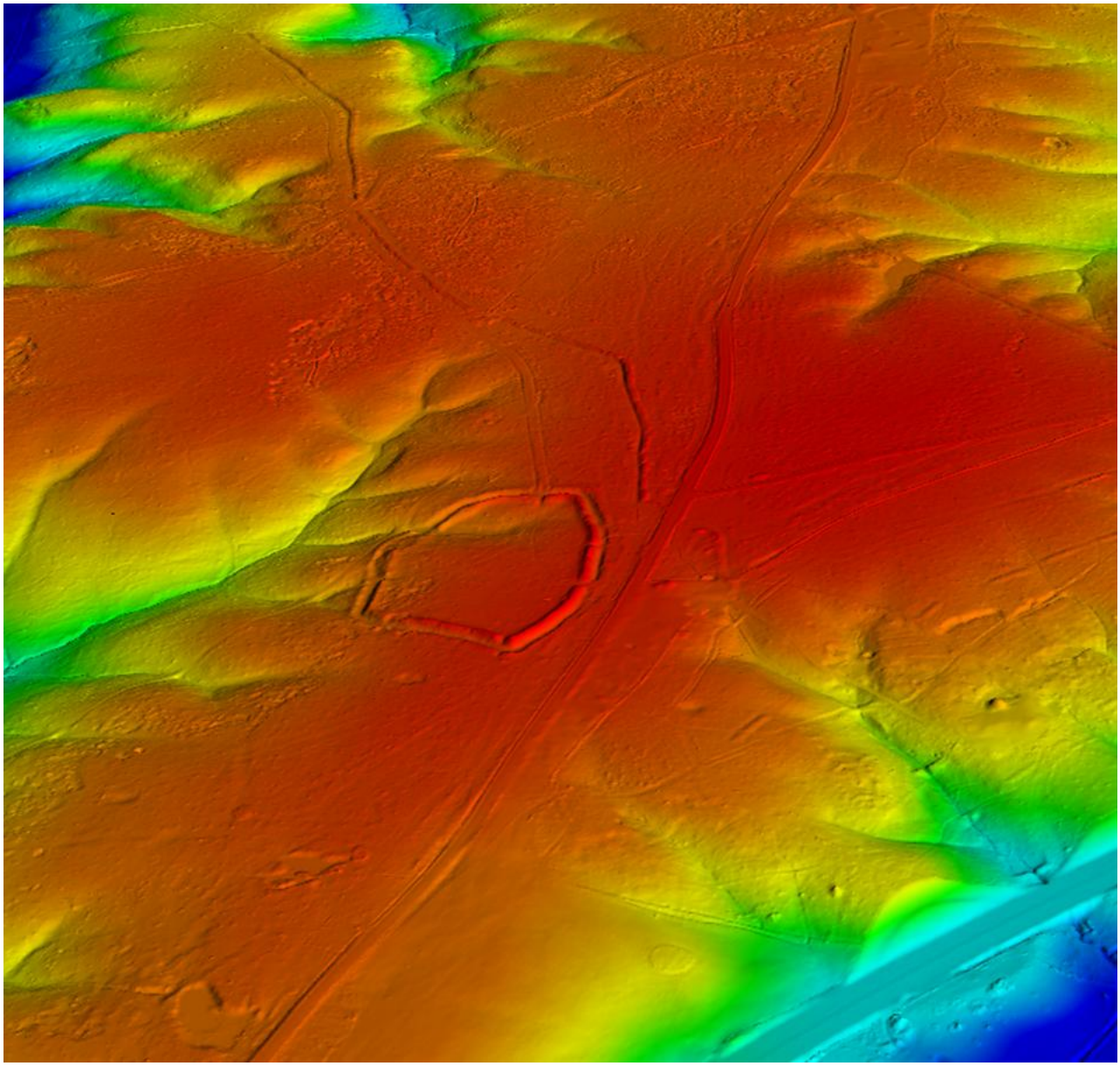
Historic England

Research Report Series 9/2026

Epping Forest Uncovered

Aerial Investigation and Mapping of Epping Forest

Daniel Hunt



Aerial Survey Team

Volume 1 of 1

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Epping Forest
Essex and Greater London

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Summary

Epping Forest is a stretch of publicly accessible woodland and open space that stretches from Manor Park in East London to Epping in Essex. The forest is one of the earliest publicly accessible and protected landscapes in England having been acquired by the City of London Corporation (CoLC) in 1878 for the enjoyment of the nation. Despite its high archaeological potential, the forest has previously lacked a comprehensive landscape study.

This report covers an aerial survey of Epping Forest carried out primarily using newly acquired 0.25m resolution lidar data commissioned by the CoLC. Aerial photographs for open areas of the forest were also assessed. The project area comprised the whole 42 sq. km of the CoLC administered Epping Forest and buffer lands where lidar and aerial photographs were used to discover, interpret and map archaeological sites across the project area adhering to Historic England's Aerial Investigation and Mapping (AI&M) standards. Archaeological Monument Records for each feature were created and directly entered into either Essex or Greater London Historic Environment Records (HER).

The project was initiated by Historic England's Partnerships Team (East Region) via a casework request and carried out by Historic England's Aerial Survey Team on behalf of CoLC.

Contributors

Mapping and research were undertaken by Daniel Hunt of Historic England's Aerial Survey Team.

Acknowledgements

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Front cover image: Lidar image looking south towards Ambresbury Banks and anti-tank defences. [Lidar © City of London Corporation]

Archive location

The Historic England Archive, Swindon.

OASIS ID:	nmr1-529013
Essex HER event no:	EEX61647
Greater London HER event no:	231249

Date of survey and investigation

Mapping was undertaken between August 2024 and May 2025. Monument recording was completed between May 2025 and August 2025. The report was completed between October 2025 and February 2026.

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Contents

Illustrations

Introduction

Project background

In 2024 and 2025 the Historic England Aerial Survey team carried out an Aerial Investigation and Mapping project of the Epping Forest landscape using bespoke lidar data and vertical and oblique aerial photography. The project was initiated by Historic England's Partnerships Team (East Region) via a casework request, with the aim of providing a new baseline archaeological dataset to the City of London Corporation (CoLC) to aid in their management of heritage assets within the forest. The results of this survey will also contribute towards future outreach activities undertaken by the CoLC involving local residents and heritage groups. These activities are likely to include an ongoing programme of monument condition and monitoring recording. Training has also been provided to City of London staff and volunteers in archaeological interpretation of lidar and earthworks and monument condition recording.

The project resulted in the creation of digital aerial mapping data and monument records for over 200 monuments within the boundaries of the forest, the vast majority of which were previously unrecorded. Historic Environment Records were created and provided within Essex or Greater London Historic Environment Records.

Methods, scope and sources

Project aims

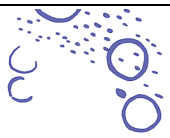
The broad aim of the project was to provide an updated baseline dataset (digital mapping and HER records) for archaeological remains visible on lidar data and aerial photography. The aims of the project were as follows:

- Identify, map and record any visible archaeological remains within Epping Forest.
- Further the understanding of the archaeological landscape of Epping Forest from the later prehistoric to the modern period.

Methodology

The project covered an area totalling 32 sq. km, encompassing all CoLC administered Epping Forest and buffer lands (Fig.1). All archaeological features visible on aerial photographs and/or lidar as cropmarks, soilmarks, earthworks or structures were mapped and recorded. These included features that were visible as extant earthworks or structures on historic photographs, but which have since been levelled or demolished. Features depicted on historic Ordnance Survey mapping were not mapped. The chronological scope ranged from the Neolithic to the 20th century, although the earliest features identified in the forest from the aerial sources date to the Iron Age.

High resolution 0.25m resolution lidar commissioned by CoLC from BlueSky International Ltd. in 2023 was the primary aerial source used for this project due to much of the project area being obscured by dense woodland. Poor resolution of existing topographic data was also a contributing factor. Aerial photographs from the Historic England Archive covering open areas of the forest were consulted alongside images supplied through the Aerial Photography for Great Britain (APGB) (under agreement with Bluesky International Ltd.) and additional imagery hosted on Google Earth. Selected archive aerial photographs were rectified and georeferenced using Aerial 5.36 software and exported as GeoTiff images. Lidar data were processed using the Relief Visualization Toolbox plugin for ArcGIS Pro to create project embedded 2D GeoTIFF images. In some instances, the standalone Relief Visualization Toolbox 2.2.1 was used to create 2D GeoTIFFs where custom parameters were applied to provide additional detail for interpretation. All georeferenced imagery was loaded into ArcGIS Pro 3.2.0 where archaeological features were digitised using Historic England's Aerial Investigation and Mapping (AIM) standards (see below).

Layer type	Description	Symbology
Bank	Features such as banks, platforms, mounds and spoil heaps	
Ditch	Cut features such as ditches, hollows, pits or hollow ways	
Extent of feature	A large area feature or group of features such as industrial complexes or boundaries of military complexes.	
Ridge and furrow	Ridge and furrow	
Structure	Built features including stone, concrete, metal and wood	

Monument records were created for each feature and inputted via remote entryto either the Essex or Greater London HER. Sites with existing records were updated to included additional information and observations derived from this survey. Greater London records can be accessed via the GLHER website (https://glher.historicengland.org.uk/) and Essex records via Heritage Gateway (https://www.heritagegateway.org.uk/gateway/).

Full details of the methods, scope and sources can be found in **APPENDIX 1**.

Previous archaeological work

Previous archaeological research within Epping Forest has been mostly limited to antiquarian and community-based excavations at a handful of sites, with more recent survey and research commissioned by the CoLC to help support their management of heritage assets across the forest.

One of the earliest known ‘excavations’ within the forest was documented by Smart Lethiellier in 1735 who describes the remains of a mosaic possibly relating to a Roman villa being uncovered during groundworks within Wanstead Park. This discovery prompted further investigations during the mid-20th century by Jack Elsden Tuff (1964) who set out to locate the villa by using correspondence between Lethiellier and William Stukeley as a guide (1883). Surveys to more accurately locate the site have continued into the 21st century with further excavation and geophysical surveys deployed. A GPR survey carried out in 2007 by Shepard and Potter located part of a buried structure possibly belonging to the Roman villa (Shepherd and Potter 2007).

Excavations were also carried out at the two Iron Age hillforts of Ambresbury Banks and Loughton Camp by General Pitt-Rivers and the Essex Field Club in 1881. Investigations were focused upon the defences and entranceways of the hillforts with exploratory investigations within the interior of Loughton Camp. Further excavations were undertaken at both sites throughout the 20th century including exploratory augering of the interiors focusing on the enclosed springheads (Alexander et al. 1978).

More recently there have been several landscape-scale projects commissioned by the local authority and CoLC to assist in with the management of the historic and natural environment of the Epping District area. In 2015 Essex County Council’s *Place Services* carried out the Historic Environment Characterisation Project for the Epping District which included the Essex portion of Epping Forest. This project set out 18 broad Historic Environment Character areas by assessing previous work on the Historic Landscape Character, Archaeological Character and Historic Urban Character of the district. *Place Services* also carried out several walkover surveys within the forest during 2013.

Recent excavations and survey have been focused on Copped Hall and its estate where work has continued since the early 2000s. Investigations have been led by West Essex Archaeological Group (WEAG) since 2001 with the aim of further understanding the layout and development of the earlier Tudor hall and grounds to help inform future restoration of the gardens (Holloway et al. 2009) (Madeley and Holloway 2010) (Holloway 2012). This work has exposed several construction phases from between the 16th and 18th centuries along with previously unknown structures such as a possible dovecote and evidence for earlier medieval structures. Iron Age, Roman and early medieval (6th to 9th century)

pottery relating to earlier activity has also been discovered. The most recent excavations took place during August 2025.

In 2018 a Parkland Management Plan (PMP) covering Copped Hall Park and buffer lands was produced by Rural Advice on behalf of CoLC. The PMP was produced in support of a Higher Tier Stewardship application to Natural England, with support funding provided by both Natural England and Historic England. The project carried out a comprehensive review and summary of documentary, map and lidar sources which culminated in a detailed chronology of the development of the historic parks and gardens. A key outcome of this work was a survey of the pond and canal earthworks at Rookery Wood by Historic England (M. Alexander 2024). This involved fieldwork and a more detailed assessment of lidar data to inform on interpretation, phasing, and condition of the earthworks.

Much work has also been undertaken to investigate and map the medieval extent of the forest through documentary, maps and field survey, specifically focussing on the Purlieu Bank. In 2011 CoLC commissioned a survey and documentary research of the Purlieu Bank, a forest boundary that is believed to have been established during the years shortly after the implementation of Magna Carta in 1215 and the Charter of the Forest in 1225 (Holder and Bazley 2012). The work was commission to support an application for the scheduling of two remaining sections of the boundary at Theydon Bois golf course and within the Lower Forest northeast of Epping town. The surveys focussed on the digital recording of the remaining earthworks along with supplementary documentary research. Both sections of bank and ditch were successfully scheduled in April 2016 (NHLE 1427620). A condition survey of the surviving earthwork was carried out by Museum of Archaeology London (MOLA) in 2023 (Southon 2023).

The Epping Forest landscape

Project area

Location and context

Epping Forest is situated in the southeast of England, straddling the counties of Essex and Greater London, and forms part of the London Metropolitan Green Belt. Nationally, it lies within the London Basin, a lowland geological region bordered by the Chiltern Hills to the northwest and the North Downs to the south. The Forest occupies a strategic position between the urban sprawl of London and the rural landscapes of West Essex, acting as a vital ecological buffer and recreational resource for both regions.

Stretching approximately 19 kilometres from Manor Park in East London to Epping in Essex, the forest covers over 2,400 hectares of ancient woodland, wood-pasture, heathland, grassland, and open plains. It lies within the Lea Valley corridor, a key ecological and hydrological axis that connects the Forest to other green spaces and river systems in southeast England.

Regionally, Epping Forest is one of the largest public open spaces in the London area and is designated as a Site of Special Scientific Interest (SSSI) and a Special Area of Conservation (SAC) under UK legislation (JNCC 2026). Its proximity to densely populated boroughs such as Waltham Forest, Redbridge, and Newham make it a critical green infrastructure asset, supporting biodiversity and public wellbeing.

Topography and geology

The topography of Epping Forest is defined by its position on a broad, elevated ridge that runs roughly southwest to northeast between the River Lea and River Roding. This ridge forms part of the upland terrain separating the Thames Valley from the Essex lowlands, with elevations of up to 120m above sea level at its highest points, such as Pole Hill and High Beech. The terrain is characterised by a series of rolling hills, steep-sided valleys, and undulating plateaus, shaped by both fluvial erosion and glacial activity. Small streams and springs are present across much of the area along with numerous wetland features such as bogs, ponds, and flushes.

Figure 1 Location maps. Project area is shown in black. County boundaries shown in red. [Includes OS data © Crown copyright and database right 2026 (Open Government Licence); data © Ordnance Survey Ireland; data © Earthstar Geographics]

The dominant geological unit is the London Clay Formation, a stiff, bluish clay deposited during the early Eocene epoch approximately 56 million years ago. This formation underlies much of the forest and is characterised by poor drainage and susceptibility to landslips. Overlying the London Clay are the Claygate Beds, a transitional layer of sandier clay found predominantly in the northern areas of the forest. These beds form steep valley sides and elevated ridges (such as those near High Beech) and offer more stable and better-drained conditions. The Bagshot Sand Formation, composed of fine sand and occasional gravel, caps the Claygate Beds in the highest areas. These well-drained soils support heathland and mixed woodland and have historically provided suitable conditions for prehistoric settlement and flint working, along with more recent sand and gravel extraction (Fig. 2).

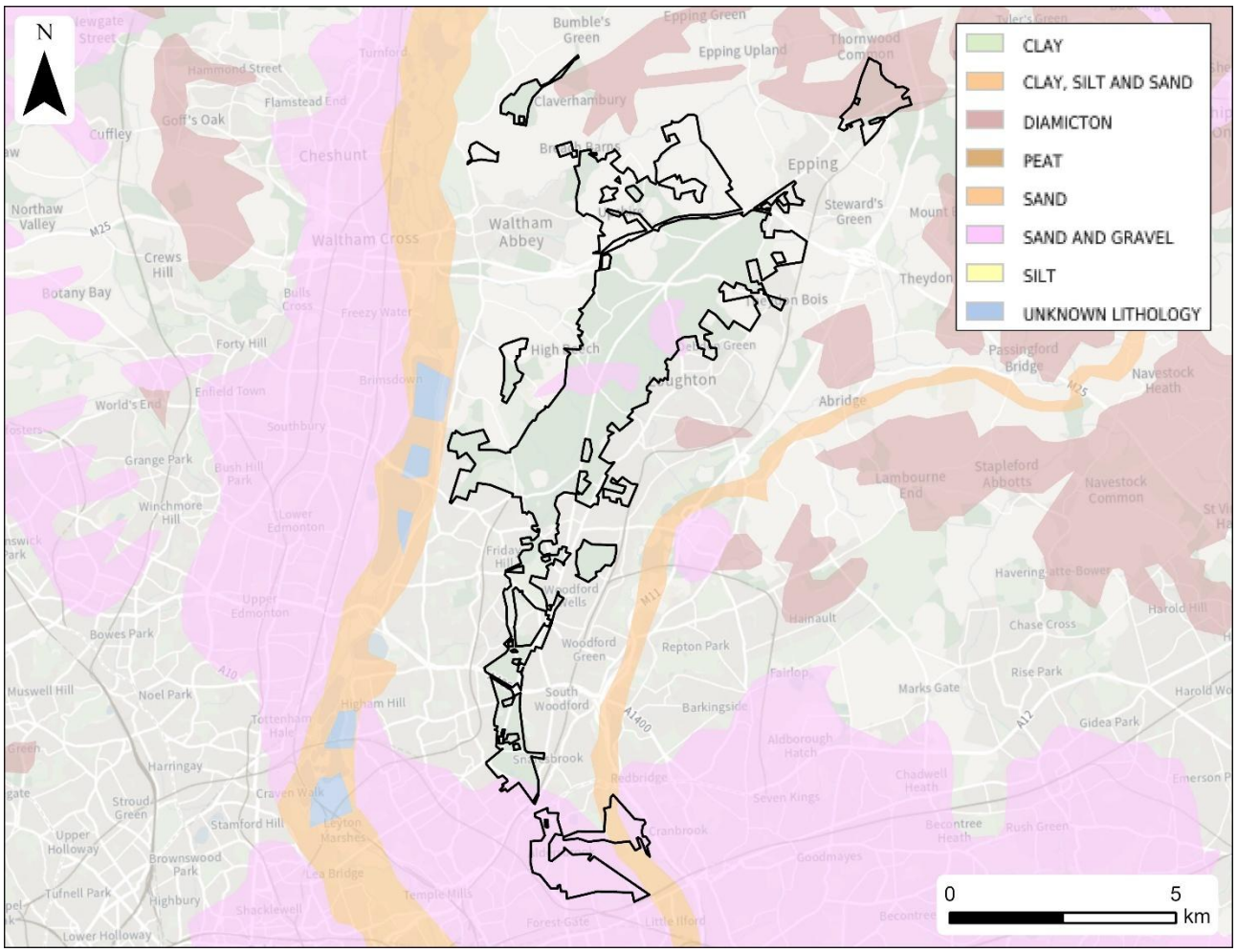


Figure 2 Bedrock and superficial geology of Epping Forest. [Contains British Geological Survey materials © 2026 Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

The southern areas of the forest (such as Wanstead Flats and Leyton Flats) present a markedly different topographical character formed of extensive areas of flat, open land, with elevations generally ranging between 15m and 25m above sea level. The flats are underlain by river terrace gravels of the Boyn Hill and Hackney Formations, deposited by

the ancestral River Thames during interglacial periods. These gravels rest atop London Clay but are thick enough to prevent its exposure. The well-drained, gravel-rich soils support grassland and heath-type vegetation and have historically made the area suitable for grazing, recreation, and military use. The openness of Wanstead Flats has also made it a strategic location for wartime infrastructure such as air raid shelters, anti-aircraft batteries and prisoner of war camps. Today, it remains one of the most accessible and widely used parts of Epping Forest, valued for its panoramic views and open skies.

Land use

Epping Forest supports a diverse range of land uses shaped by its historical management from the 11th century to the present day. The northern and central areas are dominated by ancient woodland and wood-pasture, shaped through past pollarding, coppicing and woodland grazing. Pollarding no longer occurs, since replaced with more conventional woodland management methods. Grazing does still occur within the forest but at a much lower intensity than occurred during the medieval period. During 1980s and 90s parcels of largely agricultural land were incorporated into the forest as Buffer Lands (City of London Corporation 2015).

The flats at the southern edge of the forest offer a contrasting landscape of open grassland, sports pitches, ponds, and scrub, serving as a vital green space for East Londoners. During the medieval period the flats were mostly unenclosed common pasture, used by commoners as a place to graze their sheep and cattle. Between the 13th and 19th centuries landowners gradually enclosed parts of the forest which deprived commoners their grazing and access rights to the land. This activity culminated in the passing of the Epping Forest Act 1878 which continues to prevent the further enclosure of land and preserves the forest for the benefit of the public. Since the passing of the act the forest has become increasingly used for recreational purposes, with over 4 million people now visiting the forest annually to enjoy its ancient woodlands and open spaces (City of London Corporation n.d).

Historical overview

The archaeological remains preserved within the forest provide us with important information on past human activities such as settlement patterns, defence, woodland management and parks and gardens. The remaining forest and woodland also provide an important insight into the management and shrinkage of royal forests during the medieval period. Whilst it is beyond the scope of this project and report to provide a comprehensive history of the forest, a brief overview of key features and events has been outlined here to aid in contextualising the findings of the aerial survey.

