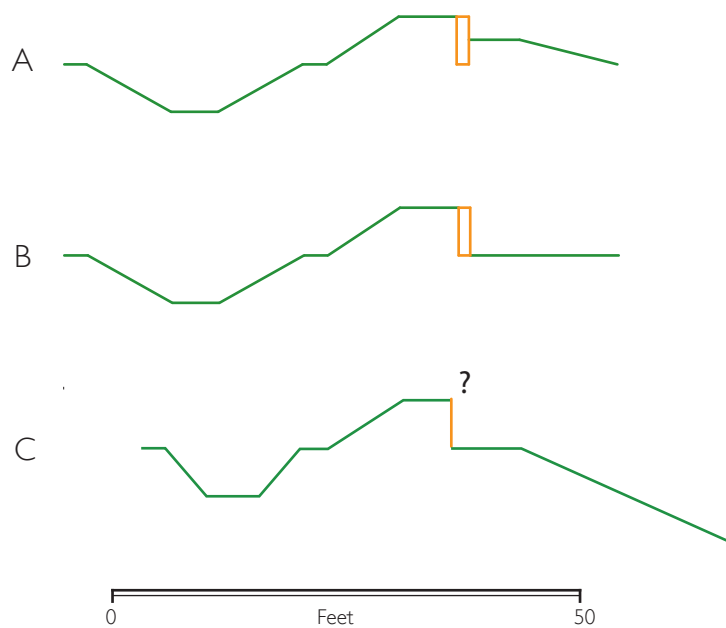


Figure 9: Cadets practising 'Rocket Drill' on a stretch of the practice fortification to the north of the Rotunda where no embrasures were built. Mortars can be seen located on hard-standings and the slopes of Green Hill can be seen in the background. The photograph was almost certainly taken by John Spiller as part of the series illustrating the Repository Exercises in 1858 (see RAHT Collection AL933 for more Spiller photographs). Courtesy of the Royal Artillery Historical trust (RAHT Collection AL27/34).

Though dating nearly 50 years after its construction, the Bayly map of 1867 (TNA: PRO MPH 1/362/4-6, Figures 36A and B) and the 1st edition 25 inch Ordnance Survey map of 1869 depict the fortification's form in great detail. The most basic sections are depicted as a flat-topped earth bank revetted by a wall, with a small berm at the foot of the scarp and then a ditch (Figure 10). Beyond the ditch is a double linear feature which may be a fence boundary or track, though this is not clear. In some sections the internal face was also revetted by a flat-topped low earthen bank as well as the brick wall (RAHT Collection AL27/34, Figures 9 and 10). The function of this bank is unclear as it is too small to be a terre-plein on which to mount cannon and surplus to requirements in the context of the RMR as a 'banquette' or infantry step. Any other earthworks relating

to the approaches to the fortification are likely to have been significantly affected by the construction of the road immediately to the east of the Rotunda between the mid-1840s and 1869 though there is no evidence to suggest any features to the east of the fortification itself. By this date the entrance close to the Rotunda has been constructed and there is scrub growing in the ditch. Earlier maps show tree or scrub cover on the approaches (e.g. NMR MD 96/124 dated 1839) perhaps reflecting the importance of the earthwork in practising the Repository exercises rather than for attack practice (though Congreve did intend a tower to be built so escalading could be taught as part of the exercises (TNA:PRO WO 55/756)). The proximity of the vegetation to the Rotunda might suggest it that it was allowed to grow for aesthetic reasons.



NB Profile interpreted from 19th century maps and photographs.
Depth of ditch not known.

Figure 10: Original profiles of the fortification as interpreted from documentary sources (NB not surveyed). Profiles A and B both represent sections through the now demolished 'Southern Bastion', one where the possible firing step is evident and one where it is not, and Profile C represent a section through the very northern end of the fortification where the ditch is much narrower. There are no photographs to show the western side of the fortification at this point so the height of the parapet has been estimated.

Photographs taken from 1858 onwards (held within the collections of the Royal Artillery Historical Trust – Albums 933, 27 and 112, Figures 8 and 9), along with the 1867 Bayly map (Figure 36A and B), show the internal faces of the fortification and the types of artillery mounted along the line in great detail. The various gun positions including hard standings without embrasures for mortars, hard standings with embrasures for guns on garrison carriages, arcs for guns on traversing carriages and positions at each apex of the two regular bastions which were for guns on traversing carriages but which, rather than having embrasures, were positioned to fire over the parapet (Figure 11).



Figure 11: A photograph taken in 1858 by John Spiller showing a "10 inch gun 87 cwt on naval slide" positioned at the point of the Southern Bastion. The ground has been raised in this location in order to enable the gun to clear the parapet. The Rotunda is just visible to the left of the photograph. Courtesy of the Royal Artillery Historical Trust (RAHT Collection AL 933/15)

The positions for traversing carriages, located within the 'South bastion' on the Bayly map of 1867 (Figure 36A), were later additions to the fortification, probably to accommodate new mountings developed after the Crimean War (1854-56). Positions for garrison carriages are shown in the same location on earlier maps (e.g. Figure 15) and photographs from around 1858 show where the existing embrasures have been reduced in depth by the insertion of a brick panel in which a pivot pin was embedded (RAHT Collection AL112, AL112/3)..

Repository Grounds complete with fortification and Rotunda

With the re-erection of the Rotunda in the Repository the recreational values that the grounds had started to develop were firmly established; on the one hand the landscape was part of a practical training facility for the manoeuvring of heavy ordnance and on the other a pleasure grounds and attractive backdrop to the striking Rotunda building. The Repository Ground's primary function remained the training of artillerymen in the movement of heavy ordnance and it was this original aim of the elder William Congreve that led to the creation, as a by-product, of the Repository Ground's picturesque landscape. After the re-erection of the Rotunda, William Congreve (junior) continued to emphasise the primarily educational role of the establishment (Skedd 2008, 18).

In the 1822 Rotunda catalogue the founding aims of the Repository were reiterated and expanded on by the younger Congreve:

The immediate objects of the instruction of this Institution are the different modes of passing Rivers, Ravines, Ditches, Narrow Roads, Precipes, Morasses, and other such obstacles, by Field Artillery; with the embarkation and disembarkation, the mounting and dismounting, both Light and Heavy Ordnance; shewing all the various expedients by which the heaviest Guns and Mortars may be landed and moved, where Cranes, Gyns, or other regular mechanical means are not to be obtained. To this also is added the Construction and Laying of Military Bridges, Scaling Ladders, and in short everything that can occur in the most difficult service, and which does not fall within the regular Field or Garrison Practice of Artillery. (Congreve 1822, 1-2)

From 1820 to 1859 the Repository was 'used exactly as intended by the elder Congreve' (Skedd 2008, 20) and the Bayly map of 1867 shows in great detail the point to which the facility had developed over this period (Figures 36A and B). In December 1838 the Royal Military Repository was described as having:

all the requisite for the instruction of the artillery in the practice of their formidable mode of warfare. Here are model rooms containing drawings and models of implements of war, workshops in which experiments are made and new models constructed, and in the open air different kinds of fortification are erected by the students, and all the details of the management of artillery are put in practice for the purpose of instruction, near an artificial fortification constructed of earth. The ground near this spot is beautifully diversified and unequal in its surface, and interspersed with several pieces of water; this condition of the ground affords excellent practice to the men, in dragging the guns up steep acclivities, or lowering them down rapid descents, turning pontoon bridges to transport them over water, and imitating all the operations of actual war.

(Saturday Magazine 1838)

Contemporary training manuals demonstrate the continuing importance of William Congreve the elder's Repository exercises well into the 19th century, a fact underlined by the lengthy and detailed lists of exercises demonstrated "at the various visits and inspections of the Masters General and Lieutenants General of the Ordnance' through the 1820s, 30s and 40s (RAHT Collection MD93). These detailed lists describe not only the types of exercise being undertaken but also the locations that these exercises were being carried out within the Repository. Additionally it is worth noting that they also describe not only the exercises undertaken on specific structures or ponds within the Repository but also in open areas in between these structures, such as the 'Ground in rear of West Batteries' (ibid). These exercises are wonderfully illustrated by the work of the pioneering photographer John Spiller (1833-1921), a chemist at the Arsenal (Skedd 2008, 18). As an important addition to the training manuals, he was commissioned to produce a series of photographs to illustrate the Repository exercises (Skedd 2008, 18; Crookes 1858, 184). A photograph album held in the collections of the Royal Artillery Historical Trust (RAHT Collection AL933) is described as containing:

'Photographs illustrative of Instruction given to the Selected Non-

Commissioned Officers, Royal Artillery in the Royal Military Repository during the summer of 1858, Photographed by John Spiller ACS.'

These photographs have extensive captions describing such exercises as 'Gun drill 32 Pounder 56 hundred weight on dwarf platform', 'Sling wagon exercise' and 'Heavy gun raft formed of 28 casks' (RAHT Collection AL933/9,10,22). Two other albums of photographs held in the collections also contain Spiller's images, some of which are not signed (RAHT Collection AL27 and AL112), whilst one group are not attributed to Spiller but seem to show steps involved in the Repository exercises, showing the various stages of "Field gun drill: Armstrong 12 pounder BL" or "Rocket Drill" for example (Figures 4, 6, 8 and 9). The images show cadets in the process of mounting ordnance next to the training line, manoeuvring ordnance using sheerlegs, gins and derricks, crossing the ponds using bridges and pontoons and how to build temporary bridges. Most of the photographs can be located on the ground today (see Appendix 1), though it is interesting to note that few of the photographs in these particular albums show the Rotunda, perhaps reflecting their practical focus (see Figure 12).



Figure 12: Cadets practising drill in the southernmost of the two bastions with the Rotunda visible in the background to the north. Courtesy of the Royal Artillery Historical Trust (RAHT Collection AL44/90).

The 1826 watercolour by George Scharf depicts some of these Repository exercises being carried out (Figure 13). Cadets can be seen in the process of mounting cannon, marching, and hauling an artillery piece across the large pond, an activity which apparently claimed the life of one cadet in 1830 (Anon. 1892, 91). The main bridge across the pond appears to be a pontoon-style construction whilst two smaller bridges are visible, one at the north-eastern corner of the largest pond where the modern dam/slucice is and one to the south-east corner over a channel carrying water into the pond.