Prehistoric and Roman period (10,000 BC to 410 AD)

Relatively little is known of this period from the forest and its immediate vicinity. The main sites attributed to this period are the two well-known hillforts of Ambresbury Banks and Loughton Camp. The sites are still very much visible as earthworks and were clearly constructed to exploit prominent locations overlooking nearby valleys. Small-scale excavations of both sites were first carried out by General Pitt Rivers and the Essex Field Club between 1881 and 1882, with further investigations led by Essex Field Club and S.H. Warren extending into the early 20th century (Cole 1884) (Warren 1928) (Alexander et al. 1978) . Much effort was spent on investigating the defences and gateways, with some limited work investigating the springs located within both sites. Both sites were constructed with an external ditch and inner earth dump rampart. Accurate dating evidence is scarce, but pottery finds suggests an Iron Age date for the occupation of both sites. Many earlier flint implements were discovered within preserved soil contexts beneath the rampart suggestive of earlier settlement activity. The earliest flints found at Loughton Camp are thought to have originated during the Mesolithic period (Brooks and Fulcher 1979).

Evidence for Roman activity within the forest is mostly limited to Wanstead Park with the discovery of a possible villa made in the early 18th century during groundworks to the north of Perch Pond within the park. Uncovered were the remains of a roman mosaic comprising tesserae of different sizes and colours covering an area of ‘20 feet by 16 feet’ (Lethieullier 1883, 154). Further investigations carried out during the mid and late 20th century aimed to more accurately locating the position of the postulated villa site. This work failed to locate a structure but did uncover further building material possibly relating to a villa site such as brick, tiles and wall plaster. More recent surveys during the 1990s and 2000s further explored the site using geophysical methods, with a ground penetrating radar (GPR) survey in 2007 locating a portion of parallel and perpendicular walls possibly of a roman structure (Shepherd and Potter 2007, 229-230). A Roman road linking London to Colchester is also thought to have passed within the vicinity of Epping Forest (GLHER 100281). Whilst various surveys have failed to locate the remains of a road to-date, the presence of the likely villa, along with a scattering of other Roman findspots around the park suggests that this was an active Roman landscape situated on a route between two significant Roman governing centres.

Early medieval period (410 AD to 1066 AD)

Little is known about the early medieval period in this part of Essex. It is broadly thought that much of what is now Epping Forest would have been densely wooded and used as a source of wood. Palaeo-environmental evidence from the forest has however demonstrated that there was a period of selective forest clearance between around 600-850 AD, suggesting there was a level of control exercised over the forest possibly by nobles or even royalty. This evidence also suggests the emergence of an organised system of wood-pasture (Place Services 2015).

Much of the present archaeological and documentary evidence for this period focusses on Waltham Abbey where there is thought to have been a royal estate and possible hundredal meeting place. Excavation within the current limits of the medieval abbey precinct have identified the foundations of three successive Saxon churches which cover a period between the 7th and 11th centuries. Legend suggests that this was also the resting place of Harold Godwinson after his defeat in 1066 (Place Services 2015).

Medieval period (1066 to 1540)

Epping Forest as we now know it represents only a small remnant portion of the much larger medieval Forest of Essex which was established during the late 11th century by William the Conqueror. Subject to Forest Law, a vast amount of the county of Essex was declared a royal forest which gave the king significant rights over a much larger area of land than he formally owned.

The boundaries of the Forest of Essex continued to be expanded during the 12th century by Kings Henry I and Henry II. The Assize of Forest of 1184 helped consolidate this expansion by codifying existing Forest Laws which significantly strengthened the king's exclusive hunting rights within the bounds of the forest, regardless of landownership. This consolidation of control adversely affected landowners and tenants, many of which would have seen their freedoms to cultivate their lands, keep animals, collect wood etc. considerably eroded by royal decree. By the early 13th century approximately one third of the country was designated as royal forest (Holder and Bazley 2012, 8).

The early 13th century saw the uncontrolled expansion and exploitation of royal control challenged by landowners across England. Tensions between the crown and landowners culminated in the signing of Magna Carta by King John in 1215 AD. This included an obligation to review and reduce the extent of royal forest by removing forest land designated since the accession of Henry II to the throne in 1154, along with the prohibition of capital punishment for forest offences. In 1217 AD Henry III issued an updated Magna Carta to include a Charter of Forest which focussed specifically on the reduction of royal forest lands in an effort to further appease landowners (Southon 2023, 6-7). This was followed by another updated charter in 1225 AD, accompanied by a perambulation which essentially accepted that all forest boundaries should revert to their pre-1154 extents. However, whilst modest disafforestation removed forest law from many areas, the precise boundaries remained disputed by Henry III.

A combination of uncertainty amongst landowners and a reluctance by the crown to concede control of the forest prompted further perambulations. A notable perambulation of forest boundaries was ordered by Edward I in 1300 which led to the gradual formalisation of boundaries, many of which remained in place for centuries after. In Epping Forest this formalisation of boundaries is possibly represented by the fragmentary remains of the Purlieu Banks. These are thought to have delineated areas outside of the reduced area of

strict forest jurisdiction but over which the king still had limited hunting rights (Holder and Bazley 2012, 8).

By the end of the 14th century, royal forests had declined in significance compared with the previous two centuries, with further disafforestation occurring. The decline of forest law enforcement led to commoners increasingly exercising their rights to graze animals and collect wood. The forest also saw an increase in encroachment and the establishment of illegal enclosures for use as parkland, arable and pastureland. These activities led to the disafforestation of most of the Forest of Essex, and by the end of 15th century only the area known as Waltham Forest (which included Epping, Hainault, and Hatfield forests) remained (Morris 2004, 16). The 16th and early 17th centuries saw the expansion of many existing estates and parks which resulted in further unregulated disafforestation. Examples of this expansion can be seen at Wanstead Park which was granted a license to enclose further land and function as a hunting park in 1509 (Compass Archaeology 2013, 10).

Post-medieval period (1540 AD to 1900 AD)

Waltham Forest continued to reduce in size during this period due in large part to a declining royal interest in the forest for hunting. This led to the removal of its legal status as a royal forest, allowing landowners to further enclose and repurpose areas for agriculture and other developments. As the once extensive forest contracted the overarching name ‘Waltham Forest’ fell out of use. The smaller, surviving woodland blocks adopted new names centred around the expanding urban centres around the forest. In the case of Epping Forest this transition is thought to have occurred between 17th century and 19th century (Buxton 1885).

By the 18th and 19th centuries, the enclosing of land across the forest had become increasingly common, threatening traditional common rights such as wood-lopping and grazing. Local communities began to resist these changes as the loss of access to forest resources disrupted long-standing customs and livelihoods. Communities also started to see their villages being consumed by the rapid expansion and urban sprawl of London. By the end of the 19th century demonstrations resisting enclosure were becoming increasingly common. Perhaps the most famous of these demonstrations occurred at Wanstead Flats on 8th July 1871 where thousands of east Londoners gathered to protest the fencing of a large section of the flats by landowner Lord Cowley. After the withdrawal of police later in the day, the protesters entered the enclosed area and set about dismantling large sections of fencing (Ramsey and Fowkes 1986, 41-2).

The forest was also subject to extensive resource extraction during this period. Clay, sand and gravel were extracted from across Epping Forest to provide material to support the ongoing expansion of London. Much of these extraction sites can still be seen as earthworks amongst the woodland, with many of the larger pits now repurposed as lakes and ponds. Modest brickmaking facilities also started to spring up across the forest such

as the 19th century Wintry Park brick and tiles works and a possible earlier brick working site near to the Robin Hood pub, Strawberry Hill.

The wealthiest landowners did not just enclose forest land for wealth production but also for leisure purposes. The 17th century onwards saw the owners of several manors across Epping Forest begin to expand and redesign their parks and gardens. The parks at Copped Hall and Wanstead Park are the two main examples of this within the forest.

The relentless pressure of development and mineral extraction culminated in the passage of the Epping Forest Act in 1878, which formally disafforested the forest and transferred its management to the City of London Corporation. The Act was the result of years of legal disputes and protest, including a landmark case brought by the Corporation against unlawful enclosures. Under the Act, the forest was designated as an open space for recreation and enjoyment, and the Corporation was appointed as its official conservators. The Act also abolished traditional lopping rights, compensating local communities with the construction of Lopping Hall in Loughton. Queen Victoria's endorsement of the forest as a public amenity further cemented its status as 'The People's Forest', ensuring its protection for future generations (Place Services 2015, 22).

Twentieth century (1900 to present)

The twentieth century saw a period of relative stability in the forest. Full disafforestation meant that the remaining areas of unenclosed forest became the responsibility of the City of London Corporation who continue to maintain it for the public today. However, this stability was briefly interrupted during the Second World War, when much of the forest lands were commandeered by the military as they were viewed as strategically important for national defence and in the housing of prisoners of war. Wanstead Flats played an especially crucial role in London's defence infrastructure and wartime logistics. The area was heavily fortified with anti-aircraft guns, barrage balloons, searchlights, and radar installations, forming part of the capital's protective shield against Luftwaffe bombing raids. Its open terrain also made it ideal for military deployment, and it became a key assembly point for Allied troops ahead of the D-Day invasion. Later in the war, Wanstead Flats was repurposed as a prisoner of war camp, initially housing Italian captives from the North African campaign and subsequently German soldiers captured after D-Day (Walker 2014b). Further north in the more wooded parts of the forest are also the remains of earthworks that relate to this period. Between The Copped Hall Estate and Loughton is a line of anti-tank earthworks that formed part of the Outer London Defence Ring along with associated gun emplacements and checkpoints (see 'Defending London' page 50).

Post-war much of the forest was returned to its previous condition. However, after the devastation of London during the blitz there was a need for housing. Parts of Wanstead Flats were retained for prefabricated housing, many of which were not removed until the 1950s. The forest retained its protected status and remained as an important public green

space for recreation. Pressure did however come from an increase in visitor numbers which placed a serious strain on the ecology of the forest. Earlier conservation efforts had inadvertently reduced biodiversity by halting traditional practices like pollarding and grazing. By the end of the century more modern conservation methods were put into place to reintroduce these practises, aiming to balance ecological health with increased public access (City of London Corporation n.d).

Aerial survey results

Overview of results

The project produced a combined total of 206 monument records for Essex and Greater London HERs, with 183 new records and 24 amendments. This represents a significant increase in the number of known archaeological sites which will greatly assist CoLC and the HERs in the management of their heritage assets. The recorded monuments date from the Iron Age to the Second World War, with the majority of features dating to the post-medieval period (139 in total). The most common features of this period are related to the extraction of sands, gravels and clays, along with medieval and post-medieval hollow ways.

	New	Existing
Essex	140	8
GLHER	41	16
Essex and GLHER	2	0
TOTAL	**183**	**24**

Table 1: Number of new and existing monument records

No Neolithic, Bronze Age, Roman or medieval features were identified by this survey. The lack of Roman and medieval features is contrary to strong archaeological and documentary evidence for human presence within the landscape during these periods. Many of the features recorded as medieval/post-medieval could possibly relate to the medieval period but could not be interpreted with enough certainty from aerial sources alone. These features include trackways, hollow ways, field boundaries and mineral extraction features. Further research would be required to more precisely date these features.

	No. of monuments by period
Iron Age	2
Roman	0
Later Prehistoric	2
Medieval	0
Medieval/post-medieval	30
Post-medieval	139
Victorian	1
Second World War	30
20th Century	3
TOTAL	207

Table 2: Number of monuments by period

All features were visible as earthworks or structures on either 0.25m resolution lidar or aerial photography, with no sites identified as cropmarks. Earthworks and structures only visible on aerial photographs relate mainly to Second World War military infrastructure situated across Wanstead Flats, Leyton Flats, and Chingford Plain. Surviving earthworks were best preserved within the wooded areas of the forest, with moderate preservation across the more open areas.

The following summary of results has been structured to discuss key themes identified during this aerial survey.

The Hillforts

The Iron Age hillforts of Ambresbury Banks and Loughton Camp are the earliest surviving upstanding archaeological monuments in Epping Forest and are among the oldest visible prehistoric monuments in the Greater London area. Both sites occupy commanding positions on high ground along the southern edge of a south-west to north-east aligned ridge between the Lea and Roding valleys.

Existing evidence for Iron Age activity within the forest is limited to excavations carried out at both hillforts during the 19th and 20th centuries. These works were largely focussed on the defensive earthworks and entranceways, with some analysis of their interiors. Little archaeological work has been carried out to contextualise both sites within their contemporary landscape. This aerial survey provided an opportunity to re-investigate both sites, their remaining earthworks, and their landscape settings using high resolution lidar data. This resulted in more accurate mapping of both sites along with the identification of a possible pair of contemporary conjoined enclosures situated to the east of Loughton Camp.

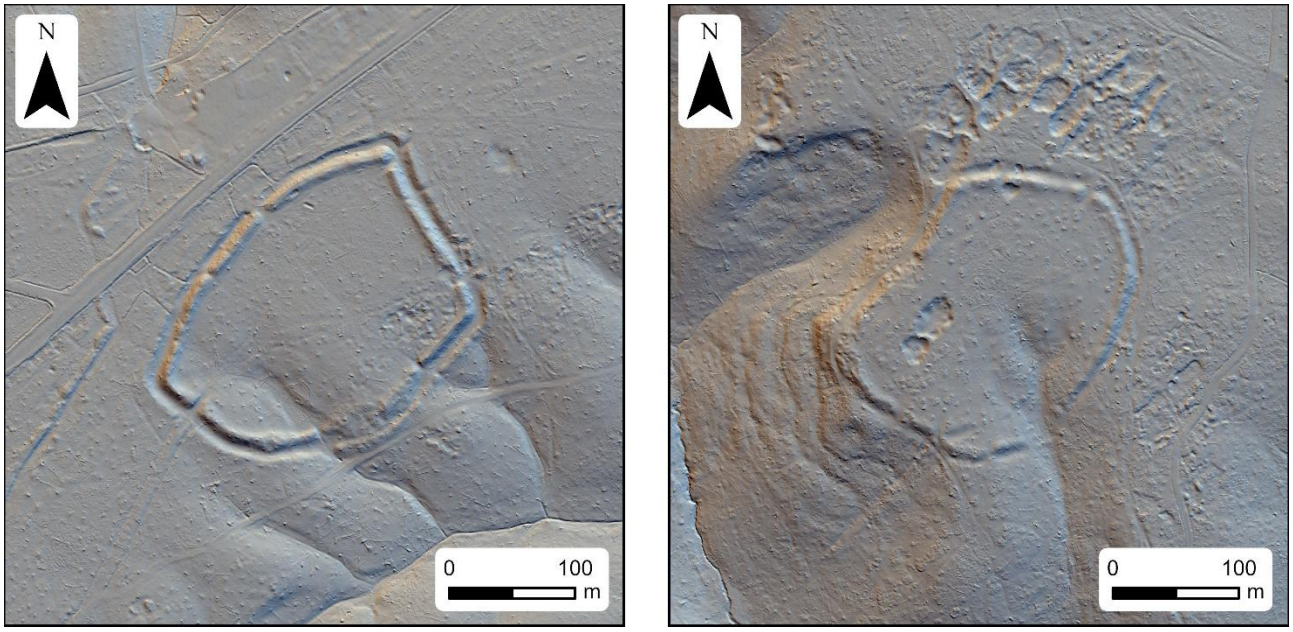


Figure 3 Extract of 0.25m resolution lidar (multi hillshade visualisation) showing Ambresbury Banks (left) and Loughton Camp (right). [Lidar © City of London Corporation]

Ambresbury Banks

Ambresbury Banks (EHER 24) is the largest of the two hillforts, enclosing approximately 2.9ha to the southeast of the Copped Hall estate on a high ridge between the Lea and Roding valleys (TL43780 00305). The hillfort is sited at the top of a south-facing slope overlooking a small tributary valley of the river Roding.

The site has a defensive circuit comprising a single bank, external ditch and traces of an external counterbank on its north, east and south sides. The east side of the fort is notably straight when compared to the remaining three sides which are slightly convex in plan. The circuit is punctuated by six main breaks, with the northwestern break being the single genuine entrance, confirmed during earlier excavations (Alexander et al. 1978, 193-194). The parish boundary between Waltham Abbey and Epping Upland (previously Epping) also passes through the original northwestern entrance and cuts northwest/southeast through the middle of the site. Other breaks in the defences were likely created through a combination of erosion (namely footfall), quarrying and remodelling. The opening on the southwestern side is characterised by the distinct inward turning of the banks and has been shown through excavation to be a post-medieval reconfiguration to accommodate a later 18th century ride (‘The Ditches Ride’) which can still be seen running southwest from the site (Alexander et al. 1978, 201).

At least four recorded excavations have been carried out between 1881 and 1968, with the various unpublished results consolidated by Alexander et al. 1978 and is summarised below.

In 1881 General Pitt-Rivers supervised the opening of a single trench across the northern defences to establish their phasing and construction. Part of this work involved the drawing of a detailed plan by the first superintendent of Epping Forest, W.D’Oyley. His detailed plan shows the layout of the earthworks and some of the key topographic features in the surrounding area.

Later excavations in 1933, 1956, 1958, and 1968 concentrated on the two major gaps in the northwest and southwest defences, aiming to clarify their origins and establish a reliable chronology for the creation of the gaps. Additional trenches were opened across the bank and ditch, and augering was undertaken within the interior to support this work.

Work during the 1950s used auger surveys to test the causeways of each of the six openings prior to opening excavation trenches. This work identified the northwest causeway to comprise undisturbed geological deposits, while the remaining five were found to be formed through the infilling of the external ditch meaning that the fort was penannular with only one entrance (Alexander et al. 1978, 193). Subsequent work investigated the northwestern gateway which identified two stone revetting walls flanking

the passageway, likely related to the original construction of the site during the early Iron Age.

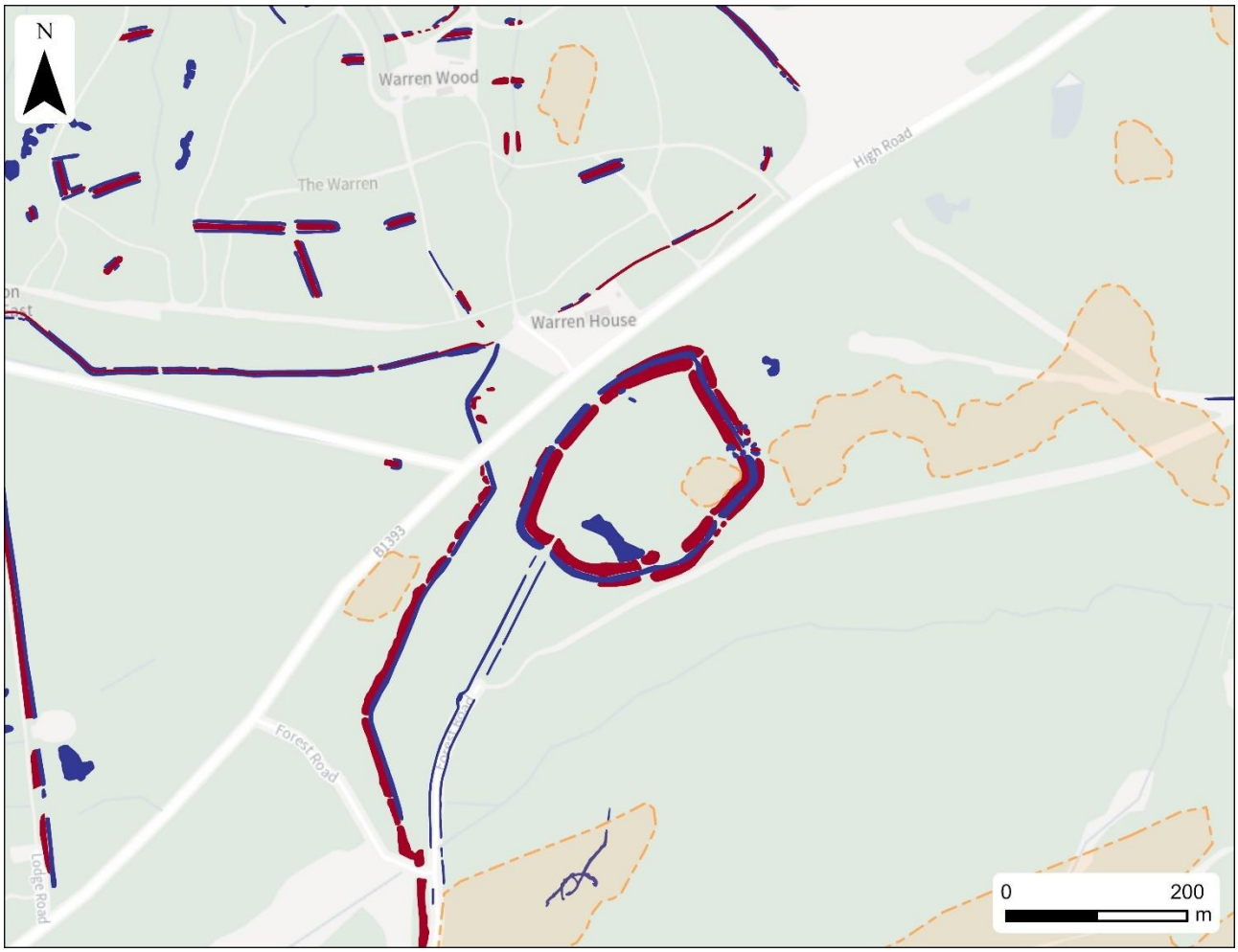


Figure 4 Extract of mapping from 0.25m resolution lidar showing Ambresbury Banks (centre) and surrounding features. Also visible are The Warren Plantation, anti-tank defences and 'The Ride'. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

The various investigations of the bank and ditch found that they were likely constructed as a single operation, with the defensive banks formed of a single unrevetted earthen bank. There also appears to have initially been a slight berm between the bank and the external ditch prior to later modifications. Various investigations of the ditch also found it to have a consistent V-shaped profile, a width of between 8-9m and was cut to bedrock to a depth of between 2-3m. The counterbanks visible on the north, east and south sides were likely formed clearing slit from the ditch during its occupation. Part of the southern counterbank was found to comprise a light clayey silt, similar to secondary silt deposits identified within the ditch (Alexander et al. 1978, 194). Pottery found within the ditch would suggest that the site was in use during the 1st millennium BC and was occupied long enough to warrant the clearing of silts from the ditches (forming the counterbanks). Pottery from the 1st century

AD was also discovered in later ditch contexts, suggesting a continued use, or re-occupation, of the site (Alexander et al. 1978, 202).

The site also encloses a spring which issues south through the defences to the small tributary below. This observation was first made by the Royal Commission in 1921 who described a natural depression and spring that "…could be dammed up to provide a water-supply." (RCHME 1921) and has been reported by the various excavations over the subsequent decades. This depression is clearly visible on the lidar data and is an impressive topographic feature that feels more like a small valley when visited on the ground. The feature measures approximately 65m by 15 m and is bounded at its southern edge by the southern earthen rampart. The remaining rampart earthwork continues to impede drainage from the spring which has resulted in a persistently boggy area, perhaps not too dissimilar to how the site appeared during the Iron Age. Having ready access to fresh water would have offered obvious benefits to occupants of the site but other uses linked to more 'ritualistic' practices should not be discounted.

Later activity at the site is also visible in the earthworks. At the eastern side is evidence of a seam of post-medieval sand and gravel extraction that extends eastwards from just inside the defences towards Theydon Road. Part of the rampart and ditch have been affected by this extraction, with evidence of pits and possible spoil heaps still visible. As mentioned previously, part of the southern side of the defences were also modified to incorporate an 18th century ride ('The Ditches Ride'). This involved partially refilling the ditch to create a causeway and cutting an opening through the rampart. Earthworks for The Ditches Ride continue southwards through the forest to Debden Green.

Loughton Camp

Loughton Camp (EHER 130) lies approximately 500m northwest of Loughton and encloses around 2.8 ha of a high plateau overlooking steep-sided valleys to the west and south. The elevated position affords extensive views southwards (when visible through the woodland) across the Thames basin and central London, highlighting the site's prominent location within the wider landscape.

The earthworks comprise a univallate circuit defined by a single earthen bank and external ditch. Much of the defences appear to mostly follow the shape of the natural topography, most notably on its western side where they closely follow the rim of the steep-sided valley overlooking a tributary of the River Roding. On its southern side are the slight earthwork remains of a short length of bank and ditch, possibly representative of either an 'annexe' or a change in plan when constructing the site (Warren 1928, 118).

Five gaps in the bank are visible, with two considered likely candidate for original entrances into the site. The largest gap is located just to the east of the possible 'annex' and marks the location of a marsh area formed through waterlogged springheads which

are enclosed within the hillfort. This marsh extends across the projected line of the defences before draining down the south-facing slope and into Loughton Brook below. There is no indication of a bank or ditch where it crosses the projected line of the enclosure defences, suggesting that this section has either been long eroded or was never constructed. Maps and accounts of work carried out during the late 19th century and early twentieth century refer to a small dam across the stream, set out of alignment with the ramparts and, possibly related to post-medieval charcoal burning (Warren 1928, 119).

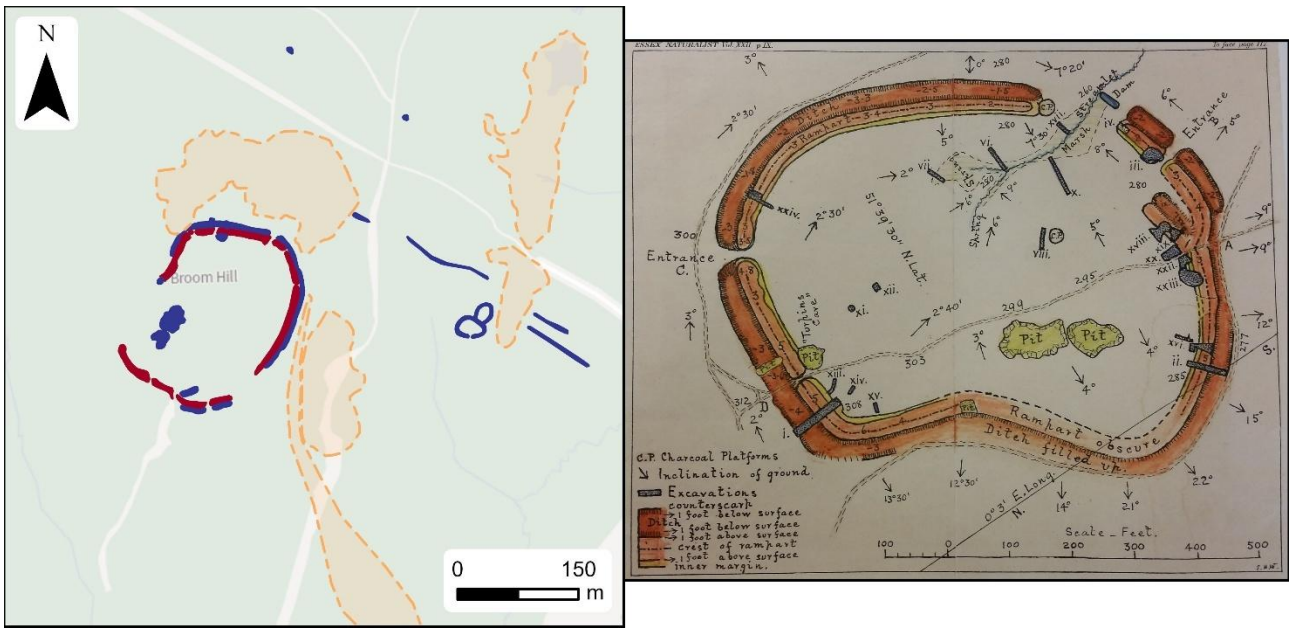


Figure 5 Left: Extract of mapping from 0.25m resolution lidar showing Loughton Camp and surrounding features. Visible to the east of the hillfort are a pair of conjoined curvilinear enclosures. Right: Planned drawing of the trench locations excavated by The Essex Field Club during 1926 and 1927. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Drawn plan extract reproduced from Warren 1928-1930.]

These variations in the earthworks became a focus of early archaeological investigation, with the first recorded excavation carried out in 1882 by General Pitt-Rivers (Cole 1884). As with his work at Ambresbury Banks in 1881, Pitt-Rivers was primarily focused on sectioning the rampart and ditch earthworks to investigate construction, phasing and to recover datable artefacts. The locations of four trenches are recorded by Pitt-Rivers who, through this work, found the ditch to be of a V-shaped profile (mirroring that of Ambresbury Banks) and recovered artefacts likely to be of Iron Age date. Drawn plans of the site were also commissioned as part of this work and were created by W.D'Oyley who provides a detailed drawn account of the layout of the earthworks and other key features in and around the site.

Later excavations were carried out during 1926 and 1927 by the Essex Field Club to build upon Pitt-Rivers' earlier work by investigating the site's interior, namely the enclosed springs and associated marsh area in the south of the hillfort. Four trenches were cut from

points along the edge of the marsh and down into its centre, but no evidence of occupation was found. However, the investigations revealed that the silts reached a depth of around 3 ft before the water table was encountered (Warren 1928, 120). The report recommended further exploration of this area. The deployment of modern paleoenvironmental sampling methods could shed valuable light on the development of this waterlogged area and provide proxy indicators for wider landscape and climatic change. More recent work in 2013 saw a geophysical (magnetometry) survey across a sample transect across the site. The transect ran north to south through the centre of the site and highlighted potential features within the interior such as possible enclosures (Parker 2013).

Outside of the hillfort, a number of features were identified on the 2023 lidar data, most notably a pair of conjoined curvilinear enclosures which may be later Prehistoric in date and potentially related to the hillfort. The enclosures are located approximately 200m to the east of the hillfort where they occupy a gentle south-facing slope overlooking Loughton Brook. Approximately 20m to the west of the enclosures lies another spring head that drains southwards into Loughton Brook, a feature that may have influenced the placement of the enclosures.

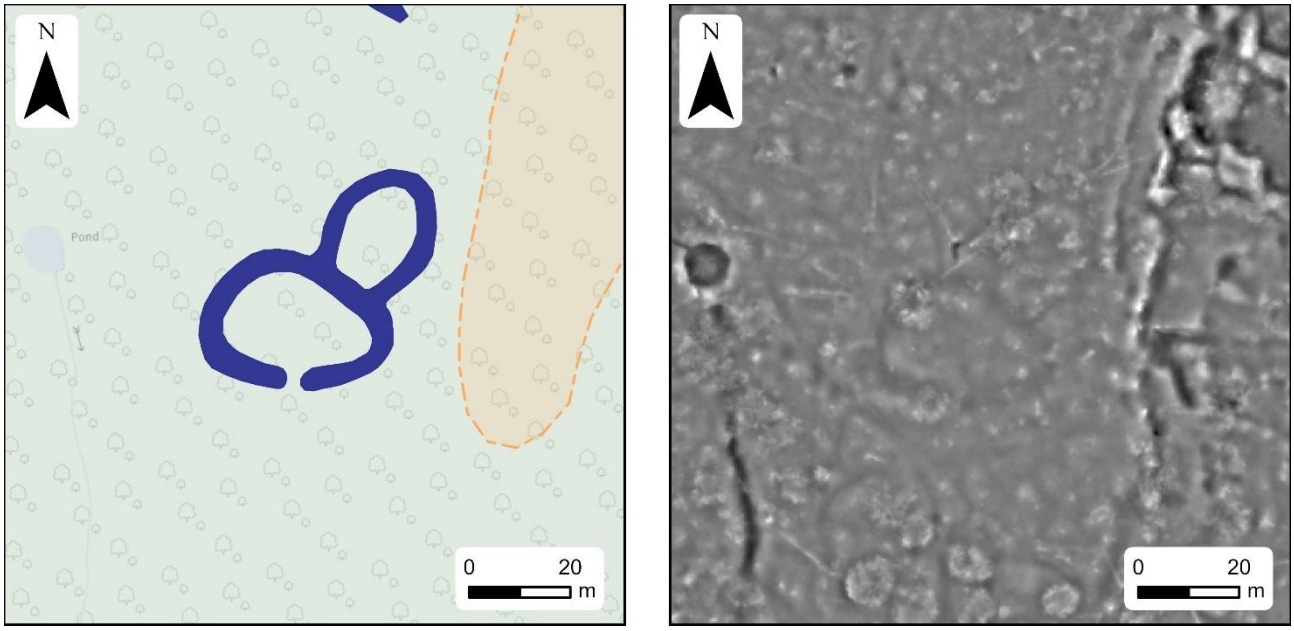


Figure 6 Left: Extract of mapping from 0.25m resolution lidar showing a pair of possible conjoined enclosures. Right: Extract of 0.25m resolution lidar (simple local relief model visualisation). [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar © City of London Corporation]

Surrounding the hillfort are also the remains of numerous pits which are limited to this area of the forest. These are likely the remains of clay pits created between the 18th and 19th centuries during the period of growth in clay extraction and brickmaking within the forest. These pits are located immediately to the north and east of the hillfort, with two similar pits situated within the interior of the site. Extending south from this area and towards

Loughton are also the earthwork remains of a braided hollow way, possibly representing a route used to access the site during the phase of clay extraction.

Parks, Gardens and Warrens

Epping Forest contains a rich mosaic of historic estates, parks and gardens, all of which illustrate centuries of aristocratic expansion and landscape development across the Epping Area. The forest is home to several significant estates and designed landscapes such as Copped Hall, Warlies Park and Wanstead Park, all of which have left lasting impressions on the landscape. Together they form an important dimension of the forest's cultural landscape and demonstrate the influence the local elites had over the Epping Forest landscape. Many aspects of these parks and gardens are still visible as earthworks and are summarised below:

Copped Hall

At the northern edge of Epping Forest stands Copped Hall (originally known as Copthall or Copt Hall), a partially restored Georgian mansion built by John Conyers between 1751 and 1758. The hall occupies a prominent ridge at the heart of its historic parkland, commanding views over shallow valleys to the north, east, and west. Its surrounding parkland landscape incorporates features dating from the medieval through to the Victorian period.

The origins of the Copped Hall estate can be traced back to the 12th century, when Henry II granted the land to Richard Fitz Aucher to establish a royal hunting lodge. In 1350 the estate passed to the Abbots of Waltham, who developed the estate into a significant manorial complex. Following the Dissolution of the Monasteries in the 16th century, the estate reverted to the Crown and was held by Henry VIII before being granted by Elizabeth I to Sir Thomas Heneage in 1564. Over the following centuries the estate passed through several prominent families, including the Sackvilles in the 17th century. During the 18th century the estate was passed onto the Conyers who undertook some of the most significant changes. They demolished the Tudor house and constructed the Georgian mansion between 1751 and 1758 within a redesigned landscape shaped by Sir Roger Newdigate, with later limited involvement from Capability Brown. In the late 19th century, the Wythes family added formal Italianate gardens, pleasure grounds, and estate buildings before the hall and estate fell into decline during the 20th century. In 1992 The City of London Corporation acquired around 295ha of land surround the house, marking the separation of ownership of the hall and its surrounding park. In 1995 the hall was purchased by the Copped Hall Trust who continue to undertake conservation and restoration on the house and the associated structures (Wells and Way 2018b).

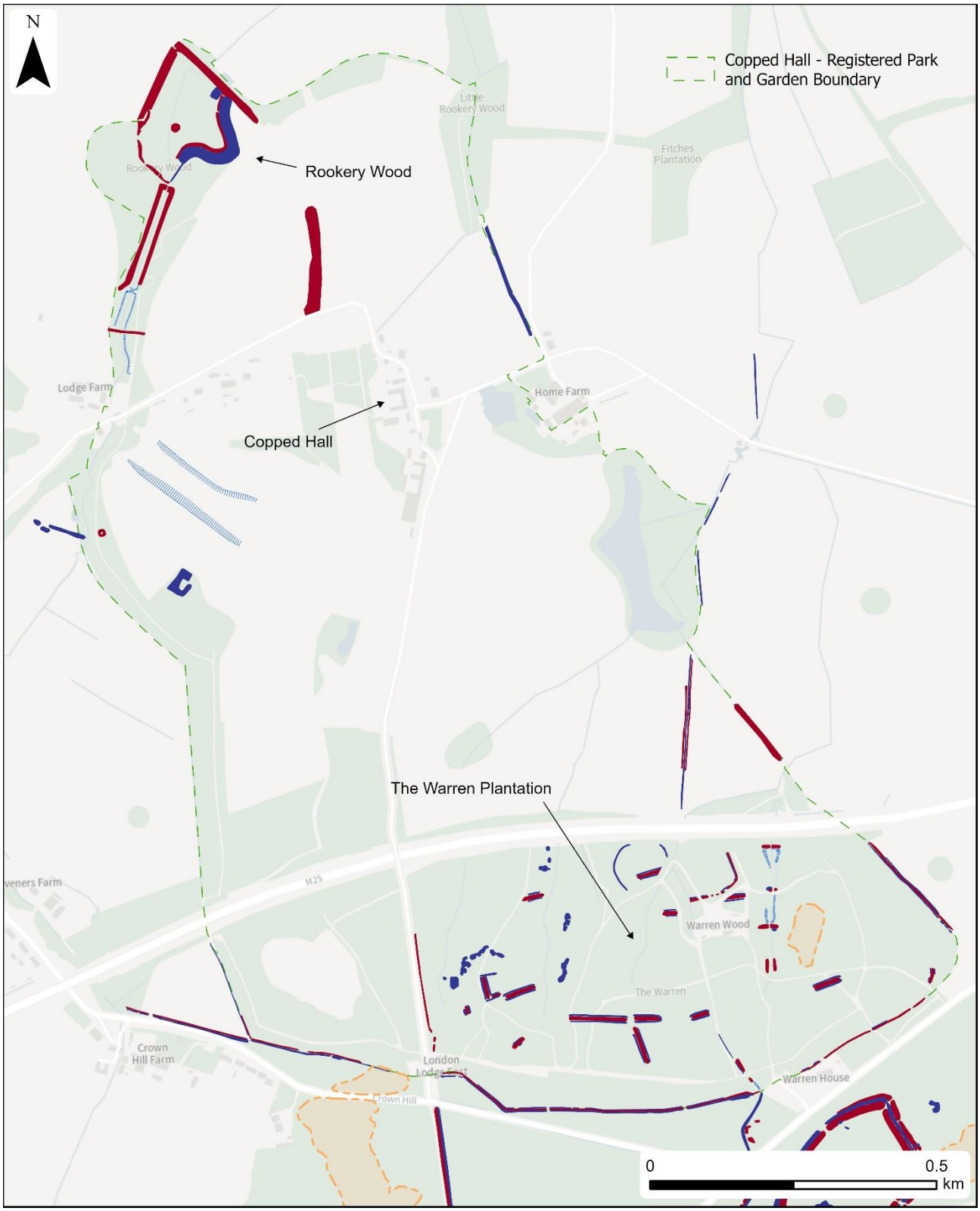


Figure 7 Extract of mapping from 0.25m resolution lidar showing features within the Copped Hall Estate. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

The majority of the surviving park falls within the project area, except for the grounds of Copped Hall, which is owned by the Copped Hall Trust. Extensive work to record and describe the parkland features of the Copped Hall estate has previously been carried out by the 2018 Parkland Management Plan (PMP). This work involved comprehensive documentary and cartographic research of the parklands along with an assessment of earthworks visible on 2017 0.5m resolution Environment Agency lidar. Point data was created for all features identified by this project, including features visible as earthworks on the 2017 lidar data. The PMP was followed up in 2019 by a walkover survey by L-P Archaeology (Quarrell 2019) which focused specifically on assessing the potential, significance and condition of archaeology across the estate. The aerial survey reported here built on this existing work through using the 2023 0.25m resolution lidar data and cartographic sources to reassess earthwork features as well and creating detailed aerial mapping that captures their form and morphology.

Rookery Wood

Rookery Wood (EHER 81534) is located at the northwest edge of the park and forms part of the woodland shelter belt (including the 'The Selvage') which defines the park's western boundary (TL42569 20200). This small area of woodland contains a complex sequence of medieval and post-medieval water management and ornamental ponds. Analysis of the site was carried out by Historic England in 2024 (Alexander 2024) as part of a separate landscape and conservation project. The project used a combination of 0.5m resolution Environment Agency lidar, field visits and documentary research to create a hachured plan of the earthworks and asses their phasing and condition. Much of the following description is based on this work. No new earthwork elements were identified by the aerial survey reported here.

The earthworks are formed of a multi-phase system of designed water features, dominated by the remains of the Square Pond, Canal Pond and the later Serpentine Pond. The Square Pond is formed of a substantial dam and causeway across a shallow valley which would have created a large, formally conceived water body with associated terraces, scarps and a probable central island. Running from its southern edge, the Canal Pond comprises a long, narrow embanked feature, later extended by a secondary excavated section, with associated bypass leats and drainage gullies. The later Serpentine Pond is a sinuous watercourse cut into the earlier silted basin of the Square Pond and is retained by curving banks, with brick-built sluices and re-routed drainage.

No known records exist for the existence of ponds before the 16th century. However, the existence of fishponds is considered likely, particularly during the period of ownership under Waltham Abbey from the mid-14th century. During this time the abbots at Waltham used the Copped Hall estate as a high-status retreat and as guest accommodation for visitors to the nearby abbey, a place where ready access to fish was likely a necessity (M.

Alexander 2024, 9-10). The Square Pond was likely created during the late 16th or early 17th century, possibly under the ownership of Lionel Cranfield. In 1677 a contract (held in the Sackville archives) refers to the construction of a new pond at Copped Hall, which may relate to the creation of (the) Canal Pond (Wells and Way 2018a, 83). By the mid-18th century, the Square Pond and Canal Pond were prominent elements within an open park setting as show in 18th century landscape impression such as the 1735 Mynde engraving (ERO D/DW E27/1). The Serpentine Pond was likely inserted by the early 19th century, with a sale catalogue map dating to around 1837 showing a sketch of the pond at the location of the existing earthworks. Subsequent changes were limited largely to woodland planting, drainage alterations, and silting.