Figure 13: Watercolour by George Scharf, dating to 1826 demonstrating the dual roles of the Repository Grounds as training area and pleasure grounds. ANI92836001 © Trustees of the British Museum

Photographs of various types of bridge construction were also taken by Spiller such as trestle, slot and pontoon bridges (RAHT Collection AL933 and Figures 14 and 16) and they were probably dismantled and reconstructed regularly, hence the need for the 'Bridge Store' marked on the 1867 Bayly map (Figure 36B). By 1839 a second bridge had been constructed and the pontoon style bridge shown on the Scharf watercolour removed by 1869 (NMR MD 96/124; Ordnance Survey 25 inch 1st edition 1869). The stone foundations of an earlier bridge or dam appear to be visible at the eastern side of the lake, though this may be the wharf shown on later photographs and maps, which was used for lowering gun with a 'crane formed of a 24 pounder on a travelling carriage' (RAHT Collection AL933/36).



Figure 14: Cadets constructing a pontoon bridge across the north-western corner of the largest Repository pond circa 1858. A caption on a similar photograph, possibly taken at the same time, by Spiller described the components as 'Blanchard's cylindrical pontoons' (RAHT Collection AL28/12). The building marked 'Boat Store' on Bayly's 1867 map was located just out of shot to the left and houses located on Hillreach can be seen in the background. Courtesy of the Royal Artillery Historical Trust (RAHT Collection AL112 – no image number).

It appears that in addition to the Repository exercises themselves the Repository landscape may also have provided the ideal terrain for teaching survey techniques as

demonstrated by the coloured map drawn 'by aid of the Pocket Sextant' by C. Stratford of the Royal Military Academy (Figure 15). Comparison with documentary and map evidence suggests that the undated sketch must have been executed between 1845, when the Dickerson memorial was erected, and 1861 (Skedd 2008, 18). It also seems that one of the ponds near the Repository was designated the 'Cadets' pond' for swimming in the mid-19th century (Guggisberg 1900, 93) though it is possible that this was one of the other ponds to the east of the Repository.

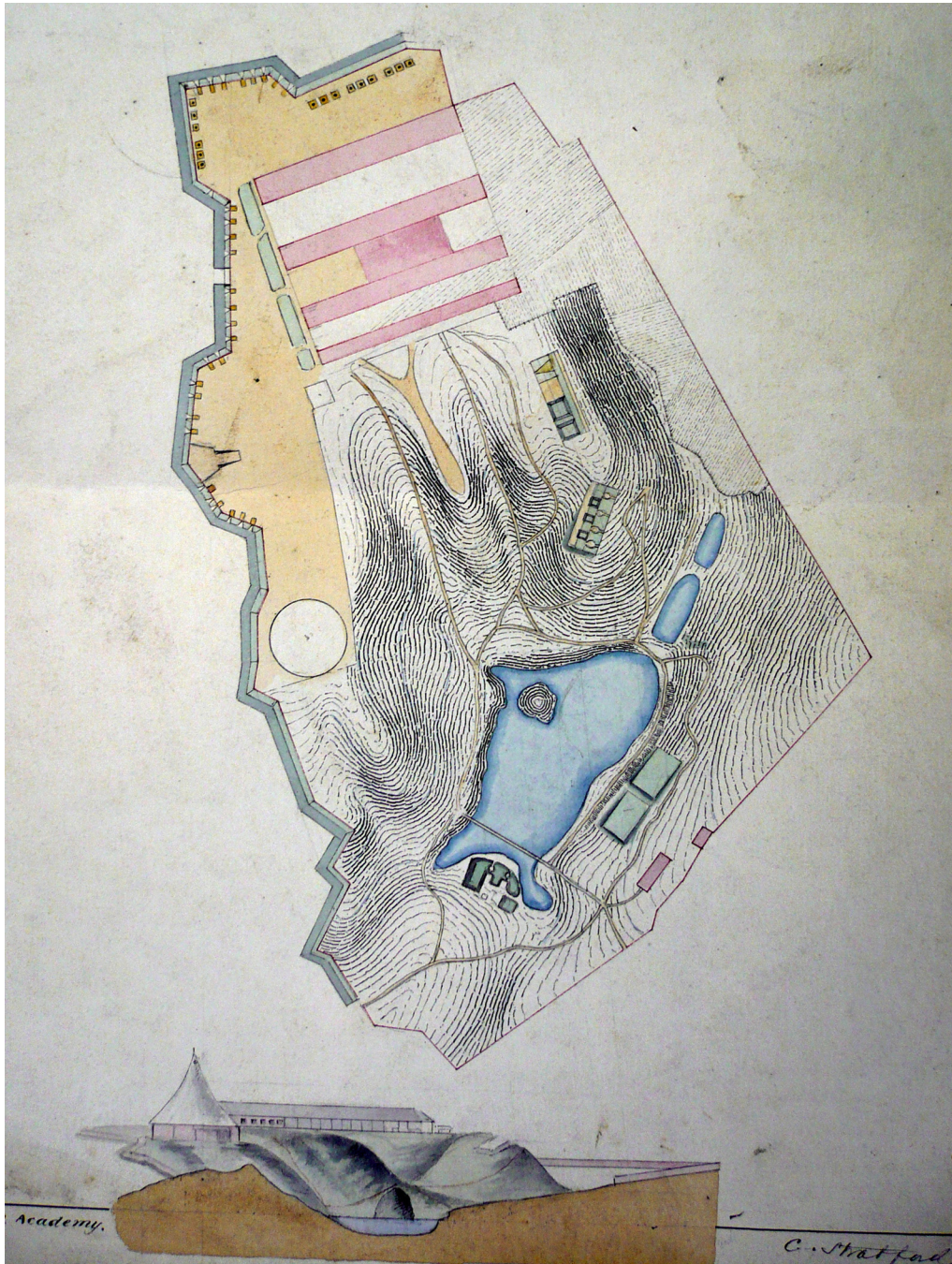


Figure 15: Undated map of the Royal Military Repository probably undertaken in the late 1840s or 1850s. The contours and profile depict the topography in great detail and the use of the 'Pocket Sextant' mentioned in the title suggests the area was used for surveying exercises. © English Heritage

The secondary role of the Repository landscape, that of a picturesque pleasure grounds which, like the Rotunda, were open to the public is demonstrated by a number of contemporary paintings, sketches and written accounts (e.g. Skedd 2008, 19-21). The Lucas print of 1820 (RCIN/PLS: 701653) shows soldiers and couples strolling up through the Repository grounds to the newly opened Rotunda (Skedd 2008, 17). The public accessibility of the grounds in this period was important in order to demonstrate the growing professionalism and military might of the army (Skedd 2008, 35). Though both views are to the east, rather than in the Repository Grounds, the 1822 and 1823 engravings by TM Baynes emphasize the picturesque nature of the Rotunda's location with views to the Thames beyond (Collage 23485 and 23484) as do later photographs (RAHT Collection Albums 44 and 112, Figure 16). The people are probably strolling past the earlier pond to the east of the site near the gun park, rather than the main Repository pond and it seems likely that the building shown on that engraving is the octagonal building that was known to exist to the west of that earlier pond (NMR MD 96/921 but also shown on the pre-Repository map of 1788 – TNA: PRO MPH 1/235). The cheveux de frise boundary seen to the right of engraving is probably enclosing the mortar battery.



Figure 16: A picturesque view, looking west across the southern end of the largest Repository pond showing a temporary bridge in the foreground and the semi-circular summerhouse to the far left-hand side of the frame. The photograph was almost certainly taken by John Spiller in 1858. Courtesy of the Royal Artillery Historical Trust (RAHT Album AL112/23)

As well as demonstrating how the Repository grounds were used for exercises, the 1826 watercolour by George Scharf also demonstrates the landscape's recreational role, as well as its use as grazing for cattle (Figure 13) – the Superintendent of the RMR also had

the right to cut hay in the grounds (TNA:PRO WO55/2864 1841) and a piggery was later constructed (Figure 36B). Couples sit on benches and stroll along paths; the one which leads up to the Rotunda may be that seen emerging on the Lucas 1820 view (RCIN/PLS: 701653). It is also worth noting the semi-circular summerhouse to the south of the main pond on the Scharf view, yet another indicator of the dual use of the Repository Grounds (Figures 13 and 16).

The Royal Military Repository became part of the regular tour of the Woolwich facilities which was offered to British and foreign dignitaries alike (Skedd 2008, 24-28). The picturesque nature of the Repository Grounds would have provided an important and pleasant backdrop against which to show important visitors the Rotunda and Royal Military Repository. Visitors from the British Royal family included William IV and Queen Adelaide in 1830 and 1835 and Victoria on her accession in 1837. Royal visitors from other countries included the Prince and Princess of Orange and their sons in 1836, in 1842 Frederick William IV (1795-1861), King of Prussia, and Duke Ferdinand of Saxe Coburg, Grand Duke Michael of Russia in 1843 and in July 1853 there was a review for the King and Queen of Hanover (Skedd 2008, 34-36).

The construction of the Royal Artillery Institution's observatory building to the east of the Rotunda in 1839 added yet another important element to the suite of training and educational facilities that had developed in the Royal Military Repository. It is not clear exactly why the observatory was located next to the Rotunda, but given the Institution's wish to 'generally further the education of artillery officers' (Richards 2008, 58-59), this juxtaposition with the Rotunda may have been intentional. Trees may have screened its visual impact on the Rotunda's setting. Skedd (2008, 17) notes that a few years later Chantrey's square stone memorial to Major-General Sir Alexander Dickson (d. 1840), Wellington's right-hand man during the Peninsular Campaign, was erected almost due south of the Rotunda in June 1845 (Timbers 2008 says 1847).

The decline of the Repository

In 1859 a School of Gunnery was established at Shoeburyness, Essex and it has been suggested that the Royal Military Repository was no longer in use as a formal training facility for the Artillery after this date (Skedd 2008, 22). It is not clear, however, how quickly or to what extent the establishment of the training facilities at Shoeburyness affected the way the Repository grounds were being used. The series of Repository exercise photographs (by Spiller) demonstrates that it remained in active use as a training facility at least until the late 1850s (RAHT Collection Album 933, 27 and 112) though that the last entry in the lists of exercises for annual inspection (RAHT Collection MD 93) is 1858 may be of some significance. It has been stated that the 'RMA Repository closed in 1900' with the Repository exercises moving to Shoeburyness at that date (Maurice-Jones 1959, 176), though photographs show that Repository exercises were taking place at Shoeburyness in the mid to late 19th century (RAHT Collection AL 61).

Though the use of the Repository Grounds as the main training area for the practice of artillery exercises may have been declining in the late 19th century, the area continued to have some military training uses and photographs from the earlier 20th century

show well-kept grounds (RAHT Collection AL932/19) suggesting its continuing use as a recreational amenity at least not many years before these photographs were taken. This is supported by Lady Lefroy's comment: 'The band of the Royal Artillery plays frequently, in the Repository Grounds or on the common, about 5 p.m, from May to October (Dickens 1879, 29). It is worth noting that an earlier reference from 1868 suggests the grounds were private and for the use of officers only (Skedd 2008, 23).

Also in 1859 the Rotunda and its contents became the responsibility of the Ordnance Select Committee (TNA:PRO WO 33/9, 238) separating its administration from the rest of the Repository and perhaps suggesting that there was less need for a historical teaching collection in the context of training. Despite the changes that were taking place in this period the Rotunda was still managed as a museum and teaching collection (Skedd 2008, 22). Skedd (2008, 22) notes how the Common and the Repository Grounds were still being used for training and drill, though their value was declining. Larger guns were beginning to necessitate larger ranges and many activities were transferred to Plumstead and Shoeburyness during the 1850s and 1860s (Anon 1895, 143-4). However the mortar battery between the Barracks and the Rotunda was in use until 1873 (Skedd 2008, 22). It is not clear whether the construction of the practice battery behind the Royal Military Academy sometime after 1851 (TNA:PRO WO55/3034), apparently around 1855 (Guggisberg 1900, 95), reflected a change in the way the Repository was being used at this time.

Though the Rotunda was still functioning as a museum during the first half of the 20th century (Skedd 2008, 25) it is not clear what status the Repository Grounds held at this time. The memories of a Woolwich resident seem to suggest that it was still occasionally accessible to the public, albeit on a restricted basis, with the lake being used for ice-skating (Peters 2008, 115). A photograph of cadets digging trenches in what appear to be the Repository Grounds in the early 20th century (RAHT Collection AL932/18 and 19; Figure 29) suggest a move to more prosaic training activities in Woolwich, with the 'science' of artillery manoeuvres being taught at Shoeburyness and elsewhere. Clearly by the time practice trenches were being dug the recreational role of the grounds was diminishing in significance. The Ordnance Survey 25 inch maps of the area appear to show that a boundary was erected to the west of the Rotunda between the 2nd (1896) and 3rd (1916) editions which may suggest that the Repository Grounds had been divorced from the Rotunda Museum at this point, though there is nothing to suggest there would not have been access through a gate. It is possible that the access to the Repository Grounds from Hillreach was also blocked around this date. The corrugated iron sheds within the Rotunda compound, one to the north of the Rotunda and two on the western boundary of the Rotunda compound, also appear to have been constructed between these dates in the early part of the 20th century. In the inter-war years, the development of married accommodation on the slopes of Greenhill to the east of the Repository further emphasises the changing role of the area.

Repository Woods in the Second World War and beyond

Aerial photographs taken by the RAF in the 1940s show that the Repository Grounds were in active use during the Second World War with trenches, dispersed storage and various other structures visible at this time, many of which left earthworks and traces

of structures that are discussed in more detail below. The woodland experienced an intense period of activity between (and possibly before) early August 1944 and October 1945 when a tented camp can be seen on gently sloping ground to the far west of the survey area beyond the two smaller ponds (RAF LA33 4083 14-AUG-1944). The function of the tented camp is unknown. It is also worth noting that the roof of the Rotunda was given a camouflage paint scheme during the Second World War (RAF I06G/UK/916 6112 11-OCT-1945). The area immediately to the east of the current entrance into Repository Woods at the northern end of the linear fortification was also in use as allotments during this period (RAF I06G/UK/916 6181 11-OCT-1945).



Figure 17: The Repository grounds in October 1945. A tented camp can be seen between the largest pond and Hillreach whilst to the east the Rotunda's camouflage paint scheme is visible. Storage huts can be seen between the pond and the Rotunda. RAF I06G/UK/916 6112 English Heritage (NMR) RAF Photography

By 1945 much alteration had also been undertaken to the southern end of the Royal Military Repository though the three northmost of the four original single-storey 19th century sheds survived at this date (RAF I06G/UK/I365 7309 02-APR-2009) as well as the mid-19th century drill shed shown on the Bayley map of 1867 (Figure 36A). By the mid 1960s all the original Repository buildings from the start of the 19th century had been removed, with exception of the gatehouse and the later drill shed (FSL 975/5 6641 23-JUL-1966).

The Repository Grounds have maintained a similar training function throughout the later 20th century and have been used for physical training and 'command task' training' (Timbers 2008, 36). A small portion of the grounds in the northwestern corner of the site was used to build housing in the 1950s but the original area of the Royal Military Repository essentially survives as the modern army depot. The recreational nature of the Repository Grounds also survives to some extent within the Dell Angling Society, whose access is restricted to area around the largest pond.

DESCRIPTION AND INTERPRETATION OF THE REMAINS

The 19th-century Repository (Figures 35 and 37)

The linear fortification

Only the northern half of the fortified line survives as an earthwork above ground. It defines the eastern boundary to the Napier Line compound, Rotunda compound and Repository Woods. It stretches for 366m from the modern entrance into the Napier Line compound (TQ 4273 7801), on a roughly north-south alignment, to the modern entrance to Repository Woods (also known as the Dell Gate, TQ 4263 7831), the point at which the earthwork originally terminated.

Between the entrance to the Napier Line compound and the Rotunda compound, the remains of one of the larger bastion sections (the 'North Bastion' on the 1867 Bayly map/Figure 36B) of the fortification is preserved as an earthwork platform, along with a section of curtain in the form of an east-facing scarp (Figure 18). Slight earthworks on the top of the platform may relate to the buried remains of the numerous embrasures and emplacements depicted in this section of the line on historic maps (Ordnance Survey 1st edition 25 inch map of 1869) and photographs (RAHT Collection Album 27).



Figure 18: The earthwork platform which defines the remains of the northern-most bastion of the two original bastions, looking south towards Woolwich Common. Photograph: Sarah Newsome 2008 © English Heritage

To the north of the bastion the Rotunda compound is defined by a stock brick wall topped by an iron fence. The wall may be a surviving part of the original revetment, a suggestion that is supported by its sloping angle close to the Rotunda compound, and

it may now appear perched on top of the earthwork due to erosion of the outer bank (which may have been deliberately slighted in order to fill in the ditch). The earthwork evidence indicates that this section of the practice fortification was constructed after, though perhaps not very long after, the bastion was constructed to the south. This could relate to different construction phases (possibly supported by the depiction on the 1821 map - TNA:PRO MFQ I/1274) but this should be treated with caution as many changes have occurred in this area, including the insertion of the current access into the Rotunda compound between 1839 and 1869 (NMR MD 96/124; Ordnance Survey 1st edition 25 inch map 1869).



Figure 19: The eastern (external) face of the practice fortification north of the Rotunda. Photograph: Sarah Newsome 2008 © English Heritage

To the north of the entrance to the Rotunda compound the earthwork is defined by an east-facing scarp which turns through a number of different angles to create a variety of flanks, salients, spurs and demi-bastions of different angles and lengths which are much more irregular than the two large regular bastions that existed to the south (Figure 19). It is possible that this irregularity was purposeful but it may have been influenced either by the location of the Rotunda and possibly the earlier stepped boundary to the Repository described above. The stock brick wall and iron fence continue along this section of the earthwork though it is clear that some sections of wall, such as that defining the northern boundary to the Rotunda compound, have been rebuilt with 20th century brick. Again later erosion has given the impression that the wall sits on top of the earthwork but the difference in ground level to the west and east of the boundary wall suggests that it is probably original (Figure 20). It is likely that the berm or step suggested by the depiction of the earthwork on the 1869 Ordnance Survey map (1st edition 25 inch) has been lost because of the earthen sod material eroding and slumping.

The earthwork is probably most substantial on the spur which is located immediately to the east of the Rotunda, framing the building and reaching a height of 5m, and this may be no coincidence though erosion in other areas must be considered (Figure 21). If the earthwork were constructed after the building was relocated here then this stretch of the line probably had more of an aesthetic than a practical training function.

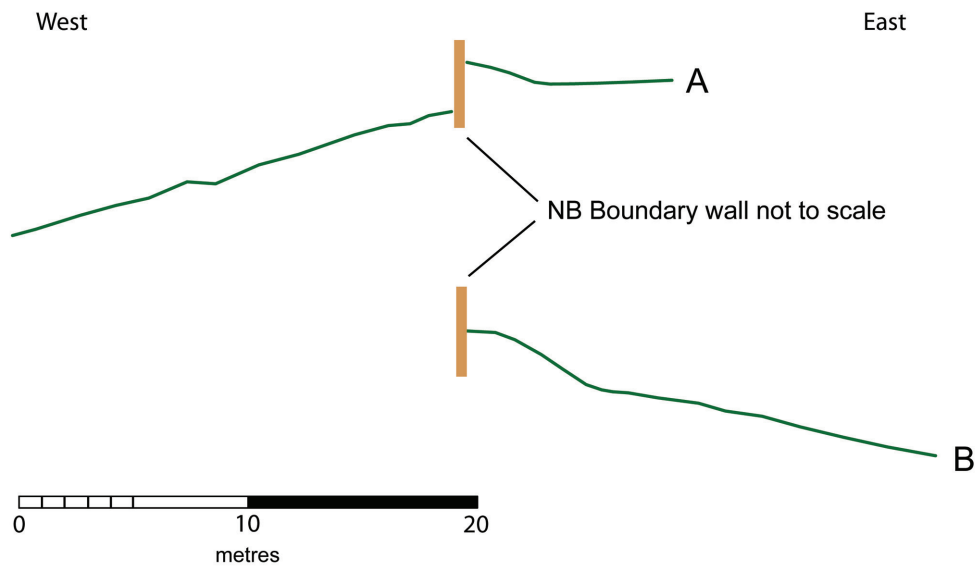


Figure 20: Profiles through fortification. See Figure 35 for profile locations.



Figure 21: The Rotunda building from the east, framed by a large spur of the practice fortification. Photograph: Derek Kendall DP049765 © English Heritage

It is worth noting at this point that though the Rotunda compound itself was not surveyed, the Rotunda building appears to sit on a large platform which is as high as the fortification earthwork and appears to sit on top of the reverse (western flank) of the earthwork which is visible inside the Rotunda compound but this has probably been caused by modern developments and alterations.

Continuing northwards, beyond the Rotunda compound, the height of the earthwork diminishes and the very slight remains of an outer ditch around 4m wide can be seen

(Figure 22). The ditch appears to disappear at the southern end under the main scarp of the line close to the northern end of the Rotunda compound. It may be that the earthwork in this section was disturbed and rebuilt to a slightly different line. The earthwork evidence suggest possible phasing at one of the angle changes (TQ 4264 7825) where the northern section of the ditch appears to cut the southern section suggesting it was constructed at a later date. The main bank scarp phasing contradicts this relationship and it is not clear whether it was the bank or ditch that had been rebuilt.