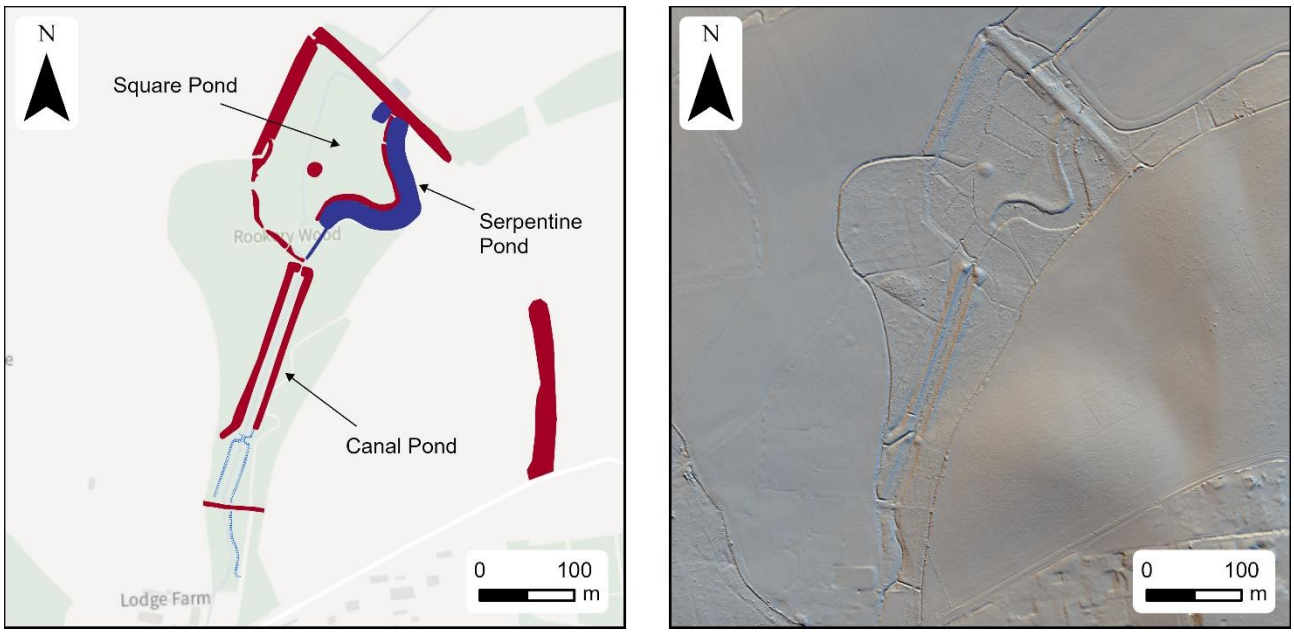


Figure 8 Left: Extract of mapping from 0.25m resolution lidar showing the complex of ponds within Rookery Wood. Right: Extract of 0.25m resolution lidar (multi hillshade visualisation). [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar © City of London Corporation]

The Warren Plantation

The Warren is a woodland plantation located at the southern end of the Copped Hall estate. Since the 1980s, it has been separated from the rest of the estate by the M25, the construction of which appears to have levelled much of the plantation's original northern boundary. Whilst the origin of The Warren is uncertain, it was likely incorporated into the Copped Hall estate during the medieval period as part of one of the numerous park enlargements recorded at that time. As the name 'Warren' suggests, it is probable that this part of the estate was initially set aside for the raising of rabbits during the medieval period, with records from the 17th century also mentioning rabbits within the park during this time (Wells and Way 2018b, 41-2). The history of tree planting within The Warren is also uncertain. The earliest recorded trees within the plantation are predominantly sweet

chestnut and Scots pine which were likely planted during the late 18th or early 19th century (Wells and Way 2018b, 39). Planting plans were also drawn up by Sir Roger Newdigate during 1749, further supporting the possibility of planting during the 18th century (Wells and Way 2018b, 43).

When the PMP was carried out in 2018 there was insufficient lidar coverage to conduct a full aerial assessment, and as such the area was identified as a ‘gap in knowledge’ in the report. The aerial survey reported here was able to address this knowledge gap by utilising the 2023 data to create detailed mapping of visible earthwork features within The Warren, summarised below:

Park Pale

Running around much of the east and south sides of The Warren are the remains of a medieval or post-medieval park pale (EHER 81421). The earthwork is defined by a discontinuous earthen bank flanked intermittently by internal and external ditches. The character of the earthworks varies along its course. West of London Lodge West, the pale is expressed as a bank with an external ditch, whereas to the east the boundary comprises a bank flanked by both internal and external ditches. Two clear interruptions between London Lodge West and Warren House possibly represent minor historic access points into and out of the park. To the east of Warren House, the park pale survives only intermittently, likely due to erosion resulting from later woodland management. There is no surviving evidence of the south-eastern corner of the park pale, suggesting that this section was entirely levelled in more recent times. The eastern-most section is formed of a single north-west to south-east aligned bank, flanked by and internal and external ditch. Immediately south of the M25 the feature has been remodelled to incorporate modern drainage channels, likely associated with nearby agriculture activity.

The precise date of the construction of the park pale is uncertain, however, map regression and documentary research undertaken as part of the 2018 PMP indicates that the boundary in its current form was likely established by 1621, with the broader park probably extended to incorporate The Warren during the mid to late 16th century (Wells and Way 2018b, 41).

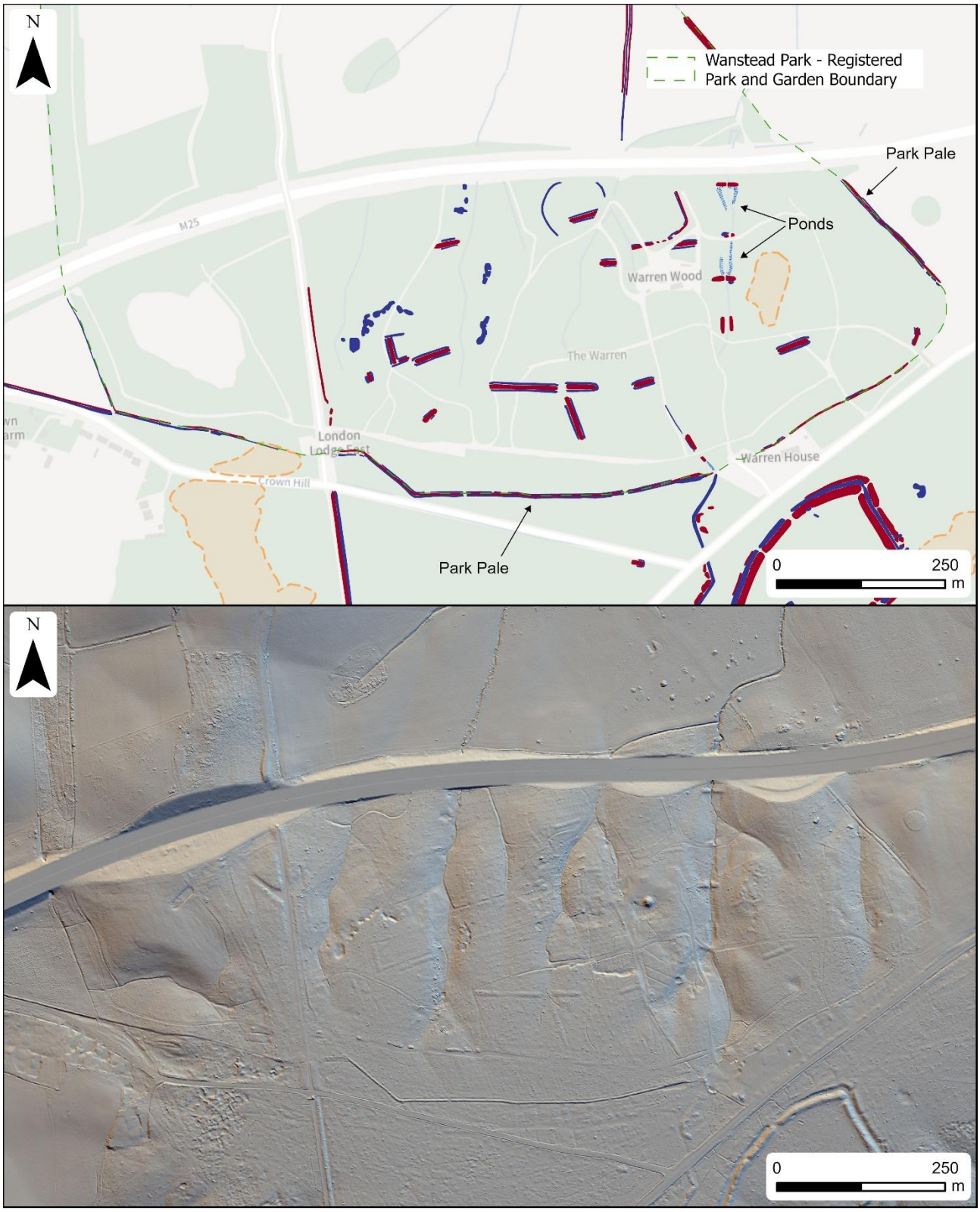


Figure 9 Top: Extract of mapping from 0.25m resolution lidar showing features within The Warren such as a park pale, pillow mounds and ponds. Bottom: Extract of 0.25m resolution lidar (multi hillshade visualisation). [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar © City of London Corporation]

Pillow Mounds

Within The Warren are a group of fourteen post-medieval pillow mounds which range in size between 15m to 100m in length and 5m to 6 m in width (EHER 81442) (see Fig. 9). The precise date for their construction is unknown; however, they likely predate the establishment of dense woodland cover in the area. As noted above, the earliest surviving trees within the Warren were planted during the late 18th or early 19th century, a date supported by documentary evidence indicating plans for extensive planting across the area during this period (see page 32-3). Many of the mounds now support mature trees, and there are instances where the pillow mounds have been truncated by later rides, routeways, and field boundaries.

Collectively, the earthworks are consistent with wider rabbit-farming practices known to have operated across the estate during the post-medieval period. Research carried out as part of the PMP attempted to quantify the number rabbits and pillow mounds present across the Copped Hall estate. A 1677 document from the Sackville Collection suggests the presence of a large amount of coneys (rabbits) scattered across ’47 and a half dozen’ locations. This figure may be interpreted as 53 separate sites across the estate where rabbits were kept. By 1686, the warrener estimated that the estate supported over ‘150 dozen’ (1,800) rabbits (Wells and Way 2018b, 41-2). Although the accounts do not refer directly to The Warren, it is plausible that the pillow mounds identified by this aerial survey formed a significant proportion of the areas used for rabbit management.

Sub-circular Enclosure

In the north of The Warren are the earthwork remains of a sub-circular enclosure approximately 100m in diameter, partially truncated on its northern side by the M25 (EHER 81447). The feature was identified previously by both the 2018 PMP and the 2019 walkover survey and was highlighted as a feature that required further research. This investigation has shown that the feature represents the remains of a planation enclosure likely created during the 19th century. The enclosure first appears on a series of draft maps created around between 1827 and 1847 (ERO D/DHF P12-18) that depict an area of woodland plantation surrounded by a dashed-line convention extending beyond the northern boundary of The Warren plantation. The enclosure is also shown in 1880 to 1882 Ordnance Survey mapping.

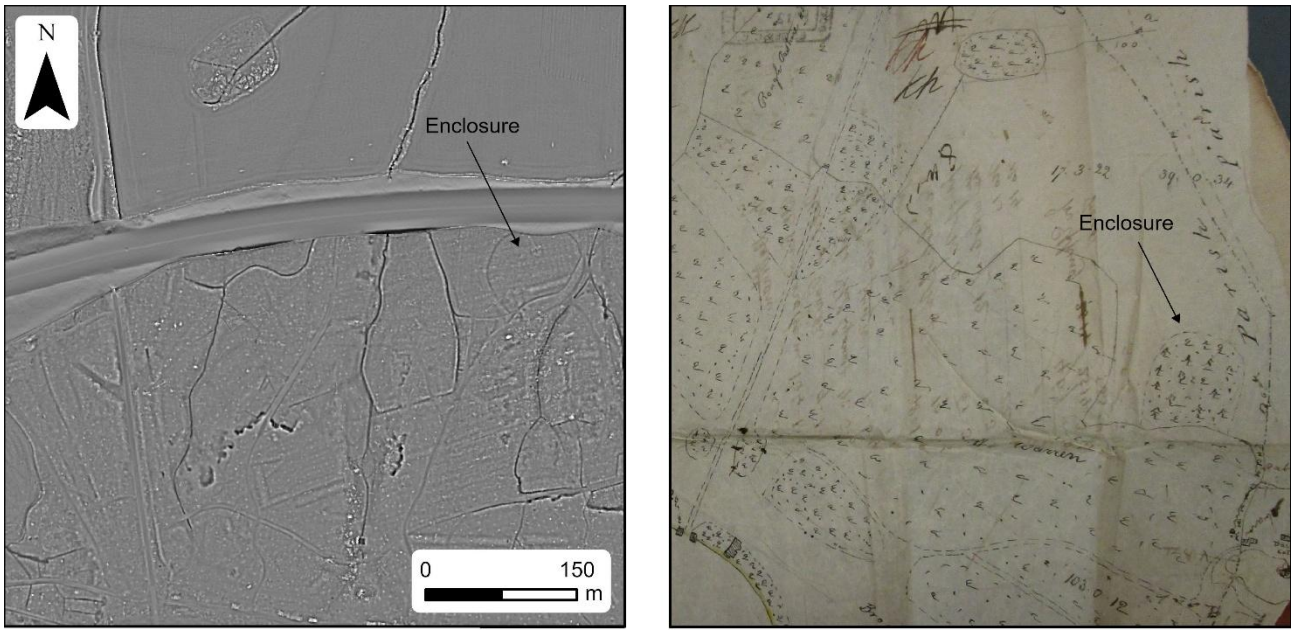


Figure 10 Left: Extract of 0.25m resolution lidar (simple local relief visualisation) showing the sub-circular plantation enclosure. Right: Extract of mapping held by the Essex Record Office labelled 'Draft map and tracing of the Copped Hall Estate'. Maps were produced between 1827 and 1847. [Lidar: © City of London Corporation. Drawn map: Reproduced from Wells and Way 2018. Held by Essex Record Office (ERO D/DHF P12-18)].

Possible Fishponds

In the northeast area of The Warren is a row of three possible medieval or post-medieval ponds, created by damming of a small stream at three separate points (EHER 81445). There is evidence that sections of the shallow valley sides were intentionally steepened to improve water retention behind each dam. The ponds were fed by a springhead located immediately south of the complex and would have drained northwards, passing to the east side of Copped Hall. The central dam appears to have been reused more recently as a crossing point for a later ride or routeway. All three dams and ponds are now heavily wooded and overgrown.

Little is known about the original function of the ponds. One theory is that they are in fact the remains of a string of three fishponds that may have been created while the estate was under the ownership of Waltham Abbey between the 14th and 16th centuries. The absence of the dams and ponds the 18th and 19th century mapping consulted by the PMP, may further support an earlier medieval date.

Other park features

Circular 'Park Feature'

Within 'The Selvage' are the earthwork remains of a small ring bank that measures approximately 14m in diameter (EHER 81454). The feature is possibly a post-medieval garden feature, with one possible interpretation being the former site of a dove cote. The feature is not depicted on any of the historic maps consulted.

Northern Avenue

Part of the post-medieval northern avenue of Copped Hall survives as a low broad earthwork bank aligned north to south extending for approximately 190m northwards from the northern edge of the Copped Hall complex (EHER 81528). A tree-lined avenue at this location is first recorded on the 1751 Eyre Survey map (ERO D/DQ 43/2). A northern avenue also appears in the 1735 Mynde engraving (ERO D/DW E27/1) which corresponds to the remaining earthwork.

Warlies Park

Situated between Waltham Abbey and the Copped Hall estate, Warlies Park is an 18th-century designed landscape that retains several elements of its historic layout. Like Copped Hall, the estate belonged to Waltham Abbey prior to the Dissolution, after which it evolved into a country house and park of increasing architectural and aesthetic significance. Earlier phases of its history are poorly documented, and surviving evidence for the estate before the 18th century remains limited.

Most of the documented development of the house and park relates to the first half of the 18th century, when the estate was owned by Frances Davenport and Richard Morgan. During this period, the park was expanded and embellished with prominent ornamental features, including a classical rotunda named ‘The Temple’ and two obelisks traditionally interpreted as commemorating the death of Boudicca. Through the 19th century, ownership of the estate passed to the Reed and Banbury families. Later, Sir Thomas Fowell Buxton donated part of the estate to Epping Forest and financed local initiatives such as the establishment of Upshire’s first church in 1901. In the 20th century, Warlies served various institutional functions, operating as a Danes-funded home under Dr Barnardo’s between 1928 and 1954, and later as a children’s home until the early 1970s (Plater 2004).

The estate retains some key elements of its 18th-century landscape design, including its undulating parkland, mature specimen trees, the rotunda, the obelisks, and water features such as Cobbin Pond. This aerial survey identified a group of previously unrecorded earthworks in Obelisk field summarised below:

Obelisk Farm

Obelisk Farm (EHER 81456), located to the northeast of Warlies Park House, contains a complex of post-medieval earthworks that are likely associated with the development of the Warlies parkland. The earthworks are contained within the large field immediately north-east of the farm buildings. At the centre of this field stands one of two commemorative obelisks built within the park during the early 18th century.

The earthworks are characterised by a series of curvilinear and linear banks, ditches, and scarps that collectively define several irregular and sub-rectangular enclosures. Along

parts of these boundaries are the remains of tree throws, indicating the former presence of trees that appear to have delineated earlier field or park compartments. At the centre of the complex is a probable tree mound which likely supported four trees. The arrangement of these features corresponds closely with tree positions depicted on the 1882 Ordnance Survey mapping (surveyed between 1866 and 1870). Three of the fields also contain remnants of ridge and furrow which likely indicates contemporary agricultural cultivation.

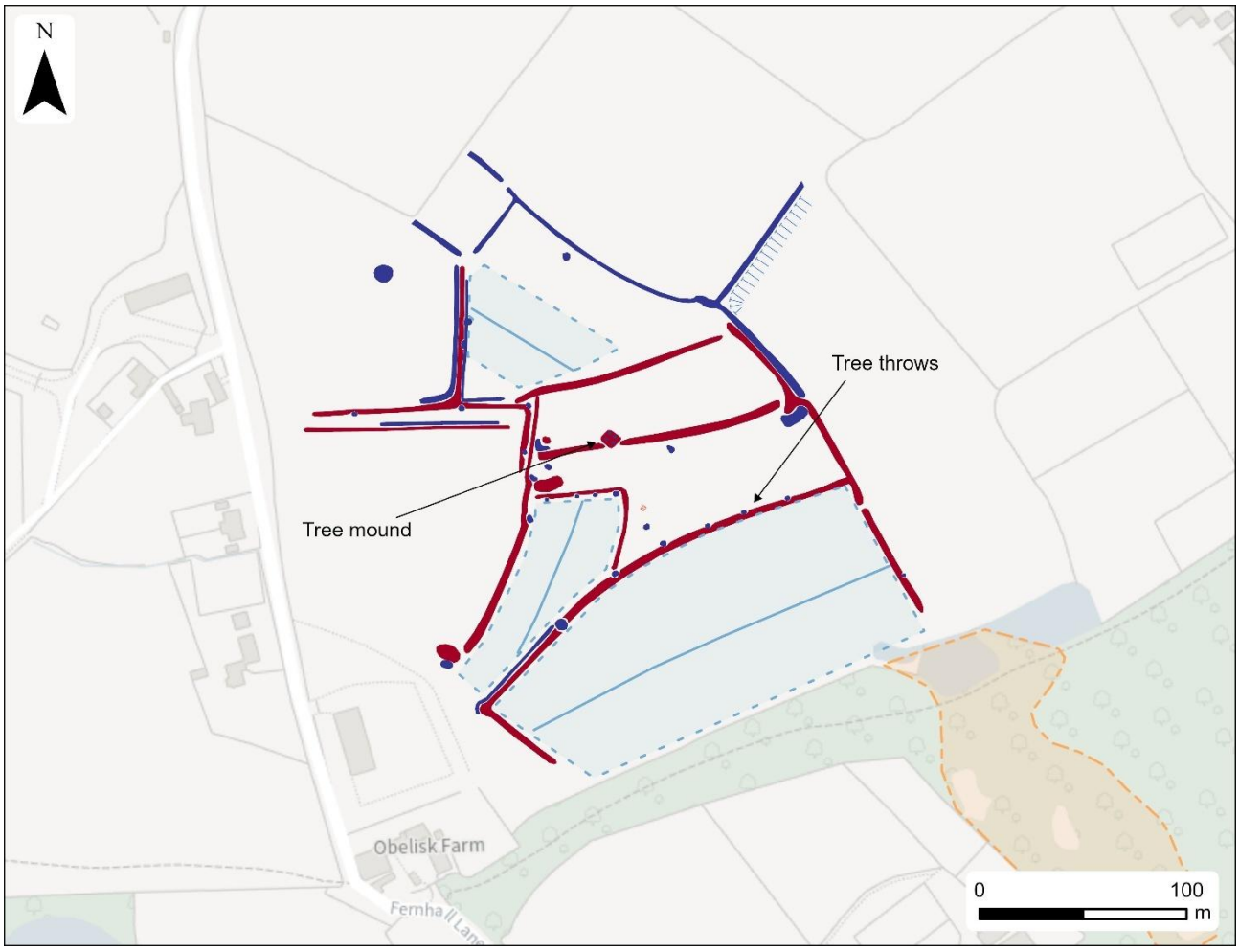


Figure 11 Extract of mapping from 0.25m resolution lidar showing features at Obelisk Farm within Warlies Park. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

Wanstead Park

Wanstead Park is a 129ha Grade II* registered park and garden embedded within the suburban fabric of east London and, with Wanstead Flats, forms the southernmost part of the City Of London Corporation administered Epping Forest. The park has suffered heavily from urban encroachment and is now surrounded by dense residential developments and major transport corridors such as the A12 and A406. However, the Park still retains a degree of seclusion and designed vistas through the preservation of belts of mature trees and open grasslands (Compass Archaeology 2013, 9).

Within the bounds of the park is evidence of human activity extending back at least until the Roman period, with early excavation suggesting a high-status villa near the Perch Pond area. During the medieval period the land formed part of a manorial estate held variously by St Paul's, the Bishop of London, and in 1499 by King Henry VII (Compass Archaeology 2013, 10). Major changes were made to the park during the late 17th century by Sir Josiah Child who first leased the property in 1667 (bought outright in 1673). Sir Josiah initiated extensive landscaping and water-management schemes that laid the foundation for much of the 18th-century work. His son, Sir Richard Child (later Earl Tylney), rebuilt Wanstead House as a grand Palladian mansion in the early 18th century and developed its celebrated gardens, lakes, and avenues. Much of Sir Richard's work was documented by contemporary surveys by Kip and Knyff (approximately 1715), Cradock (1725) and Rocque (1735). Upon his death in 1750, the estate passed to his son John, who commissioned the creation of the Grade II listed buildings The Temple and Boathouse Grotto. Following a period of decline under William Wellesley-Pole, financial pressures led to the sale of the estate's contents in 1822 and the demolition of Wanstead House between 1823 and 1824, after which the landscape became fragmented and increasingly neglected. By the late 19th century much of the former estate had been acquired by the City of London Corporation, with the remaining parts of the parkland sold off during the early 20th century (Compass Archaeology 2013, 11).