Figure 22: The slight remains of the ditch which is still visible at the northern end of the practice fortification. Photograph: Sarah Newsome 2008 © English Heritage

On the western side of the boundary wall the earthwork has been disturbed by later Second World War trench digging but short stretches of the reverse flank can be identified (Figure 37). This is also true within the Rotunda compound but again it is not clear how much the earthworks in this area have been remodelled. A number of linear earthworks are visible on the ground that slopes away to the east of the fortification. Apart from later drainage features one possible track was identified as two small parallel scarps and other earthworks may relate to later 19th-century or 20th-century landscaping.

Other 19th century military remains

A large trench nearly 30m in length and well over 2m in depth is located immediately to the west of the middle of the three ponds (Figure 23). It is angled towards its eastern end from which access is gained, and it has an accompanying bank of spoil on its southern side. The earthwork was constructed for training purposes (see Documentary Evidence for the History of the Site), and is described in a later list of exercises (RAHT Collection MD93) as the 'Fieldwork near Summerhouse Pond', is depicted on a map of 1808 (Figure 5). A map from 1839 (NMR MD 96/124) depicts the earthwork in a very similar manner to the rest of the Napier Line and it is tempting to see this as the experimental work that Congreve mentions (TNA:PRO WO 44/642). This map also shows a small detached stretch of earthwork but this may have been destroyed by a later track (Ordnance Survey 3rd edition 25 inch map 1916). The fact that the trench is not depicted on the mid-19th century colour tinted plan (Figure 15) might suggest it had gone out of use by that date but the Bayly map of 1867 (Figure 36B) shows it in great detail with evenly spaced (possibly deliberately planted) trees depicted within the base of the trench and a step or berm in the accompanying bank.



Figure 23: The 'Fieldwork near Summerhouse Pond' (RAHT Collection MD93) dating to the early 19th century located to the west of the middle pond, viewed from the west. The trench is shown on a map of 1808. NB Figure stood on northern bank for scale. Photograph: Sarah Newsome 2008 © English Heritage

A large irregular earthwork mound exists at the northern end of the large pond, measuring roughly 72m by 40m, probably material from the excavation of the pond itself (Figure 24). Earthworks are shown in this location on maps dating from 1815 onwards (TNA:PRO MPH 1/507/3-4) but the mid-19th century colour-tinted plan (Figure 15) and the 1867 Bayly map (Figure 36B) shows this series of strangely shaped earthworks in

particular detail. Photographs from around 1860 show that these earthwork clearly function in the Repository exercises, with one photograph showing that the earthwork was used for 'parbuckling' which involved lowering a cannon down a steep slope on to a raft below using a system of ropes and pulleys (RAHT Collection AL933/33). The surviving earthwork has been substantially modified, probably in the later 20th century, by the dumping of large amounts of rubble, which may be related to the infilling of an earlier north-western spur of the pond.



Figure 24: The heavily modified mound at the northern end of the largest pond. The material for this mound was probably excavated from the pond but the earthworks were part of the Repository training facilities and this supported by a Spiller photograph from 1858 (RAHT Collection AL933/33) which appears to show this mound being used to lower cannon down via a system of ropes and pulleys. Photograph: Sarah Newsome 2008 © English Heritage

On the eastern side of the largest pond, between the pond and the assault course, the locations of four or possibly five small buildings were identified as much disturbed rectangular hollows roughly 4m in width dug into the hill slope (Figure 25). Although most of these buildings appear to be 20th century in date (see below), the front of one hollow is defined by brick foundations and appears to relate to a structure recorded on a photograph of around 1858 (RAHT Collection AL112) and on the 1867 Bayly map as a 'Spring Well' (Figure 36B). The structure appears to consist of low building with a brick façade which has been dug into the hill slope.

It should also be noted that whilst the earthworks to the south-east of the respirator training room (below) are very much disturbed and partially buried by the dumping of rubble, some may relate to the training battery shown in this location on historic maps from the mid-1840s onwards and in great detail on the Bayly map of 1867 (Figure 36B).



Figure 25: Brick-built structure, possibly protecting a spring source, whose foundations are still visible on the ground. Photograph circa 1858. Courtesy of the Royal Artillery Historical Trust (RAHT Album AL112 – no number)

Landscaping

Tracks and paths around the woodland which date to the first half of the 19th century, and in some case probably to the initial use of the area for Repository exercises, are either still in use as modern tracks, or are visible as earthworks running through the woodland. One particularly clear example is a terraced track cut into the hill slope on the western side of the lake that runs towards the now blocked entrance to the grounds which can be seen on the undated colour-tint plan of the grounds from the mid-19th century (Figure 15) and in detail on the Bayly map of 1867 (Figure 36B).

The earthwork remains of two ponds survive in the south-western corner of the site where ponds are marked on a number of early 19th-century maps (Figure 5; TNA: PRO WO 55/2449; MPH 1/507). The ponds are visible as the wide and deep trough through which the modern stream runs. The pond at the northern end of the practice fortification had been infilled by the mid-19th century (Figure 36B) but is now visible as a slight depression at the northern end of the survey area, which is cut by the boundary to the site.

As the Repository Grounds were clearly functioning as a recreational space and providing an important picturesque backdrop to the Rotunda, it is likely that planting schemes were instigated. It is not entirely clear what form these may have taken, though the 1860s maps and many of the photographs show more formal planting closer to the Repository Sheds and the Rotunda and a more naturalistic landscape further to the west around the ponds (OS 1st Ed 25 inch; RAHT Collection Albums 27 and 112). The formal planting is particularly evident at either end of Number 2 and 3 sheds of the RMR close

to the Field Officers' and Staff Sergeant's quarters (Figure 36A) and the grounds close to the buildings are described as being 'tastefully laid out in formal walks and parterres' (Saturday Magazine 1838). However some evidence of formal planting can be seen in the form of earthwork terraces that survive along the northern and western boundary to the site. The 1839 and 1860s maps show lines of trees planted in these locations, presumably on the terraces (e.g. NMR MD 96/124; Figure 36B; Ordnance Survey 1st Edition 25 inch 1869). Surviving trees show that these were horse chestnut.

Other remnants of the possible planting scheme only survive in the form of individual established trees within the Repository Grounds or as large tree stumps. These trees include oak, horse and sweet chestnut, some of which may be survivals from the woodland that existed here prior to the establishment of the Repository. Any pattern within these fragmentary survivals is difficult to discern but there appears to be a possible line of oaks along the eastern side of the stream in the southern part of the grounds and also a concentration of oaks and sweet chestnut where a number of paths formerly converged to the south of the large pond. In addition to this the 1869 map also shows formal planting around the ponds and a tree-line (possibly an avenue) to the north of the large pond (Ordnance Survey 1st Edition 25 inch).



Figure 26: Charlton parish boundary marker. Photograph: Sarah Newsome 2008 © English Heritage

Recreation

To the east of the large pond, two rectangular levelled platforms roughly 52m by 16m are visible terraced into the slope. These levelled areas are marked as a 'Croquet Ground'

on the Bayly map of 1867 (Figure 36B). A small L-shaped scarp in the northern corner of the northern-most platform suggests the site of small structure. The croquet lawns were constructed sometime after 1845 and before the colour-tinted plan of the mid-19th century was surveyed (Figure 15).

Boundary Marker

A parish boundary marker is located at TQ 42507793 at the southern end of the watercourse where it becomes culverted. It marks the boundary between Charlton and Woolwich parishes and is inscribed 'C.P. 1827', C.P. being Charlton Parish (Figure 26). At least three others were originally situated within the Repository grounds but these were not located during the survey (Figures 36A and B).

Drainage



Figure 27: Dressed stone circular structure, probably related to 19th century drainage of the site, located at the southern end of the survey area. Photograph: Sarah Newsome 2008 © English Heritage

A structure related to the drainage of the area, possibly to the 19th century Repository to the east, is located at TQ 42527794 on the west-facing slope above the culverted southern end of the watercourse. It consists of a circular dressed stone structure, approximately 1m in diameter and 2m in height, which is built into the hill slope (Figure 27). At the base of the structure the top of a stock brick arch is visible, possibly inserted, which suggests that it is related to 19th century or earlier 20th century drainage. A small square structure is visible on Bayly's 1867 map (Figure 36A) in the same position but it does not appear to be linked to any of the surface gutters or drains recorded on the survey.

At the southern end of the watercourse the foundations of a brick structure 3.5m by 4.5m overall are visible covered in thick ivy. The structure appears to have had at least one internal division. The Bayly survey of 1867 (Figure 36A) suggests that these are the remains of a cluster of small structures or buildings which, given their location astride the watercourse, almost certainly relate to water-management in the Repository grounds.

The 20th-century Repository (Figures 35 and 38)

Trenches

There are over 20 military practice trenches within the survey area which can be found in three distinct groups, those to the north-east of the site dug into the back, or western side, of the linear fortification (centred on TQ 4263 7826), those to the south of the site dug into the heavily disturbed area of ground (centred on TQ 4260 7803) and those that are dispersed along the western boundary of the survey area (Figure 38).

The trenches are either linear slit trenches or dug in an L-shape (Figure 28) and vary greatly in length and depth, the smallest being only a matter of 1.5m in length and the largest being 16m in length. However they tend to fall into two broad categories, the smaller type that would have accommodated a single man, and the larger type that average around 8m in length and would have presumably accommodated more than one man. It is likely that the size of the trenches is directly related to the nature of the warfare being practiced. The cluster in the north-eastern side of the survey area suggests the 19th century linear fortification may itself have been used as a defensive position during this practice.

Photographs of cadets digging trenches (Figure 29) in the Repository (RAHT Collection AL932/18; AL27/64) demonstrate that at least some of the remains date to the early 20th century (Timbers (2008, 63) suggests circa 1905 for photograph RAHT Collection AL932/19). The form of the trenches follows pre-First World War practice, though they could easily date from the inter-war period. None of them appear to be the complex artillery trenches that were in use during the First World War (Brown and Field 2007). The cluster dug into the linear fortification, the few on the southern disturbed ground and those towards the northern end of the western boundary to the site are mostly visible by 1946 (RAF 106G/UK/1356 5097, 7309, 7310 02-APR-1946). The remaining trenches may be obscured by tree cover or, in the case of those located to the southern end of the western boundary, are probably slightly later as this area appears to be under cultivation as an allotment or garden as late as 1951 (RAF 58/774 5004 21-AUG-1951).