The majority of the surviving park landscape falls within the project area, except for the grounds of Wanstead Golf Club, which are privately owned. Comprehensive analysis of the park's historic landscape was previously undertaken by Compass Archaeology in 2013 as part of a strategic assessment of conservation measures. Extensive research has also been carried out by Dr Hannah Armstrong for her 2016 PhD and 2022 book *Wanstead House: East London's Lost Palace*. Their studies incorporated detailed documentary and cartographic research alongside an evaluation of earthworks identified on 2010 Environment Agency lidar data. Given the breadth of existing research and the density and complexity of the earthworks present within the park the section below will summarise features not identified during previous research and lidar analysis, namely work carried out by Compass Archaeology in 2013.

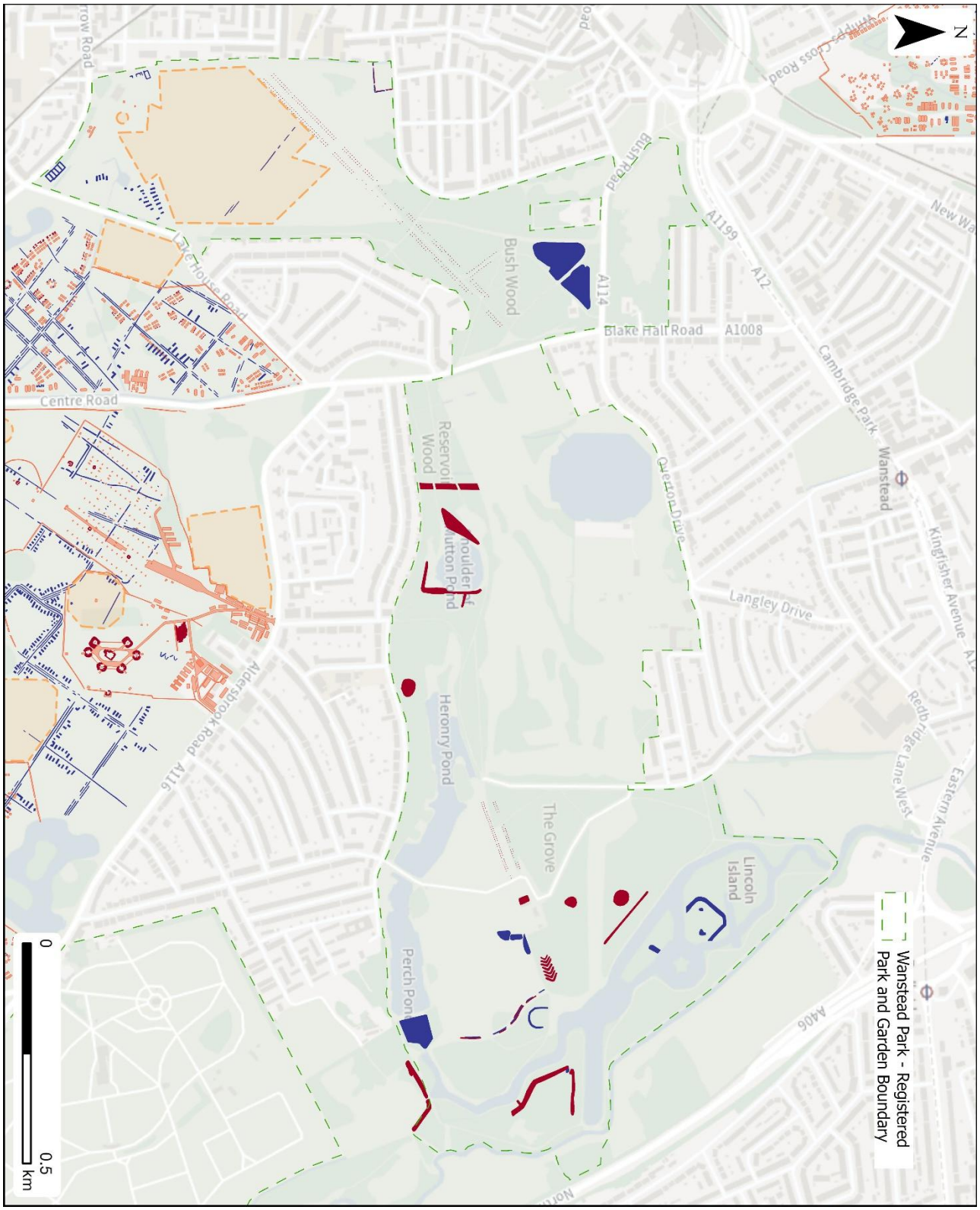


Figure 12 Extract of mapping from 0.25m resolution lidar showing features within Wanstead Park. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

Southern Avenue

To the east of The Temple is a distinctive group of seven low, east-pointing, chevron-shaped earthwork banks (GLHER 126285). The features align eastwards towards The Grotto and share the same south-west to north-east alignment as the avenue that approaches The Temple from the west. One of the seven chevron features was previously recorded by a 1990 earthwork survey by the Royal Commission on the Historical Monuments of England (RCHME) (HE Archive 831637) (RCHME 1990). Their placement suggests an early stage in the formal setting-out of the designed landscape, likely integral to the initial geometric arrangement of the avenue prior to the construction of The Temple in the 18th century.

The avenue is depicted on Cradock's 1725 plan, shown as a double-lined tree avenue extending south-west from the Long Walk towards the Ornamental Waters. Rocque's 1735 plan and his 1744 to 1746 survey show the avenue running continuously from the River Roding in the north-east to Heronry Pond in the south-west and continuing westwards along the northern bank of the pond. By the later 18th century, the avenue appears to have been curtailed due to the construction of The Temple and associated buildings. Nineteenth-century mapping documents show only the residual line of the former avenue, retained as a land boundary.

The precise function of these chevron-shaped features remains uncertain; however, their deliberate symmetry and directional orientation make it clear that they formed part of a planned formal garden or designed-landscape scheme. If they formed part of the early 18th-century avenue design, they would be expected to have been fully navigable to facilitate movement along the route. At first glance they may appear as a set of steps terraced into the shallow north-east facing slope. However, their morphology may suggest otherwise. The features are interspersed by shallow ditches, which would have made the otherwise gentle ascent quite challenging. Their absence from early 18th-century plans suggests that they were either lightly constructed or short-lived features.

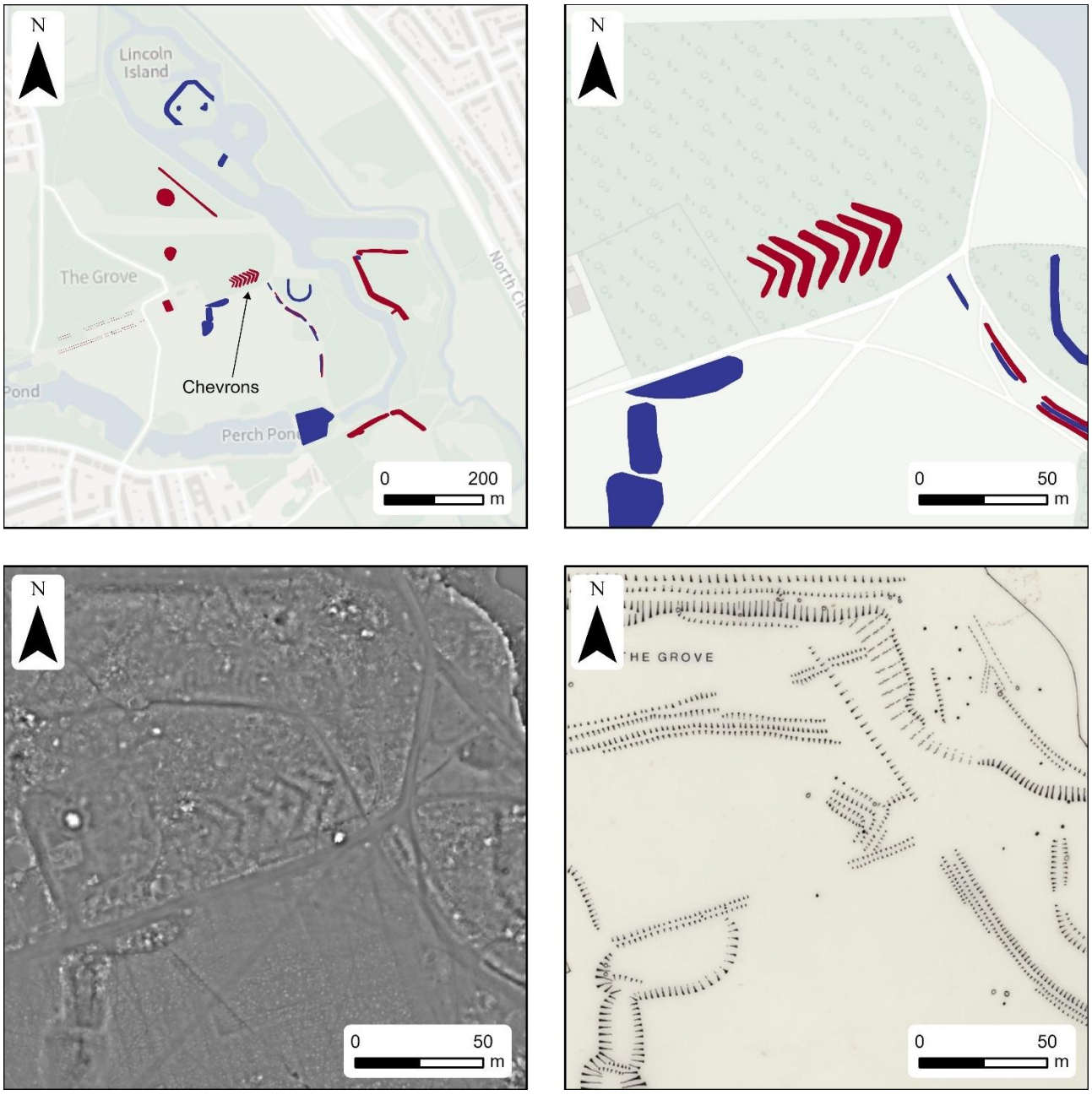


Figure 13 Top left earthwork features around the Ornamental Waters. Top right: Extract of mapping from 0.25m resolution lidar showing the chevron features. Botton left: Extract of 0.25m resolution lidar showing the chevron features (simple local relief model visualisation). Bottom right: Extract of 1990 survey drawing produced by RCHME. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar: © City of London Corporation. Survey drawing: 1990 RCHME Wanstead House and Garden Survey Plan, © Crown Copyright Historic England Archive: 831637]

Lincoln Island

The early 18th-century design of the Ornamental Waters (GLHER 113203) incorporated a carefully structured arrangement of engineered water features intended to complement the broader formal landscape. Lincoln Island (GLHER 145725) functioned as a key component within this scheme, and its layout has been well-documented by 18th- and early 19th-century plans. These cartographic sources consistently show the island divided into a

northern and southern area partially divided by a separated by an east/west aligned channel, and this division is still visible as earthworks on the 2023 lidar.

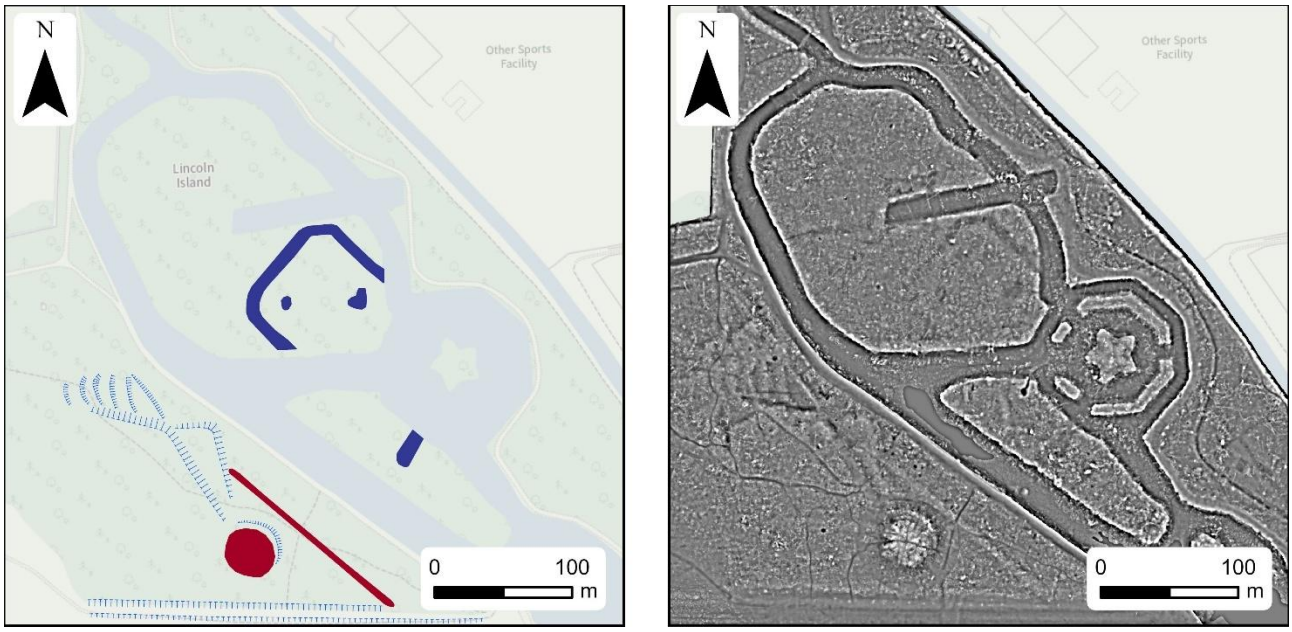


Figure 14 Extract of mapping from 0.25m resolution lidar showing the U-shape water channel element of the Ornamental Waters. Right: Extract of 0.25m resolution lidar (simple local relief visualisation). [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar © City of London Corporation]

Many elements of the original Ornamental Ponds survive as earthworks and remain clearly visible in the lidar data. Their present configuration closely reflects the layout documented by the 1990 RCHME survey, which records the earthworks largely as they appear in the 2023 lidar dataset. Notably, on the southern part of Lincoln Island, the interpretation and mapping of the 2023 lidar revealed the slight but discernible traces of a U-shaped water channel, elements of which had previously been identified by the RCHME survey. The channel once enclosed a small subsidiary island situated immediately north of the Fortification, where it surrounded a pair of hollows interpreted as former ponds. This channel and pond arrangement corresponds to a layout first depicted on Cradock's 1725 plan and subsequently illustrated on Rocque's 1744 to 1746 survey. Over the late 18th and early 19th centuries, this arrangement was progressively simplified. By 1813, both the U-shaped channel and the enclosed ponds had been infilled or modified, giving rise to the more consolidated pond system represented by the current earthworks.

Raw Materials and Brickmaking

Epping Forest is underlain by a varied geological sequence of clays, sands, and gravels, which have historically provided essential raw materials for brickmaking and construction. Between the 18th and the early 20th century, numerous extraction sites were established across the forest, many of which are still visible as earthworks. These operations were driven largely by the accelerating expansion of London's suburbs during the Industrial period, as the city sought to build more homes and infrastructure to accommodate a rapidly growing population. The proximity of Epping Forest to emerging transport routes also made it an ideal source of building materials, linking extraction sites to the areas of metropolitan development.

Sand and gravel extraction sites

Numerous post-medieval sand and gravel extraction sites were identified as earthworks across the project area. The largest concentrations of pits were identified in the northern areas of the forest between Waltham Abbey and Loughton. Here the pits are located on the underlying Bagshot Sand and Stanmore Gravel bedrock and superficial geologies. Most of these features were concentrated around the Wake Arm Roundabout, the major junction between the towns of Epping, Theydon Bois, Loughton and Waltham Abbey, presumably positioned to take full advantage of easy access to each town. Similar extraction sites were also identified at High Beech, Oak Hill, London Lodge East and Ambresbury Banks. A section of the eastern defences at Ambresbury Banks were also truncated by a serious of eight pits.

Large sand and gravel extraction sites were also identified across the mid and southern parts of the forest with the largest sites located at Woodford Golf Course, Walthamstow Forest and Leyton Flats. These appear to have been largely situated upon areas of superficial Woodford and Boyn Hill Gravel Member which comprise both sand and gravel. The largest and perhaps most striking of these sites is located at Hollow Pond on Leyton Flats, which is now a popular site for lake walks and casual boating. The site started life as a series of gravel pits opened during the 19th century to provide gravels for roadbuilding needed for the expansion of the city. Gravel extraction ceased towards the end of the 19th century, leaving behind a large area of water-filled pits across an area of marshy land. However, in 1905 the site was repurposed as part of a scheme to provide work for the unemployed. Leyton District Council and the Epping Forest Committee recruited a team of unemployed labourers to expand the largest of the quarry pits, creating the substantial expanse of water now known as Hollow Pond (Glanvill 2015).

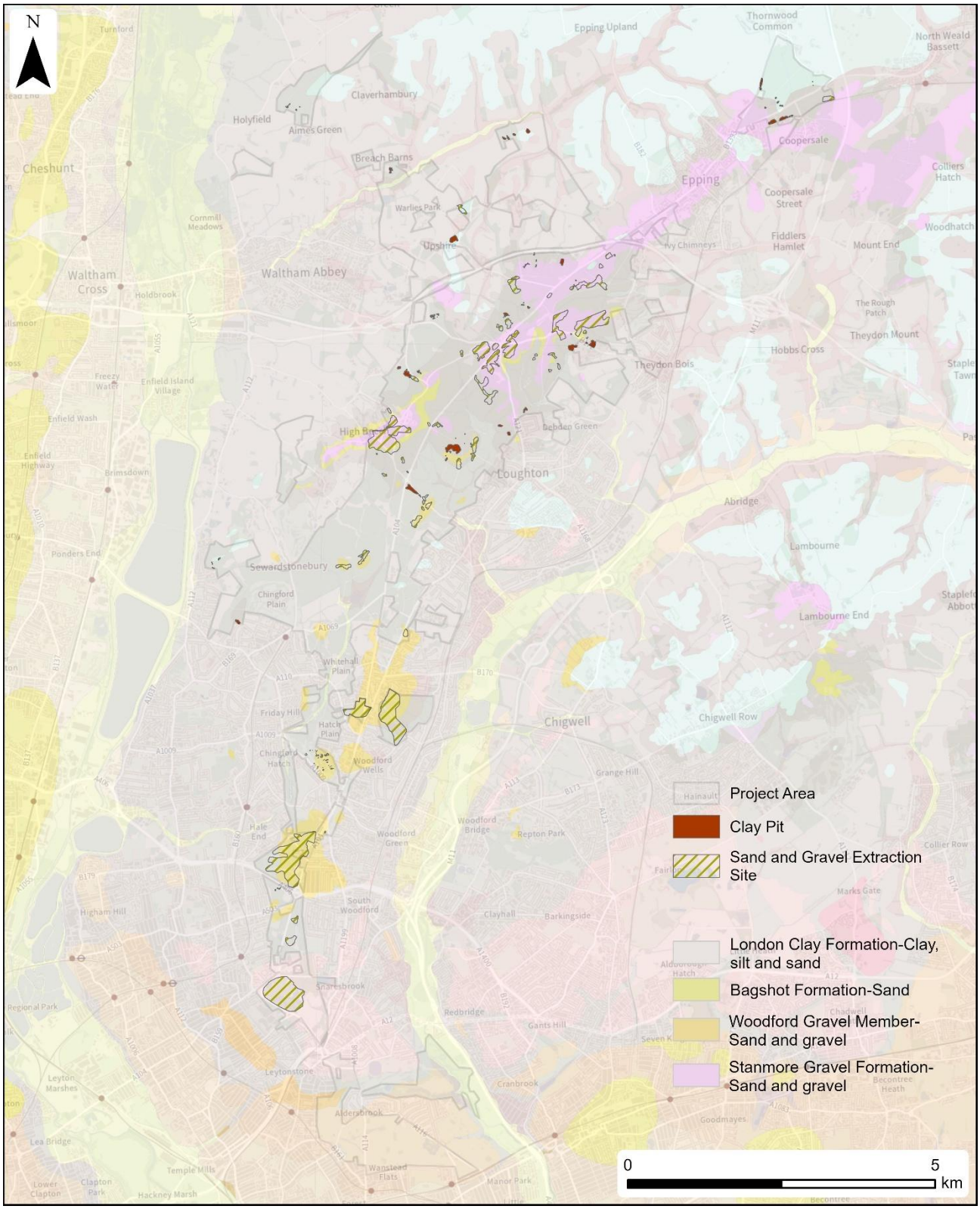


Figure 15 Distribution of Sand and Gravel Extraction sites and Clay Pits overlaid on BGS bedrock and superficial geological mapping. [Archaeological mapping: © Historic England. Contains British Geological Survey materials © 2026]

Clay extraction and brickmaking

The history of clay extraction and brickmaking in Epping Forest is closely tied to the region's distinctive London Clay geology which provided an abundant and accessible material for brick production. Its impermeable nature and fine-grained composition made it ideal for manufacturing durable bricks. Brickmaking developed significantly within the forest during the Industrial Period between the 18th and 20th centuries, coinciding with the rapid expansion of London and the growing demand for building materials.

Except for the brickfield site on Wanstead Flats, all identified clay pits were recorded within the northern areas of Epping Forest and were commonly located close to documented brickfields and brickwork sites as depicted on historic Ordnance Survey mapping. The following section provides a summary of the recorded brickfield and brickwork sites and their associated earthworks identified within the project area.

Wintry Park Brick and Tile Works

The Wintry Park Brick and Tile Works (EHER 15523) were located on the western edge of Wintry Wood in the northeast of the project area (TL 46926 03464) and were operational between 1838 and 1895. During this time the site became one of the largest brick and tile works within the forest where it played a key role in supplying bricks for local development. The site of the works was strategically chosen to exploit the thick deposits of boulder clay that underlies much of this area. At its height the site comprised clay pits, kilns, and a row of workers' cottages which remain as private dwellings today (Ryan 1999, 96). A short distance to the southeast is also evidence of a Roman kiln site (EHER 3736) which was discovered in 1891 while opening a clay pit which likely served the 19th-century works.

Within Wintry Wood are the earthwork remains of numerous clay pits which were likely related to the brick and tile works. Immediately to the north of the site is a long clay pit (EHER 81536) which runs north for approximately 180m along the eastern side of High Road. Located to the south and south-east of the former works is also a cluster of six pits, together with a larger ornamental waterbody known as 'The Lake' which is first shown on 1897 OS mapping (revised in 1895). Its absence on the earlier 1881 edition suggests the pond was created between 1873/74 and 1895 during the later years of the brick and tile works. Although its precise origin remains unclear, it is considered likely that the feature began as a clay extraction pit and was subsequently adapted for recreational use following the decline of industrial activity within the forest towards the end of the 19th century.

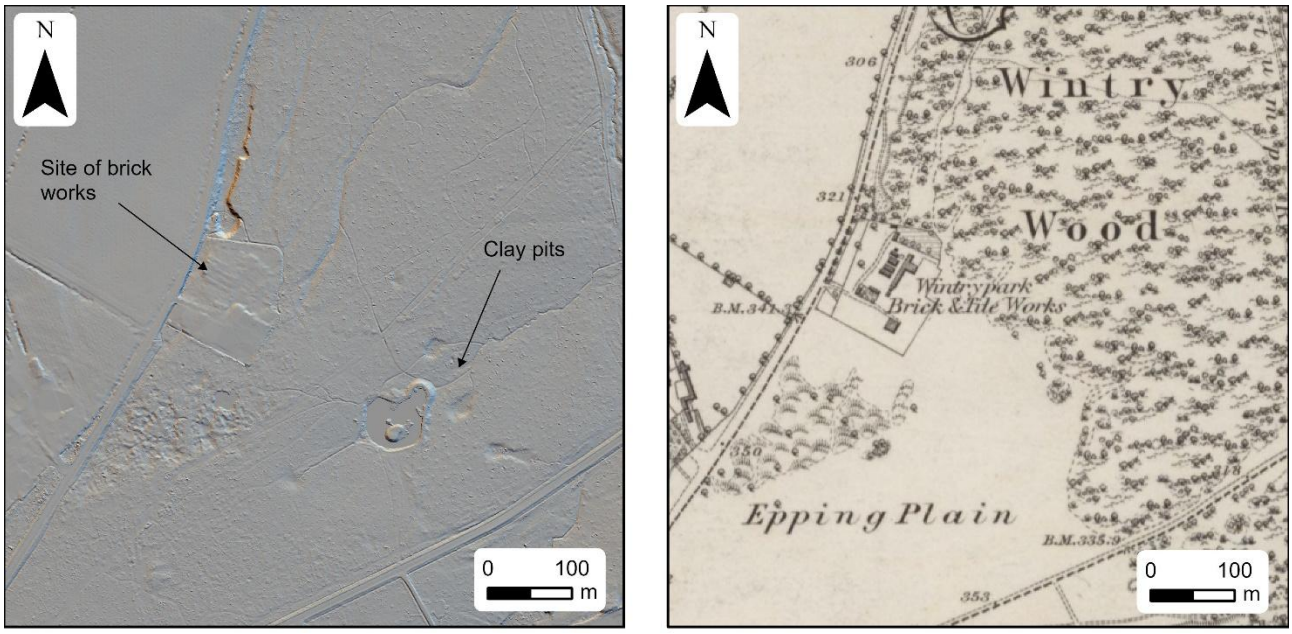


Figure 16 Left: Extract of 0.25m resolution lidar (multi hillshade visualisation) showing the earthwork remains of clay pits that surrounded Wintry Park Brick and Tile Works. Right: Extract of 1881 Ordnance Survey showing Wintry Park Brick and Tile Works. [Lidar: © City of London Corporation. OS map: Reproduced with the permission of the National Library of Scotland. https://maps.nls.uk/]

Brickworks south of Wintry Wood

Further south, along the boundary between the parishes of Epping and North Weald Bassett, lie the earthwork remains of three substantial clay pits (EHER 81536) (TL 47307 03015). 1881 Ordnance Survey mapping show the original extents of these pits, as well as the location of a contemporary brickworks situated to the south, between the parish boundary and the adjacent railway line. The precise origins of the brickworks remain uncertain; however, the associated structures appear to have undergone little alteration until at least the 1950s, when the site was partially remodelled and two of the three clay pits were infilled. The area is currently occupied by a timber yard.

Wanstead Flats (Brickfield)

On the northern edge of Wanstead Flats (TQ 4072 8673) are the earthwork remains of a large level rectangular area (approximately 170m by 170m) cut into the gentle east-facing slope (GLHER 236427). The cutting was likely created originally through clay extraction, possibly during the early late 18th or early 19th century. By the late 19th century, the site had developed into a brickfield comprising a small group of dispersed buildings, clay pits and clay mills. The precise date for the start of operations is uncertain; however, the 1873 Ordnance Survey mapping (surveyed 1863), together with contemporary testimonies indicate that the brickfield was well established by the early 1860s (Gorman 2024).

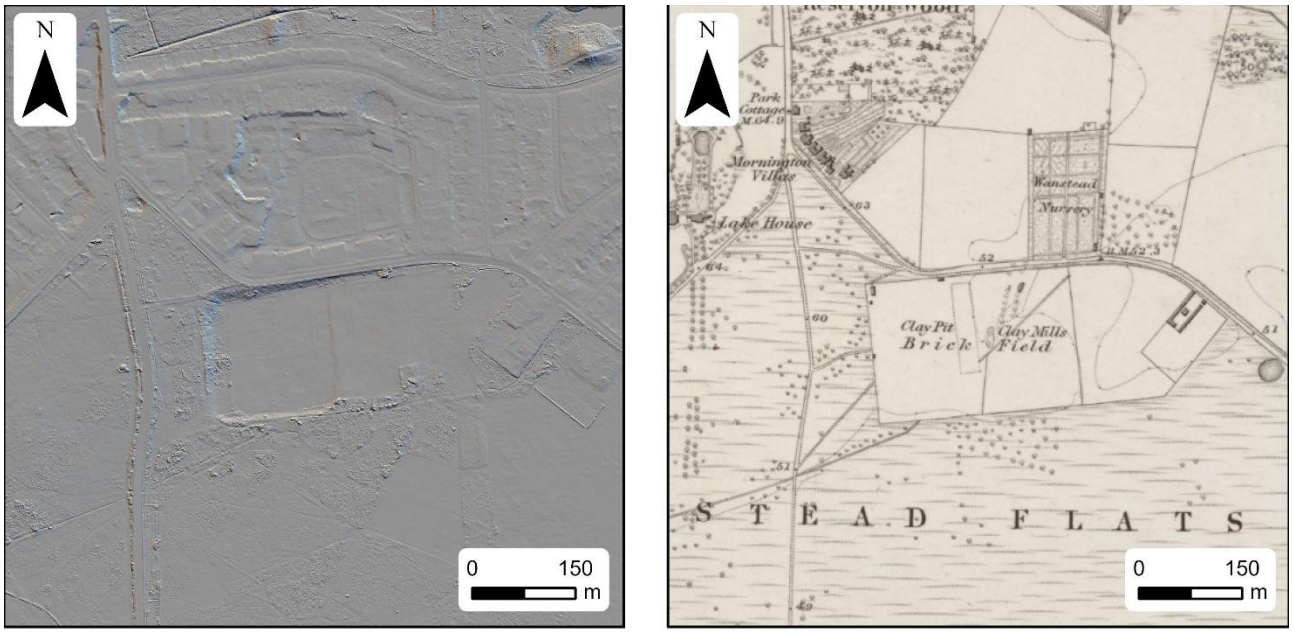


Figure 17 Left: Extract of 0.25m resolution lidar (multi hillshade visualisation) showing the earthwork remains of a brickfield at Wanstead Flats. Right: Extract of 1873 Ordnance Survey showing the brickfield and structures at Wanstead Flats. [Lidar: © City of London Corporation. OS map: Reproduced with the permission of the National Library of Scotland. https://maps.nls.uk/]

The use of the brickfield site was formalised in December 1864 through a 15-year lease granted to William Hill, senior partner in the prominent London building firm Hill, Keddell and Waldron. The lease permitted clay and brick-earth extraction on a 4-acre site, with production of bricks, tiles, and drainpipes estimated at 375,000 bricks annually. The agreement also specified the construction of kilns and clamps on the eastern side of the site, alongside fencing and ancillary structures such as stables and clay mills (Gorman 2024).

At its peak, the brickfield represented a substantial enterprise, contributing to major building projects in London and the surrounding districts. However, despite its economic significance, the brickfield was contentious locally and widely regarded as an eyesore. Local residents and campaigners became increasingly concerned about the industrial encroachment onto forest land and by the end of the 19th century the brickfield site and its assets were sold, marking the decline of brickmaking on Wanstead Flats and the gradual transition of the area into public open space (Gorman 2024).

Strawberry Hill (Brickfield)

Within the central area of the forest, immediately east of Robin Hood Cottage (formerly the Robin Hood public house), lie the earthwork remains of a brickfield site (TQ 41289 97176) (EHER 15715). The earthworks consist of a series of sub-rectangular pits, small platforms, mounds, and terraces. At the centre of the site, there are an additional pair of earthworks that may represent the foundations of two structures associated with brick production. OS mapping from 1868 (surveyed in 1866) depicts two of these pits and a curved trackway

linking the site to Earl's Path (road). The period during which the brickfield was active remains uncertain; however, cartographic evidence suggests a relatively short period of activity. The site is only identified as a brickfield on maps dating between 1868 (surveyed 1866) and 1881 (surveyed 1870 to 1872), indicating a possible lifespan of approximately five to six years.

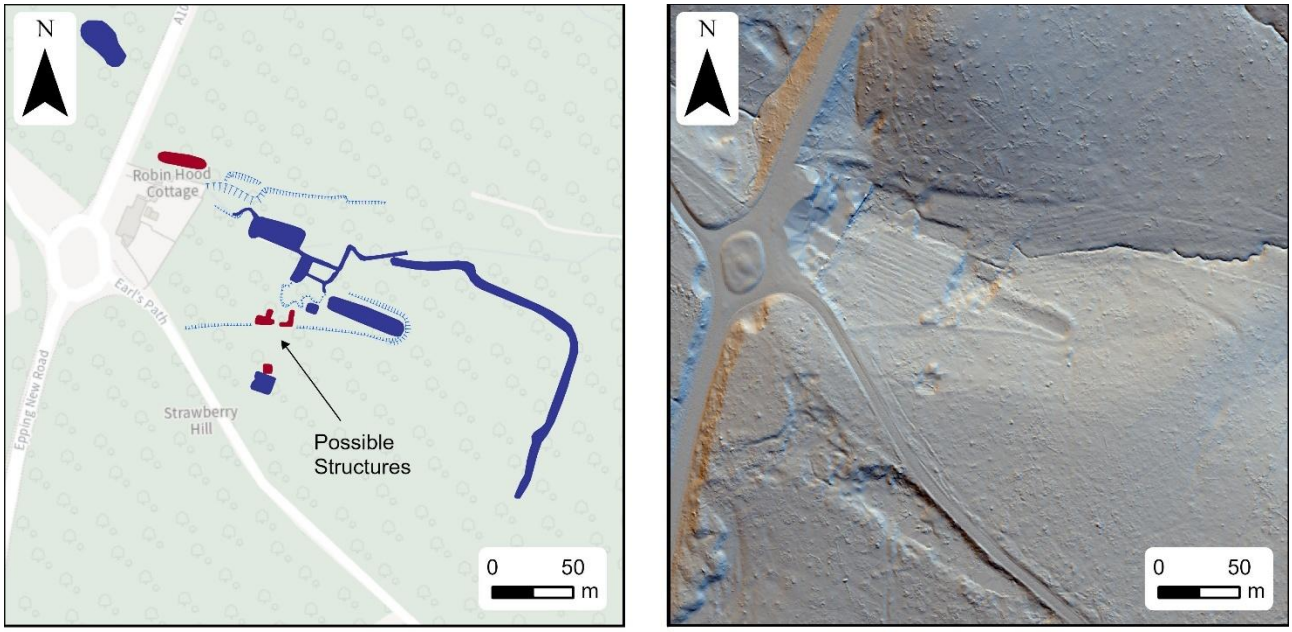


Figure 18 Left: Extract of mapping from 0.25m resolution lidar showing the complex earthworks at the Strawberry Hill brickfield site. Right: Extract of 0.25m resolution lidar (multi hillshade visualisation). [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar: © City of London Corporation]

Second World War in Epping Forest

Epping Forest is well-known for its significant role during the Second World War; a history reflected in both aerial and documentary evidence (Walker 2014b) (Walker 2024) (Wanstead Flats Working Group 2013). The proximity of the forest to the heart of London made it an important location for strategic wartime activities.

During the early war years military planners sought to strengthen the land and air defences around London which saw parts of Epping Forest incorporated into the Outer London Defensive Ring. Open areas such as Wanstead Flats and Chingford Plain were identified as potential landing sites for enemy aircraft and as such were therefore fortified with anti-landing obstacles and anti-aircraft batteries. The forest's wooded areas provided natural layer of defence against prospective land incursions, which was further enhanced through the construction of purpose-built defensive structures.

Later in the war many of the open areas of the forest (most notably Wanstead Flats) were turned over to accommodate Italian and German prisoners in Prisoner of War Camps incarcerated during the North Africa, Italian and Normandy campaigns. Large parts of these open areas were enclosed and tents erected to house the prisoners in and around existing defensive infrastructure.

Defending London

Most of the remaining earthworks recorded from this period relate to defensive lines and structures that were built across the forest to strengthen the defences of London. These defences comprised a comprehensive selection of defensive structures such as anti-tank trenches, anti-gliding trenches, gun emplacements and heavy anti-aircraft batteries.

Anti-glider trenches

Anti-glider trenches were a common feature in Britain's anti-invasion landscape, with many still visible as earthworks across the country today. Commonly constructed during the early war years, trenches were designed to deny flat, open terrain to enemy airborne forces in the event of an invasion. The defences often comprised parallel linear or zigzagging ditches, often up to several metres wide and deep, with cuttings and spoil banks created along either side.

Almost all open areas in the southern reaches of Epping Forest were fortified by anti-glider trenches, with evidence for trench cutting visible across Wanstead Flats, Leyton Flats, Woodford Golf Course, Whitehall Plain, and Chingford Plain. Their style and layout vary slightly across the different areas of the forest, likely representative of different phases of defence construction. Preservation of the features also varies from features that are still visible as earthworks on lidar to those that are no longer extant and only visible on historic aerial photography.

Figure 19 Extract of mapping from 0.25m resolution lidar showing the distribution of anti-glider features within Epping Forest. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

Wanstead Flats contains a concentration of these earthworks covering an area of approximately 95ha between Lake House Road and the City of London Cemetery (GLHER

231416). The trenches here were identified and mapped as earthworks both from the 2023 lidar data and 1944 aerial photography (Fig. 21). They comprise a broad central ditch flanked by a thinner ditch on each side, arranged in a cross-hatched layout aligned north-west to south-east and north-east to south-west. The rows of ditches were flanked intermittently on both sides by near-equally spaced sub-rectangular pits aligned perpendicular to the trenches. Where possible, planners incorporated existing landscape features such as earlier tree ring enclosures into the defensive layout, presumedly to reduce the workload during construction.

Figure 20 Extract of mapping from 0.25m resolution lidar showing the distribution of anti-glider features across Wanstead Flats. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

There appears to be two phases of trenches on the flats which are broadly separated by Centre Road which runs north to south through the middle of the area. To the east of Centre Road, defensive trenches were likely installed during the early war years, before being superseded by the installation of a heavy anti-aircraft and Z rocket battery which overlie them (see ‘Anti-glider trenches’ on page 50). These defences continued across to the western side of Centre Road, where they were possibly modified or enhanced during

the construction on the anti-aircraft batteries, as suggested by their different design and layout. On 1944 aerial photography (Fig. 21) tents associated with a D-Day mustering camp can be seen to have been laid out on the same alignment as the trenches, possibly reusing them as ready-made routes around the camp.

Figure 21 Extract of RAF/106G/LA/29 RP 3310 07-AUG-1944 showing Wanstead Flats in 1944. North is to the top of the image. [Historic England Archive (RAF Photography)]

Similar arrangements of anti-glider ditches were also observed at Woodford Golf Club between Chingford and Woodford (GLHER 232762) as earthworks on both 2023 lidar and 1944 and 1946 vertical aerial photography. Trenches were broadly laid out on north-east to south-west and north-west to south-east alignments, positioned to most efficiently dissect existing field systems to ensure maximum protection from landing aircraft.

Evidence for wartime defences were also visible on aerial sources at Chingford Plain, which was also the site of a significant heavy anti-aircraft battery (see ‘Anti-aircraft batteries’ on page 57). The defences were most visible on 1946 vertical aerial photography (Fig. 22 and Fig. 29). By contrast, the 2023 lidar data shows many of these earthworks as partially or completely levelled, likely as a result of landscaping associated with the reinstatement of the Royal Epping Forest Golf Course after the war. Two different types of anti-glider trench were observed across the plains, separated by Bury Road which runs north to south through the middle of the area. To the west of Bury Road were the remains of a crosshatch pattern of ditches flanked on both sides by regularly placed piles of upcast (GLHER 232784). To the east of Bury Road was an arrangement more akin to the features observed at Wanstead Flats (GLHER 232781; EHER 18095). The triple-ditched crosshatch pattern of ditches was laid out on a north-east to south-west axis covering the

entire open area to the north of Queen Elizabeth's Hunting Lodge. These features were visible in 1941 and 1946 aerial photographs (Fig. 22 and Fig. 29). Many of the trenches were also visible as partially levelled earthworks on 2023 lidar data.

Figure 22 Extract of RAF/3G/TUD/UK/195 Vp1 5049 10-MAY-1946 showing anti-glider trenches across Chingford Plain in 1944. North is to the top of the image. Bury Road is seen at the centre on the image. [Historic England Archive (RAF Photography)]

Anti-glider trenches are also visible across Leyton Flats on both 2023 lidar and 1944 aerial photography (GLHER 231416). The remains here comprise a pattern of single ditches laid out on a crosshatch pattern along a north-west to south-east axis. By 1944 the ditches had been mostly filled and levelled and superseded by a large temporary military camp. The nature of the remains suggests the ditches were constructed early during the war and shortly after filled and levelled prior to the construction of the camp.

Anti-tank defences

Within the forest are the remains of part of London's anti-land invasion defences known as the Outer London Defence Ring. Defensive infrastructure began to be installed in and around the capital May 1940 and was completed in two phases. The first phase comprised mostly improvised defensive measures that made use of natural features across the city, such as the River Thames and River Lea, to create a defended inner core around principal national government and royal institutions. Between July and October 1940 London's defences were expanded significantly to encircle the wider metropolitan areas of the

capital. *Operation Ironside,* as it was known, involved the creation of three concentric anti-tank lines (Lines A, B, and C), with the intention turnoff turning London into an anti-tank 'island' (Dobinson 1996c, 85).

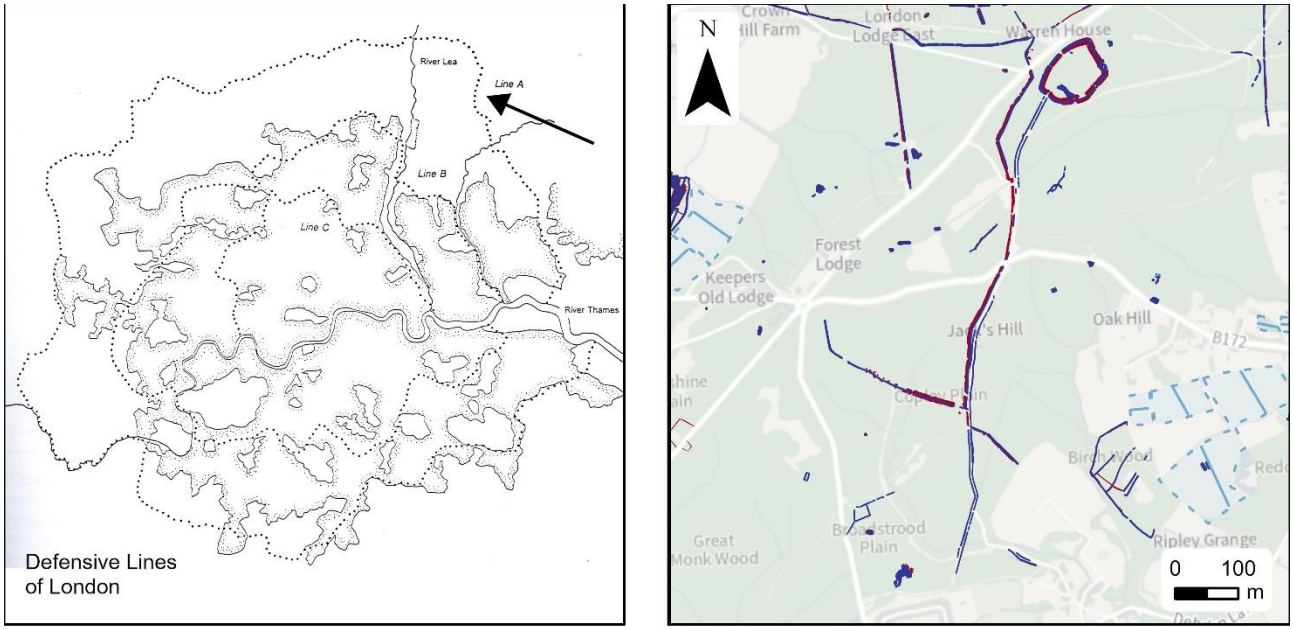


Figure 23 Left: Diagram illustrating the defensive lines of London during the Second World War. Right: Extract of mapping from 0.25m resolution lidar showing the distribution of anti-tank features running south from The Warren across Copley Plain. [Diagram: Reproduced from (Dobinson 1996c, 87) Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

Earthwork evidence relating to the outer-most defences of Line A were recorded from 2023 lidar data and 1947 aerial photography (Fig. 24) across the northern area of Epping Forest (EHER 10350). The section recorded within the project area was laid out on a broadly north to south alignment entering through the eastern area of the Copped Hall estate, past the western side of Ambresbury Banks and south towards Deben Green where it continues beyond the project area.