Figure 28: L-shaped trench located at the western side of the stream in the southern half of the survey area. The trench is probably mid-20th century in date. Photograph: Sarah Newsome 2008 © English Heritage



Figure 29: Cadets digging trenches in the Repository grounds at the western side of the small ponds some time in the early 20th century. Photograph taken looking north-west. Courtesy of the Royal Artillery Historical Trust (RAHT AL27/64)



Figure 30: Zigzag trench which is still visible as an earthwork in the same general area as Figure 29. Photograph: Sarah Newsome 2008 © English Heritage

Dispersed storage

Alongside the modern footpath between the largest pond and the assault course the locations of four or possibly five small buildings were identified as much disturbed rectangular hollows roughly 4m in width dug into the hill slope (Figure 35; 38). In one of the hollows part of a concrete plinth was noted. Aerial photographs from 1945 and 1946 show small nissen-type huts in these locations (RAF I06G/UK/916 6182 11-OCT-1945; RAF I06G/UK/I356 5080 02-APR-1946). Though one of the buildings appears to date to the mid-19th century (above), the rest of the huts probably represent some form of dispersed storage within the woodland, perhaps of flammable materials that need to be stored away from the main military buildings in case of a direct hit during a bombing raid.

The aerial photographs also show two low, flat roofed huts located parallel to the north-western boundary to the site (RAF I06G/UK/916 6183 11-OCT-1945), situated on an earthwork terrace that runs parallel to the wall and is probably of earlier date. These buildings were removed by May 1947 which suggests they may also have had a Second World War function, becoming redundant at the end of the hostilities.

Allotments or gardens

In a well-defined area to the west of the watercourse at the southern end of the site a number of very slight linear banks and scarps were recorded (Figure 35, 38) which seem to form small square or rectangular enclosures in the order of 10m in width and of varying length. In the late 19th century the northern end of this area was used as a piggery (Figure 36B) some of the scarps may relate this small building which was located

in its own small square enclosure. The earthworks to the south have the appearance of garden or allotment boundaries and this interpretation is supported by the historic aerial photographs which appear to show allotments or small garden plots being cultivated in this area in the late 1940s (RAF I06G/UK/I356 5078 02-APR-1946; RAF 58/774 5004 21-AUG-1951). 19th century maps (Figure 36B; Ordnance Survey 1st edition 25 inch 1869) also depict what appear to be paths and boundaries which may also relate to some of the earthwork remains.

Rifle range

In the centre of the woodland to the south of the largest pond is the area named on the modern Ordnance Survey map as the 'Rifle range'. It consists of a fenced area in the shape of an irregular pentagon which sits on a level terrace. In the south east corner of the site is a single storey rectangular brick building 3.5m by 11.7m with a flat concrete roof (Figure 31). The building has three bays, two of which are open to the west, and one which has been infilled with brick to create a small room at the southern end. Immediately to the north of the building is a low brick wall 6m in length and around 10 courses high and slightly angled to its northern end. Due to tree cover on the available aerial photographs it is not clear when the building was constructed but it was in place by 1971 (MAL 71074/I97 21-MAY-1971).



Figure 31: The rifle-range building viewed from the west. Photograph: Derek Kendall DP049806 © English Heritage

Immediately to the west, outside of the fence, is a substantial north-south scarp up to 3m high in places and over 35m in length which has been cut into the rising ground to the east. Historic aerial photographs show that the fence around the complex is a much

later addition and that the scarp is related to the former location of a substantial wall with angles at each which turn to the east (RAF I06G/UK/I356 7310 02-APR-1946) which is probably a butt. To the east of the butt is a structure which may have held targets and an iron rail which remains in situ may relate to this structure. The historic aerial photographs also show a small flat roofed rectangular building in the entrance to the modern compound just to the north of the one that presumably replaced it.

The range appears to have been constructed some time between 1916 and 1945 and seems to have involved shooting at targets placed in front of the protective wall to the west from a position to the east, close to the buildings which were presumably built for shelter. It seems likely that the range was used for small-bore rifle or pistol practice as the length of the range must only have been in the region of 50m at the most.

Respirator Training Room

Located on high ground immediately to the west of the 'rifle range' is a small rectangular stock brick building 6.6m by 7.7m with a double-pitched roof which becomes steeper towards the apex (Figure 32). The roof overhangs the main walls at each side and is supported by wooden columns, creating a porch area which originally surrounded the building. The western and eastern sides contain two rectangular metal framed windows. At some point the northern, eastern and southern sides of the building were modified by infilling some of the bays with red brick. This was presumably in order to make the building suitable for its current, or most recent, function as a respirator training building.



Figure 32: 20th century pavilion-type building now in use as a 'Respirator Training Room'.
Photograph: Sarah Newsome 2008 © English Heritage

The original function and date of construction of this building is unclear but it was certainly in place by 1945 (RAF 106G/UK/916 6112 11-OCT-1945). It is not depicted on the Ordnance Survey 3rd edition 25 inch map of 1916 and a structure marked as 'Platform' on the 1867 Bayly map (Figure 36B) appears to be located a little further to the east, in the vicinity of the rifle range targets. The porch and decorative pitched roof suggest that its function may have had a recreational rather than training function and its location would have commanded impressive views to the north when the scrub was lower. Its juxtaposition with the rifle range appears to be coincidental as there would have been no view of the targets to be gained from the building as it was immediately above them.

Trench

An underground trench or shelter is located at TQ 42527812 between the largest pond and the rifle range (Figure 33). This appears to be very narrow and L-shaped (as far as it could be explored) and is revetted with corrugated iron sheets. Its purpose is unclear but it probably dates to around the Second World War.



Figure 33: The entrance to the narrow buried trench which probably dates to the Second World War. Photograph: Sarah Newsome 2008 © English Heritage

It is also worth noting that a slit trench or trench shelter is visible to the east of the 19th century linear fortification at TQ 42657327 but it is not clear whether this is represented by the earthworks in this location.

Later 20th century training facilities

Though all of the woodland has been used as a training facility throughout the 20th century, later activity appears to focus on two particular areas, the area of disturbed ground at the southern end of the survey area and the assault course (Figure 34) which is located on a man-made terrace on sloping ground between the largest pond and the Rotunda compound. The assault course consists of walls to scale, water traps and other obstacles and had been constructed by 1971 (MAL 71074/196 21-MAY-1971). In the area of disturbed ground at the southern end of the site various earthworks and structures are related to the continuing training of troops, perhaps for 'command task' training (Timbers 2008, 36). A concrete sewer pipe located to the west of the smaller ponds may also have been used for training purposes.



Figure 34: Modern assault course. Photograph: Derek Kendall DP049783 © English Heritage

DISCUSSION AND CONCLUSIONS

The training grounds of the Royal Military Repository were laid out at a critical time in the evolution of the British armed forces. During the 18th century, through the efforts of gentleman scholars, military science had emerged as a new discipline, questioning earlier assumptions and analysing the profession of arms. Foremost amongst these scholars was the elder William Congreve, whose achievements included transforming practical training, improving gun carriages and, through his scientific enquires, revolutionising British gunpowder production (Cocroft 2000, 30-66). Crucially, his official positions enabled him to enact change, and this is reflected in the training grounds of the Royal Military Repository, where he identified the need for an establishment to address the theory of the Repository exercises through a teaching collection, but also grounds where this theory could be put into practice. Congreve's work was spurred on by the contemporary threats to Britain's security by revolutionary France, threats which were also reflected in the rapid expansion of the royal powder works and the protection of the south and east coasts by Martello towers and other coastal fortifications. The development of the Repository and its grounds also represents the growing professionalism of the British army during the 19th century, at a time when amateur gentlemen were being replaced skilled professionals, especially in the highly technical field of artillery. The Royal Military Academy was also established at the start of the 19th century, where young men were educated by some of the leading mathematicians and scientists of the day, in a structure paralleled in France by their academy system.

The Royal Military Repository itself appears to have moved from the Warren to the site to the west of Barrack Field at the start of the 19th century. This move was probably prompted by a number of factors, including the need to house a growing teaching collection of models and historic weaponry and the fire at the Warren in 1802. Perhaps most significant was the usefulness of the natural topography of the area, with its cliffs and gullies, for teaching the Repository exercises that William Congreve had devised some years earlier in 1774. The Repository sheds were constructed by 1804 and by 1808 the natural topography had been enhanced by the construction of a series of ponds and training batteries where, as well as learning techniques for the manoeuvre of heavy ordnance, cadets could also be trained in the crossing of water bodies and bridge construction. Debates regarding a planned northern boundary wall to the Repository restricting the public's view of the exercises, and royal visits in 1814, show the regard in which the innovative Repository training school was held at this early date. This also highlights a level of public accessibility to military training and military landscapes which is rarely seen today.

In 1818 the decision was taken to move the tent-like Rotunda, previously located in the grounds of Carlton House, to the eastern side of the Repository which was felt to be an ideal picturesque location for the building, with its pleasant woodland and water bodies, albeit artificial ones that had been created for training purposes. The move was part of a series of developments undertaken by Congreve's son, also William, when he first took charge of the Repository after his father died in 1814. By moving the Rotunda to the Repository the younger Congreve could exploit not only its connection with the recent victory over Napoleon but also house the spoils of war from the conflict that had been

added to the Repository's teaching collection and take advantage of the publicity that the eye-catching and high-profile building would bring to the Repository.

At the same time Congreve also requested that a fortification should be constructed at the Repository, which he felt was the final item required to make the training facility complete. The construction of the fortification was postponed until at least 1820 when the re-erection of the Rotunda was finally finished, but it seems to have been on-going in 1824 and complete with a variety of bastions and different gun emplacements by 1830. The fortification was located along the eastern boundary to the Repository, in the same position as an earlier boundary which may also have been fortified, though Congreve makes no mention of this when he requests the construction of the later fortified line.

Public pride in the defeat of Napoleon was reflected in the opening of the Rotunda to the general public as a museum in 1820. With the completion of the fortification (which, perhaps fortuitously, framed the building when viewed from the east), the state-of-the-art training grounds also became a pleasure grounds, providing a picturesque backdrop for the royal and state visits to the Repository and a landscape that could be enjoyed by general public. Subsequently numerous training structures within the Repository were joined by such things as croquet lawns and a summerhouse. As early as 1808 the Repository had been laid out with tracks and by the mid 19th century there was formal landscaping close to the sheds and Rotunda and more naturalistic planting around the ponds. This type of landscaping is also seen in the later 19th century at Chatham where promenades and walks were created along the sections of the Inner Lines (P Kendall, pers comm). In 1838 the Royal Artillery Institution built its new observatory immediately to the east of the Rotunda to be used for the general learning and improvement of the soldier. Its juxtaposition complemented, perhaps intentionally, the aims of the rest of the facilities.

The establishment of a new school of gunnery at Shoeburyness in 1859 appears to have heralded the beginnings of a decline in the status of the Repository and the separation of the Rotunda from the rest of the training grounds, perhaps reflecting the declining importance of the teaching collections in practical training. However, it is clear that the Repository grounds were still used for training by the cadets from the Royal Military Academy, though perhaps in a less formal way than had originally been envisaged by Congreve. The digging of trenches in the Repository in the early 20th century indicates however that the grounds were not being maintained for recreational purposes by this date and could suggest that the days of wider access to military training grounds were numbered, if not over. Though access to the Repository Grounds by the public was restricted in the 20th century, the use of the grounds for military training continued, with trench digging, a rifle range, assault course and various other facilities being constructed during this time. Tented camps were also erected in the woodland during the Second World War. At the time of writing the area is still used for training, continuing a 200 year old tradition on the site.

The archaeological survey of the landscape around the former Repository Grounds has recorded a surviving landscape of paths, terraces, ponds, training earthworks and formal planting much of which dates to the first half of the 19th century and which, in

combination with the substantial surviving remains of the practice fortification and the Rotunda, represent a significant proportion of the unique training facility that was the Royal Military Repository. It is possible that buried remains may also survive in the areas of the Repository that have been redeveloped. In addition to the surviving elements of the 19th-century landscape, a number of 20th-century practice trenches survive as well as other training facilities, evidence of a not always well-documented aspect of the modern British army.

The Repository Grounds with their designed landscape and training facilities, the Rotunda building, the linear fortification and even the observatory building represent a unique collection of buildings, structures and spaces whose history is intimately linked. The Repository Grounds are in their particular location because of the topography, the Rotunda and the linear fortification are in their location because of the Repository, and the observatory building may be located close by in order to take advantage of a close association with the Repository or the topography. The surviving archaeological remains and buildings, when combined with the excellent photographic, cartographic and documentary evidence for the Repository enable the building of a detailed narrative about a site which was at the heart of the growing professionalism of the British army, which began at the start of the 19th century as a consequence of the Napoleonic conflicts. Excellent documentary evidence gives an exceptional understanding of how different parts of the landscape were used in the Repository training, as well as the roles of specific structures.

A tradition of building military practice fortifications was beginning to develop by the late 18th century (e.g. Smith 1995, 423) and surviving 19th century structures are known from other military establishments such as Sandhurst (A Johnson, pers comm). However none of these were designed for the specific practice of Repository exercises and appear to largely relate to infantry training. In summary, the Repository Grounds probably represent one of the earliest purpose-built training landscapes in England, if not in Western Europe, a landscape which appears to have stayed in use as some form of training area until the present day. Established at a time of increasing professionalism, the training grounds of the Repository embody both the Congreves' visions of the training needs of the artillery at this time and the essentially empiric British approach to military training.

METHODOLOGY

Total Station

Detail was surveyed using a Trimble 5600 Total Station theodolite by taking radiating readings from each station on a network of 47 stations. The stations were surveyed in sequence to form a closed traverse of 23 stations with 6 link traverses of 6, 5, 5, 4, 2 and 2 stations. The traverses were adjusted for errors using Korec's Geosite software. After adjustment the data was transformed to Ordnance Survey National Grid by adjusting the positions of station numbers 4, 21 and 100 to the National Grid Transformation OSTN02 by use of a Trimble R8 survey grade GNSS receiver.

Permanent points

2 permanent and intervisible stations (1 and 2) were established on the site to allow future work with conventional survey equipment. The positions of the stations are marked by nails hammered into concrete and their positions are 542690.88, 178119.33 and 542703.71, 178199.29.

Graphical Techniques

In areas of dense vegetation detail was supplied using standard graphical techniques of offset and radiation from a temporary network of plastic pegs previously located with the Total Station theodolite and plotted on to polyester drawing film at the elected scale of 1:1000 for use in the field.

Publication

The survey plan was completed at 1: 1000 scale using pen and ink on plastic drawing film. Additional report illustrations were prepared using AutoCad and Adobe CS2 software. The report was prepared for publication using Adobe InDesign software.

Archive

The survey data has been archived in compliance with English Heritage RADF guidelines and deposited at the NMR.

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RAF 58/774 5004 21-AUG-1951

FSL 975/5 6641 23-JUL-1966

MAL 71074/196, 197 21-MAY-1971

Ordnance Survey maps

Ordnance Survey 1st edition 25 inch map 1869

Ordnance Survey 2nd edition 25 inch map 1896

Ordnance Survey 3rd edition 25 inch map 1916

Royal Artillery Historical Trust/Firepower Collection (RAHT)

Album 27 – 'Photograph album by Duncan, Lt HL RA relating to service 1868 – 1929'

Album 28 - photographs

Album 44- photographs

Album 61- photographs

Album 112 – 'Album of photographs of RMR and RMA Woolwich c.1858'

Album 932 – 'Blacker, General George Patrick Domaine CBE ?1930s'

Album 933 - 'Photographs illustrative of the Instruction given to the selected non-commissioned officers, Royal Artillery in the Royal Military Repository during the summer of 1858, Photographed by John Spiller ACS'

MD 93 - List of exercises exhibited at the Royal Military Repository at the various visits and inspections of the Masters General and Lieutenants General of the Ordnance.

MD213/13 - 'A brick tower proposed to be built in the grounds belonging to the Royal Military Repository' 1807

MD939/16 - Kaestlin JP - unpublished typescript and notes for book on Congreve

RA/20 - Letter from James Pattison to the Board of Ordnance 23 Jan 1775, letter of 25 Jan 1775 from General James Pattison to the Board of Ordnance, in 'Manuscript book of collected military papers on artillery matters. Vol II 1780-1800'.

Watercolour by George Bryant Campion showing the Rotunda from the south-east, with ramparts and monument. Royal Artillery Institution (RAI): A/C 8405/22 circa 1850

The Royal Collection

Lucas, RW | June 1820 'The Rotunda or New Model Room, built in the Royal Military Repository at Woolwich', Colour print RCIN/PLS: 701653.

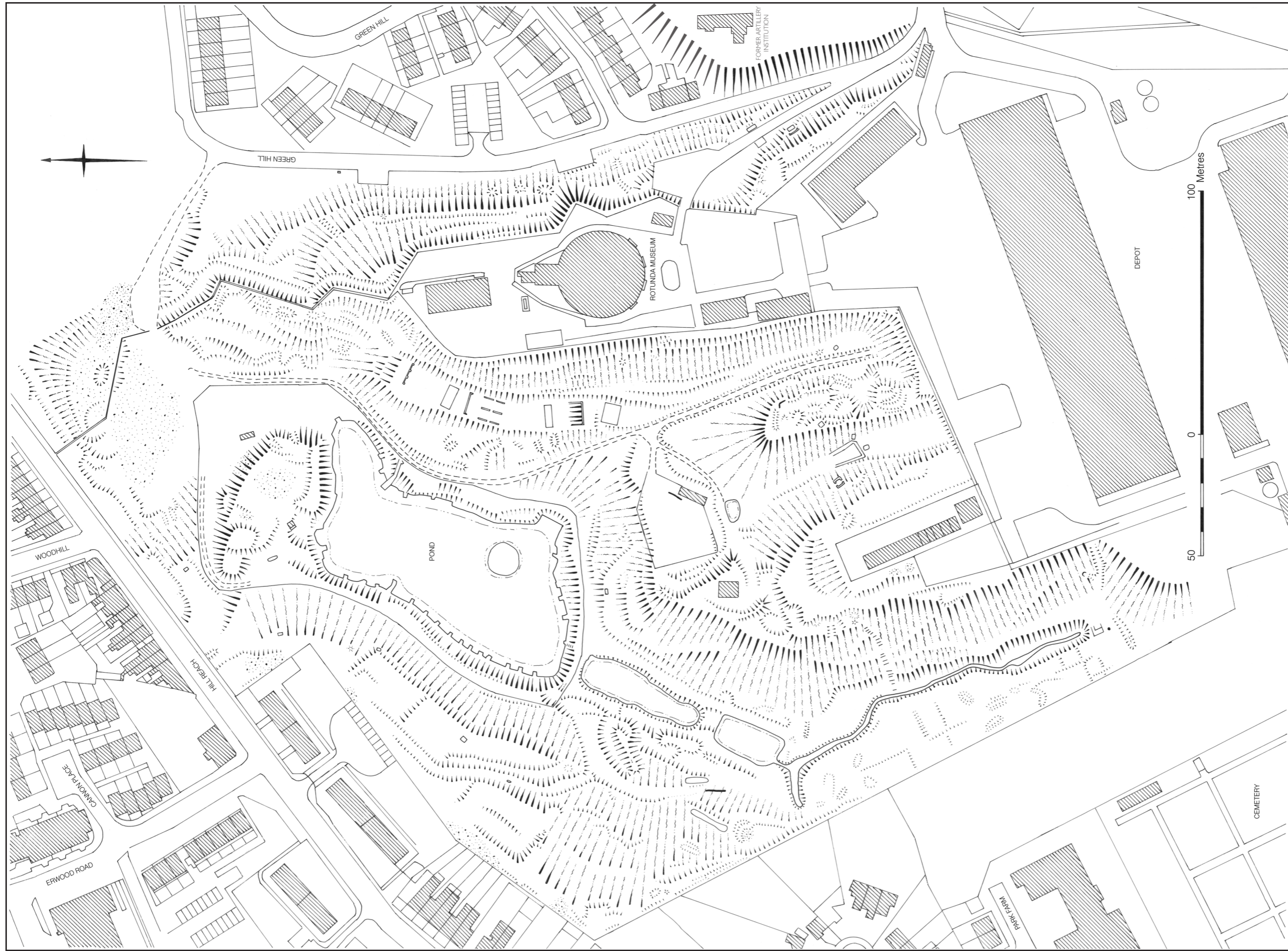


Figure 35: Archaeological remains, visible as earthworks and structures, in the former grounds of the Royal Military Repository, Woolwich based on a 1:1000 scale survey undertaken in 2008. (NB The survey drawing has been reduced for inclusion in this report and is therefore not to scale)

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ROYAL MILITARY REPOSITORY, WOOLWICH.

Surveyed in 1867 under the direction of Lt. Col. Bayly R.E. Col. Sir H. James R.E. F.R.S. M.R.I.A. Superintendent of the Ordnance Surveys.

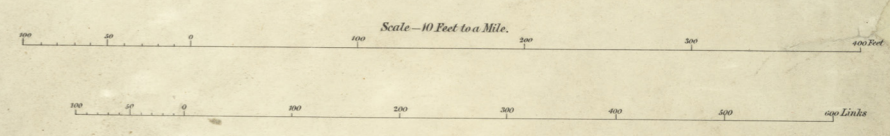


Table of Accommodation.