1940s photographs show the defences running north to south through the eastern parklands of Copped Hall between Fitches Plantation and The Warren. Here the defences primarily consisted of a single ditch, occasionally flanked by banks on one or both sides. Just north of The Warren, the feature was flanked by banks on both sides before entering the wooded area. Much of the bank and ditch features on the estate were completely levelled during the 1950s, with some of the ditches repurposed for drainage.

Figure 24 Extract of RAF/CPE/UK/2135 RP 3314 02-JUN-47 showing anti-tank defences running through The Warren and to the east of Copped Hall in 1947. North is to the top of the image. [Historic England Archive (RAF Photography)]

The defences can, in part, be traced on aerial photography continuing through The Warren before re-emerging to the west of Ambresbury Banks where they survive as earthworks. This segment features a zigzag arrangement of bank and external eastern ditch, a configuration likely designed to avoid Ambresbury Banks and to meet Epping Road at a more strategically defensible angle. This alignment would have enhanced the defensive function of the earthworks and facilitated the placement roadblock previously recorded by the HER (EHER 10349) to more effectively control movement along the main road.

South of Epping Road, the defences join the western edge of the post-medieval woodland ride known as 'The Ditches Ride'. This alignment likely took advantage of the existing treeless corridor through the forest, allowing for easier construction and improved visibility. The earthworks again comprise a bank and external eastern ditch, which follows the western side of the ride before breaking at the B172, where another roadblock was

previously recorded by the HER (EHER 10351). Beyond this point, the defensive line continues across Copley Plain, before turning south-east along an enhanced stretch of pre-existing field boundary that passes to the north of Deben Green and continues beyond the eastern edge of the project area (Fig. 25). At this junction the earthwork remains of two small gun emplacements, formed of low sub-rectangular banks, are also visible on lidar data.

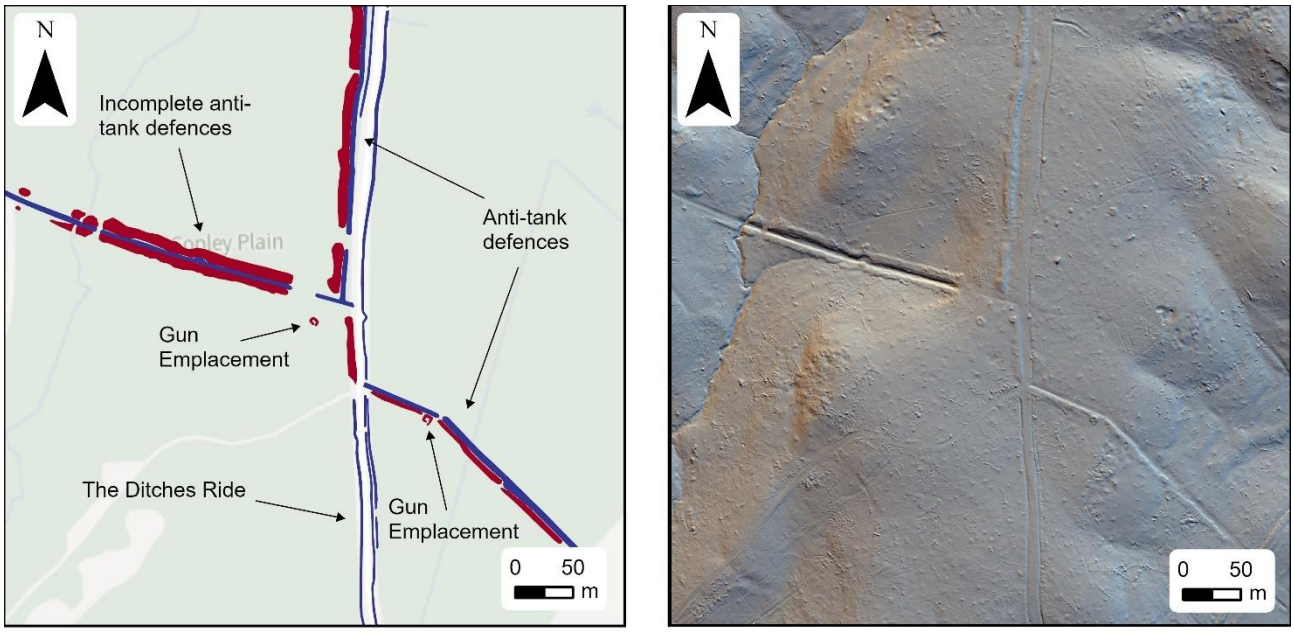


Figure 25 Extract of mapping from 0.25m resolution lidar showing the complex of anti-tank defences on Copley Plain, northeast of Deben Green. Right: Extract of 0.25m resolution lidar (multi hillshade visualisation). [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900. Lidar: © City of London Corporation]

Immediately to the northwest of the point where the defensive line turns, there is also the remains of an additional short, well-built section of anti-tank earthworks, approximately 200m in length, that may represent part of an earlier incomplete defensive configuration pre-dating the main north to south aligned section. These earthworks comprise an east to west section of a single deep ditch with V-shaped bottom, flanked on its northern and southern sides by low banks approximately one metre in height.

Anti-aircraft batteries

During the war the forest offered valuable open areas where strategic anti-air defences and artillery could be constructed. Two heavy anti-aircraft batteries and one Z-type battery were recorded at Wanstead Flats and Chingford Plain. These batteries were established as part of the London Inner Artillery Zone (IAZ); a series of anti-aircraft batteries scattered across London set up to protect the capital from aerial bombing.

Wanstead Flats

The heavy anti-aircraft battery at Wanstead Flats (designated as ‘ZE9 Wanstead’) (GLHER 133957) was identified and mapped from 1944 vertical aerial photographs (Fig. 21). Very subtle earthworks relating to some of the structures were identified on 2023 lidar data. Situated to the south of Aldersbrook Road, the latest iteration of the battery comprised a six-gun position set out around a central command post. Several ancillary buildings likely related to the operation of the battery were situated to the north, surrounding what was previously Alderbrook Farm. The entire heavy anti-aircraft battery and associated structures were enclosed by a defensive perimeter of entangled barbed wire.

The battery is first documented 22nd January 1940 and was armed until at least August 1944 (Dobinson 1996b, 395). The structures visible on aerial photographs comprise at least two different phases of development.

The first phase included a standard four-gun ‘arc’ layout surrounding a central command post, each equipped with four 3.7-inch (static) anti-aircraft guns. The emplacements were of the ‘March 1938 pattern’ design, first developed in said year to accommodate 3.7- or 4.5-inch guns developed in the lead up to the war. (Dobinson 1996a, 116). Each was reinforced by a 5m thick exterior earthen bank. The battery was linked to Alderbrook Road by a military trackway flanked by several military structures and was manned from 1940 by 86th Heavy Anti-Aircraft Regiment, 273 Battery before being moved to Cobham early 1942 (Dobinson 1996b, 395).

The subsequent phase(s) involved the addition of two auxiliary gun emplacements on western side of the existing battery along with a gun-laying (GL) Mk II radar mat and receiver, which was installed by 22nd June 1942, to the south-west of the main gun battery area. It is uncertain when the two auxiliary emplacements were installed, however, it is plausible to suggest they were installed around the same time as the radar mat in 1942 as part of an upgrade to defences. By 19th October 1942 the battery was manned by the Home Guard, before being replaced by the 156th Royal Logistic Corps (mixed), 535 Battery by 9th December 1943 (Dobinson 1996b, 395). Aerial photography from August 1944 (Fig. 21) shows the battery still in used and armed. After the war had ended the battery was decommissioned and removed, with the majority of Wanstead Flats restored to its pre-war state by 1947.

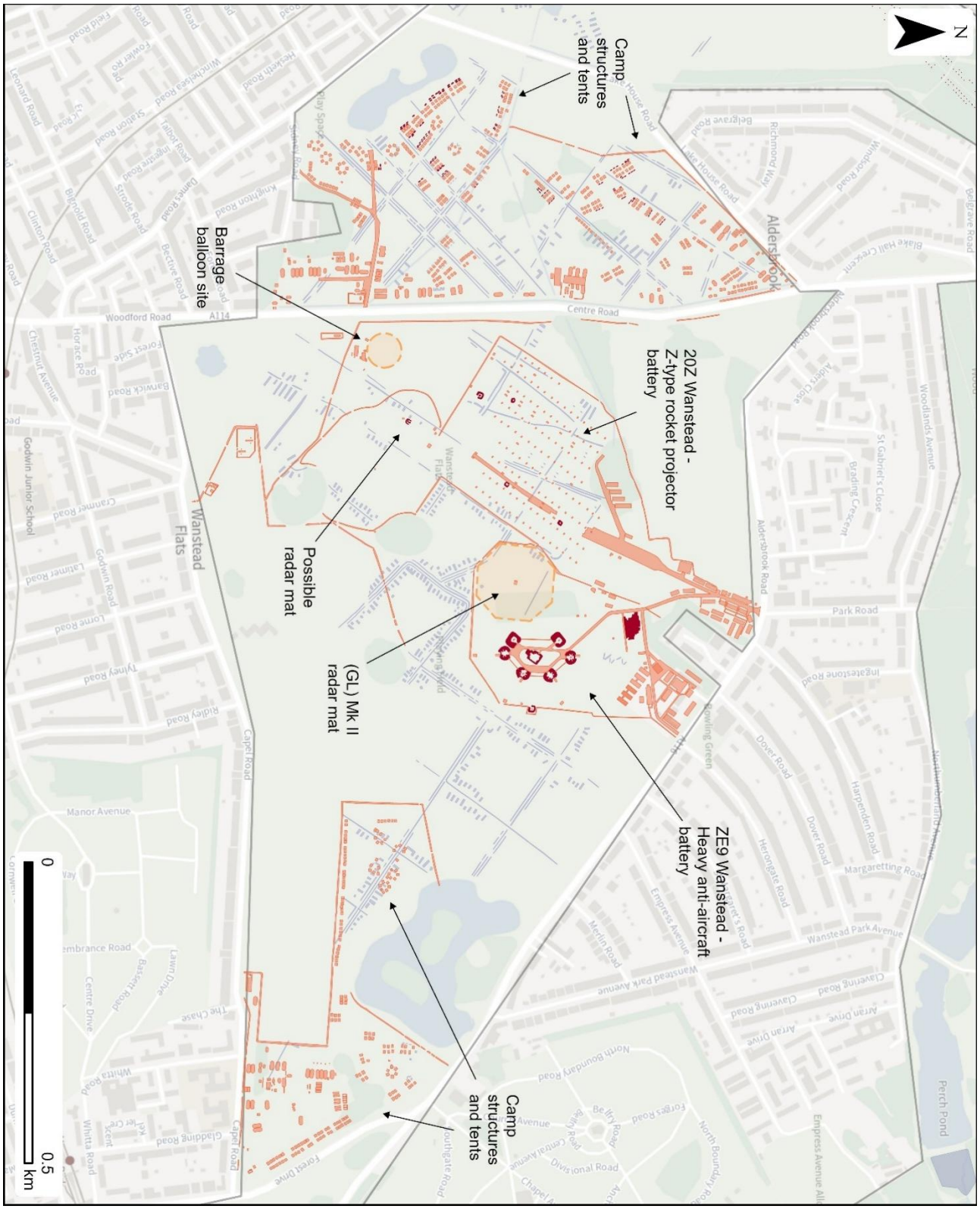


Figure 26 Extract of mapping created from 1940s RAF aerial photography showing the locations of Second World War anti-aircraft defences and camps on Wanstead Flats. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026.

Also visible on 1944 photography immediately to the west of the heavy anti-aircraft battery and radar receiver was a large Z-type rocket projector battery (designated as ‘20Z Wanstead’) (GLHER 124952). The date of construction is uncertain. However, early war anti-glider trenches are visible as earthworks underlying the battery indicate a slightly later construction, possibly around the same time as the 1942 upgrades to the heavy anti-aircraft battery to the east. The site was accessed via a concrete-surfaced road from Aldersbrook Road, using the same access as the heavy anti-aircraft battery. At least 65 fixed rocket projectors, interspersed with ammunition shelters and blast walls, were identified. The projectors were laid out in a gridded pattern, spaced approximately 25m apart along a north-east to south-west axis, with a command post positioned on the south-west side overlooking the battery. Along the southern perimeter of the battery are several smaller structures that may have served as plotting rooms. Further south still were two additional small structures that may have been related to radar operations, as well as a large barrage balloon site which can be seen in the air on 1944 vertical photography (Fig. 27). On 9th December 1943 the battery is recorded as having been manned by the 6th (Mixed) Z Royal Artillery Regiment of 37 Brigade, 197 Battery (Dobinson 1996b, 409).

Figure 27 Extract of US/7GR/LOCPP32 FP 1112 20-MAR-1944 showing a hoisted barrage balloon to the south of Z-type rocket projector 20Z Wanstead. North is to the top of the image. [Historic England Archive (USAF Photography)]

Chingford Plain

A second heavy anti-aircraft battery was identified on Chingford Plain, on the site of the Royal Epping Forest Golf Club (EHER 119988). The battery (designated as 'ZE18 Chingford') was identified and mapped from 1941 and 1946 vertical aerial photographs (Fig. 29). Although the structures are no longer extant, several trackways and building platforms are visible as partially levelled earthworks on 2023 lidar data. Located to the north of Forest View (road), the latest iteration of the battery comprised an eight-gun position set out around a central command post. To the west lay a complex of military buildings, likely serving as accommodation blocks for military personnel as well as storage for the anti-aircraft guns. Both the battery and the structures were situated within an enclosed rectangular area formed by pre-existing field boundary ditches, subsequently repurposed as drains by the Royal Epping Forest Golf. The site was further defended by a line of barbed wire which ran around the inside of the field boundary ditches.

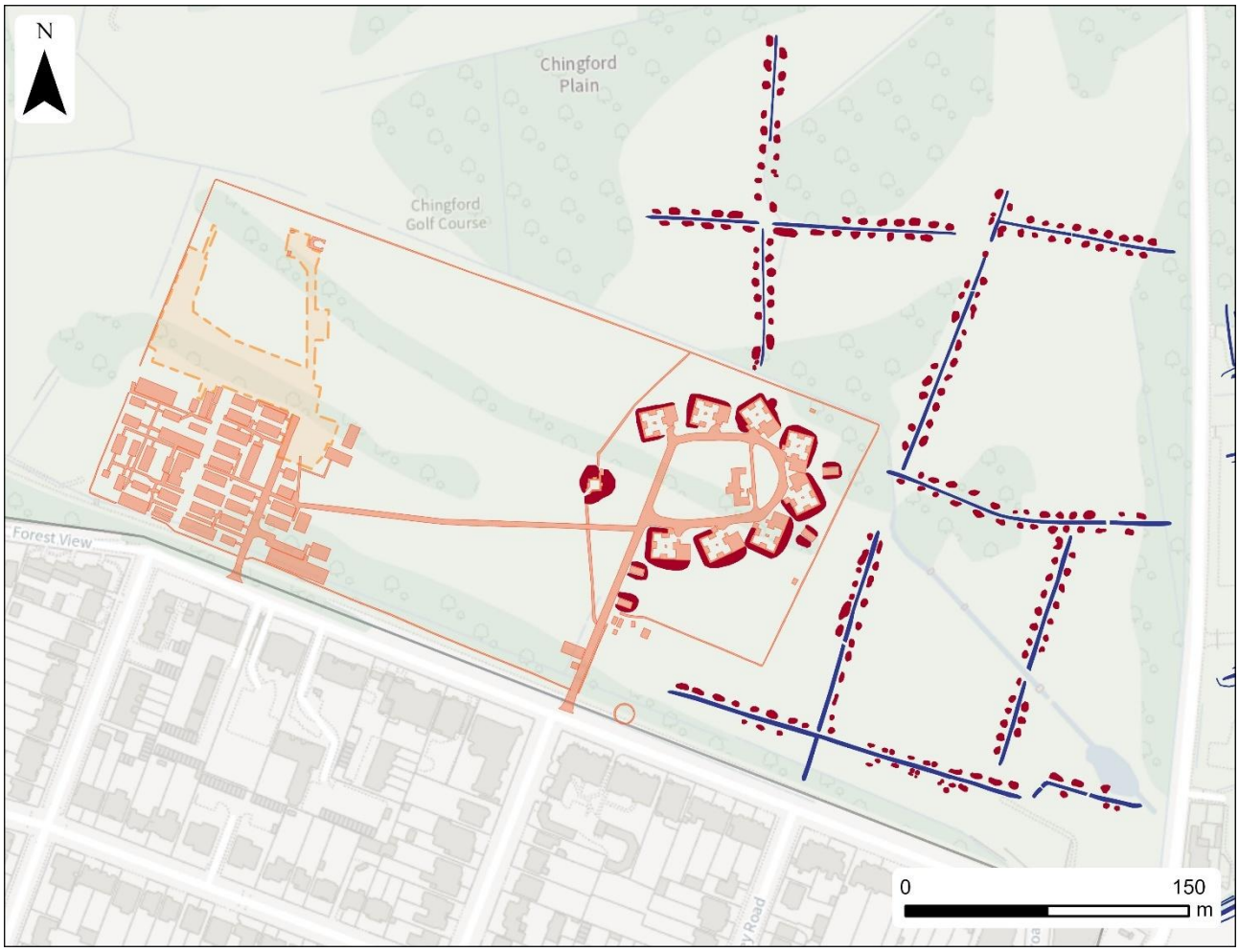


Figure 28 Extract of mapping created from 1940s RAF aerial photography showing the heavy anti-aircraft battery known as ZE18 Chingford located of Chingford Plain. [Archaeological mapping: © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900]

Like the battery at Wanstead, the Chingford Plain site was first documented 22nd January 1940 and underwent at least two phases of development (Dobinson 1996b, 394). The first phase visible on 1941 vertical aerial photography (Fig. 29) comprised a standard four-gun ‘arc’ layout surrounding a central command post. The available 1941 photography for this area is of a relatively poor quality, making it difficult to discern the precise form of the gun emplacements. However, it is plausible to suggest based on what was observed in the imagery that the four visible emplacements are similar in nature to the ‘March 1938 pattern’ variety that have been recorded on Wanstead Flats, likely armed with 3.7- or 4.5-inch guns. The battery is recorded as having been manned on 31st January 1940 by 51st Regiment, 151 Battery, and then manned by ‘caretaker only’ by 21st May 1940. By 19th October 1942 the battery was manned by the Home Guard (Dobinson 1996b, 395).

Figure 29 Extracts of RAF/S316 V 0003 10-JUL-1941 (left) and RAF/3G/TUD/UK/195 Vp1 5048 10-MAY-1946 (right) showing the development of heavy anti-aircraft battery ZE18 Chingford. North is to the top of the images. [Historic England Archive (RAF Photography)]

Between 1941 and 1946 the entire gun battery was completely remodelled, with the four original emplacements replaced by eight square versions laid out in a U-shaped configuration around a central command post. Throughout the war the battery was documented as being ‘unarmed’ (Dobinson 1996b, 394) which may indicate that the site was not equipped with static guns but instead armed with mobile guns deployed from storage when needed. Nearby are features interpreted as magazines and other ancillary buildings, likely used in the storage of the weapons and ammunition for this purpose. Also visible on 1946 photography is a line of barbed wire that clearly separates the anti-aircraft battery from the complex of military structures to the south-west. The barbed wire was likely installed towards the end of the war, when the military buildings in the south-west corner of the defended area are thought to have been repurposed to house prisoners of

war (see ‘D-Day and Prisoners of War’ on page 63). The gun emplacements were accessed via a concrete-surfaced road from Forest View (road) and connected to the prisoner of war camp area via a less formal track. The site was retained after the war as a Nucleus Force site, with guns stored off-site at a nearby ordnance depot. The site was decommissioned and removed between 1951 and 1953 during works to reinstate the Royal Epping Forest Golf Club (Ramsey and Fowkes 1986, 350).

D-Day and Prisoners of War

As well as its strategic importance in the defence of London, the forest offered valuable space for accommodating allied soldiers and foreign prisoners of war during and immediately after the war. Within the forest there is evidence for three camp areas located across Wanstead Flats and Chingford Plain, elements of which were observed on aerial photographs.

Wanstead Flats

Wanstead Flats is well known to have accommodated Allied troops in the lead up to D-Day, as well as prisoners of war. In 1940 a temporary camp is thought to have been established on the flats to briefly accommodate Italian prisoners captured during the 1940 to 1941 North Africa campaign. Local residents recalled travelling to see the prisoners as a form of entertainment, with others describing their cheerful demeanour and participation in everyday activities (Wanstead Flats Working Group 2013, 1-2). Although there are clear accounts for the presence of Italian prisoners, the exact location of the camp is uncertain. Some reports place it to the north of Manor Park Cemetery, across Capel Road (pers. comm. Gorman and Williams 2025). The earliest available wartime aerial photographs for this area were taken in 1943 (Fig. 27) which unfortunately show no evidence of camp structures at this time. This suggests that the camp was either removed by 1943 or that it was located at a different site, outside the coverage of this sortie.

Later military activity was observed on aerial photographs taken in August 1944 (Fig. 21). Photographs clearly show a large encampment occupying the triangular parcel of land between Lake House Road, Centre Road, and Dames Road, immediately west of the anti-aircraft batteries previously discussed (GLHER 231863) (see ‘Anti-aircraft batteries’ on page 57). Additional temporary structures and tents are also present in the eastern extremity of the Flats, around Alexandra Lake (GLHER 231889). The encampment comprised around 500 canvas tents arranged in rows and a variety of other larger hutment-type structures, all enclosed by perimeters of barbed wire entanglement. In places, the tents appear to have been set out along the pre-existing anti-glider trenches that divided the area into rectangular plots, possibly re-purposed as a convenient set of routeways across the camp. Access was likely afforded primarily from Centre Road, immediately to the west of the present-day Centre Road carpark, and was served by a series of concrete trackways.