F.O. Comm ^{rs}	Field Officers	Officers	Staff Serj ^{ts}	N.C.O.	Married Privates/Soldiers	Officers	Horses Troops	Hospital Patients	Prov. Mag.	W. Tank	Capacity of
	1		1		5	5					

Appropriation.

Address Letters	Basement.	Ground Floor	1 st Story	2 nd Story	3 rd Story
A		Field Officers' Qrs., Servants' Qrs., Wash Hs., Coach Hs., and Stables			
B		Superintendent's Office, Entrance, and Model Room.			
C		Staff Serj ^{ts} Instructor and Assistant's Office, Staff Serj ^{ts} Quarters.			
D		School Room, Model Room, Alution Room, Married Soldiers' Qrs.			
E		South Store, Timber Store, Wheelers' Shop, South Shop, Entrance and Office.			

REFERENCE

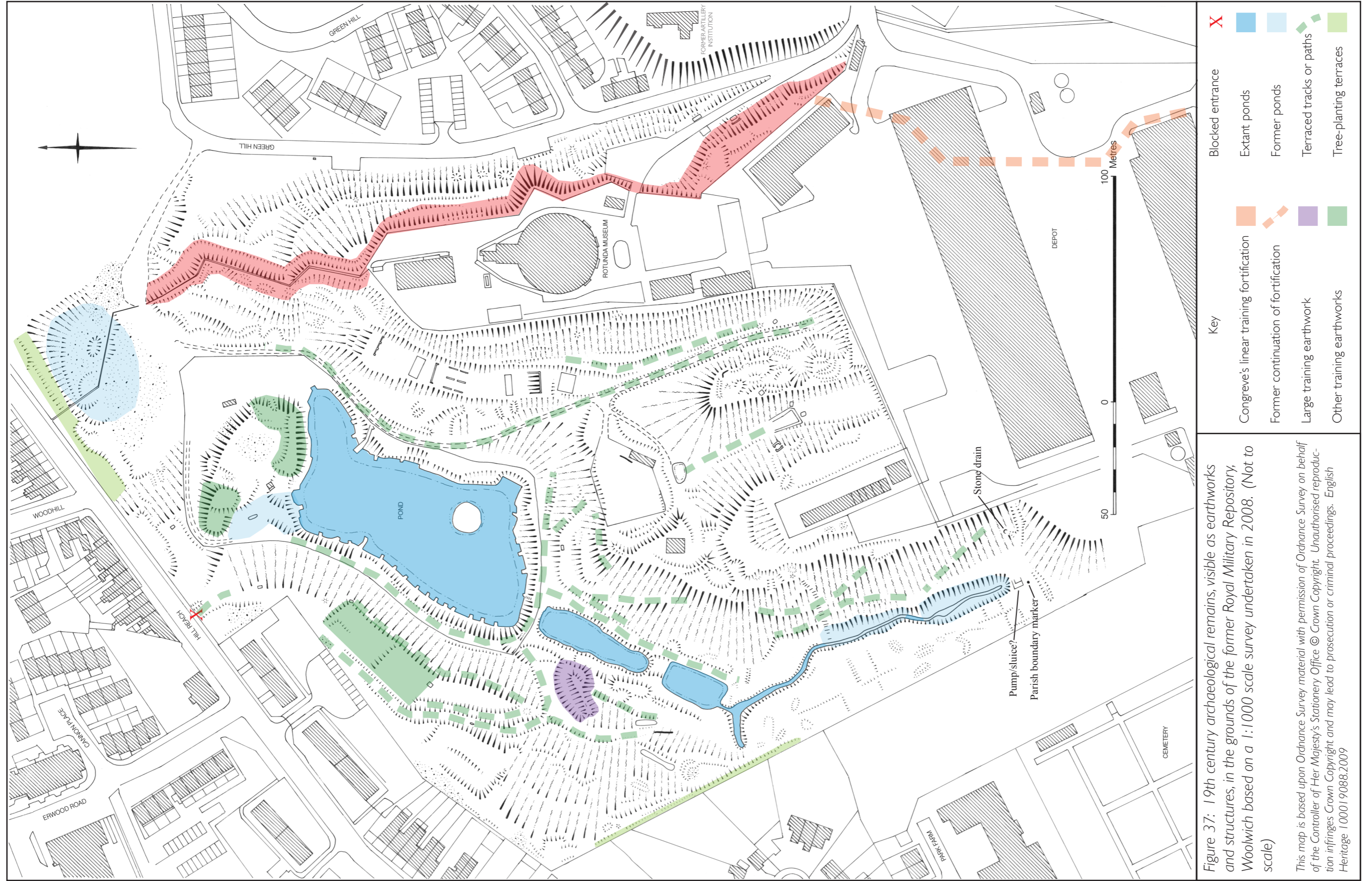
The light Ovals that denote the Gravelled surface.
 The light Brown line denotes the Pitched Pavement.
 The dark ditto denotes the Street Asphaltic Paving.
 The Grey line denotes the Flag Paving.
 The Surface Gutters are represented thus:
 The Underground Drains are represented thus: - - - - -
 The Drainage is conducted into:
 Gutterings to Underground Drains in Surface Gutters are denoted thus: - - - - - S.C.
 Pipes for Rain Water and Water Supply are represented thus: - - - - -
 The Draining Pipes are represented thus: - - - - -
 Note. The small Arrows indicate the direction of the fall in the Drains.
 The Green line denotes the Great Road.
 One storied Buildings are denoted: - - - - -
 Two do do do and marked: - - - - -
 Three do do do do: - - - - -
 The Barracks are lighted internally by Candles: - - - - -
 do do do internally by Oil: - - - - -
 The Ordnance Boundary is shown thus: - - - - -
 Lamps on Buildings are denoted thus: - - - - -
 Lamps that are elevated thus: - - - - -
 Water Taps are denoted thus: - - - - -
 Rain Water Spouts are denoted thus: - - - - -
 Dead Ends: - - - - -

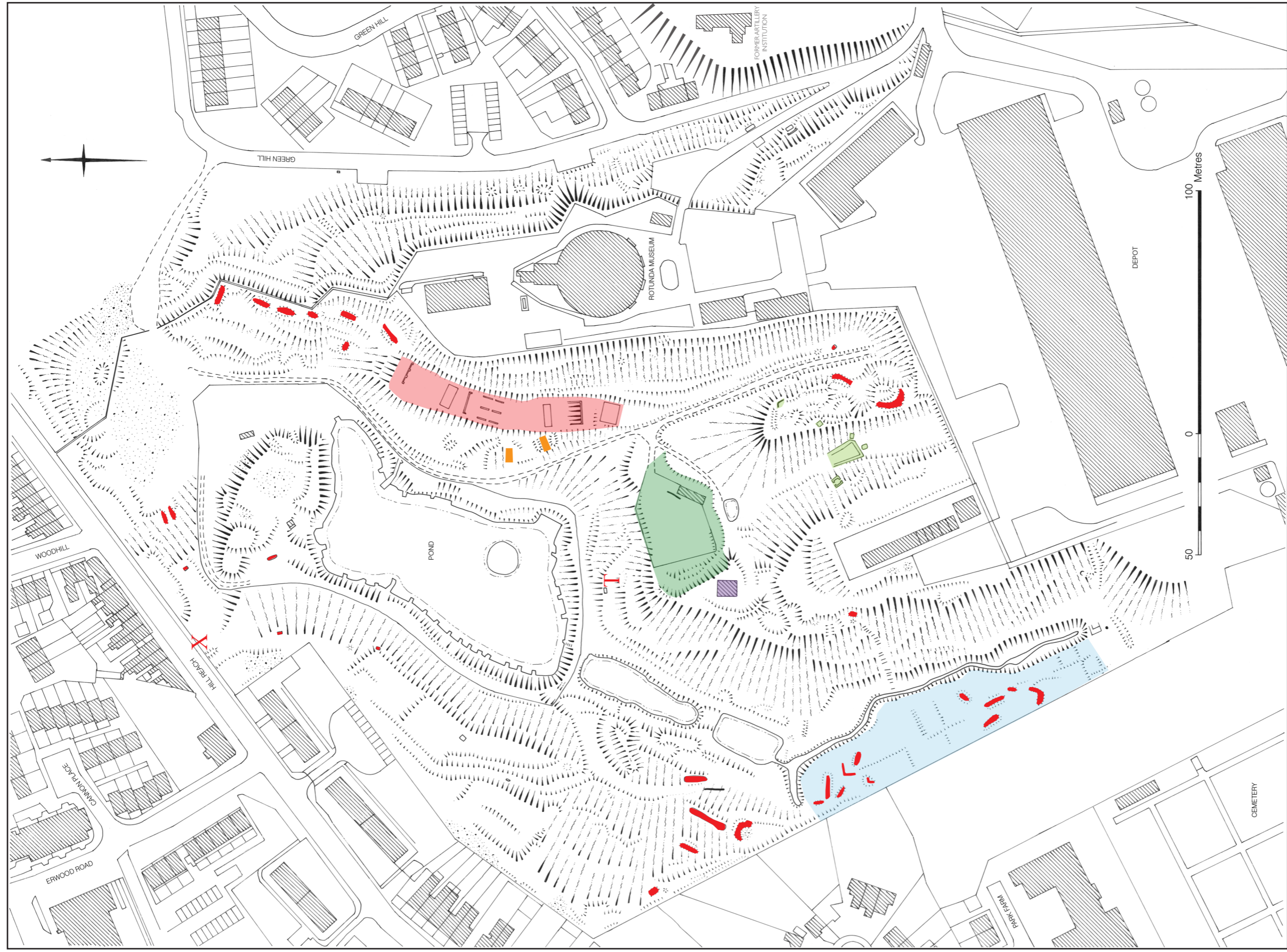
*Lt. Col. Bayly
Supt. Ordnance
30 January 1868.*

Figure 36A: 1867 survey by Lt. Col. Bayly and Col. Sir H. James, Superintendent of the Ordnance Surveys, showing the southern section of the Royal Military Repository. NB North is to the right of the image © The National Archives: Public Record Office MPHH 11362



Figure 36B: 1867 survey by Lt. Col. Bayly and Col. Sir H James, Superintendent of the Ordnance Surveys, showing the northern section of the Royal Military Repository. NB North is to the right of the image.
 © The National Archives: Public Record Office MPH 1/362





Key	
X	Blocked entrance
T	Buried trench
Red square	Practice trenches
Light blue square	Possible allotments
Orange square	Dispersed structures
Purple square	Respirator training room
Green square	Rifle range
Light green square	Modern training structures
Red square	Assault course

Figure 37: 20th century archaeological remains and training facilities, visible as earthworks and structures, in the grounds of the former Royal Military Repository, Woolwich based on a 1:1000 scale survey undertaken in 2008. (Not to scale)

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APPENDIX I

Location details for a selection of Royal Artillery Historical Trust (Firepower) photographs of the Royal Military Repository

NB This is not a comprehensive gazetteer but is intended to provide detailed locational information for some of the historic photographs held in Firepower that the authors were able to relate to either the modern landscape (Figure A1) or the 1867 Bayly map (Figures 36A and B / The National Archives: Public Record Office MPH 1/362).

Reference Number	Description	Direction of view	Located on diagram?
AL2/1/15	Platform on E side of main pond close to 'Trestle Bridge' shown on 1867 Bayly map (Figure 36B)	SE	Yes
AL27/2	Drill on path to W of linear fortification with Royal Artillery Institute building visible in background	E	Yes
AL27/2 (a)	Drill on path to W of linear fortification with Royal Artillery Institute building visible in background	E	Yes
AL27/4	Drill on path to W of linear fortification with Royal Artillery Institute building visible in background	E	Yes
AL27/5	Drill on path to W of linear fortification with Royal Artillery Institute building visible in background	E	Yes
AL27/7	Drill on path to W of linear fortification with Royal Artillery Institute building visible in background	E	Yes
AL27/8	Drill on path to W of linear fortification with Royal Artillery Institute building visible in background	E	Yes
AL27/10	Gun drill at the E end of Repository Shed No 4 (see 1867 Bayly map / Figure 36A)	W	No
AL27/12	Wooden casemate in most southerly of two batteries shown on 1867 Bayly map (Figure 36B)	NW	No
AL27/14	Armstrong 7 inch Breech Loader at apex of 'South Bastion' shown on 1867 Bayly map (Figure 36A)	SE	No
AL27/17	Sling wagon drill in area immediately north of the Rotunda (see 1867 Bayly map / Figure 36B)	NE	Yes
AL27/23	Sling wagon drill in area immediately north of the Rotunda (see 1867 Bayly map / Figure 36B)	NE	Yes
AL27/25	Triangle Gyn drill in 'South Bastion' with 'Gun Shed' shown on 1867 Bayly map (Figure 36A) in background	SE	No
AL27/26	Triangle Gyn drill in 'South Bastion' with 'Store', 'Gun Shed' and gatehouse shown on 1867 Bayly map (Figure 36A) in background	SW	No
AL27/30	Triangle Gyn in 'South Bastion' with mortar positions and 'Gun Shed' (shown on 1867 Bayly map / Figure 36A) in background	W	No
AL27/34	Rocket drill next to linear fortification north of Rotunda with mortar positions and Green Hill in background (also see Figure 36B)	E	Yes
AL27/35	Rocket drill next to linear fortification north of Rotunda with mortar positions and Green Hill in background (also see Figure 36B)	SE	Yes
AL27/37	'Three legged sheers' on E side of main pond looking past the island towards the 'Shed' and 'Boat Store' shown on 1869 Bayly map (Figure 36B)	NW	Yes

Reference Number	Description	Direction of view	Located on diagram?
AL27/40	Wooden casemate in most southerly of two batteries shown on 1867 Bayly map (Figure 36B)	W	No
AL27/41	Wooden casemate in most southerly of two batteries shown on 1867 Bayly map (Figure 36B)	NE	No
AL27/42	Wooden casemate in most southerly of two batteries shown on 1867 Bayly map (Figure 36B)	NE	No
AL27/46	Wooden casemate in most southerly of two batteries shown on 1867 Bayly map (Figure 36B)	NE	No
AL27/48	Derrick at wooden casemate in most southerly of two batteries shown on 1867 Bayly map (Figure 36B)	N	No
AL27/64	Trench digging at W side of Repository	NW	Yes
AL44/90	Repository drill in 'North Bastion' as marked on 1867 Bayly map (Figure 36B) with Rotunda in background	N	Yes
ALI 12 no frame ref (a)	Cadet construction bridge with cylindrical pontoons in NW corner of main pond with houses on Hillreach in background	N	Yes
ALI 12 no frame ref (b)	Temporary bridge in SE corner of main pond with 'Spring Well' marked on 1867 Bayly map (Figure 36B) in background	NE	Yes
ALI 12 no frame ref	Guns on traversing carriages in 'South Bastion' as shown on 1867 Bayly map (Figure 36A)	SW	No
ALI 12 no frame ref	Gun on garrison carriage possibly in NE corner of 'South Bastion' (see 1867 Bayly map / Figure 36A)	E	No
ALI 12/3	Guns on garrison carriages at the W side of the 'South Bastion' (see 1867 Bayly map / Figure 36A)	N	No
ALI 12/7	Linear fortification just to the north of the entrance located in the flank between the 'North Bastion' and the 'South Bastion' as shown on the 1867 Bayly map (Figure 36A). The dome of the Royal Artillery Institute observatory is visible in the background	NE	No
ALI 12/9	Guns on garrison carriages to the north of the entrance through the linear fortification in the flank between the 'North Bastion' and 'South Bastion' (see 1867 Bayly map / Figure 36A)	SE	No
ALI 12/10	Raft on main pond with island, path to RMR sheds and 'Platform' shown on 1867 Bayly map (Figure 36B) in background	SE	Yes
ALI 12/11	Raft on main pond with 'Bridge Store' marked on 1867 Bayly map (Figure 36B) in background	W	Yes
ALI 12/12	Raft on main pond looking towards the 'Bridge Store' shown on 1867 Bayly map (Figure 36B)	NW	Yes
ALI 12/16	Boat and sheer legs at E side of main pond close to 'Trestle Bridge' and 'Platform' shown on 1867 Bayly map (Figure 36B)	N	Yes
ALI 12/20	Temporary bridge in NW corner of main pond, across spur shown on 1867 Bayly map (Figure 36B). Houses on Hillreach in background	N	Yes
ALI 12/19	Main pond with island and 'Platform' shown on 1867 Bayly map (Figure 36B)	S	Yes
ALI 12/21	Temporary bridge to island from E side of main pond	SW	Yes
ALI 12/22	Temporary bridge on E side of main pond with island in background	W	Yes

Reference Number	Description	Direction of view	Located on diagram?
AL112/23	Temporary bridge in SE corner of main pond with 'Summerhouse' shown on 1867 Bayly map (Figure 36B) just visible in background	W	Yes
AL933/15	'10 inch gun 87 cwt on naval slide' at apex of 'North Bastion' as marked on the 1867 Bayly map (Figure 36B) which Rotunda visible in background	N	Yes
AL933/19	Possibly northern-most of two batteries shown on 1867 Bayly map (Figure 36B) with 'Platform' in background	E	Yes

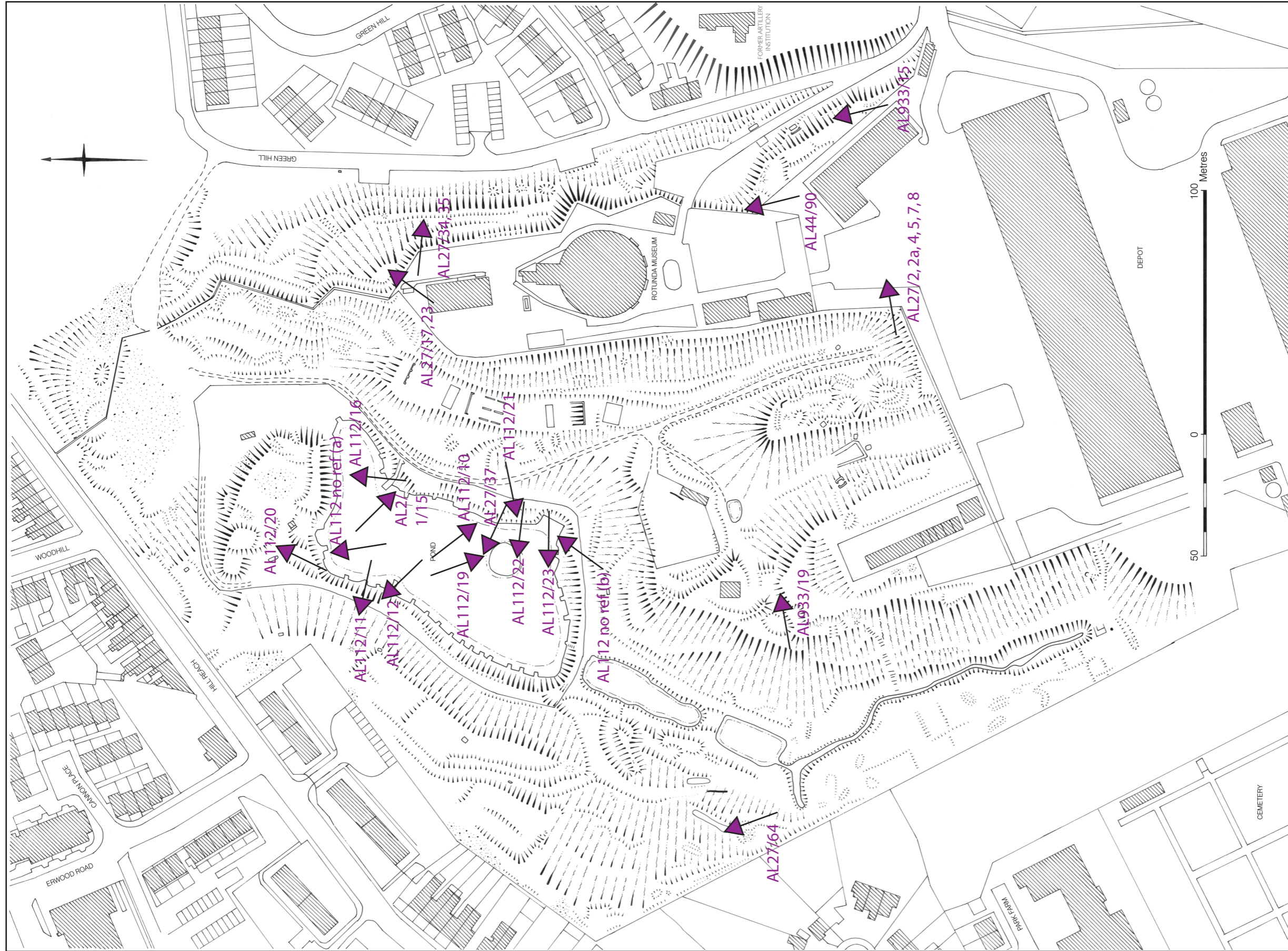


Figure A1: Location details for a selection of Royal Artillery Historical Trust (Firepower) photographs of the Royal Military Repository (Not to scale)
 NB The numbers are archive references and the arrows indicate the direction in which the photograph was taken.

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