The scale and layout of the camp would suggest that these structures related to the mustering of Allied forces supporting the Normandy campaign from June 1944 onwards. This is corroborated by numerous accounts recalling the gathering and movement of large amounts of allied troops and weapons around the area (Walker 2024). Wanstead Flats is also known to have been the site of a satellite prisoner of war camp affiliated with Camp 30 at Carpenter's Road, Stratford. Although both functions are well attested, their precise spatial relationship remains ambiguous when examining the available wartime aerial photography.

Oral accounts from local residents suggest the location of a prisoner of war camp immediately south of the junction between Lake House Road and Centre Road (Walker 2014a). Residents recall German prisoners celebrating the destruction of nearby houses following a V-Rocket strike. An area of bomb damage, visible on August 1944 photographs, to the north-west of the proposed camp may represent the site of this event (Fig. 30). A small area of large tents and other hutment-type structure which could possibly relate to the site of this prisoner of war camp are visible on photographs. These structures are neatly enclosed by existing anti-glider trenches, which could have been utilised as a perimeter boundary, and differ from the surrounding smaller, more temporary, tents which make up much of the encampment to the south. Nevertheless, the absence of definitive documentary evidence relating to the location and extent of the camp necessitates caution in adopting this interpretation.

Figure 30 Extract of RAF/106G/LA/29 RP 3309 7-AUG-1944 showing the possible location of a prisoner of war camp on Wanstead Flats. North is to the top of the image. [Historic England Archive (RAF Photography)]

By April 1946 the main camp between Lake House Road, Centre Road and Dames Road had been decommissioned and dismantled and the land reinstated for public use (Fig.31). By August 1946 there are thought to have been just 10 prisoners left in the area, but where they were accommodated is uncertain (Wanstead Flats Working Group 2013, 9).

Figure 31 Extract of RAF/3G/TUD/UK/122 V 5253 3-APR-1946 showing the majority of camp structures removed from Wanstead Flats. North is to the top of the image. [Historic England Archive (RAF Photography)]

Leyton Flats, Snaresbrook

Leyton Flats was also the site of a large encampment visible on August 1944 photography (GLHER 232733) (Fig. 32). Although documentary records for the Leyton Flats site are limited, its proximity to the Wanstead Flats camp would suggest it too formed part of the D-Day activities. The camp occupied the triangular parcel of land to the south of Snaresbrook Crown Court, between Whipps Cross Road and Hollybush Hill (road). The camp comprised around 500 smaller canvas tents and a large complex of around 160 larger tents and hutment-type concentrated mainly along the eastern edge of the site and around the primary entrance on Hollybush Hill (road). These structures were likely used for accommodation, weapon storage and administrative and logistical functions. The entire encampment was enclosed by a perimeter of barbed wire entanglement.

By May 1946 the camp was almost entirely dismantled, however, unlike Wanstead Flats, the area was not immediately returned to public use. 1946 aerial photography (Fig. 32) show many of larger more semi-permanent huts still present at the site which were in the process of being decommissioned. Aerial photography shows all remaining huts were removed by June 1947 (at the latest).

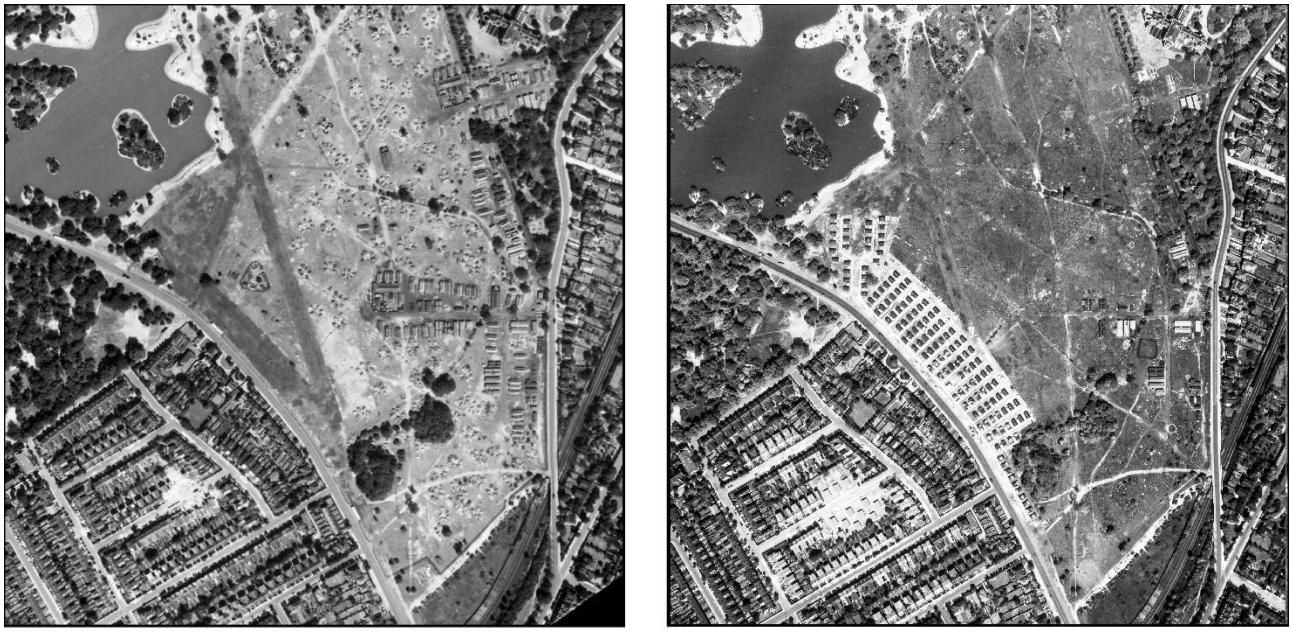


Figure 32 Extracts of RAF/106G/LA/29 RS 4151 7-AUG-1944 (left) and RAF/3G/TUD/UK/194 V 5219 10-MAY-1946 (right) showing the removal of camp structures and erection of Nissen Huts at Leyton Flats. North is to the top of the images. [Historic England Archive (RAF Photography)]

Chingford

Towards the end of the war the Chingford heavy anti-aircraft battery ('ZE18 Chingford') is also reported to have hosted a modest prisoner of war camp (GLHER 119988). As mentioned previously (see 'D-Day and Prisoners of War' on page 63), the anti-aircraft battery was established in January 1940. The first available aerial photographs of the site taken July 1941 (Fig. 29), show a large compound of huts and other semi-permanent structures. These buildings likely served the anti-aircraft battery as accommodation and gun storage throughout the war years. Later in the war it is said that these structures were converted into a prisoner of war camp (Ramsey and Fowkes 1986, 350), and between 1941 and 1946 (Fig. 29) there was a visible line of barbed wire separating these structures from the gun emplacements. The 1946 photograph also shows the camp and gun emplacements served by separate entrances from Forest View (road), likely formalised during the conversion.

Whilst an exact date for this conversion is uncertain, it is likely to have occurred after the D-Day landings in June 1944 when Luftwaffe bombing raids ceased and the need for a fully manned anti-aircraft battery diminished. The Normandy campaign also resulted in a rapid influx of prisoners of war requiring accommodation. It remains uncertain whether the

entire complex was repurposed to accommodate prisoners; however, ground-based photographs show that a hut on the north-eastern side of the complex was converted into a church, likely by the prisoners themselves. The structures remained standing into the early 1950s, finally decommissioned and removed between 1951 and 1953 during work to reinstate the golf course (Ramsey and Fowkes 1986, 350).

Project outcomes and recommendations for future research

The Aerial Investigation and Mapping of Epping Forest project has established a robust foundation for future research into the forest's historical and archaeological development. It has also generated a comprehensive baseline dataset that will facilitate the long-term monitoring, analysis, and management of the area's heritage assets. Several avenues for further specialised research have emerged as a direct outcome of this work:

- Specialist work carried out by Historic England recording the hillforts of Amesbury Banks and Loughton Camp. Level 3 analytical earthwork surveys will be carried out by the Landscape Archaeology Team to further understand the upstanding archaeological remains. This will include further research into both sites to better understand their construction, usage, and wider later prehistoric landscape context. Research will also look at their more recent history, specifically regarding the impact of previous clay extraction and forestry management on the sites.

- Monument condition monitoring work led by the City of London Corporation's Epping Forest Environmental Team. This work involves coordinating local heritage groups and volunteers to carry out condition monitoring of heritage features recorded by the aerial survey. This will greatly improve the understanding of the heritage assets within the forest and assist in future management decisions.

- The 'Epping Forest: A Landscape Revealed' documentary research project, led by the City of London Corporation's Epping Forest Environmental Team. This work compliments research carried out as part of the aerial survey and will support the in-field condition monitoring by providing further historical context to archaeological features across the forest.

Further recommendations beyond the above-mentioned work:

Hillforts

- Investigate the newly identified prehistoric enclosures, integrating survey, environmental analysis, and excavation to better determine their date, function, and relationship to the hillforts.

Parks and Gardens

- Undertake focused documentary research on Wanstead Park to clarify the historical development of the park.

- Carry out a landscape survey of chevron-shaped earthworks in Wanstead Park, assessing their construction, purpose, and relationship to the formal park layout.
- Investigate the three pond features at The Warren through documentary and archaeological research to establish their origin, intended function, and development over time.

Clay and Brick Industry

- Pursue detailed research into the forest's clay extraction and brickmaking industries, focusing on the chronology, technological practices, and landscape impacts associated with these activities.

Second World War

- Undertake targeted documentary research to refine the understanding of the location, extent, and chronology of the prisoner of war camps and D-Day embarkation or mustering camps. The period between June and August 1944 should be a particular focus of research due to the lack of currently available aerial photography for this critical period in the wartime history of the forest.

General

- Implement structured condition assessments for all recorded features to support long-term conservation planning and prioritise areas requiring intervention or further monitoring.
- Explore additional methods to detect underrepresented or missing archaeological periods (for example the Roman period).
- Pursue detailed research and analysis on the pond system at Woodredon Farm.

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Appendix 1: Methodology

Project Study Area

The project study area is 32 sq. km, encompassing all CoLC administered Epping Forest and buffer lands (Fig. 33) Of that:

- 23 sq. km of the project area was situated within the county of Essex.
- 9 sq. km of the project area was situated within the Greater London.

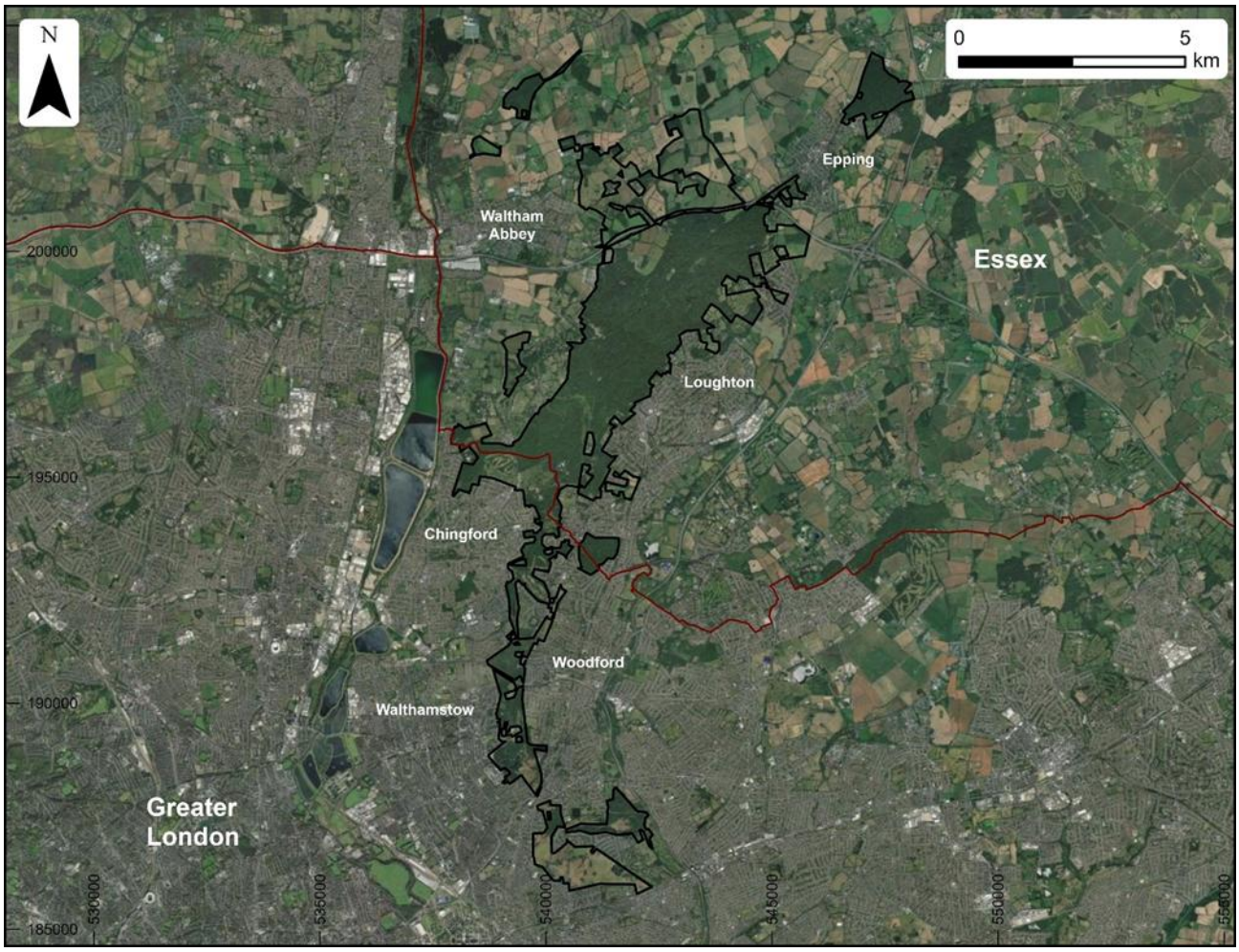


Figure 33 Project study area. Project area is shown in black. County boundaries shown in red. [Includes OS data © Crown copyright and database right 2026 (Open Government Licence); data © Ordnance Survey Ireland; data © Earthstar Geographics; data]

Sources

High resolution 0.25m resolution lidar commissioned by CoLC from BlueSky International Ltd. in 2023 was the primary aerial source used for this project. Lidar was processed and clipped by Air Photo Services. This data was commissioned to assist with management of the forest due to the poor quality of the existing topographic data.

Environment Agency DTM and DSM lidar datasets at 1m resolution were downloaded from the Defra Survey Data portal (https://environment.data.gov.uk/survey). This data was used to contextualise the 0.25m resolution data by filling gaps between disarticulated parts of the project area. EA lidar data used were captured in 2022.

Assessment of all available aerial photography for the project area was beyond the project scope. Analysis of aerial photographs was restricted to unwooded areas of the forest to identify cropmarks and earthworks and structures that are no longer extant and visible on lidar data. Three principal unwooded areas were selected for analysis:

- Wanstead Flats
- West Snaresbrook
- West Sewardstonebury

Archival cover searches were restricted to vertical aerial photographs taken between 1941-1949 to identify and record Second World War military structures within the forest. The archive loan included both prints and born-digital files, provided in three cover searches (Historic England Archive Loan Numbers: 146880, 146900 and 146902). These loans are summarised below.

	No. of prints	Date range
Vertical images (Military)	168	1941–1949

Ortho photography covering the project area was supplied through the Aerial Photography for Great Britain (APGB) (under agreement with Bluesky International Ltd.) via Web Map Services (WMS). That imagery includes the following:

25cm resolution layers:

4th September 1999, 2nd July 2002, 12th July 2003, 13th July 2003, 27th June 2010, 12th August 2016, 2nd August 2018, 22nd August 2019, 16th June 2021, 17th July 2021, 21st April 2022.

12.5cm resolution layers:

30th May 2001, 29th January 2006, 6th November 2006, 15th April 2008, 23rd August 2009, 23rd April 2010, 28th April 2013, 24th August 2014, 12th August 2016, 2nd August 2018, 29th June 2019, 16th June 2021, 17th July 2021, 21st April 2022

Google Earth Pro and a Microsoft Bing.com/Maps layer from was also consulted.

At present there is no access to the CUCAP archive (see above) so those photographs could not be consulted. A small number of scanned images were viewed using the CUCAP online map viewer (https://www.cambridgeairphotos.com/map/).

In addition to the aerial photographs and lidar, other sources of information were consulted to inform interpretation and understanding of sites. They included:

- Historic Ordnance Survey maps;
- Greater London and Essex HER data including spatial data and textual monument records and other GIS layers (e.g., digitised Tithe Award maps);
- Historic England Research Records (Warden);
- The National Heritage List for England;
- Tithe maps (Genealogist website accessed through the Historic England Library);
- British Geological Survey (BGS) data;
- UK Soil Observatory (UKSO) data;
- Results from previous archaeological investigations (reports, survey data, journal articles, monographs, regional Research Framework).

Mapping and Investigation

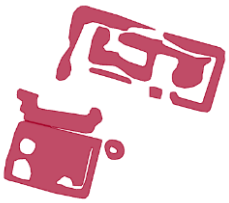
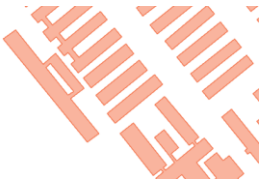
All archaeological features visible on aerial photographs and/or lidar as cropmarks, soilmarks, earthworks or structures were mapped and recorded. These included features that were visible as extant earthworks or structures on historic photographs, but which have since been levelled or demolished. Features depicted on historic Ordnance Survey mapping were not mapped. The chronological scope ranged from the Neolithic to the 20th century, although the earliest features identified in the forest from the aerial sources date to the Iron Age.

All available aerial photographs were viewed under magnification and in stereo where possible, using a handheld stereoscope. Digital imagery was viewed on-screen in a GIS environment. Selected archive aerial photographs were rectified and georeferenced using Aerial 5.36 software and exported as GeoTiff images. The rectification process involves matching features on 1:2,500 Ordnance Survey digital mapping and/or APGB orthophotographs (the control) with the same features on the scanned aerial photograph to remove all height and tilt distortion. Mapped features can be within ± 1m of their true

ground position but the accuracy will decrease in areas with poor control (Evans 2019). An APGB 5m digital terrain model was incorporated into the calculation to improve accuracy by compensating for undulating terrain.

The lidar and digital APGB orthomosaics were already georeferenced and so could be imported directly into the mapping software. Lidar data were processed using the Relief Visualization Toolbox plugin for ArcGIS Pro to create project embedded 2D GeoTIFF images. In some instances, the standalone Relief Visualization Toolbox 2.2.1 was used to create 2D GeoTIFFs where custom parameters were applied to provide additional detail for interpretation. All georeferenced imagery was loaded into ArcGIS Pro 3.2.0 where archaeological features were digitised in accordance with Historic England's Standards for Aerial Investigation and Mapping Projects and the *Aerial Investigation and Mapping Technical Specification*. That includes features with a potential date range from the Neolithic to 20th-century military remains. Features were recorded according to morphology using Historic England mapping conventions, using ESRI ArcPro 3.2.0 GIS software. These features were mapped on different layers based on the original form of the feature (bank, ditch etc) irrespective of whether these were seen as earthworks or cropmarks and textual attribute data was captured for every feature (see tables below).

Monument records were created for each feature and inputted via remote entry to either the Essex or Greater London HER. Sites with existing records were updated to included additional information and observations derived from this survey. Greater London records can be accessed via the GLHER website (https://glher.historicengland.org.uk/) and Essex records via Heritage Gateway (https://www.heritagegateway.org.uk/gateway/).

LAYER NAME	DESCRIPTION	TYPE
BANK	Polygon for features such as banks, platforms, mounds and spoil heaps	Polygon 
DITCH	Polygon for cut features such as ditches, hollows, pits or hollow ways	Polygon 
EXTENT_OF_FEATURE	Polygon outlining a large area feature or group of features such as industrial complexes or boundaries of military complexes.	Polygon 
RIDGE_AND_FURROW_AREA RIDGE_AND_FURROW_ ALIGNMENT	Polygon depicting the outline of a ridge and furrow plot Polyline depicting the direction and form of a block of ridge and furrow	Polygon and Polyline 
STRUCTURE	Polygon for built features including stone, concrete, metal and wood	Polygon 

Historic England AI&M mapping conventions.

Attribute	Description	Sample data
HEUID	Historic England Research Record Unique Identifier (UID)	79060 (where possible)
HER_No	HER uid for those features concorded with existing HER records	MKE12345
HERPREF	HER PrefRef for those features concorded with existing HER records	TR 36 SW 123
LAYER	Original feature form	DITCH
PERIOD	Date of feature (EH Thesaurus). Single or dual indexed terms	MEDIEVAL
NARROW_TYPE	Monument Type (EH Thesaurus). Specific monument type for individual features	FISHPOND
BROAD_TYPE	Monument Type (EH Thesaurus). Broader monument type to enable grouping of individual features	CISTERCIAN MONASTERY
EVIDENCE_1	Form of remains (EH Thesaurus) as seen on PHOTO_1	EARTHWORK
SOURCE_1	Source feature was mapped from (air photograph or lidar)	NMR RAF/3G/TUD/UK/3 PART I 5097 14-DEC-1945
EVIDENCE_2	Form of remains (EH Thesaurus) as seen on PHOTO_2	LEVELLED EARTHWORK
SOURCE_2	Latest available source (air photograph or lidar) to give indication of current state of preservation (not applicable for cropmark sites)	NMR 28225/36 19-OCT-2011
Heritage_Gateway	URL to full monument record on Heritage Gateway	Heritage Gateway - Results

Historic England AI&M attribute data fields applied to the Epping Forest project.

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